Line Oriented Flight Training Guide

LOFT Facilitator Course For General Aviation

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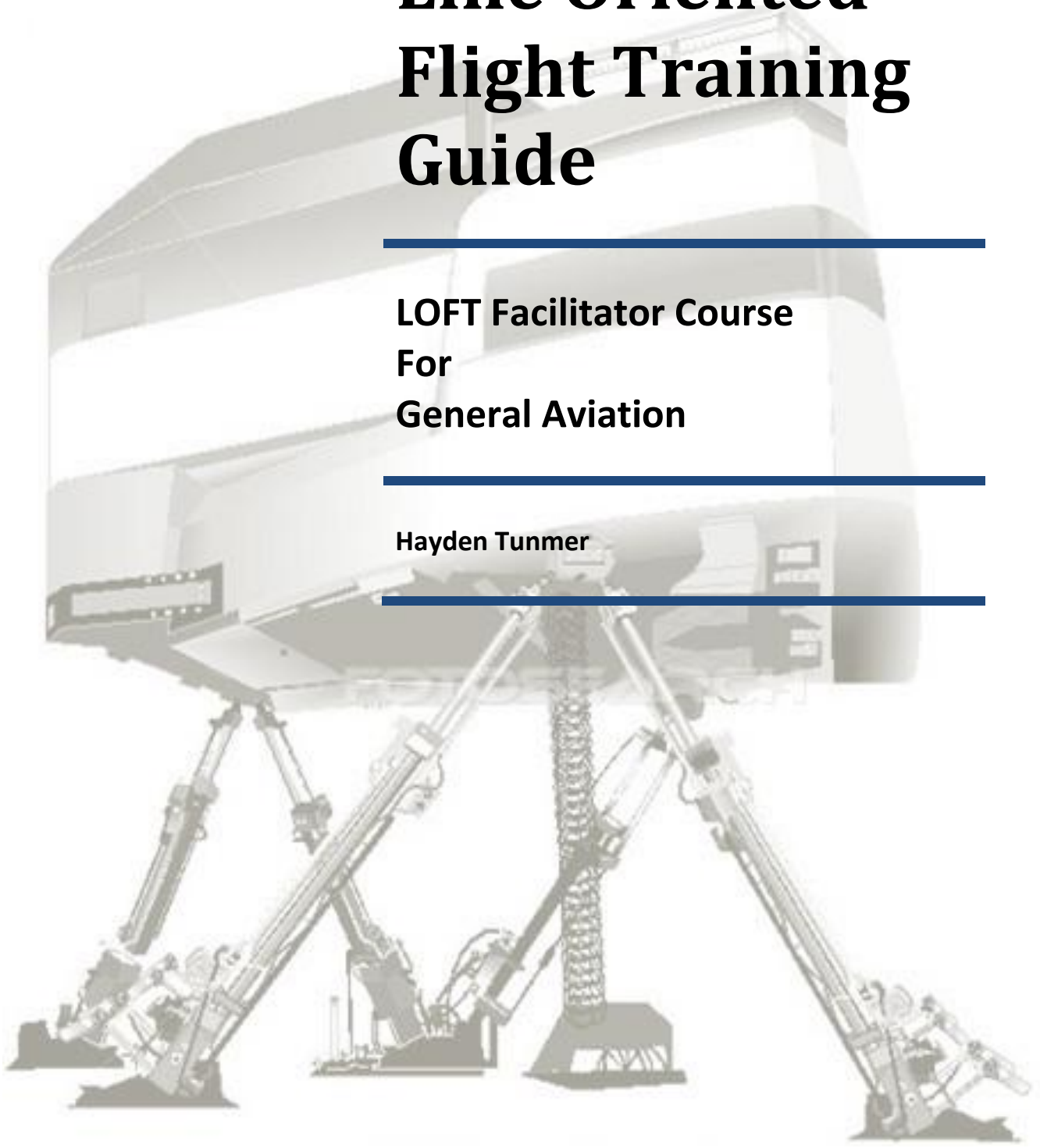

1 RECORD OF REVISIONS

Revision Letter	Revision Date	Revised by	Date Revised	Signature
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2 LIST OF EFFECTIVE PAGES

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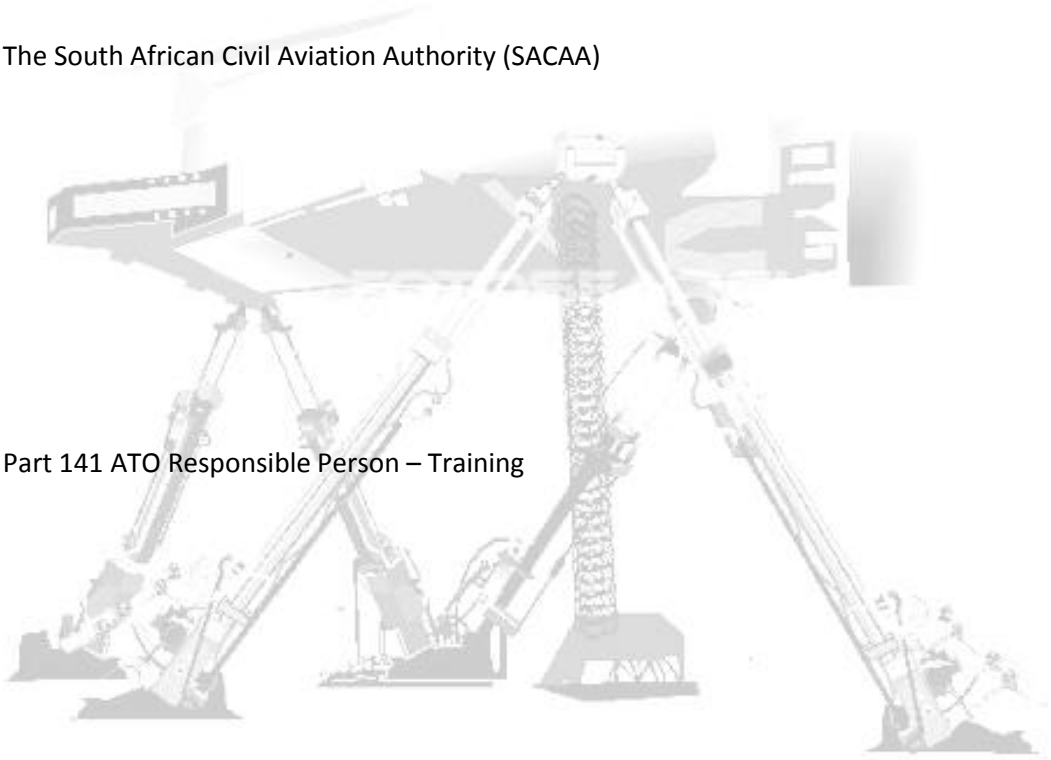
3 APPROVAL PAGE

The information contained in this document has been reviewed and is determined to be compliant with all the requirements.

This Manual has been approved by:

The South African Civil Aviation Authority (SACAA)



Part 141 ATO Responsible Person – Training

Part 141 ATO Quality Assurance Department

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5 DEFINITIONS

5.1 Advanced Qualification Programme (AQP)

AQP regulatory guidance allow Part 141 ATO's that are subject to the training and evaluation requirements of Part 121 and Part 135 to develop innovative training and qualification programs that incorporate the most recent advances in training methods and techniques. AQP emphasizes crew-oriented training and evaluation. These training and evaluation applications are now grouped under the general term of line operational simulations (LOS), including line oriented flight training (LOFT), special purpose operational training (SPOT), and line operational evaluation (LOE). Due to the role of CRM issues in fatal accidents, it has become evident that training curriculums should develop and evaluate both technical and CRM skills. In AQP, a structured LOS design process is employed to specify and integrate the required CRM and technical skills into LOS scenarios.

5.2 Captain

The pilot designated by an operator to be in command of the aircraft.

5.3 Check Captain

The pilot designated by an operator, and who is suitably qualified (refer to Line Familiar), to carry out line checks of flight crews in normal line flight operations

5.4 Evaluator

A qualified SACAA Designated Flight Examiner (DFE) that carries out an assessment on a candidate in a LOFT scenario. The evaluator may be a DFE I, DFE II or DFE III as required by the operator.

5.5 First Officer

The pilot designated by an operator to be second in command of the aircraft.

5.6 Instructor

A pilot that has been licensed and rated according to the SACAA regulations stipulated in FCL 61. Facilitators referred to in this document are assumed to be qualified as Grade II or Grade I Flight Instructors.

5.7 Line Familiar

Describes a flight crewmember or facilitator who is familiar with an operator's line operations. This person is either line qualified or otherwise qualified by participation in an approved line observation program. (An acceptable line observation program would include observation from the cockpit jump seat of a line crew on at least two operational flight segments. This should be accomplished twice annually, and the line observation program should be included as a part of the approved training program.)

5.8 Line Operational Evaluation (LOE)

An evaluation of crewmembers and crews in a flight training device or flight simulator during real-time Line Operational Simulations. LOE is primarily designed in accordance with an approved design methodology for crewmember evaluation under an AQP.

5.9 Line-Oriented Flight Training (LOFT)

Refers to the use of a training simulator and a highly structured script or scenario to simulate the total line operational environment for the purposes of training flight crews. Such training can include initial training, transition training, upgrade training, recurrent training, and special training, e.g., route or airport qualification training. The appropriate term should appear as a prefix with LOFT, e.g., "Recurrent LOFT," to reflect the specific application.

5.10 Line Operations Simulation (LOS)

LOS is synonymous with the term "full-mission simulation," but LOS avoids the other misleading and irrelevant connotations of "mission." LOFT, then, is the use of LOS for *training* purposes. Any other use of LOS should be expressly stated. For example, LOS can be used to aid in the development and evaluation of operating procedures and new equipment, proficiency checking, pilot selection for new-hire programs, or cockpit human factors research.

5.11 Line Qualified

Describes a flight crewmember or facilitator who is current and qualified to conduct actual flight operations in an assigned aircraft and duty position.

5.12 LOS Facilitator

You, the facilitator, who administers the LOFT or SPOT training session. For an AQP or LOE, a Designated Flight Examiner who administers the evaluation session.

5.13 Qualification LOFT

An approved flight simulator course of LOFT to facilitate transition from training using flight simulation to operational flying. Qualification LOFT meets the requirements of CARS Part 121 & CARS Part 135.

5.14 Recurrent LOFT

An approved flight simulator course of LOFT which may be used to meet recurrent flight training requirements and to substitute for alternate proficiency checks. Recurrent LOFT meets the requirements of CARS Part 121.03.

5.15 SOP – Standard Operating Procedures

Standard Operating Procedures are procedures developed by an aircraft manufacturer or by an operator for the guidance of flight crews to operate an aircraft. The SOP's would cover all procedures required from the pre-flight actions to shutdown of the aircraft in a day to day operation.

5.16 Special Purpose Operational Training (SPOT)

An approved course of operationally oriented flight training, conducted in a flight simulator or flight training device, which may be used to learn, practice, and accomplish specific training objectives; e.g., training in a variant of an aircraft or special aircraft equipment.

5.17 SRM

Single Pilot resource management (SRM) is CRM pertaining specifically to pilots operating single pilot aircraft.

5.18 Task Familiar

Describes a flight crewmember that 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.

6 GENERAL

6.1 Objectives

This Line Oriented Flight Training guide is intended to provide you with the required information to qualify you to design, facilitate and assess a LOFT training session successfully.

This facilitation course is intended to prepare you, the facilitator, for the task of conducting the LOFT element of recurrency training, CRM training, initial type ratings and other elements of flight training. This training may be conducted on a specific aircraft, an FNPT II trainer or Flight Training Device. You are required to be type instructor rated or instructor rated on the group of types being represented by the FNPT or FSTD***. It is also assumed that you are CRM qualified and current.*** This training guide includes background reading as well as the training material required to qualify you as a facilitator.

In order for a Grade II or SACAA approved Flight Instructor to qualify as a facilitator for Part 135 and Part 121 recurrency training programs, such instructor must first attend a LOFT facilitator's course. Such course must be conducted by an ATO that has been approved for such recurrency training programs.

6.2 LOFT Facilitator Course Requirements

The Loft Facilitator course will consist of the following elements:

1. Ground school
2. One full LOFT course supervised by a qualified LOFT facilitator.
3. One solo course terminating in a check flight on the respective students / candidates. (This check may be the instrument rating portion or proficiency check of the recurrency training)

The ground school will consist of the following minimum elements:

1. An introduction to LOFT
2. LOFT / LOE / SPOT differences
3. Guidelines for the design & development of LOFT scenarios
4. Guidelines for the training and qualification of LOFT Facilitators
5. LOFT briefing / de-briefing techniques
6. CRM elements for LOFT
7. Risk management (model)
8. Simulation elements: Technical, Realism, Advantages and Limitations

6.3 Introduction to LOFT

The use of flight training devices and flight simulators has become increasingly important in training flight crewmembers. As the level of sophistication in simulators increased, operators have come to rely on simulators for part or all of their flight training programs. 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 manoeuvre-based training alone. LOFT training occurs in a simulator with a complete crew using representative flight segments, which contain normal, abnormal, and emergency procedures that may be expected in line operations. In short, LOFT means realistic, "real-time", full mission training.

The value of LOFT is such that several country's aviation administration's permit its use instead of the usual annual flight tests, provided that certain specified conditions are met. An example of these conditions would be that the compulsory aspects in a flight test would need to be included in the design of the LOFT session i.e. an instrument approach to minima with a go-around etc.

LOFT can have a significant impact on aviation safety through improved training and validation of operational procedures. LOFT presents to aircrews scenarios of a typical daily operation in their operator or general aviation operation with reasonable and realistic difficulties and emergencies introduced to provide training and evaluation of proper flight deck management techniques and CRM principles. It has become evident that training curriculums must develop pilot proficiency in both technical and CRM skills. CRM however is a stand-alone concept and LOFT provides an environment to practice and cement CRM skills and principles.

LOFT scenarios may be developed from many sources, but accident reports provide a realistic and appropriate starting point. A properly conducted LOFT programme can provide great insight into the internal workings of an operator's training programme for the following reasons:

- If similar mistakes seem to be recurring among pilots, it may indicate a potentially serious problem as a result of incorrect procedures, conflicting or incorrect manuals, or other operational aspects. An example would be if pilots keep forgetting to select flaps for takeoff – it would be possible to train and demonstrate the effects this would have to the safety of the aircraft in a simulator.
- It may reveal areas in aircrew training programmes which are weak or which need emphasis. To expand on this for example, automation is heavily relied upon in advanced aircraft. This may lead to a decrease in performance of the actual handling skills of the pilot. Emphasis would then be placed on handling skills as part of a LOFT programme by introducing automation failures.
- It may reveal problems with instrument locations, information being presented to pilots, or other difficulties with the physical layout of a particular flight deck. This would influence a change in ergonomics/design of cockpits for future aircraft purchases.
- Operators can use it to test and verify flight deck operational procedures. Once a new procedure is introduced, it can be tested in a simulated line flight to ensure it actually works, before it is implemented in an aircraft.

LOFT should not be used as a method of checking the performance of individuals. Instead, it is a validation of training programmes and operational procedures. An individual pilot or crew needing additional training after a LOFT session should be afforded that opportunity immediately with no stigma or recrimination.

A LOFT session should not be interrupted except in extreme and unusual circumstances. Repositioning the simulator and repeating problems is inconsistent with the principles of LOFT. Part of the benefit of LOFT is derived from an individual or crew being able to quickly appreciate the results, either positive or negative, of operational decisions. After completion of such a session, a thorough debriefing should be made of all aspects. This may be accomplished by:

- An initial self-debriefing by the crew.
- Followed by the LOFT facilitator's debriefing.

This critique should include the use of such aids as voice and video recorders, as well as written notes.

6.4 An Introduction to LOFT Methodologies

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 operators 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.

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.

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

7 BASIC ELEMENTS OF LOFT TRAINING

7.1 General Overview of LOFT

The following points reflect many of the characteristics of LOFT that distinguish it from other forms of simulator training:

The features that characterize LOFT are as follows:

- LOFT is the practical application of day to day line operations included into a training programme which is carried out in an approved simulator.

- LOFT involves a complete crew, each member of which operates as an individual and as a member of a team just as he does during line operations.

- LOFT involves simulated real-world incidents unfolding in real time. Similarly, the consequences of crew decisions and actions during a LOFT scenario will accrue and impact the remainder of the trip in a realistic manner.

- LOFT is casebook training. Some problems have no single, acceptable solution; handling them is a matter of judgment. LOFT is training in ***judgment*** and ***decision-making***.

- LOFT requires effective interaction with, and utilization of, all available resources; hardware, software, and "liveware," or the human resources. A LOFT scenario requires the exercise of resource management skills.

- LOFT is training. LOFT is a learning experience in which errors will probably be made. It is not a checking program in which errors are not acceptable. The purpose of LOFT is not to induce errors, but cockpit resource management is, in part, the management of human error. It is a well known fact that under some circumstances, such as 'high-workload situations, human error is likely. When it does occur, ***how will it be detected and corrected*** to minimise the adverse impact upon the overall safety of the operation. Just as it is necessary to practice landing skills in order to gain and maintain aircraft-handling proficiency, it is necessary to practice human-error-management skills; the former requires a simulator or airplane, and, the latter, the presence of errors or error-inducing situations.

7.2 Crew Composition and Participation

LOFT should take place in a line operational environment with a complete crew. A complete crew will always be scheduled and every effort will be made to maintain crew integrity. During LOFT, each crewmember performs both as an individual and as a member of a team, as is expected during line operations.

In the case of a single pilot / single crew LOFT scenario, the pilot will occupy the relevant seat and perform all tasks as appropriate for single pilot operations.

7.3 Phases of LOFT Training

LOFT scenarios should contain the following phases: briefing, pre-flight planning documents and activities, flight time, and debriefing. These are described in the following paragraphs.

Briefing.

Before the flight segment begins, the facilitator should brief crewmembers on the LOFT scenario, including the training objectives and the role of the facilitator (i.e., the facilitator is considered "not present," except as an Air Traffic Controller (ATC) or as another ground base entity). The role of the flight crew 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.

Pre-flight Planning Documents and Activities.

Pre-flight 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 unfavourable weather conditions or how to correct improper fuel loads. Pre-flight activities include cockpit setup, computation of takeoff data, etc.

Flight Segment.

The flight segment includes taxiing, takeoff, flying, and landing and shut down procedures. It should also include the time in which communication with ATC and other ground agencies takes place.

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 which needs improvement. The debriefing involves facilitator 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 later sections for further discussion of critiques, debriefing, and use of video records.)

7.4 No-Jeopardy Training

LOFT is "no-jeopardy" training, i.e., the facilitator does not issue a passing or failing grade to a participating crewmember. As a LOFT scenario progresses, it is allowed to continue without interruption so crewmembers may learn by experiencing the results of their decisions. Decisions which produce unwanted results do not indicate a training failure, but serve as a learning experience. If the LOFT facilitator identifies crewmember performance deficiencies, additional training or instruction will be provided. This training or instruction may be in any form, including additional LOFT. Before the crewmember may return to line operations, the performance deficiencies will be corrected and the facilitator will document the training as satisfactorily completed. The "no-jeopardy" concept allows crewmembers to use their full resources and creativity without facilitator interference. At the end of a LOFT session and after debriefing, the facilitator certifies that the training has been completed.

7.5 Uninterrupted Training

LOFT scenarios run full-length, with no interruption by the facilitator permitted. The effects of crewmember decisions are allowed to accrue and influence the rest of the flight. The concept is that crewmembers will learn more effectively if they are allowed to learn from their experiences, rather than being interrupted and corrected by a facilitator. In rare cases, and only during Qualification Loft, a facilitator may choose to intervene if he determines negative learning is taking place.

Activity	Device	Purpose	Can it be Interrupted?	Training/Validation or Evaluation	Sequencing of Events
Ground Training	Classroom/CBT devices	Indoctrination & Systems training	Yes	Training & Validation	Syllabus
Manoeuvres/Procedures Training	FSTD & Simulator	Aircraft manoeuvres & operational procedures	Yes	Training & Validation	Isolated manoeuvres & operational procedures.
SPOT Training	FSTD & Simulator	CRM skills, Differences trng, Windshear, Low Vis trng etc.	Yes	Training	Isolated manoeuvres & procedures
LOFT Training	FSTD & Simulator	Crew oriented trng (CRM) in prep for LOE	No, Except to begin different scenarios	Training	Specific flight scenario with varying length scenarios

Activity	Device	Purpose	Can it be Interrupted?	Training/Validation or Evaluation	Sequencing of Events
Line Operational Evaluation (LOE)	FSTD & Simulator	Evaluate the trng & qualifications of crew members	May be segmented to condense distances for Intl ops.	Evaluation	Specific flight scenario from T/O to LDG
Operating Experience	Aircraft	Consolidation of knowledge & skills in an operational environment	Yes	Experience	Routine flight ops
License/Rating Test	Aircraft / Simulator	To evaluate a crew members ability to satisfactorily perform required manoeuvres to the required standard	No	Evaluation	Routine flight ops
Proficiency Check	Aircraft / FSTD & Simulator	To evaluate crew proficiency, knowledge, skills and ability to operate as part of a crew	No	Evaluation	Routine flight ops

7.6 LOFT Debriefing or Feedback

LOFT includes feedback to crewmembers on their performance in the scenario. This takes place during the debriefing phase.

Critique of crewmembers should take place during the debriefing by the facilitator. Critiques should include positive feedback regarding crew performance. Critiques should include discussion of individual and flight crew performance by the facilitator as well as assessment by the crewmembers of their own performance. The critique should consider the crewmember's judgment and the crew's interaction with all resources in handling problems. This includes interaction with ATC, company communications, software materials (e.g., company operations manuals and flight manuals), workload-reducing devices (e.g., autopilot and flight management systems), and other crewmembers.

Recorded audiovisual feedback is very useful as a debriefing aid for most types of LOFT because 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 behaviour. Recorded audiovisual feedback should be destroyed at completion of the debriefing. Debriefing methods and tools are discussed later on in this manual.

8 TYPES OF LOFT or LOS

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.

8.1 Recurrent LOFT

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. Recurrent LOFT is best conducted with a complete line qualified crew. Interruption of Recurrent LOFT is not permitted. Recurrent LOFT may be substituted on an alternate basis for the proficiency check requirements *of* ***SA CAR 121.03.6 which requires that each flight deck crew member undergoes operator proficiency checks every six calendar months as part of a normal flight deck crew complement.***

8.2 Qualification LOFT

Qualification LOFT is designed to prepare crewmembers, who are not yet fully qualified for line operations and whose training has been provided in accordance with an Advanced Simulation Plan, for actual flight operations. Qualification LOFT provides training that facilitates the transition from flight simulator training to operational flying. Scenarios are designed to represent typical flight segments. An example of a specific flight segment would be the procedures to be followed in the event of an engine failure on a multi-engine aircraft. Qualification LOFT is instructional in nature; therefore, when it is essential to do so, facilitators may momentarily interrupt a scenario for instructional purposes. Qualification LOFT is best conducted when the student crewmember, which is not yet fully qualified, is scheduled with a crew complement whose other members are line qualified. For example, a Captain would be scheduled with a line qualified First Officer.

	Recurrent LOFT	Qualification LOFT
Interruption	No direct instruction permitted and does not permit interruption.	Interruption of the scenario is permitted for the purpose of instruction in the case of learning.
Flight Segments	One or more flight segments, depending upon the training objectives.	One or more flight segments, depending upon the qualification objectives.
Crew Complement	A complete crew which is line qualified is required. The facilitator conducting the LOS session will not act as a substitute crewmember.	A complete crew complement is required. Ideally, the crewmember who is qualifying would be scheduled with other crewmembers that are fully line qualified.
FSTD Device	Any SACAA approved FNPT II training device. However, the use of the highest level simulator (Level C/D) is encouraged.	Any SACAA approved FNPT II training device. However, the use of the highest level simulator (Level C/D) is encouraged.

9 SPECIAL PURPOSE OPERATIONAL TRAINING (SPOT)

9.1 Overview of SPOT

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

9.2 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.

Examples of SPOT may include training which:

- Focuses on crew resource management skills.
- Provides differences training on variants of aircraft.
- Provides specific phase of flight training (ETOPS, RVSM, and Low Visibility).
- Trains in special aircraft equipment (e.g., navigational equipment and flight management systems, Electronic Flight Instrument System (EFIS) i.e. Garmin 1000 displays.

- SPOT permits direct instruction and allows for interruption of the scenario by the facilitator.
- SPOT may include use of a complete or partial crew, depending upon the training objectives.
- SPOT may contain any number of full or partial flight segments, depending upon the training objectives. For instance, if training is required for a particularly complex airport's departure procedures. Then just that departure segment may be simulated in a SPOT.
- SPOT may use a wide range of flight simulators and FSTDs, depending upon the training objectives.

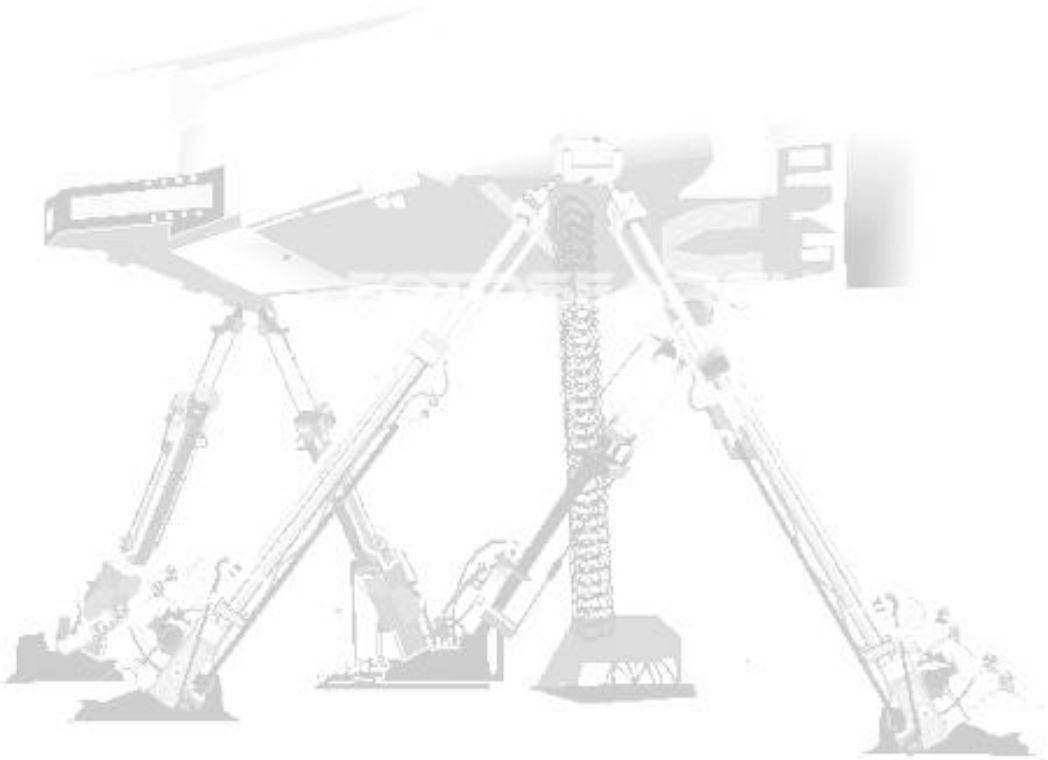
9.3 Applicability of SPOT in General Aviation

The use of SPOT training in general aviation is very applicable to advanced training for students completing Instrument Ratings, Multi-Engine ratings, Turbine endorsements etc.

As an example, each aspect such as the VOR approach, in the case of an Instrument rating syllabus may be included and trained or practiced in the form of a SPOT exercise utilizing the FSTD giving the student an overall picture as to how the segmented training fits into the overall operation of a normal flight. You will be able to demonstrate to the student, in real time, how to

prepare for the instrument approach procedure as you fly towards the beacon. The student will be able to see how long it takes to brief and do the instrument setup and then learn to plan accordingly. This can be practiced several times by use of re-positioning and repetition of the phase of the approach that needs attention. Once all phases have been satisfactorily been completed, a “full” simulation of the approach from start to finish can be demonstrated and experienced by the student as a whole. This will enable the student to put all the phases into perspective and see the approach in its entirety.

There are many other examples of SPOT training pertaining to what you are busy teaching. Engine failures flight paths on Multi-Engine aircraft would be another example together with the securing procedure of the failed engine.....What else can you think of?



10 ADVANCED QUALIFICATION PROGRAMME (AQP)

10.1 Introduction

The Advanced Qualification Programme is well established in the United States and regulated by the FAA by the Special Federal Aviation Regulation (SFAR) 58, which is a little-known part of the regulations. SFAR 58 allows air operators to train pilots using proficiency and decision making rather than manoeuvres for pilot evaluation. The regulation is called Advanced Qualification Program, or AQP. An AQP program shifts the pilot certification responsibilities away from the FAA and places the training responsibility on the operator that has an approved AQP program.

SFAR 58 1(a) reads, "This Special Federal Aviation Regulation provides for an alternate method for qualifying, training, certifying, and otherwise ensuring competency of crew members …." Today this "alternate method" can only be approved for pilots if they are already required to be trained under either Part 121 (the air operator regulations) or Part 135 (the on-demand charter regulations).

An operator can have an approved AQP program as long as it meets the following requirements:

- The training must include cockpit resource management (CRM).
- The training must incorporate line-oriented evaluation (LOE), which is the logical way to test line-oriented flight training (LOFT).
- The flight facilitator and check airmen must undergo additional cockpit resource management training.
- The operator must keep data for the FAA to use for performance assessment.

The SFAR specifically requires the pilots to be trained using real world scenarios. SFAR 58. 7 (b) says "Approved training on and evaluation of skills and proficiency of each person being trained under AQP must use cockpit resource management skills and technical (piloting and other) skills in actual or simulated operations scenario." These scenarios must be played out in either approved flight training devices or flight simulators.

10.2 AQP and the SA CATS & CARS.

An approved program must have three curriculum sets: indoctrination, qualification, and continuing qualification. The indoctrination course is designed for newly hired employees of the company and covers company policies and general aeronautical knowledge. The qualification curriculum places a person into a specific duty position on a particular type of airplane. The

continuing qualification curriculum establishes the cycle that ensures that those who have been trained remain proficient. Our general aviation equivalents are introductory flights, practical tests, and renewals.

Once an AQP program is approved, pilots are not held to any specific number of hours of experience but are instead tested on how they handle situations. The biggest difference between AQP and conventional training is that AQP is all about the mission and not the manoeuvre. Pilots might be able to fly a great chandelle, but what will they do on a dark and stormy night? AQP does not completely eliminate the use of manoeuvres, but it does make the assumption that manoeuvres alone are inadequate.

As an example, a pilot might have 1000 flight hours, but that does not guarantee that the pilot can manage information, utilize all resources, and make decisions effectively. Flight hours are a gauge of experience, but no two pilots have had the same experience within their flight hours. Any two pilots may have faced completely different challenges during those 1000 hours. Therefore, should flight hours be used as the sole assessment tool?

AQP eliminates flight hours as the assessment tool. Pilots qualify for a certificate or type rating not when they accrue logbook time, but when they can deal with situations that would be encountered in the real world. Pilots in an AQP program are trained using LOFT and then tested using LOE. An LOE is a real-time flight from one airport to another that will involve several “event sets,” An event set begins with an “event trigger.” When the examiner introduces the trigger to the crew, the crew must react with a set of actions to meet the unusual occurrence.

Today, the operators use the investigation from actual aircraft accidents and NASA forms to develop the events sets. When several event sets are used together, a full- blown setup scenario emerges.

The abovementioned statements do not advocate the complete abandonment of manoeuvres training. Of course pilots must learn to land in a crosswind, recover from stalls, and fly instrument approaches, but we should do more. We should do better. We should incorporate decision training and LOFT into our GA flight training and make it as normal as learning to taxi.

The current South African regulations, CAR 61.04.1, stipulate that a person is qualified to have a private pilot licence after 50 hours of flight experience. Would any two pilots be exposed to exactly the same experience during those 50 hours? Not in all likelihood, so the question posed is why should there be a “one-size-fits-all” regulation? Do these 50 hours guarantee that the pilot will be an effective decision maker in addition to a proficient manoeuvre maker? The AQP concept is that no single number should be considered the magic number. A person should become a pilot on the day that he or she can display safe aircraft manipulation and safe decision-making abilities together. For some, this will take more than 50 hours; for others, it might take less time.

Conducting a standardized test is a challenge for any organization. How can anyone be sure that a person given a pilot check ride in Port Elizabeth is meeting the same standard as a person taking the same check ride in Cape Town or Johannesburg? Any facilitator will tell you that no two examiners test alike and no two tests consist of exactly the same items. Incorporating more decision-based tests and training examiners to administer such tests would require some effort, and it would also require a partnership. The current operator AQP programs rely heavily on the operators themselves to train and evaluate. Likewise, the CAA would have to rely heavily on flight facilitators to do the preliminary decision training and evaluation. This is now partly catered for by the SACAA appointing Designated Flight Examiners (DFE) to conduct testing on behalf the Authority. These DFE's are subjected to oversight by the SACAA to maintain regulated standards.

The SFAR 58 now allows those enrolled in an approved AQP program to receive their commercial or operator transport pilot certificates without the conventional check ride. The certificate is awarded after the completion of the AQP curriculum. Once again the final evaluation for completion includes real-world scenarios. SFAR 58, 8© states "[to pass the course] an applicant must show competence in required technical knowledge and skills (e.g., piloting) and cockpit resource management knowledge and skills together." is the essence of the whole idea. Can a person operate the aircraft and at the same time use resource and make decisions to ensure a safe flight and do this all at the same time? Many general aviation pilots cannot, but don't blame them completely because they were never actually trained to do it in the first place.

AQP itself is a continuum. For years operators had no accidents because of errors in pilot technique. The accidents that did take place were due to errors in judgment and decision making. So AQP was designed to fight that problem. The question needs to be asked, has AQP swung too far? Are pilots now less skilled in the actual manipulation of the aircraft because AQP placed emphasis on crew coordination and decision making? AQP within the operators must itself strike a balance between manoeuvres and mission. This will mean even more training, part on repetitious drill and practice of manoeuvres and emergency procedures and part on CRM and decision making. The result is inevitably the cost of safety will go up.

As for general aviation, AQP may never become a reality. In the meantime pilots and facilitators are not prevented from using AQP techniques inside their normal training and recurrency.

11 LINE ORIENTED EVALUATION

11.1 LOE Introduction

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 by the SACAA for its intended use in the AQP. The manner in which an operator will conduct, assess and, if necessary, re-train a candidate must be detailed in the operators' AQP documentation.

11.2 LOE Structure

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 will be part of the operator's approved AQP documentation. For example, if a Captain falls ill, his position may only be replaced by a line qualified captain to make up the full crew complement.

11.3 Evaluation of the LOE

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 technical and CRM criteria of success using a grading scale. Another accepted method is to grade a pilot's technical proficiency by assessing a manoeuvre i.e. a steep turn. This is referred to as the manoeuvre-based method and, where applicable, this manoeuvre grade is linked to a CRM behaviour/skill that may

have contributed to the manoeuvre grading. For example, the candidate, before commencing a steep turn, briefs the other crew member on how he will be carrying out the manoeuvre and asks for inputs on any deviations that may occur. This would result in being able to grade the candidate accurately as he has demonstrated both his technical ability as well as CRM ability in one manoeuvre. Either method though is acceptable.

11.4 LOE Evaluator

A person who assesses the performance of crewmembers, facilitators, or other evaluators should be an approved Designated Flight Examiner by the SACAA. An evaluator must have satisfactorily completed the certificate holder's AQP evaluator training. The Facilitator 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. Evaluation techniques and guidelines are discussed in a later chapter.

11.5 Conducting the LOE

Operators conducting LOE may be approved to use any level FSTD, depending on the objective of the evaluation and the capability of the device. The FSTD, FNPT II or Full Flight Simulator however has to have the SACAA's approval for LOE before it may be utilized.

11.6 Debriefing the LOE

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 operators 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.

12 OTHER USES OF LOFT AND LOS

12.1 Introduction

The focus of the previous discussion has been upon Recurrent LOFT. The purpose of this discussion is to explore other uses of LOFT and to look at other potential applications of LOS. However, because most of the experience to date has been with Recurrent LOFT, much of what follows is intended to suggest possible avenues for exploration rather than to present guidelines.

12.2 Other Uses of LOFT

Training applications of line-operations simulation include initial or new-hire training, transition training, upgrade training and special training programs. Each of these is discussed briefly below.

12.2.1 Initial training

Because of its orientation, Initial LOFT might be an excellent introduction to line operations for the new-hire pilot. Because of its emphasis upon integrated, coordinated crew operations, Initial LOFT would seem to provide the most benefit as the capstone of an initial or new-hire training program. The Initial LOFT scenario should be designed so that the new-hire is required to exercise all the individual skills and knowledge areas developed earlier in the training program. Thus, scenarios developed for Initial LOFT should be designed so that the focus is largely upon the newly hired crew member, depending on what role the new-hire will fill (e.g., first officer in two-pilot operations, second officer in three-pilot operations).

Initial LOFT training should include:

- Emergency and Abnormal situations should be emphasized.
- The scenario should highlight "normal" line operations and the way in which the new-hire should function as a team member. Initial LOFT would be a good vehicle for introducing the new crewmember to the myriad distractions that can occur in normal line operations. The new-hire must learn to recognize various demands being placed upon him or her, to assign priorities to those demands, and then to proceed in an orderly fashion to complete the various tasks competing for his or her attention.
- The new-hire can also be exposed to situations that require monitoring of other crewmembers and making appropriate callouts in accordance with standard operating procedures.

- Situations where learning when to "speak up “in the cockpit is an important process. Initial LOFT scenarios can be designed to force a situation in which “speaking up” is highly desirable.

- Because the emphasis of Initial LOFT is upon an individual crewmember, even though they function as a team member, it is probably not necessary to use a full line crew in these scenarios. As long as the individuals in the other seats play appropriate roles, these crew members could be LOFT facilitators rather than regular line pilots. This allowance does not relax the requirement that these facilitators be completely familiar with line operations, however.

- It is also possible that these Initial LOFT programs could be integrated with LOFT facilitator training, thus meeting a dual purpose of maintaining facilitator qualifications for LOFT and completing the new-hire training process.

12.2.2 Transition Training

Much of the discussion about Initial LOFT also applies to Transition LOFT. Transition training is also known as conversion or type rating training in South Africa. Again, the focus is upon an individual functioning as a member of a team. The scenario should be designed to exercise crew coordination, communications, and management skills, and it should emphasize unique characteristics and features of the aircraft to which the trainee is transitioning. For example, if the trainee is transitioning from a basic piston aircraft to more advanced turbine aircraft, the LOFT scenario might be designed to highlight the vast differences in both normal and abnormal characteristics between piston and turbine aircraft.

Transition LOFT scenarios should be designed to emphasize normal line operations initially. If abnormal and emergency situations are introduced, they should either be introduced late in the scenario or be placed in a separate scenario. Again, since the emphasis is upon an individual trainee, it is probably not necessary to use a complete line crew for Transition LOFT.

12.2.3 Upgrade LOFT

LOFT would seem to be particularly valuable for upgrade training, especially because of the emphasis upon command, leadership, and resource management. Upgrade LOFT scenarios should emphasize situations in which effective command and unambiguous communications are required. These scenarios should force the trainee to:

- recognize conflicting task demands
- set priorities
- Ask for assistance or delegate responsibilities when necessary.

Upgrade LOFT is of particular importance for upgrading captains. Because this situation may be the first opportunity for the new captain to exercise resource management skills, it is important to structure the Upgrade LOFT scenario to thoroughly exercise these skills.

12.2.4 Special LOFT

Line-operations simulation can be used for any training that requires coordinated crew performance. Examples might include:

- engine-out ferry training and qualifications (this could be an actual preview of the equipment and route for the ferry flight)
- charter-operations qualifications (this could be either a preview of a specific charter trip or generalized charter-operations training)
- Remedial training for pilots, particularly for pilots having command, leadership, or resource management problems.

12.2.5 Single Pilot Operations

LOFT is a very useful tool for developing and training single pilot operational procedures. It is most useful in highlighting the workloads required for a safer operation as a single crew member. This form of LOFT can be used to develop good judgement and decision making skills as well as implementing procedures and flight profiles for single pilot operations. Integrating the use of a checklist and practising the use thereof may also be fine tuned using this form of LOFT.

12.3 Other Uses of Line-Operations Simulation (LOS)

Because line-operations simulation provides a highly realistic, dynamic environment for flight crews, LOS can be used in any application in which the objective is to achieve a successful outcome of the integration of human performance and the use of aircraft systems. Perhaps the best examples are in the area of evaluation. LOS can provide a very effective tool for:

Evaluating and developing operating procedures
Checklists
Aircraft-operating manuals
Charts
System Software

Users of LOFT were surprised to discover deficiencies in certain abnormal or emergency procedures as a result of difficulties observed during LOFT scenarios. It may be beneficial to check out thoroughly any changes in procedures by observing how they actually work during suitably designed line-operations simulation scenarios. For example, the development and evaluation of new fuel management techniques may be a good candidate for LOS.

The same observations apply to the evaluation of new hardware in the cockpit. The final stage of evaluating new hardware (i.e. a new GPS coupled to an autopilot) and its integration into an existing cockpit might include a LOS scenario. Problems associated with the operation of the new equipment or changes in the amount or distribution of workload among the various

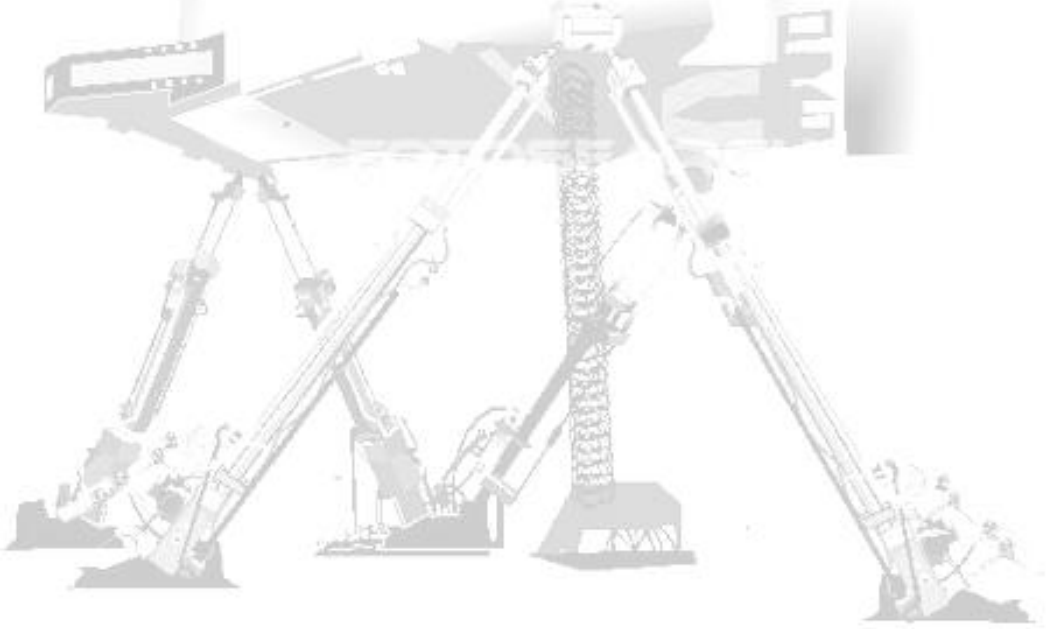
crewmembers will become apparent in a LOS scenario when they might otherwise remain undetected. It is interesting to speculate whether or not the early experiences with the Ground Proximity Warning System might have been different had the system been thoroughly evaluated by LOS prior to its introduction into line service. Similarly, LOS may play an important role in putting the new-generation of electronic cockpit aircraft into operational service.

LOS has been utilized by at least one operator to conduct proficiency checks. As advanced simulators continue to replace the aircraft as a training and checking tool, line checks in the simulator may become commonplace. However, this use of LOS may require an even greater emphasis on "normal" line operations.

Finally, mention must be made of the use of LOS in human factors research. Any research issue that involves the performance of individuals and crews during line operations is a candidate for LOS. Examples include:

- the effects of pilot fatigue
- distraction
- complacency
- high workload

Also, LOFT and LOS provide excellent opportunities to evaluate new pilot training programs. The Ruffell Smith study demonstrated the effectiveness of LOS for human factors research.



13 CREW RESOURCE MANAGEMENT (CRM) FOR LINE ORIENTED FLIGHT TRAINING

13.1 Background

Investigations into the causes of accidents have shown that human error is a contributing factor in 60 to 80 percent of all air operator incidents and accidents. Long-term NASA research has demonstrated that these events share common characteristics. Many problems encountered by flight crews have very little to do with the technical aspects of operating in a multi-person cockpit. Instead, problems are associated with poor group decision making, ineffective communication, inadequate leadership, and poor task or resource management. Pilot training programs historically focused almost exclusively on the technical aspects of flying and on an individual pilot's performance; they did not effectively address crew management issues that are also fundamental to safe flight.

The industry has come to the consensus that training programs should place emphasis on the factors that influence crew coordination and the management of crew resources. The need for additional training in communication between cockpit crewmembers and flight attendants has been specifically identified.

Continuing NASA and FAA measurements of the impact of CRM training show that after initial indoctrination, significant improvement in attitudes occurs regarding crew coordination and flight deck management. In programs that also provide recurrent training and practice in CRM concepts, significant changes have been recorded in flight crew performance during line-orientated flight training (LOFT) and during actual flight. CRM-trained crews operate more effectively as teams and cope more effectively with non-routine situations.

The human factors safety challenge and the CRM training response may be defined as follows:

Human Factors.

The multidisciplinary field of human factors is devoted to optimizing human performance and reducing human error. It incorporates the methods and principles of the behavioural and social sciences, engineering, and physiology. It is the applied science that studies people working together in concert with machines. It embraces variables that influence individual performance and variables that influence team or crew performance. It is recognized that inadequate system design or inadequate operator training can contribute to individual human error that leads to system

performance degradation. Further, it is recognized that inadequate design and management of crew tasks can contribute to group errors that lead to system performance degradation.

CRM Training.

The application of team management concepts in the flight deck environment was initially known as cockpit resource management. As CRM training evolved to include flight attendants, maintenance personnel and others, the phrase "Crew Resource Management" was adopted.

As used in this course, CRM refers to the effective use of all available resources: human resources, hardware, and information. Other groups routinely working with the cockpit crew, who are involved in decisions required to operate a flight safely, are also essential participants in an effective CRM process.

13.2 The Mission of CRM Training

CRM training has been conceived to prevent aviation accidents by improving crew performance through better crew coordination. This is achieved by combining CRM training in LOFT scenarios.

13.3 Basic Concepts of CRM

CRM training is based upon awareness that a high degree of technical proficiency is essential for safe and efficient operations. Demonstrated mastery of CRM concepts cannot overcome a lack of proficiency. Similarly, high technical proficiency cannot guarantee safe operations in the absence of effective crew coordination. Experience has shown that lasting behaviour changes in any environment cannot be achieved in a short time, even if the training is well designed. Trainees need awareness, practice and feedback, and continuing reinforcement: in brief, time to learn attitudes and behaviours that will endure. To be effective, CRM concepts must be permanently integrated into all aspects of training and operations.

While there are various useful methods in use in CRM training today, certain essentials are universal:

- CRM training is most effective within a training program cantered on clear, comprehensive SOPs.
- CRM training should focus on the functioning of crewmembers as teams, not as a collection of technically competent individuals.
- CRM training should instruct crewmembers how to behave in ways that foster crew effectiveness.
- CRM training should provide opportunities for crewmembers to practice the skills necessary to be effective team leaders and team members.
- CRM training exercises should include all crewmembers functioning in the same roles (e.g., captain, first officer, flight attendants) that they normally perform in flight.

- CRM training should include effective team behaviours during normal, routine operations.

Good training for routine operations can have a strong positive effect on how well individuals function during times of high workload or high stress. During emergency situations, it is highly unlikely (and probably undesirable) that any crewmember would take the time to reflect upon his or her CRM training in order to choose the appropriate behaviour. But practice of desirable behaviours during times of low stress increases the likelihood that emergencies will be handled effectively.

Effective CRM has the following characteristics:

- CRM is a comprehensive system of applying human factors concepts to improve crew performance.
- CRM embraces all operational personnel.
- CRM can be blended into all forms of aircrew training.
- CRM concentrates on crewmembers' attitudes and behaviours and their impact on safety.
- CRM uses the crew as the unit of training.
- CRM is training that requires the active participation of all crewmembers. It provides an opportunity for individuals and crews to examine their own behaviour, and to make decisions on how to improve cockpit teamwork.

LOFT sessions provide an extremely effective means of practicing CRM skills and receiving reinforcement.

Audiovisual (taped) feedback during debriefing of LOFT and other training is an excellent way for flight crewmembers to assess their skills as individuals and as team members. Bulk erasure of taped sessions is suggested to encourage candour among participants while assuring their privacy.

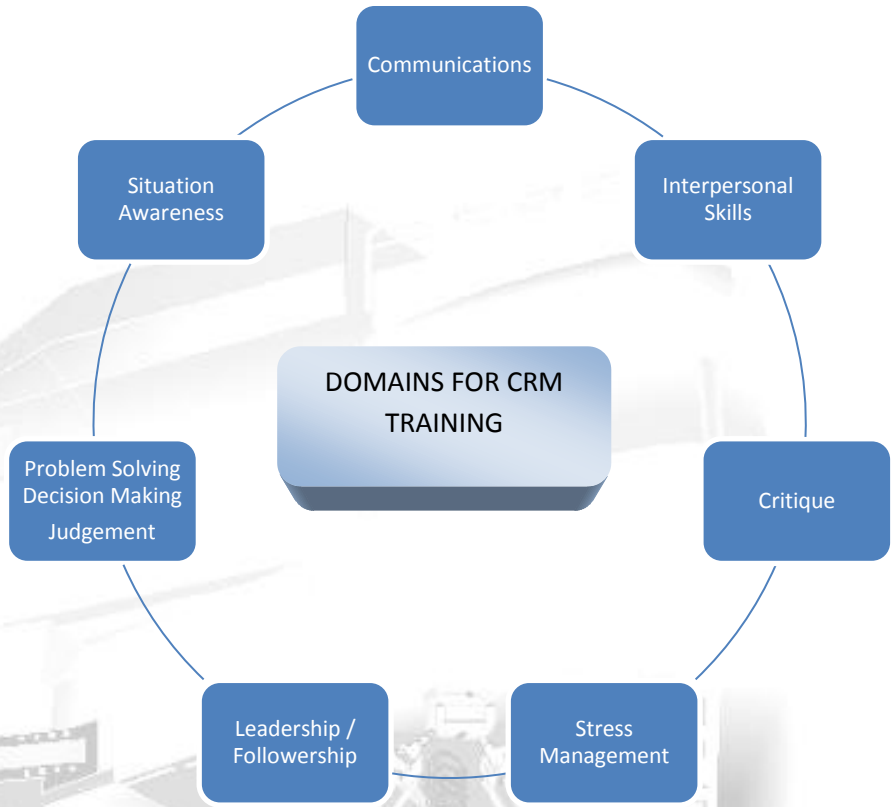
In cases where simulators are not available, crewmembers can participate in group problem-solving activities designed to exercise CRM skills. Through taped feedback during debriefing, they can then assess the positive and negative behaviours of all crewmembers.

Crewmembers may also participate in role-playing exercises. Such exercises permit practice in developing strategies for dealing with events or event sets, and enable analysis of behaviours shown while dealing with them. Again, taping the role-playing exercises is useful for assessment and feedback during debriefing. Crewmembers' abilities can be clearly observed in such areas as adherence to SOPs, decision making, teamwork, and leadership.

Attitude and/or personality measures can also be used to provide feedback to participants, allowing them to assess their own strengths and weaknesses.

Success of CRM training depends upon check airmen, facilitators, and supervisors who are highly qualified in the operator's SOPs and specially trained in CRM.

13.4 Domains for CRM Skills Training



13.4.1 Communication/Interpersonal skills.

Specific skills associated with good communication practices include such items as polite assertiveness and participation, active listening and feedback. In order to improve the communication channel, cultural influences must be taken into account as well as factors such as rank, age, and crew position, all of which can create barriers to communication in the cockpit situation. Polite assertiveness is a skill frequently ignored in communications training but vital to a healthy cockpit. A pilot-in- command may be open to communication but temporarily unable to receive and comprehend. Other crew members must be aware of the importance of the information they hold and have a strong feeling of self-value; a single hesitant attempt to communicate important data constitutes a failure to discharge individual responsibility. Pilots-in-command must constantly strive to emphasize this responsibility in their team-building efforts. The concept of "legitimate avenue of dissent" is an important vehicle for "clearing the air", maintaining lines of communication and maintaining self-image.

13.4.2 Situation Awareness.

Situation awareness refers to one's ability to accurately perceive what is going on in the cockpit and outside the aircraft. It further extends to the planning of several solutions for any emergency situation which could occur in the immediate future. Maintaining a state of awareness of one's situation is a complex process, greatly motivated by the understanding that one's perception of reality sometimes differs from reality itself. This awareness promotes on-going questioning, Cross-checking and refinement of one's perception. Constant, conscious monitoring of the situation is required. Note that the situation referred to here includes the human environment. The evaluation of oneself and others for partial or total incapacitation is vital but often overlooked.

13.4.3 Problem-Solving / Decision-Making / Judgement.

These three topics are very broad and interrelate to a great extent with each other as well as with the other areas. One may consider problem-solving as an over-all cycle of events beginning with information input and ending with pilot judgement in making a final decision. During the phase in which information is requested and offered, some conflicting points of view may be represented. Skills in resolving conflict are therefore especially appropriate at this time. All decisions must come from the pilot-in- command because the team will fail if command authority is not maintained. This requires the support of all crew members. The in-flight, immediate post-decision review is likewise a vital concept for promoting good decision-making.

13.4.4 Leadership/"Followership".

In this area, there is clear recognition that the command role carries a special responsibility. For instance, although individual crew members should be actively planning and managing their own workloads with respect to time, the pilot-in-command is responsible for supervising the over-all management of the flight. This command authority must be acknowledged at all times. The effectiveness of command authority cannot be assumed by position alone. The credibility of a leader is built over time and must be accomplished through conscious effort. Similarly, every non-command crew member is responsible for actively contributing to the team effort, for monitoring changes in the situation, and for being assertive when necessary.

13.4.5 Stress management.

Stress creates a special kind of problem for a crew since its effects are often subtle and difficult to assess. Although any kind of emergency situation generates stress, there is also the stress, both physical and mental, that a crew member may bring to the situation and which others may not be able to detect. A crew member's over-all fitness to fly may nevertheless decline because of fatigue, mental and emotional problems, etc., to the extent that other crew members should consider that individual as incapacitated. Skills related to stress management refer not only to one's ability to perceive and accommodate to stress in others but primarily to anticipate, recognize and cope with one's own stress as well. This would include psychological stresses such as those related to scheduling and rostering, anxiety over training courses and checks, career and

achievement stresses, interpersonal problems with both cabin crew and other flight crew, as well as the home and work interface, including related domestic problems (family health, children's education, etc.). It would also include so-called life event stresses, such as those related to the death of a spouse, divorce, or marriage, all of which represent major life changes. Several operators are attempting to alleviate stress problems by encouraging open and frank communications between operational management and flight crew members, and by viewing stress as part of the "fitness to fly" concept. The prerequisite for this is management understanding of the stress problem. In at least one case the understanding required by management personnel was fostered by having managers and other non-crew personnel attend the CRM training.

13.4.6 Critique.

Skills of critique generally refer to the ability to analyse a plan of action whether future, current, or past. Since techniques for accomplishing critique vary according to the availability of time, resources, and information, three basic types of critique are distinguished:

- pre-mission analysis and planning;
- on-going review as part of the in-flight problem-solving process; and
- Post-mission debriefing.

All three are of vital importance but are often overlooked both in operations and during instruction. Each type has two fundamental elements, i.e. remembering to perform the critique, and structuring of the critique itself.

13.5 Assessment of CRM Training

It is vital that each training program be assessed to determine if CRM training is achieving its goals. Assessment of the training program should include observation and feedback by program facilitators and self-reports by participants using standard survey methods.

The emphasis in this assessment process should be on crew performance. The essential areas of CRM-related assessment include:

- Communications
- Decision making
- Team building and maintenance
- Workload management
- Situation awareness.

An effective way of assessing the crew's performance of CRM in a LOFT scenario is to use the LMQ CRM standards table:

13.5.1 LMQ CRM Standards Table

This is similar to the outcomes based education model whereby a set of standards is published and the examiner is able to make an assessment from the published observable actions.

	Observable Actions
Communications	**Crew members:** •Know when, what, how much and to whom they need to communicate. •Ensure the recipient is ready and able to receive the information. •Pass messages and information clearly, accurately, timely and adequately. •Check the other person has the correct understanding when passing important information. •Listen actively, patiently and demonstrate understanding when receiving information. •Ask relevant and effective questions and offer suggestions. •Use appropriate body language, eye contact and tone. •Are open and receptive to other people's views.
Teamworking	**Crew members:** •Agree and are clear on the team's objectives and members' roles. •Are friendly, enthusiastic, motivating and considerate of others. •Use initiative, give direction and take responsibility when required. •Are open and honest about thoughts, feelings and intentions. •Give and receive criticism and praise well. •Confidently do and say what is important to them. •Demonstrate respect and tolerance for other people. •Involve others in the planning and implementation.
Workload Management	**Crew members:** •Are calm, relaxed and careful. •Prioritise and schedule tasks effectively. •Use time available efficiently to complete tasks. •Offer and accept assistance, and delegate when necessary. •Review, monitor and cross-check actions conscientiously. •Follow procedures appropriately and consistently. •Only concentrate on one thing at a time, and ensure tasks complete.
Situation Awareness	**Crew members:** •Are aware of what the aircraft and its systems are doing. •Are aware of where the aircraft is and its environment. •Are aware of the condition of the people involved in the operation including passengers. •Are able to recognise what is likely to happen, to plan and stay ahead of the game. •Keep track of time. •Are able to identify threats to the safety of the aircraft and people. •Develop what if scenarios and make pre-decisions.
Problem Solving And Decision Making	**Crew members:** •Identify and verify why things have gone wrong and do not jump to conclusions or make assumptions •Seek accurate and adequate information from appropriate resources. •Persevere working through a problem. •Use and agree the most effective decision making process. •Agree decision criteria and prioritise. •Consider as many options as practicable. •Make decisions when they need to and are not impulsive. •Consider risks but do not take unnecessary risks.

13.6 The Critical Role of Designated Examiners and Facilitators

The success of any CRM training ultimately depends on the skills of the people who administer the training and measure its effects. CRM facilitators, check captains, supervisors, and course designers must be skilled in all areas related to the practice and assessment of CRM. These skills comprise an additional level to those associated with traditional flight instruction and checking.

Gaining proficiency and confidence in CRM instruction, observation, and measurement requires special training for facilitators, supervisors, and check captains in many CRM training processes. Among those processes are role-playing simulations, systematic crew-cantered observation, administering LOFT, and providing usable feedback to crews.

Facilitators, supervisors, and check captains also require special training in order to calibrate and standardize their own skills.

Facilitators, supervisors, and check airmen should use every available opportunity to emphasize the importance of crew coordination skills. The best results occur when the crews examine their own behaviour with the assistance of a trained facilitator who can point out positive and negative CRM performance. Whenever highly effective examples of crew coordination are observed, it is vital that these positive behaviours be discussed and reinforced. Debriefing and critiquing skills are important tools for facilitators, supervisors, and check captains.

Feedback from facilitators, supervisors, and check airmen is most effective when it refers to the concepts that are covered in the initial indoctrination/awareness training. The best feedback refers to instances of specific behaviour, rather than behaviour in general.

13.7 Evolving Concepts of CRM

13.7.1 Crew Monitoring and Cross-Checking

Several studies of crew performance, incidents, and accidents have identified inadequate flight crew monitoring and cross-checking as a problem for aviation safety. Therefore, to ensure the highest levels of safety, each flight crewmember must carefully monitor the aircraft's flight path and systems and actively cross-check the actions of other crewmembers. Effective monitoring and cross-checking can be the last line of defence that prevents an accident because detecting an error or unsafe situation may break the chain of events leading to an accident. This monitoring function is always essential, and particularly so during approach and landing when controlled flight into terrain (CFIT) accidents are most common.

13.7.2 Error Management.

It is now understood that pilot errors cannot be entirely eliminated. It is important, therefore, that pilots develop appropriate error management skills and procedures. It is certainly desirable to prevent as many errors as possible, but since they cannot all be prevented, detection and recovery from errors should be addressed in training. Evaluation of pilots should also consider error management (error prevention, detection, and recovery). Evaluation should recognize that since not all errors can be prevented, it is important that errors be managed properly.

13.7.3 Advanced CRM.

CRM performance requirements or procedures are being integrated into the SOPs of certain operators. Specific callouts, checks, and guidance have been included in normal checklists, the quick-reference handbook (QRH), abnormal/emergency procedures, manuals, and job aids. This integration captures CRM principles into explicit procedures used by flight crews.

13.7.4 Culture issues.

While individuals and even teams of individuals may perform well under many conditions, they are subject to the influence of at least three cultures – the professional cultures of the individuals themselves, the cultures of their organizations, and the national cultures surrounding the individuals and their organizations. If not recognized and addressed, factors related to culture may degrade crew performance. Hence, effective CRM training must address culture issues, as appropriate in each training population.

13.8 SUMMARY

Effective CRM begins in initial training; it is strengthened by recurrent practice and feedback; and it is sustained by continuing reinforcement during LOFT training.

14 CRM FOR SINGLE PILOT LOFT (SRM)

14.1 Introduction

Whilst this chapter is solely applicable to single pilot LOFT, it is recommended as best practice for general aviation.
A working group was set up to investigate and research Single Pilot Aircraft (SPA) CRM. The group came to the conclusion that most of the information was equally, or sometimes even more relevant to pilots of SPA, but that the presentation of that information was not always in a format best suited to pilots of SPA. SPA operations can be less complex with respect to certain aspects of CRM compared to MPA operations. There is no inter-crew communication and there are no flight deck issues involving authority and leadership. However, in other areas such as error management, decision making and planning, the lack of an additional crewmember can make the situation more demanding. The single pilot does not have the advantage of learning from the experience of other crewmembers on the flight deck and often has to learn from his own mistakes. The only debriefing and evaluation available to the single pilot during normal operations is self-evaluation. The following is a summary of points the group highlighted as being particularly relevant.

14.2 SRM Communication

Whilst communication across the flight deck may not be relevant to pilots of SPA, there are many situations in which communication is equally important. Such situations would include keeping the passengers and other non-flying crew members informed during normal and abnormal operations, liaising with ground crew and communications with ATC. The latter being particularly critical for flight safety as the cross check of instructions between crews on multi-pilot aircraft may not be available in the single pilot situation. It is absolutely vital, therefore, that if there is any doubt at all about ATC instructions, clarification is sought. Standard RT phraseology (Ref ICAO Doc 4444) should always be used particularly when talking to ATC units that do not have English as their first language. Other factors which may affect the correct understanding of communications are:

- High workload
- Fatigue
- Distractions and interruptions
- Inaccurate perceptions.

It must also be recognised that communications with the company by way of keeping up to date with changes in procedures, new information, additional airport and route information etc. is more demanding as there is no one else on the flight deck with whom to crosscheck the information. However, much can be gained from liaison with fellow crewmembers before and after flights in the crew room and operations/ planning rooms.

14.3 SRM Health and Capacity for Flight

Incapacitation procedures have reduced the accident statistics for multi-pilot aircraft. However, these procedures are not available to safeguard SPA in the case of incapacitation of the pilot. It is even more important, therefore, that pilots ensure that they are in a properly fit condition to fly if they are the only member of the flight crew. In the event of feeling unwell during flight do not press on but land at the nearest suitable airport making use of all assistance available by declaring an emergency and making full use of any automatics.

14.4 SRM Workload Management

Workload management is probably the most important item of single pilot CRM. There is no opportunity to delegate tasks in the air and there is a greater potential for the single pilot to become overloaded especially during an unusual, abnormal or emergency situation. Maintaining situational awareness and preserving mental capacity for planning and decision making is more difficult. Attention to, and being aware of, the process of prioritisation is one way to try to maintain some spare capacity.

Comprehensive self-briefing and pre-flight planning are essential. The aim should be to have a thorough understanding of all the aspects of the flight, weather conditions, airport procedures, routing, aircraft serviceability etc. and that as much of the work as possible should be carried out on the ground, prior to flight. Problems should be anticipated and “what if?” procedures thought through so that in the event of any unplanned events the contingencies can be put into place without the workload increasing to an unmanageable level.

In the event of an abnormality or emergency it is even more important to comply with standard operating procedures. This will help one to stay calm, make proper diagnosis of the problem and take the appropriate action. Reduce workload as much as possible, engage the autopilot if available, advise ATC and request for radar positioning. Many accident investigations highlight the fact that the checklists were not used and that inappropriate action was taken which prevented or reduced the likelihood of reaching a successful conclusion.

14.5 SRM Error Management

Much of the error management in a multi-crew environment relies on cross checking of vital data and actions by the other crewmember. This facility is not available to the single pilot and therefore other techniques have to be employed.

In an ideal world the system will have eliminated latent errors. However, in the real world latent errors ready to trap the unwary pilot do exist in many guises. Therefore one needs to be constantly alert for these traps and be conversant with the aircraft and the operation to the greatest extent possible. Adherence to SOPs is again one of the main defences and all pilots should be alert to situations which are new, untried, distract from normal operations or are outside SOPs. The pilot should be comfortable with the operation. If not then it is probably

necessary to take action to restore the comfort factor even if this means a decision to delay or cancel the flight. Workload planning will allow the pilot to make decisions in good time and to self cross check any critical actions before implementation.

14.6 SRM Decision Making

There are a number of guides and mnemonics' which are designed to assist the decision making process for multi-pilot crews. These generally involve:

- Assessing the situation and gathering data
- Considering options
- Deciding on the "best" option
- Communicating your intentions
- Carrying out the actions
- Checking/reviewing the situation
- Adapting to new information or changing situations.

Research shows that experienced pilots use previous experience of similar situations to "short cut" the decision making process. However, no two situations are exactly the same and it is important to recognise that the decision making process is driven by the pilot's situation assessment which in summary is the perception of the present situation.

In the SPA case there is usually no one to help gather the information and cross check actions. Also, facing an abnormal or emergency situation alone can be a frightening and traumatic experience. A natural reaction can be one of shock (surprise) or disbelief, which is called startle reflex. This is a completely normal and instantaneous phenomenon as the brain can absorb information about an emotionally significant event (such as fear) before we are consciously aware of it. This initial startle reflex can provoke a desire to try to resolve the situation quickly - perhaps leading to incorrect actions being taken. Therefore, one should try to stay calm and above all continue to fly the aircraft. There are some situations which require immediate action but the majority of incidents will tolerate a short delay while you gather your thoughts and assess the situation.

14.7 SRM Situational Awareness

There are many elements which relate to situational awareness. Some of the elements are the status of the aircraft and its systems and the geographical position of the aircraft. Careful monitoring of the aircraft systems together with a good technical knowledge will help the pilot maintain situational awareness and to stay ahead of the aircraft. This, combined with good workload management, will increase spare capacity and allow better anticipation of potential problems.

Geographical position and safety altitude should be constantly monitored and crosschecked using all available aids. Environmental influences such as bad weather should also be anticipated and a plan of action formulated in case the planned flight path, destination etc. has to be changed. A mental picture of the aircraft's position should be maintained at all times.

Situational awareness is particularly critical in the departure/approach and landing phases of flight. Many Controlled Flight Into Terrain (CFIT) type accidents have occurred due to loss of

aircraft position awareness and proximity of terrain. Statistics indicate that this is a high risk area to SPA types. The risk may be increased due to the aircraft being fitted with less sophisticated equipment but lack of planning, “press on itus”etc, also aggravate the situation.

14.8 Commercial Pressures

In the single-pilot environment commercial pressures may be greater and more personalised. The pilot may be “persuaded” by the operator who may also be the owner of the business. With no one else to share the burden one may be more prone to accede to such pressures and accept a situation which is against your better judgement. Such pressures may also come from passengers who may be anxious to get to an important meeting or simply want to get home.

14.9 Single Engine Operations

Single engine aircraft are normally employed on local flights only and facilitators of these aircraft have not been required to have any formal CRMI (CRM Instructor) qualifications other than to have completed a basic CRM awareness course. However, from 1 January 2007 CRMI accreditation requirements will apply to facilitators of these aircraft.

14.10 SRM Assessment

Assessment for single pilot operations is divided between formal assessments as required by SACAA regulations and self assessment.

14.10.1 Self Assessment

The single pilot does not have the benefit of feedback from another crew member and therefore has to learn from his own experiences. However, much can be gained from a little self analysis. After a flight it is worth reflecting on what went well and why this was the case; what did not go so well is probably more easily recalled and one can speculate the reasons for this and how one could handle a similar situation in future. The problem with self assessment is one of keeping a balanced view. This may be helped by discussing events with a colleague who can give a more independent opinion. This will also allow single pilot crews to gain some benefit from each other’s experience. A mark of good CRM is being open about one’s mistakes and sharing the experience with others.

14.10.2 Formal Assessment

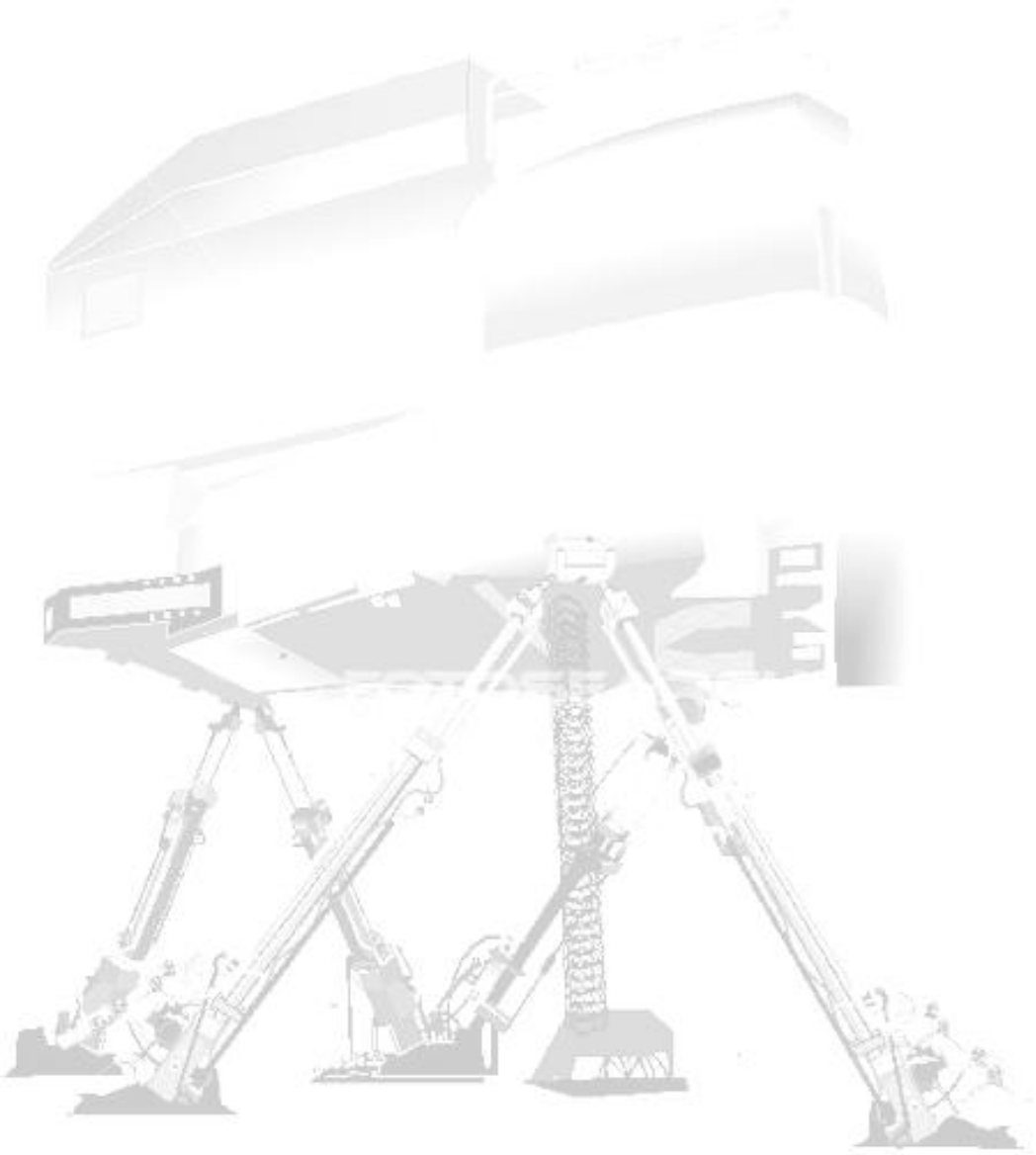
JAR-OPS require that a pilot is assessed on his/her CRM skills. (reference). The reason for this is so that feedback can be given to the individual and to the crew and so that the CRM training system can be improved. However, another way of looking at it is this:

- Assessment is an evaluation of one’s CRM performance and provides feedback and knowledge of how you are doing, and.....
- If you don’t measure (evaluate) you don’t know.
- If you don’t know you can’t fix, and;
- If you don’t fix it’s only a matter of time!!!!

Companies are required to have an assessment system which is published in the operations manual. There are a number of assessment models to choose from and operators are free to develop alternative systems acceptable to the SACAA.

The system used should not be over complicated and should reflect the scale of the company operations and the type of operations undertaken.

The use of the LMQ CRM standards table referred to in Chapter 13 may be used in SRM assessments.



15 JUDGEMENT AND DECISION MAKING

15.1 Introduction

Accident reports are filled with circumstances where a pilot was caught off guard by the events of a flight and was simply carried away by them. Many people do not understand that making decisions is as common to a flight as takeoff and landing. There are situations on every flight where a decision is called for, and every second that passes without making the decision makes the situation more critical. In these situations some pilots are just unaware that a decision is staring them in the face and screaming “solve me!” There can be a real lack of understanding that decisions are necessary to the safe outcome of the flight. Some pilots assume that controllers would not let them get into too much trouble or that things will just work out because things always seem to work out. These attitudes lead to crashes. The majority of accident reports reveal the lack of decision making ability of the pilots and one could compare that to the pilots walking like zombies through a mine field with explosions going off all around them. They miss the warning signs, and they miss opportunities to decide on a course of action that would solve their problems. Some, while completely unaware, happily press on to their own fatal accidents.

The solution?

Pilots must realize that making decisions is their job as pilot in command and that there will be countless points of decision on every flight. Pilots must accept this fact and start to expect to make decisions because decision making is normal. When flying along to a destination and when the pilot workload is low, the pilot should be planning for and anticipating the decisions that are bound to present themselves. Which runway is in use at the destination? How should I manoeuvre to be in a position to enter the pattern? Should I expect to fly an instrument approach at the destination? If I do fly the approach, should I be planning on a straight-in or circling approach? These are examples of decisions that are inevitable. You will not be able to see perfectly into the future, but you can plan and expect to make these decisions as a routine function of any flight. Understanding that pilots have flown deeper and deeper into trouble because they could not see that decisions were called for, one wants to shake them awake and make them snap out of it as if they were under hypnosis and yell “you are PIC; don’t just sit there! Make some decisions, any decisions; it’s your job, your duty!”

Decisions are not the product of some abnormal flight situation that a pilot might never face in a career of flying; they are everyday, normal routine. Pilots should expect to make decisions on every flight. Pilot must search, like a detective, routing out the hidden decision need that calls for PIC attention and **ALWAYS BE PREPARED TO MAKE MORE DECISIONS**

15.2 Pilot Categories

15.2.1 Expert Pilots

Hundreds of pilots who work in general aviation every day could be considered experts. These pilots fly everything from glass cockpit corporate business jets to crop dusters. They earn their living flying transoceanic flights, meeting the schedule of “on-demand” passengers, hauling cargo, and giving flight instruction. The difference between an expert pilot and a novice pilot is simple: experience and the ability to make decisions. Experience and decision making go together, but it is not clear which comes first. Pilots who have had the benefit of many flight hours may have seen situations during those flight hours that help them make decisions. In other words, their experience guides their decisions. Or it may be that pilots who can make good decisions in the first place remain on the job longer and live longer. They have the longevity that allows them to gain the experience. It probably is a combination of the two. Either way there is a definite difference between novice pilot behaviour and expert pilot behaviour.

If there really is an observable and measurable difference between expert pilot performance and novice pilot performance, can there also be teaching strategies developed that would help novices act more like experts? If such a strategy were developed, it would have to start with a definition of just what expert pilot behaviour is. So what do expert pilot’s do that is different and worth copying?

15.2.2 Characteristics of Expert Performance

Expert pilots are able to anticipate and prepare far more than the novice pilots. Experts can fly with ease, never coming near a mental saturation point. This leaves them with the mental capacity available to think ahead and plan for upcoming events. Experts never seem to be in a hurry, yet they are always doing something. They never let a free moment go without planning something or doing something that will help out later. Expert pilots do all the extras and little things that make the job easier.

In any flight procedure there are several task layers. There are tasks that absolutely have to be done if the flight procedure is even possible. An example of this would be tuning in a navigation radio to a frequency that is used for an instrument approach. Without that frequency the pilot cannot know where to go, so tuning that frequency is an absolute necessity.

Then there are tasks on a slightly higher level than that, although not absolutely required, make the procedure run smoothly. An example is pre-reading the missed-approach instructions so that when the time comes for the missed-approach procedure to be executed, experts calmly add power and begin the procedure without immediate reference to any chart. Non-expert pilots rarely are that prepared at the missed-approach point. They often fumble around looking for the proper chart while the airplane is somewhat out of control.

The third task layer involves situation awareness management. One example of the expert at work is dialling in an additional navigation radio frequency on a second radio, even though this second radio is not required for the flight procedure at hand. Experts use it anyway to more clearly determine their position. With this knowledge the experts are aware of their relative position throughout the procedure and are able to call on this knowledge. At times they will turn with a tighter radius to make a smooth course intercept. The only way the expert could have known that a tighter radius was called for was having knowledge of relative position. With the course intercept made smoothly, the approach procedure begins under control and no time is wasted passing through the course and attempting to re-intercept from the other side. Experts are constantly and predictably completing these extra third-level tasks. The result is that the procedure appears effortless and everything is under control. One commonality that all experts have is the ability to physically fly the airplane without using up all their mental energy. These pilots are able to hold altitude and heading when that is required and still plan ahead. When the physical workload increases, such as a turn or descent, a descending turn, or a course intercept, they are capable of keeping pace both with the physical task of manipulating the airplane controls and also with the mental tasks. They do not miss radio calls. They are assertive and clear with radio transmissions. They do not miss altitude changes. They reduce speed when they should. They are in command.

Experts never seem to “get behind the airplane”, but this is no accident. They are always planning ahead. They are always doing something that although it is not actually mandatory at the time will pay off soon thereafter. Here is a short list of some preparations that expert pilots make:

- Experts set a VOR (very high frequency omni directional range) radio to an outbound course before arriving at the station.
- Expert pilots ask for an updated wind report when turning on the final approach course or on short final when landing.
- Experts tune in a backup navigation frequency on the second radio.
- Before flying into an air traffic control sector, experts observe the communications radio frequency for that upcoming sector and tune in that frequency on the second communications radio when the workload is light. When the time comes to switch to the new frequency, it only will take the flip of a switch and the workload at that point is reduced.
- When faced with instrument approach weather decisions, experts ask for weather reports from many surrounding airports before arriving at a final decision.
- Experts under a heavy workload circumstance will solicit information from the controller. During “crunch” time, experts might ask about the length of a runway or the tower frequency or the direction of traffic flow, rather than attempting to look this information up in a directory or chart book.
- Experts, when faced with unknown circumstances, make backup plans. If the pilots face an instrument approach with weather at or near the minimums, experts make plans in advance for the possibility of a missed approach or a circle to land or even a tail-wind landing.

- Experts use all their resources, which includes non-pilot passengers. These pilot's have non-pilot passengers look for other air traffic, hold chart books, flip pages, and any other task that would be helpful during high workload events.
- Experts use backup radios to listen to pre-recorded weather broadcasts (Airport Terminal Information Service, or ATIS).
- Expert pilots anticipate station passages so that they can start and end timed segments of the flight properly.
- Expert pilots make and take the time to listen to the Morse code identifying broadcast of navigation radios.
- Experts update altimeter settings as the flight progresses. They double-check for the proper setting before and during instrument approaches to ensure that the proper minimum descent altitude or decision height is reached.
- When expert pilots are unable to land due to low clouds at one airport, they ask the controller if other airplanes have recently landed on an instrument approach at a nearby airport. The logic is that if other pilots are landing, it would also be possible for them to land as well. This helps make alternate airport decisions.
- Expert pilots ask for additional information from other pilots who have flown the course ahead of them.
- Expert pilots do not hesitate to discuss problems that arise with air traffic controllers.
- When airplane malfunctions occur, expert pilots take appropriate internal action and advise controllers on their situation and what impact the malfunction has on the remainder of the flight.

Experts do very little talking during the flight except to air traffic controllers. They very often talk to themselves, however. These internal conversations can be characterized as reminders and questions to themselves. Some common examples of these are:

"I've got that set up in number 2."

"I'm ready to make the turn outside the marker beacon."

"I'm at 9000 – 1000 feet until level off."

"Can I get a DME reading off of East London from here?"

These are not addressed to the controllers but rather are audible thoughts. When the expert pilots do address controllers, they often have suggestions for the controllers. On the surface this might seem somewhat backward. Most of the times you think of controllers telling the pilots what to do, but experts never wait for a controller to come up with a plan. They are ahead of the controller:

"Can I get a 320 heading now?"

"I can accept a tight turn-on to the localizer."

"Confirm you want a left turn; my chart indicates a right turn on the missed procedure."

"How much longer will you need me on this heading?"

These pilot suggestions are usually made professionally but forcefully. The fact that the pilot knows enough about the situation to be making suggestions to the controllers is evidence of his or her awareness.

Experts are aware of what is taking place around them. They are seldom caught off guard. They do not miss any important clues or information coming from inside or outside the airplane. They take on each challenge and work it through to a logical conclusion. Whenever a solution is not immediately found to a problem, an alternative is decided upon. Expert pilots are expert trouble-shooters. They know their airplane's systems and can diagnose the problems.

There really is a big gap between experts and novices and this problem is bigger than we anticipated. The challenge then for every flight facilitator today is to figure out ways to help pilots act more like experts, even though they have low flight time and little experience. It would seem logical that if we want to act like experts, we should just do what they do.

15.2.3 The Information Managers

Piloting an airplane was once considered a physical task. It involved the moving of levers, switches, and flight controls. Today the pilot must do much more. The pilot is an organizer, a planner, and a systems manager. The job of piloting has shifted from physical to mental tasks. Pilots who have been able to make this shift are the pilots who fly more safely and with more confidence. Pilots who fly mechanically, simply following instructions and "driving" the airplane around like they would a truck, are dangerous. It is clear that the job of safe piloting is no longer just operating a machine; it is managing information.

This group is referred to as the information managers because it is their skilful handling of incoming information that makes their flights safe and relatively uneventful. Members of this group are characterized by their ability to anticipate. These pilots are able to control the airplane/simulator without coming near a mental saturation point. This leaves mental capacity available to think ahead and plan for upcoming events. These pilots never seem to be in a hurry, yet they are always doing something. They never let a free moment go without planning something or doing something that will help them out later. These pilots do all the "extras" and little things that make the job easier. In any flight procedures there are several task layers. There are tasks that absolutely have to be done if the flight procedure is even possible. Then there are tasks on a slightly higher level that, although not absolutely required, make the procedure run smoothly. The third task layer involves situation-awareness management and turns out to be the definition of the information manager category. The information manager is constantly and predictably completing these extra third-level tasks.

The definition of information managers sounds much like the earlier description of expert pilots. This is no coincidence. Expert pilots are information managers and vice versa. Taken a step further, a pilot who is an information manager is also a living definition of pilot in command. Men and women who fly as information managers are role models of piloting expertise. They are what we all should strive to be and what all flight facilitators should train their students to become.

15.2.4 Non-assertive Decision Makers

Pilots that make up this group are good, solid pilots. They have had adequate flight training in the past. They know the rules and procedures, but they are not confident. They are like a sports team playing not to lose instead of playing to win.

Specifically, members of this group are characterized by their inability to arrive at a timely decision and/or trust their decision to be sound. They are sometimes timid and unable to take control of the situation. Many are so unsure of themselves that even when decisions are made, they have no confidence in their decision and often change from their first course of action several times. Most of these pilots fly the airplane well and do not seem to be saturated with the physical tasks of operating the airplane controls. They have the mental time necessary to make decisions, yet they have little or no confidence to carry the decision out. As a result they cannot form long-term plans to get out of trouble.

Often pilots who are non-assertive decision makers will attempt to exit the role of pilot in command. They will solicit instruction, tips, or hints from air traffic controllers, flight facilitators or other pilots who are riding along, or even passengers. Often their communications with controllers is placed in the form of a question, as if they were seeking a confirmation that the decision they are considering is plausible. This always creates an uneasy conflict with the controller because it is always the pilot who is the decision maker. One of the scariest questions that can be posed to a non-assertive decision maker from an air traffic controller is “what are your intentions?” Many times these pilots will not have anticipated that a decision is eminent and therefore have no answer. The question “what are your intentions? Is the controller language for “what is your decision?” Most decisions made in flight do not come with much time to deliberate. When the controller asks, “what are your intentions?” the controllers is actually saying, “your time to make a decision has run out – what do you plan to do now?” This lack of decision anticipation can place pilots under a great deal of pressure, and sometimes hesitation of speech, slurred words, and illogical actions follow.

There is also a negative carryover from their instrument training. When asked “What are your intentions?” in a critical situation, these pilots act surprised that the controller is asking them to make a decision. They act as if their past facilitators had made all the decisions for them during training flights. They do not fully comprehend what is entailed in the phrase *pilot in command.* Even though their safety is at risk, they do not want to assume responsibility for decisions.

They cannot or will not take control of the situation for fear that any decision they might make will be the wrong decision.

It should be understood that the roles of air traffic controller and pilot in flight are well defined. The pilot’s title in these circumstances is pilot in command. The SA CATS & CARS are clear that the final decision in any circumstance is with the pilot. When a controller “assigns” an instruction, course, altitude or route to a pilot, it is left to the pilot to accept or reject that assignment. Pilots and controllers do work together or even fly a particular course to an airport. The reason that the power is with the pilot is logical. It is the pilot whose life is ultimately at stake, and therefore it is

the pilot who is ultimately responsible. Non-assertive decision makers do not always respect this pilot/controller relationship. Often they expect the controller to provide guidance and in doing so abdicate their ultimate decision authority. Air traffic controllers will make it clear they are asking questions. They do not accept responsibility for the pilot's decision and make it clear that they are there to help, but not to fly the airplane. Non-assertive decision makers tend to talk during flight more than information managers do, but most of the conversation has the ultimate goal of either soliciting suggestion from the controller (or facilitator) or confirming a decision they are unsure of.

15.2.5 The Snowball Effect

This group of pilots is characterized by being "behind the airplane." These pilots are aware of what is going on but cannot keep up with the workload. Very often the reason they do not keep up is directly due to their lack of preparation and wasting of time. These pilots will hear "expect ILS 32 approach" from the controller (which is controller jargon for "get ready!") but will wait up to 5 minutes to select that approach's frequencies and otherwise set the cockpit to be ready for the approach. Snowball pilots do not anticipate. They are reactive rather than proactive. The idea of the snowball is that it starts off small, but as the snowball rolls down hill, it gets larger and larger. The analogy to the pilots of this group would be that small mistake or oversight causes them to first get slightly behind the demands of the workload, and then they can never get caught up. Unfortunately, these pilots routinely report or fail to look at an item on an approach chart, not because they did not think it important, but because they simply did not have time to do it. By the time one item is taken care of, two other items should have already been addressed, and by the time they get around to dealing with those two items, six others will be overdue. Members of this group struggle between the physical demand to control the airplane and the mental demands to think and plan ahead. After a particularly rough flight, many will make comments like "I knew better than to do that," but they were simply workload saturated to do everything or think of everything. Much of these problems are self-inflicted. Because they are unable to take in new, incoming information and utilize this information in a timely manner, they constantly are making the task harder for themselves.

The pilots from this group have this in common: Their flights are often a constant, frustrating struggle for them. It can be like watching a person frantically treading water only to eventually lose the battle. Mistakes are made by these pilots not because they do not know any better, but because they do not have enough time to get to it. These pilots seldom if ever get past that first task level, the tasks that are the absolute minimum. These pilots will have normal, stress-free flights from time to time, but the characteristics of the snowball category will reappear when pilot workload increases and weather decreases. Examples of the mistakes that snowballers make are:

- Not properly setting up radio frequencies
- Not anticipating a course intercept and flying through the course to the other side, which in turn required a re-intercept, and a loss of time that could have been used doing something else
- Not aware of position relative to an instrument approach or airports

- Not properly setting up headings
- Rough control of the airplane
- Overcorrecting for courses and altitudes
- Failure to descend once established on an approach course
- Missed radio calls
- Flight past a missed approach point with no action taken
- Requesting one particular approach but tuning in the frequency for a different approach
- Failure to reduce speed and consequently flying the approach faster than the en-route speed
- Failure to report passing certain points when asked to do so by the controller
- Misunderstanding headings, for example, assigned the heading of 020 but flying 200 instead
- Not making calculation for time or cloud heights
- Misreading the approach chart instructions
- Not finding time to even look at the chart
- Not finding a particular chart in an approach book. The charts are arranged in alphabetical order, but when mentally saturated with workload, it appears they cannot remember the alphabet
- Tracking to a radio station, but upon arrival being unprepared to act beyond the radio station

Pilots in the snowball effect group do not offer many quotes while the flight is in progress; they simply do not have time. What is said is usually broken sentences that trail off as their mind races to something else. Once a pilot said, “if the glide slope were and I…” followed by silence.

The frustration of knowing what to do but not being able to react fast enough to do it can change some pilot’s mood. Some have responded to controller instructions with an angry tone of voice. I saw a pilot become so frustrated when he could not find an approach chart and position it so he could see it that he ripped the book.

Watching snowball pilots can be painful and frustrating. One always feels like you’d want to throw them a lifeline. The real scary part is that in some cases you know you are watching what could be the last minutes before a fatal accident.

It can also be like watching a person juggling three balls and you throw them a forth – the problem is that their best is only three. Many of these pilots can either make decisions or fly the airplane, but they cannot do both. There is a direct negative correlation between tasks accomplished and aircraft control. When they encounter a distraction, their airplane control suffers.

15.2.6 The Lost In Space Category

The name of this category should speak for itself. The pilots of this group are characterized by being oblivious to the factors around them. Do not misunderstand this characterization; these people are good “stick and rudder” pilots, in that they can fly the airplane well, but they easily get in over their head. These pilots simply drive the machine (airplane) around with no

comprehension of their surroundings. They have little or no situation awareness. Points of decision during a flight may arrive, and they may be unaware of their existence. It is not that these pilots make poor decisions; the problem is that they sometimes do not even know that a decision is called for. They make no correlation between actions that are going on around them and the consequences of those actions. They will get into real trouble and never even know they were in danger.

Other problems that are customary to this group are

- Improperly switching a navigation radio when they are using that radio to navigate.
- Repeating instructions back to the controller by rote, but then not carrying out the instruction that they had just repeated.
- Failure to prepare for an upcoming flight procedure.
- Losing position awareness on the approach, leading to a failure to descend on the approach course at the proper time.
- Consulting the wrong approach chart when setting up the radios for an approach.
- Once a pilot flew the approach at the destination airport without the glide slope, made a missed approach, asked to divert to an alternate that had a full ILS approach. When arriving at the alternate, he elected not to use the ILS Approach although it was available and was the only approach that could safely get the airplane below the clouds. He never understood the implication of losing the glide slope at the destination, so he did not think it a problem not to use it at the alternate.

15.2.7 Illogical decision makers (subgroup)

Many pilots, when faced with a decision, will make an irrational or illogical decision. Once a pilot faced with an alternator failure in the clouds requested a holding pattern. One got lost on the cross-country flight. As the sun went down, the pilot decided to land in a field rather than at an airport that was 6 miles away. When under stress, pilots can make decisions that at the time seem perfectly sound but later loom to be illogical. Pilots who can be classified into the illogical decision makers group also display characteristic in common with either the snowball effect group or the non-assertive decision makers. Therefore you could consider the illogical decision makers a subgroup because their illogical solution to the problem may have been their lack of assertiveness or workload saturation.

15.2.8 Good decision makers/poor fliers (subgroup)

A small group of pilots just do not fly the airplane very well. They can be rough with the controls or at times it seems like the airplane is in control and that they are just along for the ride. Examples are a failure to descend on an approach that if flown properly would have ended successfully. Another example is a pilot landing in a crosswind without taking crosswind corrective action and landing the airplane with a “side load” or even running off the side of the runway. I have known a handful of pilots who can make sound judgments and good decisions, but their lack of flying precision prevents them from ever using their judgment.

15.3 The Value of Pilot Grouping

The grouping of pilots into categories should not be misunderstood. Remember that pilots are all human, and human performance will vary from day to day and even hour to hour. The characteristics description of the pilot categories never represents a single pilot. The descriptions are a composite of many observations. Any pilot taken individually can have performance characteristics from several different groups.

So what is the value of grouping? It is very hard to solve problems and make improvements until you know what the problem is. As a pilot you know many of your own weak areas, and it is hoped that as you read about the different pilot categories, you saw some of your own thoughts and actions played out. This means that you have further defined a problem or weak area. You may also relate it to many of your own flights where you got behind the airplane or were not as aware as you should have been. You always learn more from other pilots as they learn from you. As a flight instructor, you been able to see problems developed from a vantage point than few people have ever had, and you are a better pilot because of that view. As a LOFT facilitator, you might use the categories to identify problems and issues with your students. Please do not "pigeonhole" your students with the categories. Don't ever say, "My 2 o'clock lesson this afternoon is a real snowballer!" Instead, look for the problems that the categories contain and use them as a tool to teach with a better strategy.

15.4 The Decision Making Process

Knowing the goals of your flight with a clear choice of safety as your primary concern does not by itself allow you to make the best and most-informed decision. You need to recognize how a good decision is made in order to make consistently good decisions yourself. Knowing your goals helps you to evaluate the available options.

We can take a hint from the world of business. Developed in business academia and most commonly taught in business management courses is the "DECIDE" model of making a good decision; aviation facilitators have adapted this model slightly for aviation purposes. We are going to apply business decision making principles to making good choices in flight, thereby recognizing the goals of the flight to help make what is hopefully the best possible choice in a given situation.

The **DECIDE** model, has been further modified to, break decision making into six distinct steps:

1. **Detect** that a decision needs to be made.
2. **Evaluate** the options available.
3. **Choose** the best option
4. **Implement** that choice.
5. **Detect** any changes that come about as a result of that implementation.
6. **Evaluate** those outcomes to determine whether your decision was a good one or if you need to begin the process anew.

Have you noticed a pattern'? Every time you make a decision, you alter the conditions of the flight, and quite often those altered conditions require you to make yet another decision to safely meet your goals. Flying is, after all, a constant string of making decisions, so it's not difficult to see why one poor decision can snowball into an accident. Let's look at a real-life example of the decision-making process.

Do you have a decision to make? Consider the DECIDE model:

- Detect the need to make a decision.
- Evaluate your options, considering the goals of your flight.
- Choose the option that best meets your goals.
- Implement that choice.
- Detect the changes that result from your decision.
- Evaluate the result and your need to make further decisions.

Whether related to flying or in any pursuit in your life, having discipline when making choices, having a firm grasp of your goals and their priorities, and utilizing as much information as you can gather will enable you to make good, informed decisions.

It's easy to read a book and practice the "Decide" model, but real life has factors that tend to impair our ability to use the process objectively. Let's take a look at some factors that impact your ability to make good decisions.

15.4.1 Fatigue

How does fatigue affect a pilot'? Fatigue's effects are similar to those of alcohol impairment: reduced perception lessened motor skills, and the inability to control one's actions. That's a worst-case scenario, just before you're ready to fall into deep sleep.

What's really dangerous is how fatigue can begin to sneak up on you before it becomes an obvious factor.

15.4.2 Stress

Stress, too, has unpredictable yet measurable effects on human performance. There are all sorts

of stress, and they are not all bad. Without some sort of deadline, for instance, most people would have a great deal of difficulty motivating them to get things done. There comes a point, however, when stress begins to have negative effects.

The destructive types of stress are those that cause the conscious mind to focus fixate on a problem to the point that other mental functions are suppressed. At this point, the "stressed-out" person relies on rote or subconscious memory and repetition to accomplish mental and physical tasks. A stressed person can fix breakfast or brush his or her teeth or even drive a car while under this mind-numbing stress because those sorts of functions are practiced so often that the subconscious mind has experience in dealing with most of the variables likely to be encountered. Unfortunately, that's not usually the case with flying.

15.4.3 Medication and Health

Depending on the type of flying you do, you need to demonstrate your body's fitness for flight from every 3 years to as often as every 6 months. Regardless of the interval between issuances of your medical certificate, however, the flight physical is a measure of your fitness at that point in time. When you've established your body's basic "airworthiness," it's up to you to make the determination before each flight that you're still capable of piloting.

Even seemingly innocuous illnesses might become serious cockpit distractions. I served in the Air Force with a fellow officer who "washed out" of pilot training because of a toothache. It seems that at some point early in his life he had some rather extensive dental work done. Whoever performed the oral surgery had failed to completely eliminate pockets of air beneath the jaw line; whenever this prospective pilot flew above about 5000 feet, the expansion of this pocket of air gave him a toothache excruciating enough to just about disable him. Eventually, I believe, he had the surgery corrected, but not in time to allow him to continue a military flying career.

15.4.4 Alcohol

The effects of alcohol consumed the night before a flight might carry over until morning, affecting pilot performance and decision making well after the party is over. Use the 8-hour "bottle-to-throttle" rule merely as guidance. You might find that you need more time than that to recover from the effects of alcohol, especially as you age.

Thankfully, the incidence of alcohol-related aviation accidents is quite low. Statistically however, drunken flying leads almost inevitably to fatalities. The whole premise of cockpit resource management is that safe flying requires proper planning, good decision-making, and good judgment. Alcohol inhibits your ability to do any of these things well.

15.4.5 Personality

A pilot's own personality traits can aid or hinder his or her decision-making skills and aptitude as a pilot. Pilot mind-sets can be distilled into five categories:

- Macho
- Impulsive
- Invulnerable
- Antiauthority
- Resigned

Looking at the list, you might think that one or more of these traits are actually good. I doubt very much that a person could fly an airplane without a balanced measure of each of these

characteristics. You probably would never have learned to fly without an antiauthority streak; most people probably thought you were a little crazy to be going up in one of those "little airplanes" in the first place. A pilot could never launch on a long cross-country or IFR flight without a good dose of machismo, or confidence, to cite another example. The situation can become dangerous when one or more of these personality traits become dominant to the point that your thinking is clouded and your sight is blinded regarding the true goals of a flight.

Let's look at how you can recognize when a personality trait begins to destroy your decision-making and piloting abilities.

15.4.6 The Five Hazardous Attitudes

1. **Antiauthority:**
   "Don't tell me!"

This thought is found in:

People who do not like anyone telling them what to do. They think" Don't tell me!" In a sense, they are saying, "No one can tell me what to do." They may either be resentful of having someone tell him or her to do or may just regard rules, regulations, and procedures as silly or unnecessary. However, it is always your prerogative to question authority if you feel it is in error.

2. ***Impulsivity:***
   "Do something-quickly!"

This is the thought pattern of people who frequently feel the need to do something, anything, immediately. They do not stop to think about what they are about to do; they do not select the best alternative-they do the first thing that comes to mind.

3. ***Invulnerability:***
   "It won't happen to me."

Many people feel that accidents happen to others but never to them. They know accidents can be affected; but they never really feel or believe that they will be the one involved. Pilots who think this way are more likely to take chances and run unwise risks, thinking all the time, "It won't happen to me!"

4. ***Macho:***

"I can do it."

People who are always trying to prove that they are better than anyone else think, "I can do it!" they "prove themselves by taking risks and by trying to impress others. While this pattern is thought to be a male characteristic, women are equally susceptible.

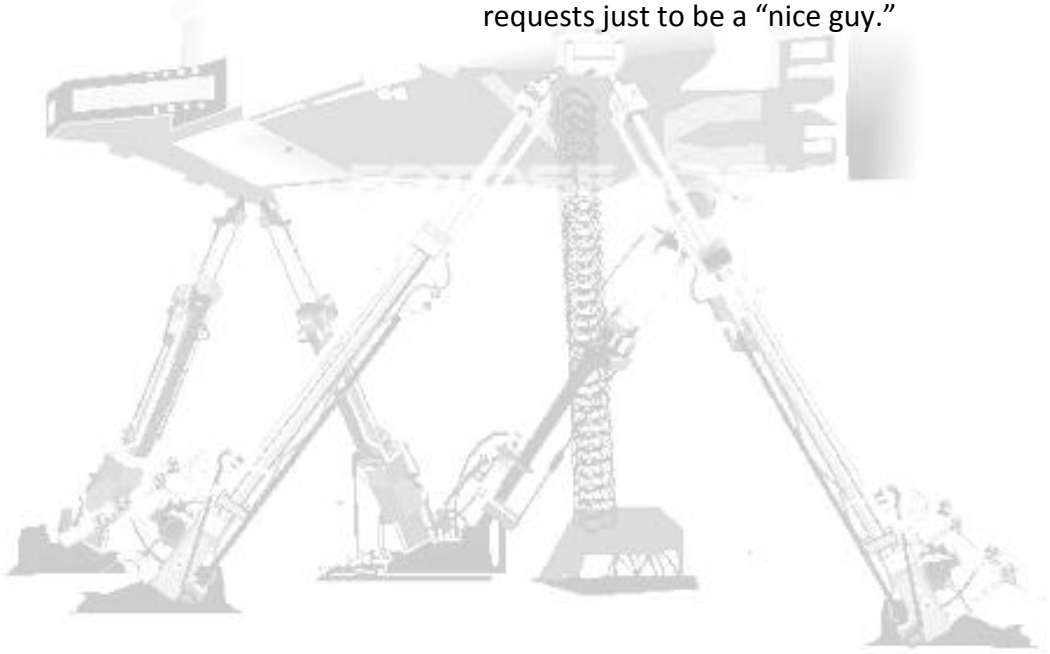
5. Resignation:
"What's the use?"

People who think, "What's the use?" do not see themselves as making a great deal of difference

In what happens to them. When things go well, they think, "That's good luck." When things go

badly, they attribute it to bad luck or feel that

someone is "out to get them." They leave the action to others-for better or worse. Sometimes, such individuals will even go along with unreasonable requests just to be a "nice guy."



16 GUIDELINES FOR TRAINING AND QUALIFICATION OF LOFT FACILITATORS

16.1 Introduction

There is wide variance of opinion with respect to such issues as the number and qualifications of facilitators. The discussion which follows represents a consensus of professional, industry, and organizational opinion, and seeks the best compromise from a training-effectiveness standpoint.

Facilitators 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:

- Facilitators should be Line Familiar.
- Facilitators should be suitably qualified and accordingly licensed.
- Facilitators should be trained in CRM.
- Facilitators should be trained in Briefing, Debriefing and Critique techniques.

16.1.1 Line Familiar

Flight facilitators should be line familiar (i.e., familiar with the operations for which they are providing training). This will ensure that facilitators accurately perceive and evaluate situations as they arise. In cases where facilitators 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, facilitators will maintain an understanding of the operational demands confronting line crewmembers.

16.1.2 Qualified as a Flight Instructor

Flight facilitators should be qualified as defined in the SA CATS FCL 61 and SA CARS Part 61. The facilitator/facilitator should be at least a Grade II flight instructor and the evaluator/assessor should be a designated flight examiner (DFE I/DFE III).

16.1.3 Trained in CRM

Facilitators will have received or receive training in CRM skills in order to observe and critique these areas in LOS. See the chapter discussing CRM principles later in this guide. For further information refer to Chapter 16.

16.1.4 Briefing, Debriefing and Critique Techniques

Facilitators should be trained to conduct the briefing and debriefing/critique phases of LOS, including how to provide effective feedback.

16.2 LOFT Facilitators' Responsibilities

The following paragraphs outline the responsibilities of a facilitator administering LOFT training:

16.2.1 Briefing and Preparation

Facilitators should be able to effectively convey the purpose of the LOS and how it is representative of line operations. Facilitators 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.).

16.2.2 Flight Segment

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

16.2.3 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. When it's available, a simulator with the highest level of accuracy (Level D) should be used to reinforce the illusion of reality.

16.2.4 Resources

The facilitator/evaluator's goal is to produce crew performance and behaviour 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.

16.2.5 Facilitator Role

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

16.2.6 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.

16.2.7 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 behaviour 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.

16.2.8 Debriefing and Critique

Facilitators should provide both positive and negative feedback during critiques of individual and crew performance. Prior to the facilitator’s critiques, crewmembers should be encouraged to critique themselves. Facilitators will provide feedback to the crew to encourage the changes needed for improved performance. Facilitators should also provide specific recommendations to improve individual crewmembers’ performance. Chapter provides tools and guidelines for this skill.

16.3 Specialised Training of Facilitators

Facilitators and check captains selected to conduct LOFT exercises should receive training in the concepts and conduct of LOFT. Such training would include but not be limited to:

- the conduct of the crew briefing and complete familiarity with all pre-flight procedures, including flight plans, weather reports, minimum equipment lists, aircraft performance data, aircraft loading procedures, etc.;
- observation and understanding of resource management, including the crew concept and crew co-ordination;
- the pacing and selection of items in the LOFT scenario and the introduction of abnormal and emergency procedures or situations;
- an in-depth understanding of observational, communication, command and leadership skills, as well as related psychological aspects;
- development of the individual's own skills in interacting appropriately with the flight crew during the briefing, the LOFT exercise and the debriefing; and
- training in assessment skills with appropriate guidance in specific areas such as the exercise of command responsibilities, planning, organization, interpersonal communications, problem solving, decisiveness, judgement, knowledge of aircraft systems and performance, knowledge of and compliance with aviation regulations and ATC procedures, sensitivity, leadership, assertiveness, smoothness and flying skill, work standards and crew co-ordination.

16.4 Standardisation of LOFT

Standardization of LOFT will be achieved if facilitators are given a complete training programme at the outset, followed by periodic monitoring. Additionally, a feedback and critique programme using flight crew members is essential if such a programme is to work. Facilitator standardization is improved if LOFT facilitators monitor each other. Standardization can be more easily achieved if the LOFT facilitator group is small and works almost exclusively on the LOFT programme. LOFT should not be conducted by anyone other than a properly qualified facilitator, but the facilitator can perform other functions within a training department if necessary. Regular facilitator standardization meetings should be scheduled. During these sessions, LOFT scenarios can be assessed and re-evaluated for improvement.

17 GUIDELINES FOR LOFT BRIEFING, DEBRIEFING, PERFORMANCE ASSESSMENT & FEEDBACK

17.1 Introduction

In some ways, there is an apparent conflict inherent in the discussion that follows. For maximum effectiveness, LOFT must be perceived as pure training by crewmembers and facilitators alike. LOFT is learning through experience, which includes making mistakes and errors. To keep minds open, to benefit most from the experience, it is essential that LOFT be entered into with a feeling of freedom, openness, and enthusiasm. Reserve or defensiveness due to concern about "failing" must not be permitted to inhibit participation and involvement in a LOFT scenario.

On the other hand, an open, honest, constructive critique of individual and crew performance can greatly enhance the value of the training experience. Particularly when dealing with issues such as crew coordination, command, leadership, and resource management, insight into individual limitations and weaknesses is an important component of learning and training. Furthermore, everyone involved in any training program is charged with a responsibility for the continuing safety of flight operations through ensuring that the people in the system meet acceptable proficiency and performance standards. For these reasons, there is no such thing as a "no-Jeopardy" training exercise. In any training program, at some point a decision is made that the trainee has progressed satisfactorily through the program; otherwise, additional training is provided. Yet it is essential to create an atmosphere in which mistakes and errors can be made without fear of failure, embarrassment or punishment. As discussed in the following section, creation of this environment is one of the most important roles the facilitator plays in a LOFT program.

17.2 Pre-LOS Briefing

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.

17.2.1 Pre-LOS Briefing Guidelines

Some important elements to be briefed prior to the LOS are:

- Except for the LOE, LOS is designed as a pure learning experience.
- 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 facilitator 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.
- 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.
- All phases of flight will be sequenced in real time. Standard planned routing will be followed unless the crew or ATC requests rerouting.
- Mistakes may be made, just as they sometimes occur on the line, and the aircrew is expected to continue the operation.
- 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 field destination. Scenarios should be written to offer several operational choices.
- 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.
- 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.
- Headsets and emergency breathing equipment will be used by all crewmembers as required in line operations.

17.3 CRM component of the Pre-LOS Briefing

A thorough LOS CRM briefing provides the following:

- 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).
- Is interactive, two-way, and emphasizes the importance of questions, critique, and the offering of information.
- Sets the agenda, outlines expectations, and establishes a “team concept.”
- Covers pertinent safety and operational issues.
- Identifies potential problems such as weather, delays, and abnormal system operations.
- Provides guidelines for crew actions; division of duties and crew workload are addressed.
- Sets expectations for how deviations in simulator performance and mechanical problems are to be handled.
- 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.

17.4 Responsibilities of the Facilitator in LOFT Debriefing

To a considerable extent, the conflict between "training" and "checking" in a LOFT program can be offset by the manner in which the facilitator sets the scene during the post-flight debriefing. The facilitator should emphasize that:

- LOFT is designed as a pure learning experience.
- LOFT is a new training concept designed to accent command responsibilities, crew coordination, communication, and cockpit resource management.
- Mistakes may well be made, just as they sometimes occur on the line, but the crew must carry on. To some extent, LOFT is an exercise in "mistake management."
- There is frequently no book solution to a LOFT exercise-there may be no "right' solution.
- The facilitator's role is to manage the training situation, not to "teach" right solutions, nor to "test" the trainees.
- There will be an opportunity for full self-analysis during the debriefing.

- The facilitator will take notes during the LOFT session only to assist in the debriefing.

Generally, these comments apply to all training programs. However, because of the nature of LOFT, other roles played by the facilitator are very different from those normally played. It is critical that both trainees and facilitators understand these differences. A LOFT facilitator is not a "teacher' in the traditional sense of that word. As emphasized in Chapter 7, in order to achieve the highest degree of perceived realism, it is imperative that the facilitator neither intervene nor intrude in any way into a LOFT scenario. Rather than actively participating in a LOFT scenario, the facilitator manages it. Similarly, the role that the facilitator plays during the debriefing session is primarily that of moderator. Because there are no "right" solutions to many LOFT problems, it is more important -for the facilitator to guide the debriefing session, so that the full range of potential approaches to the problem is explored, rather than to impose his or her ideas about how the problems should have been handled. To accomplish this, the facilitator *must* have time to observe performance adequately. Facilitators should make detailed notes of observations made during the LOFT session so that they can guide the debriefing appropriately; these notes should be used only for the debriefing.

17.5 Items for Discussion during Debriefing

Because the focus of LOFT is upon cockpit resource management skills, a LOFT debriefing session should concentrate on this area. Thus, key items for discussion include crew management, crew coordination, and crew communications. The utilization of systems and other resources are other areas for attention. The discussion should include the use of ATC and company communications; manuals, charts, and other software; the use of other crewmembers; and the use of the autoflight system, and other potential workload-reducing devices. It is the facilitator's responsibility to ensure that these items are fully explored during the debriefing session.

17.6 Self Critique versus Facilitator Critique

Experience has shown that crews frequently debrief themselves. Self-criticism and self-examination are almost always present in these situations and in many cases they are much more effective than facilitator criticism. Frequently crews are more critical of themselves than the facilitator would ever be. Thus, the facilitator should do everything possible to foster this sort of self-analysis while at the same time keeping it at a constructive level. In his role as moderator, the facilitator can guide the discussion to areas that he has noted need attention. Questions about certain procedures, decisions, .and mistakes should be asked. However, unless absolutely necessary, the facilitator should avoid "lectures' about what is right and what is wrong. Obviously the facilitator should avoid the embarrassment of crew members as much as possible.

A suggested format for a debriefing would include:

- A positive general statement should open the discussion.
- Crewmembers should then be encouraged to discuss the operation both as a whole and in parts.
- Referring to their notes, facilitators must assure coverage of all aspects of the flight; no single feature should be permitted to dominate the debriefing.
- The facilitator should mention possible alternatives, different ways of accomplishing the objectives.
- The facilitator should use the question technique to develop discussion; "what if. . . “Is a useful technique for debriefing.
- At the appropriate time, the facilitator should summarize and recap the key learning points in the debriefing.

17.7 Satisfactory Completion

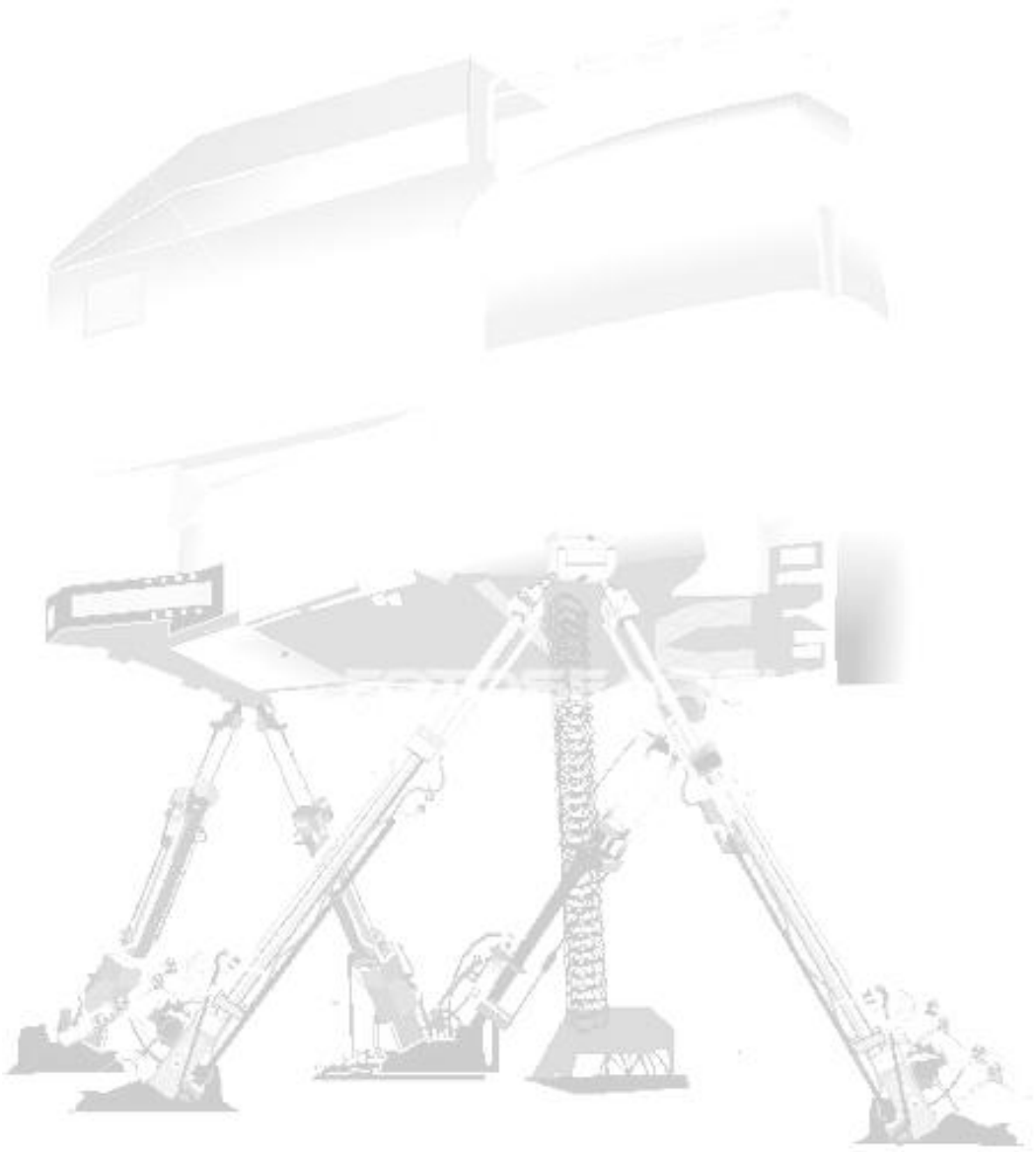
As discussed previously, everything should be done to assure crews participating in LOFT that their jobs are not in jeopardy every time they enter the simulator for a LOFT session. While "satisfactory completion" is an inescapable aspect of LOFT, at the same time it is hard to imagine "unsatisfactory training" if conducted appropriately. In some cases, LOFT may underscore areas that need extra attention, but often even serious mistakes made during LOFT are obvious to the individual crew member and need no further discussion. Even a session that results in a "crash" may be a "satisfactorily” completed, LOFT session if it is evident that the crew has learned a lesson from its experience and that lesson cannot be improved upon. However, in some cases, mistakes may indicate deficiencies that do require additional work. Additional training, when necessary, could be structured to allow crewmembers an opportunity to run through the areas of difficulty in a more effective manner. An advantage of this approach is that learning may be more effective than in situations in which crewmembers are left with unpleasant memories of poor performance. The manner in which the need for additional training is conveyed to a crewmember is of vital importance and represents a challenge to companies, their facilitators, and to the SACAA.

During debriefing both total crew performance and individual performances should be openly discussed and assessed by the facilitator. Critical assessment of an individual can be mentioned in the presence of the full crew, but remedial details should be handled privately. Tact is required to avoid the appearance of checking rather than training.

17.8 Summary

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.



18 GUIDELINES FOR THE DESIGN & DEVELOPMENT OF LOFT SCENARIOS

18.1 Introduction

The design and development of scenarios for LOFT programs require considerable attention to the needs of the particular operator. Different air operators, different operations within an operator, and different pilots within an operation all have various types of training needs. It is essential that considerable flexibility be permitted in order to meet these various training requirements.

The design and development of a LOFT program should be guided by a consideration of the skills required of an individual pilot, as well as the skills necessary for a fully integrated flight crew, such as crew coordination and cockpit resource management. A well-designed LOFT - scenario will exercise both sets of skills. LOFT is also a good vehicle for providing experience with problems in aviation operations such as distraction, complacency, forgetting, and failure of information transfer.

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 pre-flight 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.

These guidelines deal mainly with Recurrent LOFT, but the LOFT concept may be utilized in areas other than recurrent training (See Chapter 14). Although these other applications are not considered in this chapter in detail, most of the guidelines for scenario design and development discussed in this chapter are appropriate for other uses of LOFT and LOS (as are the guidelines in other chapters). The major consideration governing the use of LOFT for any operation is the specific objective for which it is being used and the situational context in which it is being applied.

The latter requires a painstaking amount of attention to the variables within an operation. All LOFT scenarios and flight segments should be designed on the basis of a formal and detailed statement of *specific objectives* and desired end products. For example, if an operator is experiencing an unusual frequency of a specific operational problem, such as problems with wet or icy runways, then the LOFT scenarios should be designed to include that particular operational problem. Other specific objectives could include maintenance of CAT II qualifications, winter-operations training, unusual airport or runway operations, or pilot incapacitation training.

18.2 **Step 1**..... Defining the Objectives for your LOFT

The process of defining specific objectives for LOFT and LOS is an important first step because it encourages serious thought about the factors that should be incorporated in a particular scenario.

18.2.1 Generalised Scenarios versus Detailed Scripts

Experience with LOFT indicates that scripts should be as detailed as possible. This is an absolute necessity, because creating the illusion of the real world requires considerable attention to detail. The absence of detailed scripts leaves the LOFT coordinator largely on his own and requires him to improvise such things as the type, number, and timing of problems, and the coordination of air traffic control (ATC). In most cases this requirement would interfere with the facilitator's ability to observe and evaluate the crew and both quality control and the value of the training experience often suffer. Communications should be scripted and utilized verbatim. The pacing and timing of the scenario should be precisely specified so that the facilitator knows exactly when and how to introduce each element of the scenario. To assist the facilitator, it is useful to have on the script a detailed statement of the crew's expected actions in each situation.

Sub scenarios should be designed in anticipation of crew actions. 'In many cases, the exercise of 'reasonable judgment", in an approach to a problem might permit a variety of actions. For example, if a scenario incorporates a situation in which diversion to an alternate airport, although not required, is a "reasonable" choice, then the scenario designer should plan a sub scenario that covers the diversion leg. If a diversion is not desirable in a given scenario, then steps should be taken to ensure that such a decision is not likely by using weather or operational factors (e.g., closing the only open runway at the alternate). Alternatives should also be provided if the modification of scenario timing is necessary. Unexpected missed approaches, for example, might cause modifications to scenarios in order to stay within simulator scheduling constraints. Facilitators need to have the flexibility to omit parts of a. scenario when crew actions prolong the completion of certain legs. However, it should be understood that, despite the best efforts of the designer, it is never possible to anticipate all crew actions. For this reason, the LOFT facilitator must be flexible (and creative) at all times.

The LOFT facilitator should not routinely add to or modify a scripted situation, but, if the facilitator observes that a crew is overloaded to such an extent that further learning is impossible, he should be permitted to exercise *reasonable* judgment to prevent further compounding of the crew's situation. This can be done either by deleting planned problems, or through assistance rendered within the context of the scenario. For example, ATC might become more "helpful," company maintenance might propose a solution to a systems problem, or the dispatcher might be able to provide some useful assistance via a "SELCAL" message to the trip.

18.2.2 Simulator Capabilities, Features, and Limitations

State-of-the-art simulators and visual systems are capable of duplicating virtually every aspect of flight in a highly realistic manner. Several operators have recently included elaborate ground visual systems complete with gates, ramps, and taxiways. In light of these developments, and the fact that advanced simulators offer economic advantages by reducing aircraft training time, most operators will soon have all of the elements needed for highly effective LOFT training programs.

Nonetheless, certain simulator problems that cause interference with the realism associated with LOFT can and will occur. If a component required for a given scenario is inoperative, that scenario should not be flown. However, if the inoperative equipment is not required for the planned scenario (i.e., the inoperative equipment is not a vital simulator system or an MEL item) and if the crew's perception of reality is not impaired, the simulator can be used to conduct a LOFT session. Minor simulator malfunctions (instruments, etc.) can be placarded 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 airplane, the scenario can proceed, with modification if necessary, just as would a line flight.

The use of certain simulator capabilities to provide replay, to be frozen, to be repositioned, etc., which are not consistent with a continuous, real-time operation should not be permitted within the LOFT context, although these features are useful for other types of training. However, some repositioning is acceptable on certain simulated long-range flights. This repositioning must be done as unobtrusively as possible, and it is best accomplished by slewing simulator position along the intended route of flight.

18.3 Step 2..... Origin, Routing, and Destination

The origin, routing, and destination of a particular scenario is dictated by the specific training needs arising from the route structure of an operator. Operators typically flying short-haul routes will need substantially different scenarios than those serving long, nonstop routes. Other factors for consideration are the weather, climate, and other environmental factors. Some operators, presently conducting LOFT programs, have utilized weather information from actual days along a

trip route. Simulator visual and other capabilities and limitations must be accounted for, or worked around, at a very early stage of scenario design and development.

The simulator navigation area must be applicable to the route selected by you and navigation and approach charts should be current and up to date. It has been pointed out that the major advantage of LOFT is realism, but much of this realism is lost if the scenarios are not consistent with an operator's route structure or if the crew is unable to use actual charts, manuals, and other materials. In many cases, it may be feasible to use actual trip sequences for LOFT scenarios.

Other factors for consideration are alternate airports, fuel, and air-traffic-control situations. It cannot be overstressed that the specifics of location choice depend entirely on the training needs -and route structure of the operator. For example, if an operator is experiencing air traffic-control problems in a certain location, it would, of course, be advantageous to construct a scenario around those problems and to choose a route where those problems are most likely to occur. _

18.4 Step 3..... Abnormal and Emergency Conditions

Problems and anomalies should also be chosen on the basis of the specific objectives of a given LOFT scenario. Problems can be roughly categorized into two types. The two types are classified as simple and complex problems.

SIMPLE PROBLEMS	COMPLEX PROBLEMS
These have no further impact on the conduct of the flight once they have been diagnosed Example: A hung start or a potential hot start and corrected.	These cannot be corrected in flight and continue for the duration of the flight Example: A failed essential A.C. bus.

It is desirable to utilize both problem categories in designing LOFT scenarios; however, the overuse of simple problems in a single scenario will greatly detract from the realistic simulation of line operations. The success of a given LOFT scenario is heavily dependent upon creating and sustaining an illusion of reality. The use of frequent, simple, or unrelated problems such as hung starts, stuck start valves, hot starts, and similar types of problems will cause many pilots to feel that they are "back in the box for a check". **Problems should not be compounded.**

Problems should not be made unnecessarily complex. The simultaneous presentation of multiple problems is somewhat unrealistic and should not be routinely designed into scenarios, although multiple problems may develop as a result of inappropriate crew actions. LOFT should not

incorporate the notion of "burying" the crew. Moreover, an accident" should never be the inevitable outcome of a scenario, although it is always possible that one will occur. If an "accident" does occur during a LOFT session, it may provide the crew with a vivid learning experience.

The use of problems for which there is no solution is permissible and sometimes desirable. For example, one operator has utilized a hung main landing gear to provide a problem for which there is no solution. Some feel that the inclusion of these kinds of problems will help prevent "simulator syndrome," where crew members begin to feel that there *must* be a solution to all real-world problems because "they've always found one in the simulator."

18.5 Step 4..... Candidate Problems

Problems for inclusion in LOFT scenarios can be drawn from a number of sources. Anything that can be realistically reproduced in a simulator is a candidate problem. Frequent y misunderstood or misused sections of Flight Operations Manuals or Aircraft operating Manuals can provide material for LOFT scenarios. Other sources of problems include reports from the NASA Aviation Safety Reporting System, other flight-incident reports from the operator's Safety Management System (SMS), National Transportation Safety Board (NTSB) accident reports, and FAA Maintenance Difficulty Reports. The following table of problem categories may be useful to the scenario designer:

Operational Problems	Environmental Problems	Equipment Problems	Crew Problems
Pre-flight: dispatch release, hazardous cargo, fuelling options, Notices to Airmen (NOTAMS)	Weather, wind, crosswind limitations, temperatures Runways wet, icy, closed Runway and touchdown-zone lighting problems	Airborne equipment problems	Interaction with cabin crew
Minimum Equipment List (MEL) items	Runways wet, icy, closed	Ground equipment problems	Flight-crew problems
Cabin/passenger problems	Runway and touchdown-zone lighting problems	Support equipment	Incapacitation (obvious or subtle
ATC problems		Ground-based radio aids	
Weight and balance problems			

18.1 Step 5..... Scenario Length

The length of a given LOFT scenario is entirely dictated by the route structure and training needs of the specific operator. Regional operators, for example, probably need scenarios with relatively short stage lengths. Depending on their needs, operators may find it beneficial to structure their LOFT scenarios so that sufficient time remains in the simulator period to practice specific manoeuvres or operating procedures following completion of the LOFT scenario. The proper mix of LOFT and manoeuvre-oriented training can be determined only on the basis of the specific requirements of the operator, crew, equipment, and other unique factors. These factors must be considered when decisions about scenario length are made.

18.2 Step 6..... Pacing, Tempo, and Quiet Periods

The pacing and tempo of a given scenario must be consistent with the location, departure time, and phase of flight, and must be in keeping with the specific objectives of that scenario. Scenario designers should avoid the continual introduction of problems such that the entire flight segment is characterized by problem solving. The design should allow for periods of relative inactivity, just as in the real world. This type of design is highly desirable because it allows crews to deal with problems from a perspective more closely approximating what would actually occur on a line trip. However, it is also necessary to incorporate segments in a scenario in which stress is generated by the sequence, pacing and tempo of events. Learning to cope with this stress effectively is an important part of resource management training.

18.3 Step 7..... Scenario Revisions and Quality Control

After development, scenarios should be carefully tested; revisions will almost always be required. Even after testing and approval by the SACAA, a scenario often will require further revision. Both the input of the LOFT coordinator and feedback from line crews is valuable in this regard. Routine coordinator meetings are beneficial and help assure continuity among the different coordinators as well as in aiding in the refinement of scenarios. In addition, crews should be encouraged to provide feedback after their experiences with LOFT.

New scenarios should be continually developed so that there is a constant turnover (new ones added as they are available and old ones deleted or saved for future use). All scenarios should be kept current with respect to navigation facilities, regulations, communications, company procedures, and aircraft modifications. Accuracy of scenarios with respect to system hardware and software is another detail essential to the credibility of LOFT.

18.4 Step 8..... Inadvertent Departures from Scenarios

Despite careful planning, and regardless of the direction a flight was intended to follow, crews may elect to pursue a course of action that was not contemplated when the scenario was developed. In these instances, the LOFT coordinator has the option of permitting the selected action and supporting it with appropriate clearances, and weather, or alternatively, preventing the selected action by providing adverse weather, closed airports, or inoperative navigational aids. The latter 'course should be utilized with care since in many cases it is preferable to allow crews to proceed as they elect. (See Chapter for another discussion of this topic.)

18.5 Step 9..... Assessing and Validating the LOS Scenario

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 behaviour areas that have been integrated and validated by the design team. The desired behaviours are presented with a brief statement of what constitutes unsatisfactory behaviour.

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 manoeuvre. Within the event set, specific objectives are assigned, any one of which could be involved in the unsuccessful outcome of the event set.

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 Facilitators, Designated Flight Examiners, line pilots, and SACAA inspectors provide the information needed to validate or modify the scenario.

Some key areas for assessment to be included in LOS design are:

18.5.1 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.

18.5.2 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.

18.5.3 Decision-making

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.

18.5.4 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.

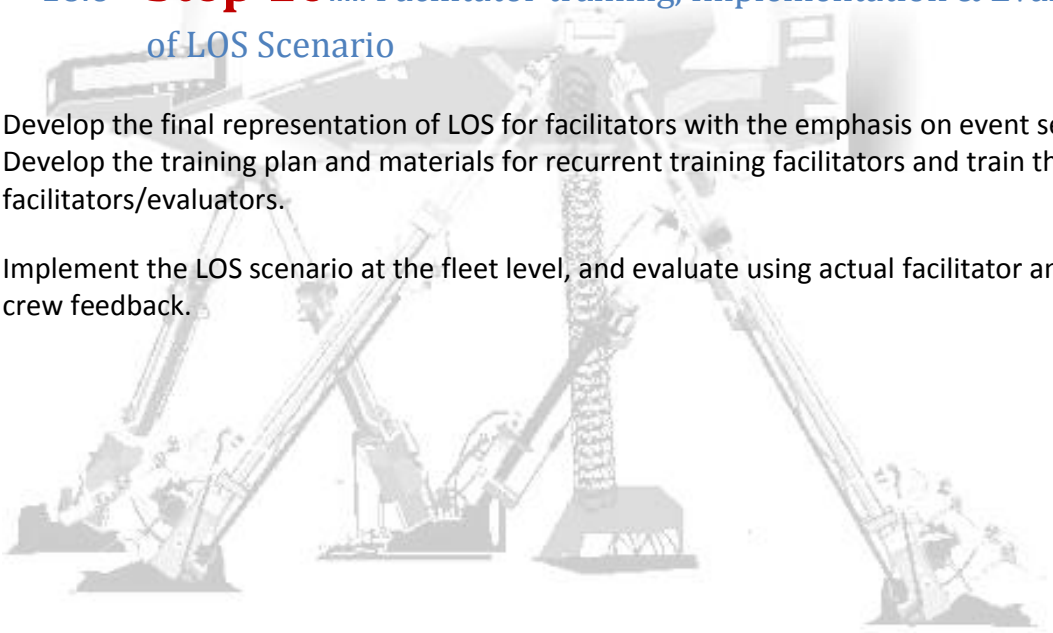
18.5.5 Unsatisfactory Performance

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.

18.6 **Step 10**..... Facilitator training, Implementation & Evaluation of LOS Scenario

Develop the final representation of LOS for facilitators with the emphasis on event sets. Develop the training plan and materials for recurrent training facilitators and train the facilitators/evaluators.

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



18.1 Example LOS Scenario Event Set with Phases of Flight and Proficiency Objectives – Simple Aircraft

SCENARIO EVENT SET NUMBER	PHASES OF FLIGHT	TERMINAL PROFICIENCY OBJECTIVES
Scenario Event Set 1	Pre Departure, and Start up	Dispatch–"Hot & High" operation. Pre-flight - with Malfunctions Start & Pre-Taxi – Engine Fire/Mag drop.
Scenario Event Set 2	Taxi	Follow taxi instructions, Ambiguous instruction to cross an active runway.
Scenario Event Set 3	Takeoff	Takeoff -"Hot & High" performance Tyre burst on takeoff run. Climb to Cruise Altitude - "Hot & High" conditions.
Scenario Event Set 4	Climb	Climb to Cruise ATC-advise of tyre burst on takeoff with suspected damage. Fuel leak develops from damage.
Scenario Event Set 5	Cruise	En route Cruise – Fuel leak develops from damage. Unbalanced fuel scenario. Range/Endurance limited by fuel leak. Suitable en-route diversion decision/return to departure field
Scenario Event Set 6	Descent	Descent from Cruise – suitable en-route diversion decision/return to departure airfield.
Scenario Event Set 7	Approach and Landing	Instrument approach to minima's (smoke from fire near airfield) Landing with burst tyres. Taxi In or Tow in
Scenario Event Set 8	Taxi/Parking	Parking Shutdown Post Shutdown

18.1.1 Example of the above Scenario's Event Set Index with Phases of Flight and CRM Behaviours

SCENARIO EVENT SET NUMBER	SITUATIONAL AWARENESS	WORKLOAD MANAGEMENT	PLANNING	DECISION MAKING
Event Set 1 - Pre Departure	Notices Mag Drop/ Actions Engine Fire drills	Manages engine fire drills/notices mag drop.	PF notices hot conditions and calculates density altitude	PF analyzed departure WX. Decides whether to continue flight after eng malf.
Event Set 2 - Taxi	Discussed taxi route and was aware of active runway.		Taxi – routing and active runway consideration.	SMGS plan ramp coordination
Event Set 3 - Takeoff	Discussed "Hot&High" density alt before it could become a problem	Set clear priorities for tasks and their order.	Engine Failure flight path & procedures discussed.	Continue takeoff or not after tyre burst.
Event Set 4 - Climb	Noticed damage/fuel leak.	Prioritised tasks to be completed.	Planned for unbalanced fuel. Considered range – fuel leak.	Decided on diversion strategy
Event Set 5 - Cruise	Set aircraft up for intended cruise configuration. Navigation appropriate with diversion decision.	Dealt with fuel problem Performed required checklists and announced compliance	Assessed WX at diversion field Calculated time and distance to alternate.	Decided to divert to original point of departure or alternate.
Event Set 6 - Descent	Aware of WX at alternate and smoke at destination.	Prioritized tasks and got ready for approach	Reviewed approach procedures and A/C condition.	Decided to divert to original point of departure or alternate
Event Set 7 - Approach and Landing	Aware of burst tyre, effect of unbalanced fuel.	Properly prioritized tasks Planning for landing(tyre,fuel,taxi)	PF briefed cabin crew PF planned and briefed approach	Decided to Land or Go-Around.
Event Set8 – Taxi In	Able to taxi or request tow.	Shutdown according to normal procedures.	discussed taxi on burst tyre.	PM advised ATC of inability to taxi or towing intentions

18.1.2 Example of the above Scenario's Event Set Matrix

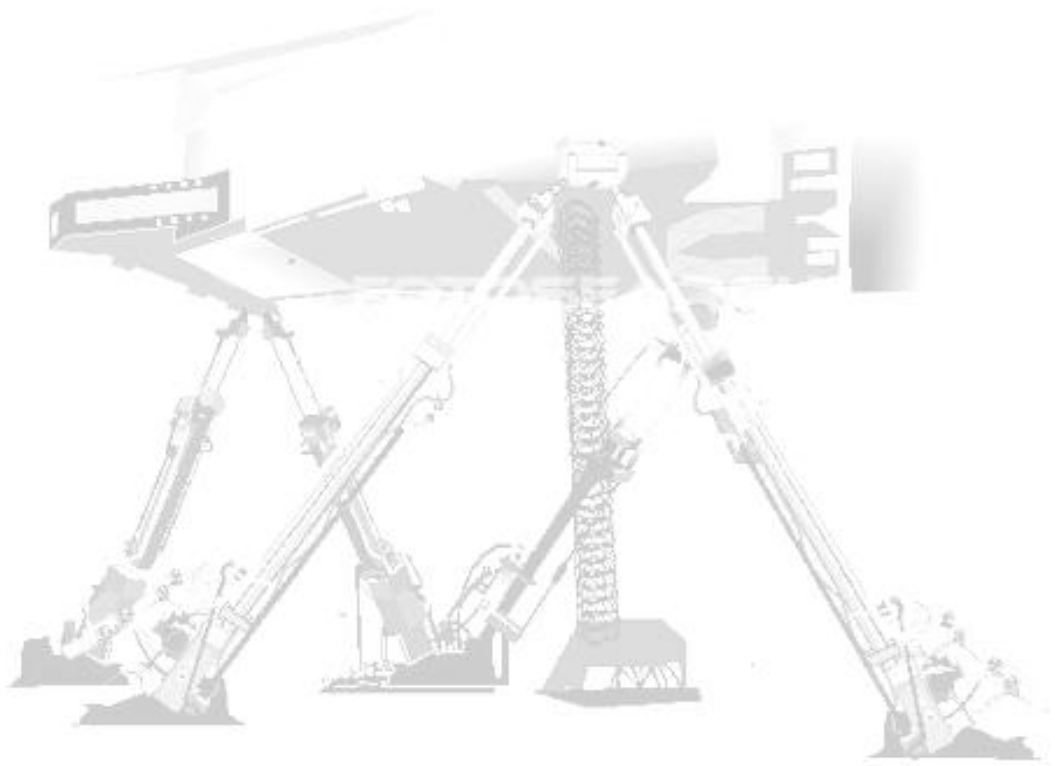
An event set matrix will provide a quick reference source for specific items to be accomplished during the LOS, and will help to ensure that all proficiency objectives identified in the training programme are accomplished. In addition, the matrix can be used to categorize the problems as simple to complex in order to identify demands that will be placed on the crew. CRM performance indicators for each event set must also be developed. This will require the integration and validation of the CRM skills to be added to the matrix.

EVENT SET	PHASE OF FLIGHT	TECHNICAL REQUIREMENTS	KEY EVENTS	CRM BEHAVIORS
EVENT SET 1 - Pre-departure / Engine Start .	Pre Departure Engine start	The crew must consider hot and high density altitude operations Performance figures should be reviewed.	Departure, en-route and arrival in hot conditions. Destination WX is at non-precision minimums. During pre-flight crew may have a popped CB. During engine start there is an Engine Fire. OR The LH engine magneto has a RPM drop, but clears after remedial action.	Open, interactive crew climate established, crew asks questions and seeks answers 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 hot conditions with takeoff gross weight near density altitude limit. Flaps as required for takeoff. Engine run up required for takeoff	Taxi in congested ramps and taxiways in low visibility(smoke) The taxi crosses an active runway on the way to the takeoff. There is rapidly rising terrain to the south of the departure runway. Complex departure	COMMUNICATION: ATC interaction, problem definition about smoke and rising terrain. WORKLOAD MANAGEMENT: Prioritize tasks for hot conditions and departure. DECISION MAKING: Captain decisive about rising terrain issues, with crew input

EVENT SET	PHASE OF FLIGHT	TECHNICAL REQUIREMENTS	KEY EVENTS	CRM BEHAVIOURS
EVENT SET 3 - Takeoff	Takeoff	Engine run up required before takeoff position Max power takeoff. Identify burst tyre on takeoff run.	Turn onto runway at low speed. Power stabilised against brakes. Critical to maintain centre line in low visibility with burst tyre.	COMMUNICATION: ATC interaction, problem definition about rising terrain. WORKLOAD MANAGEMENT: Prioritize tasks for departure. DECISION MAKING: Captain decisive about rising terrain issues, with crew input.
EVENT SET 4 - Climb	Climb	Manage fuel leak during climb. Departure constraints to be met.	Crew to check radar terrain clearance charts. Turbulence at initial cruise level.	COMMUNICATION: ATC interaction, problem definition about fuel leak and terrain clearance. WORKLOAD MANAGEMENT: Prioritize tasks for fuel leak and departure constraints DECISION MAKING: Captain decisive about rising terrain issues, fuel leak and diversion strategy.
EVENT SET 5 -Cruise	Cruise	Engine fuel leak checklist. Range/Endurance calculations. Use of remaining fuel before switching tanks. GRID MORA considerations. Burst tyre considerations	Weather radar usage. Fuel leak with imbalance. Affected tank empties. High terrain considerations. Diversion strategy	COMMUNICATION: ATC interaction, problem definition about fuel leak, fuel im- balance and diversion. Cabin crew advised. WORKLOAD MANAGEMENT: Prioritize tasks for non-normal checklists and diversion. PF directed PM to deal with fuel range/endurance calculations PM performed needed checklists and announced compliance

EVENT SET	PHASE OF FLIGHT	TECHNICAL REQUIREMENTS	KEY EVENTS	CRM BEHAVIOURS
	Cruise (contd.)			PLANNING: Crew assessed one engine landing with WX at diversion field PF calculated time and distance to alternate. DECISION MAKING: Captain decisive high terrain, with crew input on being able to return to original departure point, or divert.
EVENT SET 6 - Descent	Descent	Fuel imbalance – Aircraft controllability Landing checklist. Flap selection for landing due to burst tyre consideration.	Fuel range/endurance for descent. Fuel management. Diversion planning and approach preparation.	COMMUNICATION: ATC interaction, problem definition about fuel leak & diversion. Declared Emergency. Cabin crew advised. WORKLOAD : PF prioritized tasks and got ready for approach PLANNING: Reviewed controllability and braking effectiveness on touchdown. Possible evacuation
EVENT SET 7 – Approach & Landing	Approach & Landing	Fuel imbalance – Aircraft controllability Landing checklist. Flap selection for landing due to burst tyre consideration	Fuel range/endurance for descent. Fuel management. Diversion planning and approach preparation Instrument approach to minimas due to smoke from fire near airfield.	COMMUNICATION: ATC interaction, Cabin crew advised of possible evacuation. WORKLOAD: PF properly prioritized PM provides backup for PF on all his tasks PLANNING: Planned and briefed Approach

EVENT SET	PHASE OF FLIGHT	TECHNICAL REQUIREMENTS	KEY EVENTS	CRM BEHAVIOURS
EVENT SET 8 -Taxi	Taxi	Taxi or Tow in requirements.	Taxi with burst tyre Tow in procedure. Normal shutdown procedures	COMMUNICATION: ATC & Emergency services interaction, Cabin crew advised to evacuate/resume normal duty. WORKLOAD: Capt properly prioritized checklist items



18.2 Example LOS Scenario Event Set with Phases of Flight and Proficiency Objectives –Advanced Aircraft

SCENARIO EVENT SET NUMBER	PHASES OF FLIGHT	TERMINAL PROFICIENCY OBJECTIVES
Scenario Event Set 1	Pre Departure, and Push Back,	Dispatch – Winter/Cold Wx Ops Pre-flight - with Malfunctions Start and Pre-Taxi - Hung Start
Scenario Event Set 2	Taxi	Taxi – Low Vis Taxi – Winter conditions De-icing
Scenario Event Set 3	Takeoff	Takeoff - Winter Conditions Climb to Cruise Altitude - Winter Conditions
Scenario Event Set 4	Climb	Climb to Cruise Altitude - Winter Conditions
Scenario Event Set 5	Cruise	En route Cruise - Winter Conditions, with Malfunctions – Severe Compressor Stall
Scenario Event Set 6	Descent	Descent from Cruise - Winter Conditions, with Malfunction Engine Out Drift down - Winter Conditions
Scenario Event Set 7	Approach and Landing	Engine Out ILS - Winter Conditions Engine Out Landing - Winter Conditions Taxi In - Winter Conditions
Scenario Event Set 8	Taxi/Parking	Parking - Winter Conditions Shutdown - with APU Fire Post Shutdown

18.2.1 Example of the above Scenario's Event Set Index with Phases of Flight and CRM Behaviours

SCENARIO EVENT SET NUMBER	SITUATIONAL AWARENESS	WORKLOAD MANAGEMENT	PLANNING	DECISION MAKING
Event Set 1 - Pre Departure			PF planned de-ice for winter operations SOP PF briefed rising terrain	PF analyzed departure WX and requests takeoff alternate
Event Set 2 - Taxi	Crew discussed route and hold over times		Taxi – Low Vis De-icing pad	SMGS plan Pad coordination
Event Set 3 - Takeoff	Crew discussed icing issue before it could become a problem	Crew set clear priorities for tasks and their order		
Event Set 4 - Climb	PF requested higher altitude			
Event Set 5 - Cruise		PF directed PM to deal with engine problem PM performed needed checklists and announced compliance	Crew assessed one engine landing with WX at diversion field PF calculated time and distance to alternate.	PF stated that they cannot go back to original point of departure.
Event Set 6 - Descent		PF prioritized tasks and got ready for approach	PF reviewed single engine approach procedures and A/C evacuation	
Event Set 7 - Approach and Landing		PF properly prioritized PM provides backup for PF on all his tasks	PF briefed cabin crew PF planed and briefed SE ILS	
Event Set8 – Taxi In			PF/PM discussed taxi on single engine.	PM advised ATC of inability to taxi on single engine

18.2.2 Example of the above Scenario's Event Set Matrix

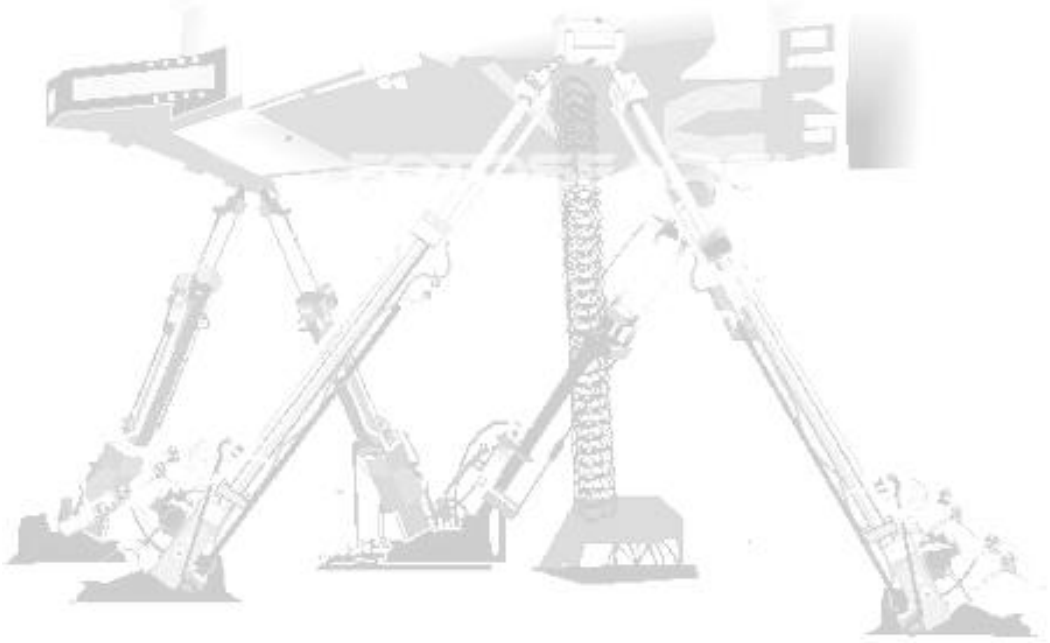
An event set matrix will provide a quick reference source for specific items to be accomplished during the LOS, and will help to ensure that all proficiency objectives identified in the training programme are accomplished. In addition, the matrix can be used to categorize the problems as simple to complex in order to identify demands that will be placed on the crew. CRM performance indicators for each event set must also be developed. This will require the integration and validation of the CRM skills to be added to the 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	De-icing procedures must be followed. Takeoff alternate is required.	Departure, en-route and arrival in winter conditions. Destination WX is at CAT IIIa minimums. During pre-flight 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.	Open, interactive crew climate established, crew asks questions and seeks answers 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	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.	COMMUNICATION: ATC interaction, problem definition about de-icing and rising terrain. WORKLOAD MANAGEMENT: Prioritize tasks for de-icing and departure. DECISION MAKING: Captain decisive

EVENT SET	PHASE OF FLIGHT	TECHNICAL REQUIREMENTS	KEY EVENTS	CRM BEHAVIOURS
	Taxi (contd.)	position Cycle gear after takeoff	Complex departure	about rising terrain issues, with crew input.
EVENT SET 3 - Takeoff	Takeoff	Engine run up required in takeoff position Cycle gear after takeoff Static thrust takeoff.	Turn onto runway at low speed. Thrust stabilised against brakes. Critical to maintain centre line in low visibility.	COMMUNICATION: ATC interaction, problem definition about de-icing and rising terrain. WORKLOAD MANAGEMENT: Prioritize tasks for de-icing and departure. DECISION MAKING: Captain decisive about rising terrain issues, with crew input.
EVENT SET 4 - Climb	Climb	Anti-Icing during climb. Departure constraints to be met.	Crew to check radar terrain clearance charts. Moderate icing in climb. Turbulence at initial cruise level.	COMMUNICATION: ATC interaction, problem definition about de-icing and terrain clearance. WORKLOAD MANAGEMENT: Prioritize tasks for anti-icing and departure constraints DECISION MAKING: Captain decisive about rising terrain issues, with crew input.
EVENT SET 5 -Cruise	Cruise	Engine Stall/Surge/Limit memory items and checklist. Autoflight/FMC usage for engine out condition. GRID MORA considerations.	Weather radar usage. Severe engine compressor stall on engine with start malfunction. Engine out drift down in the cruise-high terrain considerations.	COMMUNICATION: ATC interaction, problem definition about engine failure-icing and terrain clearance. Cabin crew advised. WORKLOAD MANAGEMENT: Prioritize tasks for non-normal checklists and driftdown. PF directed PM to deal with engine problem PM performed

EVENT SET	PHASE OF FLIGHT	TECHNICAL REQUIREMENTS	KEY EVENTS	CRM BEHAVIOURS
	Cruise (contd.)			needed checklists and announced compliance PLANNING: Crew assessed one engine landing with WX at diversion field PF calculated time and distance to alternate. DECISION MAKING: Captain decisive about rising terrain drift down compliance, with crew input on not being able to return to original departure point.
EVENT SET 6 - Descent	Descent	Engine out Landing checklist. Engine out landing distance calculations. Flap selection for landing and FMC programming.	Engine out descent. Icing conditions in descent with single engine – wing anti-ice required.	COMMUNICATION: ATC interaction, problem definition about engine failure & diversion. Declared Emergency. Cabin crew advised. WORKLOAD : PF prioritized tasks and got ready for approach PLANNING: PF reviewed single engine approach procedures and possible A/C evacuation
EVENT SET 7 – Approach & Landing	Approach & Landing	Engine out ILS profile. Engine out landing procedure. Engine out non-normal checklist completion.	ILS in icing conditions. Low visibility CAT II approach with manual landing.	COMMUNICATION: ATC interaction, Cabin crew advised of possible evacuation. WORKLOAD: PF properly prioritized PM provides backup for PF on all his tasks PLANNING: PF planed and briefed SE ILS

EVENT SET	PHASE OF FLIGHT	TECHNICAL REQUIREMENTS	KEY EVENTS	CRM BEHAVIOURS
EVENT SET 8 -Taxi	Taxi	APU Fire memory items. Evacuation checklist.	APU Fire after taxi in.	COMMUNICATION: ATC & Emergency services interaction, Cabin crew advised to evacuate. WORKLOAD: Capt properly prioritized checklist items



19 RISK MANAGEMENT MODEL

19.1 Introduction

Because of the inherent reluctance and lack of ability to make good decisions, the industry has developed a model as a template. Take note that this is a model NOT a checklist. As a model it is intended that this process is to become part of your cockpit culture. In fact part of your every day culture. Your make up. Your aviation upbringing. The earlier we start instilling this sort of culture the better.

19.2 Background Information

This model was designed in conjunction with the Advanced qualification Programme (AQP) designed by the FAA.

The main object of this programme is to encourage companies to design training programmes which enable a seamless integration of CRM, procedural elements and technical skills, thereby enabling the crew to make a more balanced decision in the event of a risk management scenario.

In the process of designing these training programmes it was decided to research the possibilities of a problem solving model checklist which could provide the “seamless integration between procedural, technical and CRM skills” while simultaneously accommodating type specific requirements of each aircraft. The Risk Management Model (RMM) is the result of this research programme.

19.3 Designing the Risk Management Model (RMM)

The model under discussion is for a two-man cockpit; however, a model for a three-man cockpit is also available.

The RMM is based on the assumption that the crew is proficient in the following:

- Aircraft Handling skills (Manual and auto flight)
- Technical Knowledge (Type specific)
- Procedures (Manufacturer and Company)

It must also be emphasised that the RMM and CRM is intended to provide an extra dimension to the pilot’s management skills and not to replace the requirement for knowledge or skills in any of the above mentioned aspects.

19.3.1 The Model "Footprint"

The RMM is based on the Battelle "Situational Assessment Model" that was developed for the FAA.

This model focussed mainly on factors that influenced a flight crew's **assessment** of a situation and the subsequent **management** of available resources.

The model also did not spell out any management requirements.

The RMM expanded on the Battelle model and also includes the following:

- Procedures to identify the problem.
- Procedures to rectify / contain the problem.
- Making a decision.
- Implementing the decision.

However, the process to "Rectify / Contain the problem" has very specific needs that can only be accommodated by allocating it to a phase of its own. This additional phase consisted mainly of corrective actions, according to the manufacturers non-normal checklists and/or company procedures, therefore, it was decided to call this the **"Action Phase"**

ASSESSMENT PHASE
Accomplish actions to **diagnose/assess** the problem.
ACTION PHASE
Accomplish **actions** to contain/rectify the problem.
MANAGEMENT PHASE
Accomplish actions to **safe-guard the continuation** of the flight after the event.

19.3.2 Providing "Seamless Integration"

To provide the seamless integration as required by the AQP, the following modification to the RMM was made:

- During each phase in the RMM specific guidance is provided, indicating when manufacturer's / company procedures, as well as suggested and appropriate CRM elements should be applied.
- Furthermore, proficient handling skills and management of the auto flight system are always applicable, therefore these elements are re-enforced in the introduction phase of the RMM.
- RMM procedures should only be accomplished when the flight path is under control and the aircraft is not in a critical phase of flight. Hence the introduction of –

- AVIATE, NAVIGATE, COMMUNICATE (ANC). The RMM recognises the importance of ANC; therefore RMM actions may only be accomplished once ANC has been satisfied. Should a situation occur where an ANC requirement develops during the execution of the RMM, the RMM should immediately be stopped to attend to the ANC requirement, thereafter, continuation of the RMM is permitted.

19.4 In Summary:

19.4.1 Assessment Phase

This phase relies mainly on the crew's knowledge of the systems and / or environments as well as good communication between crew members. Ideally consensus should be reached as to the assessment of what the problem is.

19.4.2 Action Phase

During this phase, emphasis is placed on the technical / procedural knowledge combined with good communication and monitoring techniques. Usually the aircraft QRH supplies sufficient information to handle a specific event or scenario. Where the QRH lacks guidance in the rectification of an event / scenario, the crew is required to combine knowledge and experience to ensure a safe outcome.

19.4.3 Management Phase

This phase relies mainly on the application of good CRM practices. To assist the pilots in this process, appropriate CRM principles are listed to serve as "memory joggers". It is not possible for all CRM principles to be listed; the crew are therefore required to continually maintain a good CRM awareness throughout this phase.

19.5 The RMM Checklist Philosophy

Recall Items must be accomplished from memory. The crew member reading the RMM (usually the Captain), verifies that each recall item has been accomplished. The RMM is normally read aloud during such verification, but the PF is not required to respond, except for items which are not in agreement with the checklist.

Reference Items are read aloud by the by the Captain to assist in stimulating crew response and to ensure systematic and seamless integration.
Information providing guidance in CRM principles is presented in [brackets]. This information should not be read aloud.

However, once the crew are fully trained in the application of the RMM, the crew may accomplish the entire RMM from memory. When time permits, the Captain can refer to the RMM as an "aide memoir" to ensure that all elements have been covered.

19.5.1 The Monitoring Concept

One of the most important elements in the design of the RMM was influenced by the following study:

A NTSB study of 37 crew-involved accidents in the USA from 1978-1990 showed that 84% of the accidents were as a result of a mode failure of proper monitoring or challenging by crews. In almost the same percentage, it was the lower authority unit (First Officer) which failed to make the switch from "assist" to "override"

Rather than make the subordinates monitor and challenge their superiors**, the cockpit procedures were re-designed to provide the best possible monitoring, without having to rely solely on CRM.**

Traditionally operators have a "leg for leg" flying policy whereby the Captain and the First Officer share the flying duties. If a problem occurred when the Captain was the Pilot Monitoring (PM) he inevitably ended up accomplishing all the checklist actions. This results in a possibility for a poor monitoring scenario.

The RMM rectifies this possible problem by stipulating when the Captain is to operate as Pilot Flying (PF) or the Pilot Monitoring (PM) for each phase of the RMM.

ASSESSMENT PHASE	Ideally Captain should be	**PM**
ACTION PHASE	Ideally Captain should be	**PF**
MANAGEMENT PHASE	Ideally Captain should be	**PM**

19.5.2 "Handing Over Control" Concept

To comply with the above requirements it becomes necessary for the crew to hand over control of the aircraft for each phase of the RMM. Once the crew are trained, this procedure vastly enhances pilot situational awareness, because the pilot doing the hand over:

- Briefs the other pilot on the present flight path, ATC clearance received and intentions.
- Confirms the Flight Mode Annunciations (FMA)
- Carries out a confidence check on ANC (Aviate, Navigate, Communicate)

The handing over control will only take place once the aircraft is fully under control, at a safe altitude and ANC has been satisfied.

19.6 The Practical Application of the RMM

In the event of a non-normal occurrence:
As soon as the aircraft is under control and at a safe altitude, the crew may commence the accomplishment of the recall (memory) items of the RMM checklist. The Captain should continue to use all available resources to him.

ASSESSMENT PHASE **Captain ideally PM as he is best equipped to ensure the event is correctly and timorously identified.**

What is Wrong?
To start with the Captain must ensure that all switches and circuit breakers are in the correctly positioned. Ensure that the problem is correctly identified and verified.

Can It Be Rectified Or Contained? Firstly, if there are manufacturers or company procedures that can accommodate the problem, Identify the appropriate checklist/procedure by name. If no checklist exists, determine the best course of action.

Ideally, the Captain should be PM during this phase. However, for situations that are time critical and an in-depth evaluation is not necessary to identify the problem (fire warnings, rapid decompression, TCAS,GPWS etc), the Captain need not hand over control to ASSESS, if he had been PF. He should remain PF and with the assistance of the First Officer, promptly ASSESS the situation and immediately commence the ACTION phase.

Consensus on the diagnoses of the event must be achieved before commencing the ACTION phase.

ACTION PHASE **Captain ideally PF through the auto flight system as this enables him/her to MONITOR the First Officer while you actions the QRH as well as monitoring the flight path of the aircraft.**

The main objective of the action phase is to rectify or contain the problem.

The Captain therefore calls for the accomplishment of the appropriate checklist or crew procedure (as agreed upon).

The First Officer systematically accomplishes checklist items while the Captain monitors his actions.

For the Captain to remain situationally aware ("in-the-loop"), the First Officer should read the checklist aloud and deliberately repeat each instruction the QRH instructs him to do as you do it. The Captain will follow each step and monitor the checklist progress which also allows him/her to dictate the pace at which the procedures are accomplished, permitting him/her to slow the pace down if desired.

If the Captain needs to interrupt the checklist procedures to accomplish more important duties, he will announce "Stop the Checklist", and when ready to continue again, he will announce "Continue the Checklist"

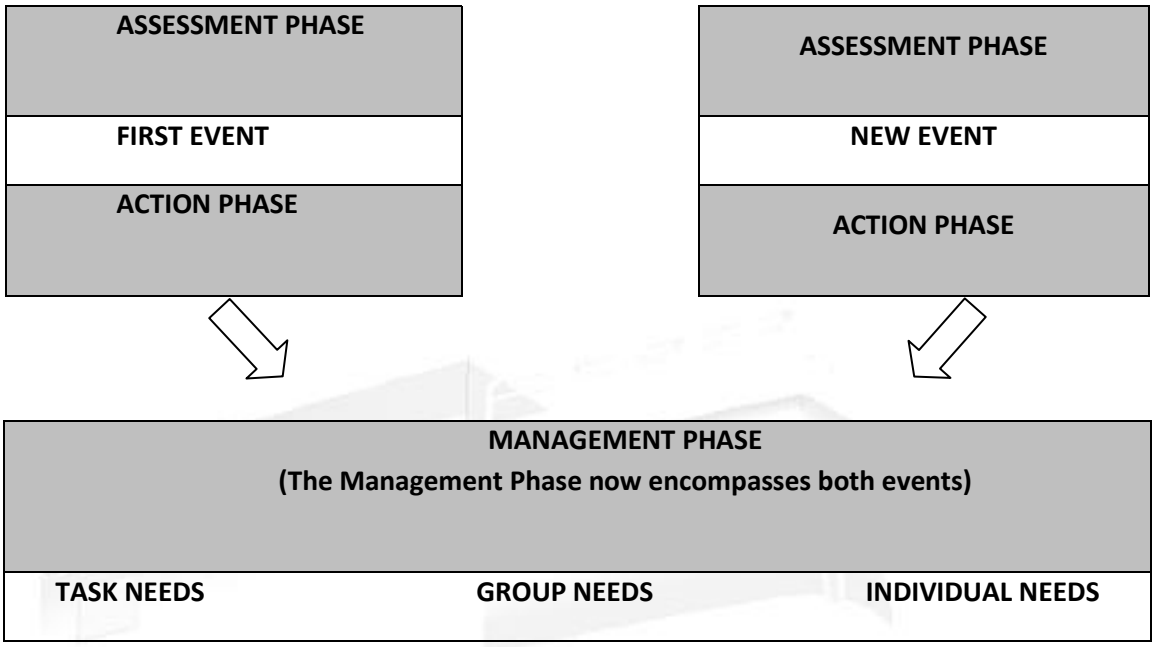
After completion of the ACTION phase the Captain hands over control to the First Officer, following the appropriate procedures so that you may commence with the management phase.

MANAGEMENT PHASE **Captain ideally PM as this enables him/her to best utilise all his/her resources to manage the event.**

Still working from recall, The Captain accomplishes the recall portion of the MANAGEMENT phase namely:

"EVENT STATUS"

- **Summarise the Situation. RE-ASSESS if necessary.**
- **Confirm the correct procedures have been accomplished.**
- **If "Land at Nearest Suitable Airport" is required, then TASK needs for suitable airport should be the only needs considered. (Group, Individual needs do not need to be considered regarding airport choice.)**
- **If additional malfunctions are identified, the Recall of the RMM phases for the new event must be actioned.**
- **Management of both events can then take place.**



The primary objective of the MANAGEMENT phase is to safeguard the continuation of the flight. To achieve this
The Captain needs to include all available resources to him/her to enable him/her to make a rational decision.

Making The Decision

Consider:

TASK needs	**GROUP** needs	**INDIVIDUAL** needs
Operational needs	Crew	Monitor Stress levels
A/C Performance	Passengers	Individual crew members
ETOPS/EROPS	Company	Individual Passengers
AWOPS	ATC	
Fuel Dump/Endurance		
MEL/Maintenance		
Airfield Suitability		

- Itemise best possible options [Open Participation, Brainstorm, gather information]
- Check for poor judgements [Do – No Do; Over Do – Under Do; Early Do – Late Do]
- Summarise
- Decide [Sell decision if required]

When time permits, the Captain should refer to the RMM checklist to confirm all the relevant steps/items have been accomplished.

As the PM, the Captain is now in the ideal position to monitor the First Officer flying the aircraft through the auto flight system.

The Captain is also able to make all the necessary radio calls himself, without having to relay the through the First Officer.

All of the Items under Task, Group and Individual needs must be considered in determining the best outcome for the continuation of a safe flight, including the selection of an appropriate suitable airport, if necessary.

Good decisions depend on the Captain utilising all the crew resources to obtain all the relevant facts. Having considered all the relevant facts you will be in a position to make a good, rational decision.
However, for events where facts are not available, intuitive decisions may have to be made based on the experience of the crew and “gut feel”.

As part of the summary, always check for possible Poor Judgement Chains.

The Captain remains the sole decision maker. Ideally the crew should be in agreement with the decision, however, if the Captain makes an unpopular decision he should endeavour to “sell” it to the crew.

19.6.1 Implementing The Decision

- Satisfy TASK, GROUP and INDIVIDUAL needs.
- Monitor progress by continuously checking for poor judgements.

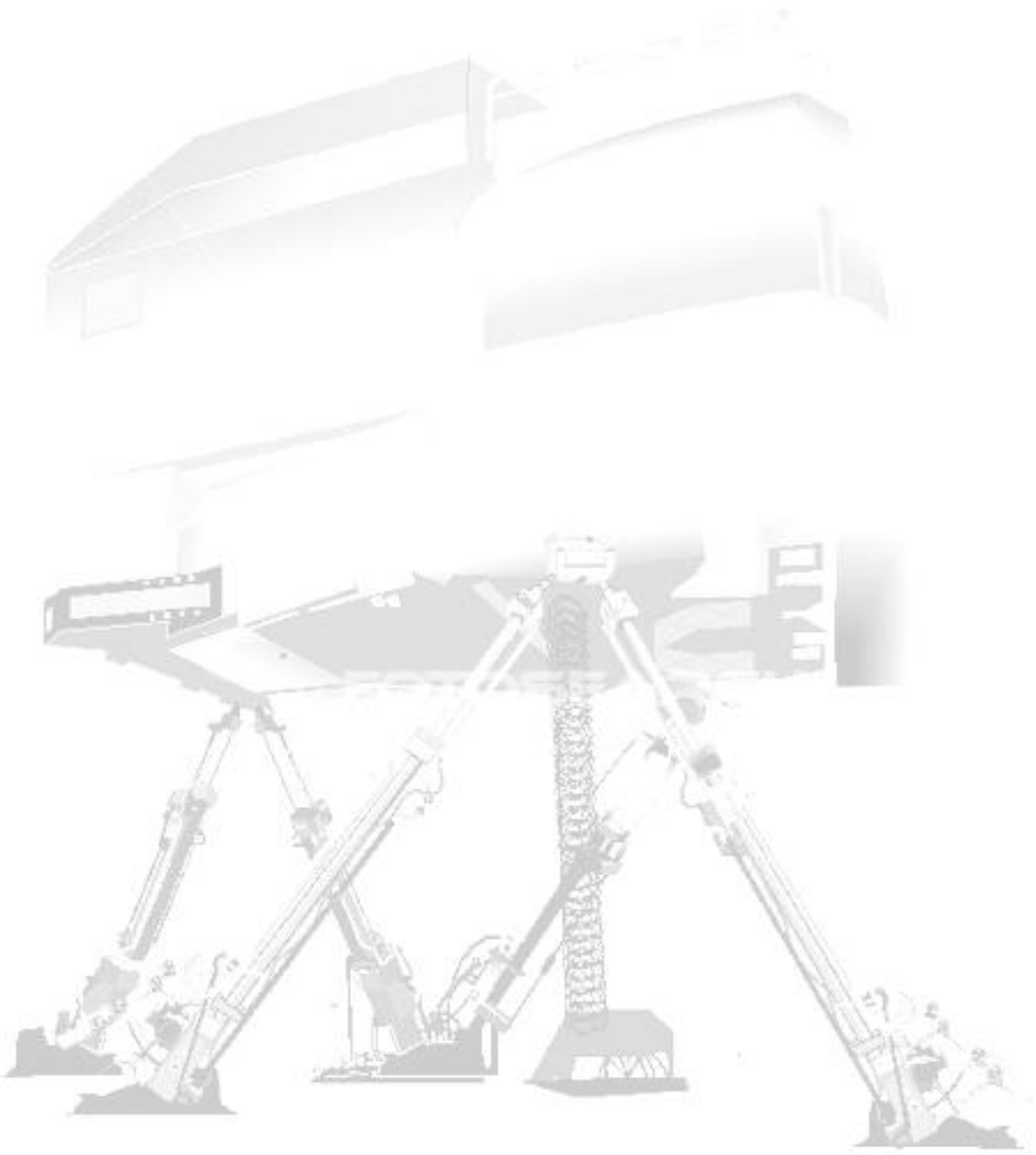
Most incidents usually have an effect on the originally planned flight. The best way to accommodate these implications is to refer back to the items listed under Task, Group and Individual needs and systematically action each one.

Risk management does not only imply the solving of problems as they occur. It also relies on anticipation and planning ahead and continuously “looking ahead” and considering appropriate “what if” scenarios. Always be prepared to modify the plan.

Time permitting, prior to commencing the Approach briefing for the landing, The Captain should accomplish a brief review of the RMM. This will serve as a “memory jogger” for any possible outstanding non-normal checklist items, as well as a final check for possible poor judgements.

The RMM should now be stowed and all attention be given to Aviate, Navigate and Communicate.

As an aside, the RMM is not limited to the use in only non-normal technical events. It is recommended that it be used for any situation or event. Examples like departure delays, diversions, incapacitations, FDP problems etc can be well managed by applying RMM principles.



RISK MANAGEMENT MODEL

AVIATE, NAVIGATE, COMMUNICATE CONTINUOUSLY

[USE AUTOPILOT IF AVAILABLE]

[CONSIDER TIME MANAGEMENT]

ASSESSMENT PHASE	**Captain preferably PM**
[Seek information, test understanding, propose, prioritise, summarise] CHECK CBs & SWITCHES **DIAGNOSE: What's wrong?** **How to rectify / contain?**	• **Identify & Verify** • **Applicable procedure**
ACTION PHASE	**Captain preferably PF**
[Monitor, Test understanding] PROCEDURES TO RECTIFY / CONTAIN THE PROBLEM Action appropriate QRH items, if none available, Action corrective procedures based on pilot experience	
MANAGEMENT PHASE	**Captain preferably PNF**
[Prioritise, Seek Information, Test Understanding, Summarise] EVENT STATUS	

MAKING THE DECISION:

[Seek information, test understanding, propose, build]

- ❑ **CONSIDER:**

TASK NEEDS

Operational:
A/C Performance
Endurance
ETOPS
AWOPS
ATC Considerations
DDM/MEL
Technical considerations

GROUP NEEDS

- Crew
- Passengers
- Company

INDIVIDUAL Needs

- [control stress]
- Individual crew member requirements.
- Passenger considerations

- ❑ **Itemise best options** [Open, Participation]
- ❑ **Brainstorm options and check for poor judgement** [PJ = do – no do; over do – under do; early do – late do]
- ❑ **Summarise**
- ❑ **Decide** [Selling (if required)]
- ❑ **IMPLEMENTING THE DECISION:**
- ❑ **Satisfy TASK, GROUP and INDIVIDUAL needs**
- ❑ **Monitor progress (continually check for poor judgements)** [Participation, delegation]

19.7 Risk Management Model for Single Pilot Operations

The risk management model for single pilot operations follows the same principles and guidelines as outlined in the multi-crew risk management model. Its philosophies remain the same and the management phase has made use of the acronym “DECIDE” to guide the pilot through the steps of managing an event. This model would be applicable to single pilot crews operating simple aircraft.

Below is the example of the management model:

<table>
<tr><th colspan="2">EVENT MANAGEMENT MODEL</th></tr>
<tr><td colspan="2">AVIATE, NAVIGATE, COMMUNICATE CONTINUOUSLY
USE AUTO PILOT IF AVAILABLE
CONSIDER TIME MANAGEMENT</td></tr>
<tr><td>ASSESS</td><td>RECALL</td></tr>
<tr><td colspan="2">CHECK ANNUNCIATORS, SWITCHES & CB’S
DIAGNOSE: What’s wrong?
IDENTIFY / VERIFY
How to rectify/contain?</td></tr>
<tr><td>ACTION</td><td>RECALL</td></tr>
<tr><td colspan="2">CONTAIN THE PROBLEM
NON-NORMAL CHECKLIST</td></tr>
<tr><td>MANAGE</td><td>REVIEW</td></tr>
<tr><td colspan="2">SUMMARISE: WHAT HAPPENED? WHAT ELSE?</td></tr>
</table>

MAKE THE DECISION (DECIDE MODEL)

D ETECT

a decision process

E VALUATE

fuel; weather (dep/alt/dest); aircraft serviceability/risks; pax; crew; cost

C HOOSE

either continue/divert/return

I MPLEMENT

the decision. Aviate Navigate Communicate. Tell ATC

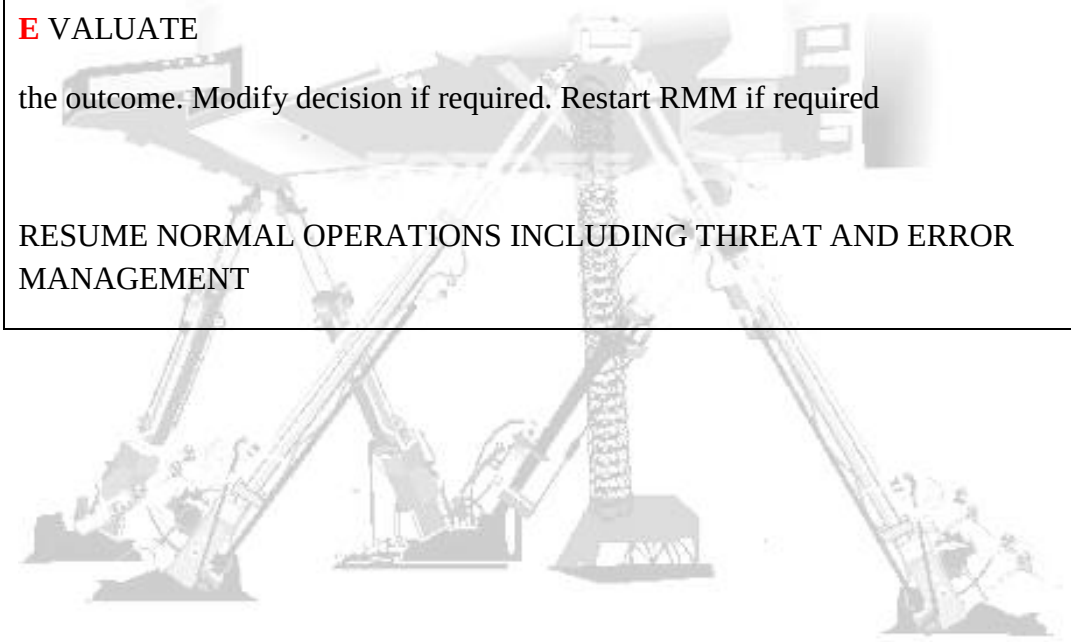
D ETECT

monitor for any changes of fuel/weather/aircraft technical state

E VALUATE

the outcome. Modify decision if required. Restart RMM if required

RESUME NORMAL OPERATIONS INCLUDING THREAT AND ERROR MANAGEMENT



20 REFERENCES

Reference Material

- The Operator Training Pilot 2nd Edition – Tony Smallwood – Ashgate Publications
- UK CAA CAP 737 Crew Resource Management Training 29 Nov 2006 www.caa.co.uk
- UK CAA CAP720 Flight Crew Training: Cockpit Resource Management (CRM) and Line-Oriented Flight Training (LOFT) (Previously ICAO Digest No.2) 1 Aug 2002 www.caa.co.uk
- NASA Conference Publication 2184 – Guidelines for Line-Oriented Flight Training Vol. 1 John K. Lauber and H.Clayton Foushee
- FAA AC 120-54A Advanced Qualification Program- 23 Jun 2006 www.faa.gov
- FAA AC 120-35C Line Operational Simulations: Line Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation -27 Sep 2004 www.faa.gov
- Operator Pilot Training Centre – Crew Resource Management – K.Paterson
- Operator Pilot Training Centre – LOFT Facilitator Course – K.Paterson
- Analysis of Training of Cognitive Skills in a Line-Oriented Flight Training Environment Timothy E. Goldsmith and Peter J. Johnson
- Scenario-Based Training in Technically Advanced Aircraft as a Method to Improve Risk Management – Michele M. Summers
- Specification of Observable Behaviours within LOE/LOFT Event Sets – Thomas L. Seamster Ph.D., William R. Hamman M.D., Ph.D., Eleana S. Edens, Ph.D.

Internet Web Sites

- UK CAA
  www.caa.co.uk
- SA CAA
  www.caa.co.za
- Federal Aviation Administration
  www.faa.gov
- Advanced Qualification Program and Flight Operational Quality Assurance
  www.aqp-foqa.com
- Federal Aviation Administration (FAA) Human Factors:
  www.hf.faa.gov
- Industry CRM Course Developers web site:
  www.crm-devel.org
- RAeS (Royal Aeronautical Society) CRM Standing Group:
  www.raes.org.uk/human_factors/xcrm-sg.htm
- University of Texas Psychology - Helmreich's homepage:
  http://www.psy.utaxas.edu/psy/helmreich

21 Appendix 1

21.1 Example of the above Scenario's suggested Assessment Form

INITIAL SIMULATOR TRAINING	**SESSION 18** **LINE ORIENTED SIMULATION**

DATE	NAME	FACILITATOR

1.Not Yet Competent	2.Below Standard	3. Satisfactory	4.Very Good

EXERCISE	COMMENT	GRADE			
Prioritisation		1	2	3	4
Risk Management Application		1	2	3	4
Communication (Internal & External)		1	2	3	4
Stress Management		1	2	3	4
Delegation		1	2	3	4
Spatial Orientation/Situational Awareness		1	2	3	4
Checklists		1	2	3	4
Flight Patterns & Procedures		1	2	3	4
Planning		1	2	3	4
Other: (Specify)		1	2	3	4

GENERAL ASPECTS	COMMENT	GRADE			
SOPS and Normal Procedures		1	2	3	4
General Flying Ability		1	2	3	4
Safety , Airmanship & CRM		1	2	3	4
Emergency/Abnormal Procedures		1	2	3	4
Technical Aspects		1	2	3	4
Command Ability or Potential		1	2	3	4

COMMENTS:		
The above items have been completed as indicated and a suitable de-briefing held	**FACILITATOR SIGNATURE:**	**PILOT SIGNATURE:**

TIME THIS SESSION: 04:00	TOTAL TIME TO DATE: