White Paper

Flight Path Management

Recommendations

First Edition, 2026

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Contents

Definitions

Adapted competency model: A group of competencies with their associated description and performance criteria adapted from an ICAO competency framework that an organization uses to develop competency-based training and assessment for a given role.

Air operator certificate (AOC): A certificate authorizing an operator to carry out specified commercial air transport operations.

Approved training organization (ATO): An organization approved by and operating under the supervision of a Contracting State in accordance with the requirements of ICAO Annex 1 to perform approved training.

Assessment: The determination by an instructor, assessor or evaluator as to whether a candidate meets a required competency standard under given conditions, by collecting evidence from observable behaviors. Assessment takes place during instruction and evaluation.

Candidate: An individual who is undergoing a formal summative assessment.

Competency: A dimension of human performance that is used to reliably predict successful performance on the job. A competency is manifested and observed through behaviors that mobilize the relevant knowledge, skills, and attitudes to carry out activities or tasks under specified conditions.

Competency-based training and assessment: Training and assessment that are characterized by a performance orientation, emphasis on standards of performance and their measurement, and the development of training to the specified performance standards.

Competency standard: A level of performance that is defined as acceptable when assessing whether competency has been achieved.

Conditions: Anything that may qualify a specific environment in which performance will be demonstrated.

Error: An action or inaction by an operational person that leads to deviations from organizational or the operational person's intentions or expectations.

Error management: The process of detecting errors and responding to them with countermeasures that reduce or eliminate the consequences of errors and mitigate the probability of further errors or undesired states.

Evaluation: For the purpose of this document, evaluation means the summative assessment of a trainee's performance or the evaluation of the training system.

> ***Note**: "Validation", as used under the FAA, is equivalent to a summative assessment.*

Evaluator: A person authorized to conduct the formal and final summative assessment of a trainee's performance.

Event: A combination of a task or a sub-task and the conditions under which the task or sub-task is to be performed.

Evidence-Based Training (EBT): Training and assessment that is characterized by developing and assessing the overall capability of a trainee across a range of competencies rather than by measuring the performance of individual events or manoeuvres.

Facilitation technique: An active training method, which uses effective questioning, listening and a non-judgmental approach and is particularly effective in developing skills and attitudes, assisting trainees to develop insight and their own solutions and resulting in better understanding, retention and commitment.

Flight crew member: A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Human performance: Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

ICAO competency framework: A competency framework, developed by ICAO, is a selected group of competencies for a given aviation discipline. Each competency has an associated description and observable behaviors.

Instructional systems design (ISD): A formal process for designing training which includes analysis, design, production, and evaluation.

Instructor: For the purpose of this document, an instructor is a person authorized to provide training and to conduct evaluations.

Maneuvers: A sequence of deliberate actions to achieve a desired flight path. Flight path control may be accomplished by a variety of means including manual aircraft control and the use of auto flight systems.

Monitoring: A cognitive process to compare an actual to an expected state.

> ***Note**: Monitoring is embedded in the competencies for a given role within an aviation discipline, which serve as countermeasures in the threat and error management model. It requires knowledge, skills, and attitudes to create a mental model and to take appropriate action when deviations are recognized.*

Observable behaviour (OB): A single role-related behaviour that can be observed and may or may not be measurable.

Operations manual: A manual containing procedures, instructions and guidance for use by operational personnel in the execution of their duties.

Phase of flight: A defined period within a flight.

Performance criteria: Statements used to assess whether the required levels of performance have been achieved for a competency. A performance criterion consists of an observable behaviour, condition(s), and a competency standard.

Pilot flying (PF): The pilot whose primary task is to control and manage the flight path. The secondary tasks of the PF are to perform non–flight path related actions (radio communications, aircraft systems, other operational activities, etc.) and to monitor other crewmembers.

Pilot monitoring (PM): The pilot whose primary task is to monitor the flight path and its management by the PF. The secondary tasks of the PM are to perform non–flight path related actions (radio communications, aircraft systems, other operational activities, etc.) and to monitor other crewmembers.

Threat: Events or errors that occur beyond the influence of the flight crew, increase operational complexity and must be managed to maintain the margin of safety.

Threat management: The process of detecting threats and responding to them with countermeasures that reduce or eliminate the consequences of threats and mitigate the probability of errors or undesired states.

Trainee/Trainer. For this guide, the following terminology is applied:

a. *"Trainee" means a pilot or an instructor/evaluator receiving training and assessment*
b. *"Trainer" means an instructor/evaluator conducting training and assessment*

Training objective: A clear statement that is comprised of three parts, i.e., the desired performance or what the trainee is expected to be able to do at the end of training (or at the end of particular stages of training), the performance standard that must be attained to confirm the trainee's level of competence and the conditions under which the trainee will demonstrate competence.

Undesired Aircraft State (UAS): For the purpose of this document, UAS are generally characterized by divergences from parameters normally experienced during operations (e.g., aircraft position or speed deviations, misapplication of flight controls, or incorrect systems configuration) associated with a reduction in margins of safety. Often considered at the cusp of becoming an incident or accident, undesired aircraft states must be managed by flight crews.

Unsafe situation: A situation which has led to an unacceptable reduction in safety margin.

Acronyms

ADDIE	Analyse, Design, Develop, Implement, and Evaluate
AOC	Air Operator Certificate
AOV	Area of Vulnerability
ATC	Air Traffic Control
ATO	Approved Training Organization
CBTA	Competency-Based Training and Assessment
COM	Communication (Pilot Competency)
CRM	Crew Resource Management
EASA	European Aviation Safety Agency
EBT	Evidence-Based Training
FAA	Federal Aviation Administration (United States)
FCOM	Flight Crew Operating Manual
FCTM	Flight Crew Techniques Manual / Flight Crew Training Manual
FD	Flight Director
FFS	Full Flight Simulator
FMA	Flight Mode Annunciator
FMS	Flight Management System
FPA	Aeroplane Flight Path Management - Automation (Pilot Competency)
FPM	Aeroplane Flight Path Management - Manual Control (Pilot Competency)
FSTD	Flight Simulation Training Device
ICAO	International Civil Aviation Organization
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
ISD	Instructional Systems Design
KNO	Application of Knowledge (Pilot Competency)
KSA	Knowledge, Skills, and Attitudes
LOC	Localizer
LTW	Leadership and Teamwork (Pilot Competency)
MCO	Multi-Crew Operation
MEL	Minimum Equipment List
MSA	Minimum Sector Altitude
NASA	U.S. National Aeronautics and Space Administration
OB	Observable Behavior

OM	Operations Manual
PANS-TRG	Procedures for Air Navigation Services - Training (ICAO Doc 9868)
PF	Pilot Flying
PM	Pilot Monitoring
PRO	Application of Procedures and Compliance with Regulations (Pilot Competency)
PSD	Problem Solving and Decision Making (Pilot Competency)
RNAV	Area Navigation
RNP	Required Navigation Performance
RVSM	Reduced Vertical Separation Minima
SAW	Situation Awareness and Management of Information (Pilot Competency)
SOP	Standard Operating Procedure
SPO	Single Pilot Operations
TEM	Threat and Error Management
WLM	Workload Management (Pilot Competency)

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Chapter 1. Introduction

1.1. Purpose of this document

The objective of this document is to provide practical recommendations and guidance to operators (AOC) and Training organizations (ATO) wishing to enhance their operational and training policies for safe, effective and efficient flight path management by the flight crew.

Over the last 20 years, deficiencies in effective flight path management have been identified as one of the main contributing factors leading to accidents. As an example, between 2005 and 2025, the IATA Safety Report shows that a total of 270 fatal accidents occurred, of which 63 were caused by Manual Handling / Primary Flight Controls errors.

The IATA Safety Report data is supported, among other safety bulletins, by the FAA Safety Alert for Operations (SAFO) 13002, which presents an analysis of flight operations data including normal operations, incidents, and accidents indicating an increase in manual handling errors.

Recognizing that effective flight path management is the prerequisite for safe and efficient aircraft operations, this document:

- Provides safety data samples showing contributing factors to flight path management deficiencies
- Elaborates on the operational and technological challenges that could compromise effective flight path management
- Proposes operational policies to support effective flight path management
- Proposes a competency-based approach to training for the enhancement of the flight path management by the flight crew

Training program examples included in this document are based on latest ICAO provisions and industry best practices. However, AOCs and ATOs remain responsible for ensuring that their training programs are compliant with the applicable regulations and for obtaining approval of their training programs from their Civil Aviation Authority.

1.2. Flight Path related definitions

Flight path. The trajectory or path of an object (aeroplane) travelling through the air over a given space of time. *ICAO Doc 10011*

'Flight path' means the trajectory or path of the aeroplane travelling through the air over a given space of time. *EU Air Operations regulation*

'Flight path management' means active manipulation, using either the aeroplanes automation or manual handling, to command the aeroplane flight controls to direct the aeroplane along a desired trajectory. *EU Air Operations regulation*

Flightpath Management. The planning, execution, and assurance of the guidance and control of aircraft trajectory and energy, in flight or on the ground. *FAA Advisory Circular 120-123*

Pilot flying (PF). The pilot whose primary task is to control and manage the flight path. The secondary tasks of the PF are to perform non-flight path related actions (radio communications, aircraft systems, other operational activities, etc.) and to monitor other crew members. *ICAO Annex 1*

Pilot monitoring (PM). The pilot whose primary task is to monitor the flight path and its management by the PF. The secondary tasks of the PM are to perform non–flight path related actions (radio communications, aircraft systems, other operational activities, etc.) and to monitor other crew members. *ICAO Annex 1*

These definitions illustrate the importance of effective flight path management for safe and efficient operations. Hence, effective flight path management:

- Involves cognitive resource allocation, such as attention, combined with previously acquired knowledge. This enables the flight crew to detect, understand, project into the future (i.e., create a mental situational model), and take appropriate decisions or actions.
- Includes comparing the intended state against the actual state, identifying deviations, proposing solutions, and correcting or intervening, as necessary.
- In a multi-crew environment, it requires maintaining a shared mental model among flight crew members, communicating any changes or intentions, and intervening appropriately to ensure a safe flight.

As flight path management requires knowledge, skills, and attitudes to plan (to create a mental model), to ensure the guidance and control of aircraft trajectory and energy, and to take appropriate action when deviations are recognized, effective flight path management necessitates the demonstration of the pilot competencies which serve as countermeasures in the threat and error management (TEM) model. This is further explained in the following paragraph.

1.3. TEM, Pilot Competencies and Flight Path Management

1.3.1 TEM and pilot competencies

The threat and error management (TEM) model is a conceptual framework that assists in understanding the interrelationship between safety and human performance in dynamic and challenging operational contexts.

Since the 1990s, the TEM model has been used in several ways:

Safety analysis tool — can focus on a single event, as is the case with accident/incident analysis, or can be used to understand systemic patterns within a large set of events, as is the case with operational audits,

Licensing tool — helps clarify human performance needs, strengths and vulnerabilities, allowing the definition of competencies from a broader safety management perspective,

Training tool — helps an organization improve the effectiveness of its training interventions and, consequently, of its organizational safeguards, and

Operational tool — helps an organization increase its safety margins by providing the operational personnel tools as well as strategies and tactics to manage potential threats and errors.

In 2020, the publication of Amendment 7 to ICAO Doc 9868 (PANS-TRG) formalized the competencies of the approved adapted competency model as the individual and team countermeasures against threats and errors, and undesired aircraft states. These competencies include elements previously addressed within the nontechnical skills (NTS/NOTECHs) or Crew Resource Management (CRM) training concepts.

From a practical perspective, the flight crew members demonstrate their competencies to perform their tasks and to manage the threats and errors happening during the flight profile. This is illustrated in the Threat and Error Management Model for Training, Licensing and Operations (Figure 1 below). This model is used by many operators and training organizations.

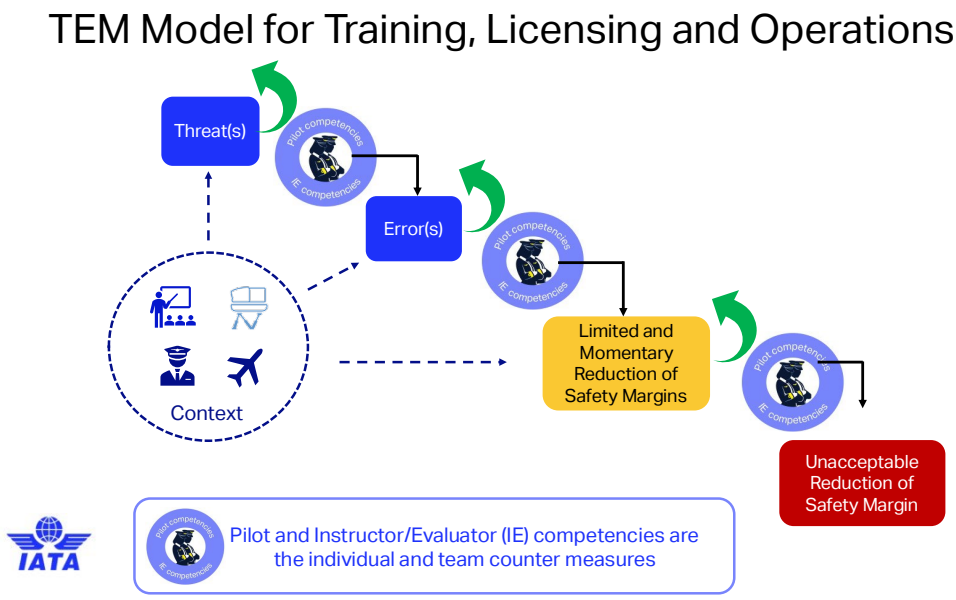


Figure 1 – IATA, TEM Model for Training, Licensing and Operations.

1.3.2 Pilot competencies and flight path management

The pilot competency framework is composed of the nine pilot competencies as follows:

- Application of knowledge (KNO)
- Application of procedures and compliance with regulations (PRO)
- Communication (COM)
- Aeroplane Flight Path Management, automation (FPA)
- Aeroplane Flight Path Management, manual control (FPM)
- Leadership and Teamwork (LTW)
- Problem Solving and Decision Making (PSD)
- Situation awareness and management of information (SAW)
- Workload Management (WLM)

Appendix A provides the detailed IATA Pilot Competency Framework, which includes the competencies descriptions and observable behaviors.

The applicability to Single Pilot Operations (SPO) and Multi-Crew Operations (MCO) is further detailed in the following IATA guidance available for free download on iata.org: Competency Assessment and Evaluation for Pilots, Instructors and Evaluators Guidance Material

The relationship between the pilot competency framework and flight path management is obvious as it includes the competencies Aeroplane Flight Path Management, automation (FPA) and Aeroplane Flight Path Management, manual control (FPM). Nevertheless, effective flight path management implies planning, to ensure the guidance and control of the aircraft trajectory and energy, and taking appropriate action when deviations are recognized.

Consequently, all the pilot competencies of the framework must be demonstrated to ensure safe and efficient operations.
For example:

- Aircraft energy management involves Situation Awareness and Management of Information (SAW)
- Real time management of operational threats having an impact on the flight path requires Problem Solving and Decision Making (PSD), and
- Detection of the flight path deviation imposes the demonstration of Communication (COM) and Leadership and Teamwork (LTW) in a multi-crew environment
- Effective management and recovery from interruptions, distractions and variations requires the demonstration of Workload Management (WLM)
- …

Chapter 5, dedicated to the training program for the enhancement of flight path management, provides guidance on how to identify the Observable Behaviors (OB) that must be regularly demonstrated for effective flight path management.

1.4. Target Audience

This document provides recommendations for the definition of the operational and training policies supporting effective flight path management. Therefore, the following personnel can benefit from the recommendations contained in this document:

- Civil Aviation Safety Inspector in charge of AOC and/or ATO oversight
- Flight Standard Department managers
- Training managers
- Course developers
- Instructors and Evaluators
- Pilots

Chapter 2. Safety Data

As mentioned in Chapter 1, in paragraph 1.3.2 Pilot competencies and flight path management, effective flight path management requires the demonstration of all the pilot competencies.

This is evidenced in the IATA Safety report accessible through the link here: IATA - Interactive Safety Report

2.1. Long term records (20 years) for fatal accidents

Figure 2 below provides a macroscopic view regarding the contributing factors that led to the 270 fatal accidents recorded over the past 20 years. To access the following dashboard, select the period 2005-2025, select "All" for end states and select "Fatal" for Fatal vs non-fatal.

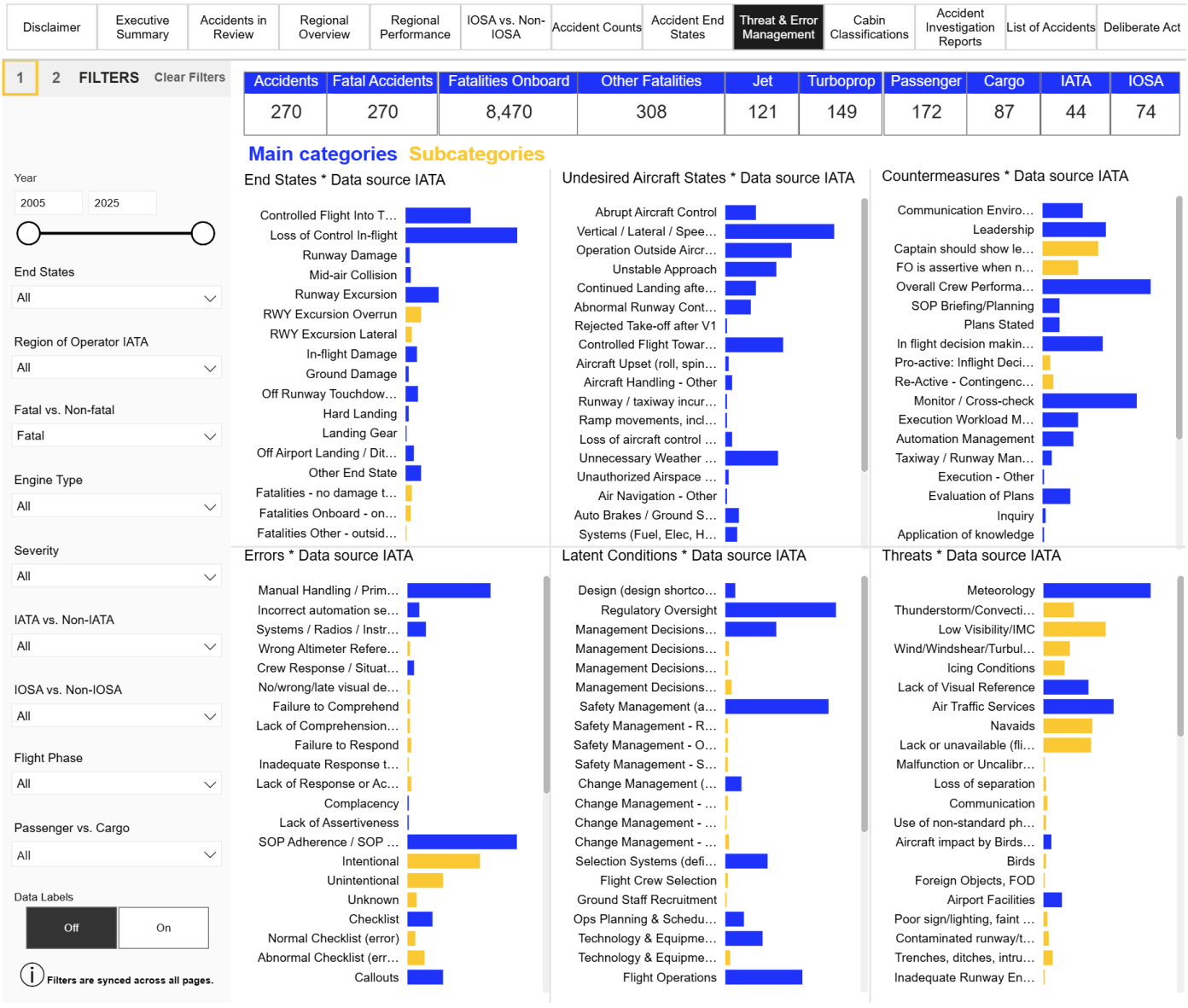


Figure 2 - IATA - Interactive Safety Report dashboard, period 2005-2025.

A. The categories Controlled Flight into Terrain (CFIT) and Loss of Control in Flight (LOC-I) represent the most fatal accidents with 63 accidents (CFIT) and 108 accidents (LOC-I).

B. The undesired aircraft states that led to those accidents are mainly related to flight path deviations (vertical, lateral …) and mismanaged flight path resulting in unnecessary weather penetration, operations outside aircraft limitations, unstable approach etc.

C. The main categories of threats the crew had to manage were related to adverse meteorological conditions, air traffic services and lack of visual references. When scrolling further down, the threats aircraft malfunctions and operational pressure are visible.

D. The most common errors that have contributed to the accidents are related to adherence of procedures and, as expected, manual handling errors and automation settings errors.

E. The countermeasures that have been deficient to manage the threats and errors and to recognize and recover from the undesired aircraft state relate to all the pilot competencies. This is obvious for the countermeasures "leadership" relating directly to the pilot competency LTW, "In flight decision making" relating directly to the pilot competency PSD, automation management relating directly to the pilot competency FPA, etc. It is less obvious for the countermeasures "overall crew performance" and "monitoring/cross check" as they commit several pilot competencies such as PSD, SAW, WLM. Also, please note that since 2022, the IATA countermeasures taxonomy is the pilot competency framework, which is accessible by scrawling on the right of the countermeasures tab.

2.2. Recent records (5 years) for fatal accidents

Figure 3 below provides a macroscopic view regarding the contributing factors that led to the 35 fatal accidents recorded over the past 5 years. To access the following dashboard, select the period 2020-2025, select "all" for end states and select "Fatal" for Fatal vs non-fatal.

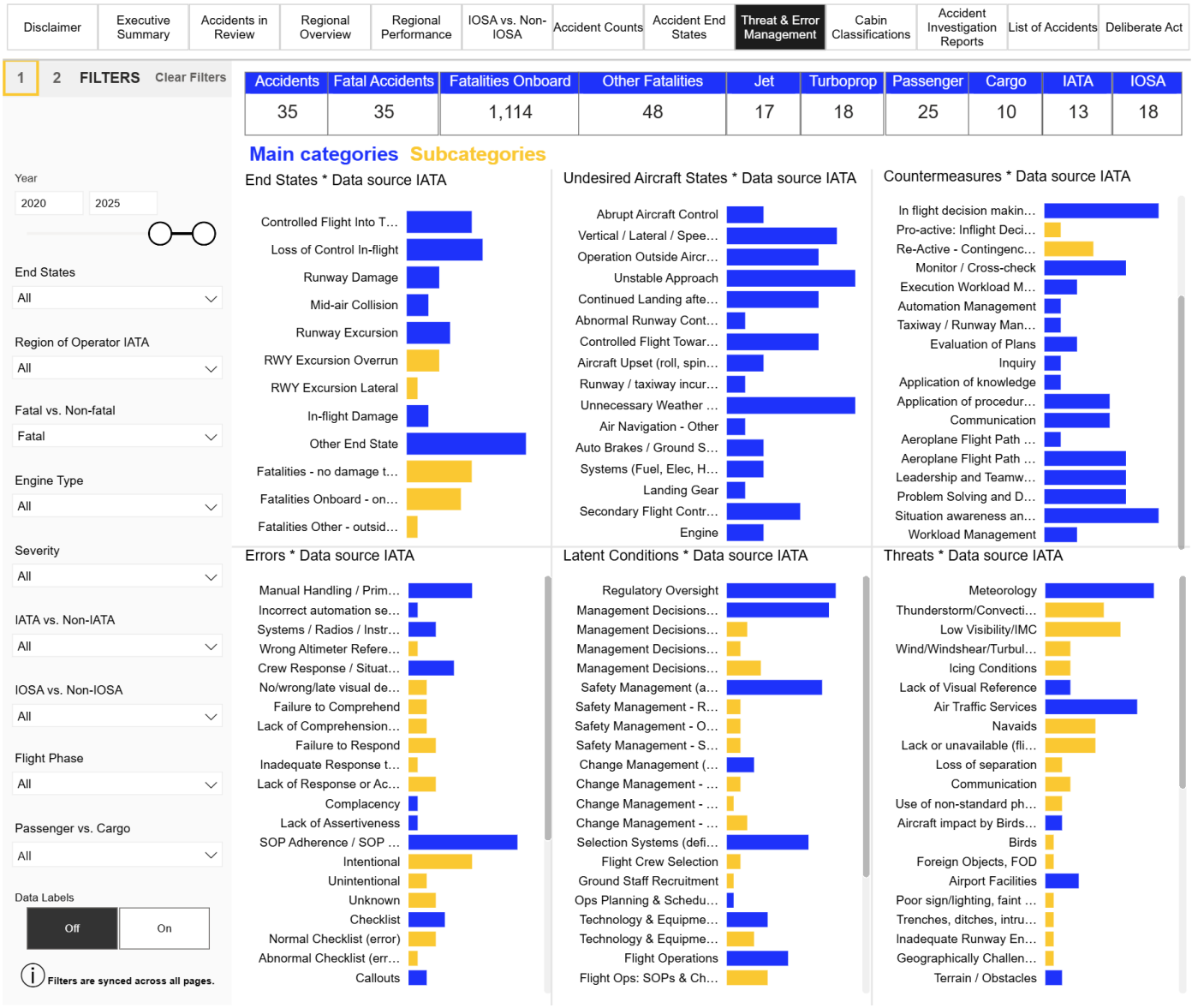


Figure 3 - IATA - Interactive Safety Report dashboard, period 2020-2025.

A. The categories Controlled Flight into Terrain (CFIT) and Loss of Control in Flight (LOC-I) are still representing most of the fatal accidents with 6 accidents (CFIT) and 7 accidents (LOC-I).

Other end State: Any other accident where:
• Information available at the ACTF meeting was not enough to determine the accident end state.
For example: a) Aircraft is missing b) The investigation is still ongoing and the ACTF is unable to assign an end state classification c) The aircraft crashed but no report is available
• The End State does not fit into other categories

B. The undesired aircraft states that led to those accidents are still mainly related to flight path deviations (vertical, lateral …) and mismanaged flight path resulting in unnecessary weather penetration, operations outside aircraft limitations, unstable approach, continued landing after unstable approach etc.

C. The main categories of threats the crew had to manage were related to adverse meteorological conditions, air traffic services. When scrolling further down, the threats aircraft malfunctions and operational pressure are visible. The threat aircraft malfunction being less predominant.

D. The most common errors that have contributed to the accidents remain particularly focussed on a lack of adherence to procedures and as expected, on manual handling errors and automation settings errors.

E. The countermeasures that have been deficient to manage the threats and errors, and to recognize and recover from the undesired aircraft state, relate to all the pilot competencies. This is more evident since the pilot competencies were introduced as the flight crew countermeasures in the IATA dashboard in 2022. Hence, the competencies FPA and FPM are identified as deficient countermeasures, but it is noticeable that the pilot competencies COM, LTW, PSD, SAW have also been identified as deficient in even larger proportions.

In summary, the data provided in paragraphs 2.1 and 2.2 shows that the safety records have improved significantly over time, while the number of fatal accidents (as well as the number per million of sectors) has globally decreased. The data shows that all the pilot competencies (flight crew countermeasures), which were weak or deficient, contributed to the CFIT and LOC-I accidents. These categories of end state, CFIT and LOC-I, are intrinsically linked to ineffective flight path management.

Consequently, effective flight path management requires the implementation of operational and training policies that place emphasis on a broader approach to human performance and not only focuses on manual handling and automation management.

Chapter 5, dedicated to the training program for the enhancement of flight path management, provides guidance on how to identify the Observable Behaviors (OB) that must be regularly demonstrated for effective flight path management.

Chapter 3. Challenges

Today's operational environment is highly complex, shaped by numerous constraints such as regulatory requirements, increasing airspace density, and environmental considerations, while the newest generation of aircraft introduces increasingly sophisticated automation and guidance systems. This situation creates, among others, human performance challenges for the flight crew to maintain their competence and confidence for effective flight path management during operations.

3.1. The human performance challenge related to the operations

Modern aircraft systems, including advanced autopilot and autothrottle functionalities, are designed to optimize flight performance, reduce pilot workload, and enhance overall safety and efficiency. As a result, pilots typically operate the aircraft with automation engaged for approximately 90–95% of the time, even sometimes during recurrent training sessions. Automation is predominantly used during climb, cruise, descent and approach phases, allowing the flight crew members to focus on the realization of their tasks across the flight phases and to effectively manage the threats and errors during the entire flight profile.

It is important to note that the use of automation and/or guidance systems is also often mandatory due to regulatory, operational and/or environmental constraints. Typical examples are related to the operations in RVSM airspace, to the Performance Based trajectory (SID/STASRs RNP X), the RNP AR approaches, etc.

Consequently, aircraft operations under manual control remains essential but is generally limited to the take-off and landing phases and sometimes to a portion of the climb and approach phases as illustrated in Figure 4 below.

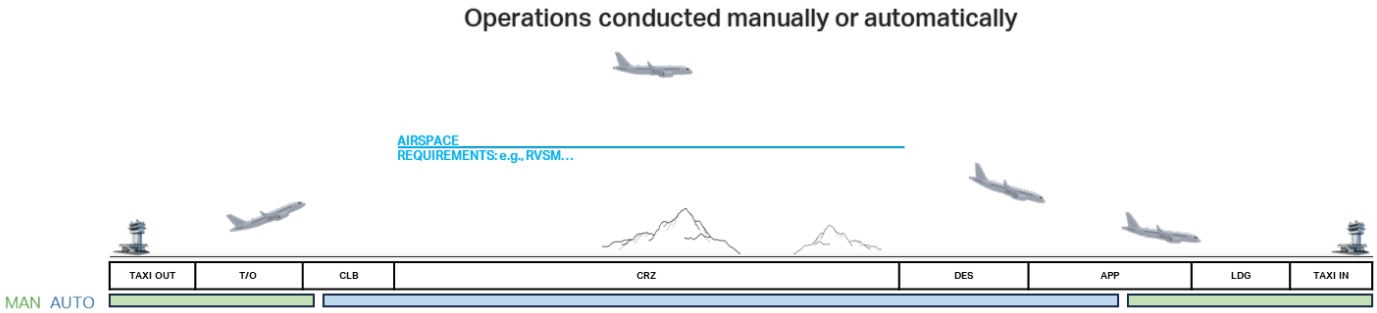


Figure 4 - Representative distribution of manual (MAN) and automated (AUTO) flight operations across the flight profile, illustrating typical pilot engagement from takeoff through climb, cruise, descent, and landing.

Recent analyses (2012), *EASA Cockpit Automation Survey*, highlights the risks of diminished manual flying proficiency due to over-reliance on automation. This has led to an increased emphasis on balancing automation use with manual flight in operations. Operators' automation policies vary widely, from encouraging full automation at all times to promoting manual flying during low workload conditions or outside complex airspace. Regulatory bodies advocate for recurrent simulator training and operational opportunities to reinforce manual flying skills, ensuring pilots can safely transition between automated and manual operations.

3.2. The human performance challenge related to technology

Automation has significantly enhanced flight safety by improving the precision and timeliness of routine tasks, reducing errors, and lowering associated risks. Modern aircraft widely rely on autoflight systems, such as autopilot and autothrust, which streamline operations and decrease pilot workload, allowing flight crews to focus on monitoring and maintaining situational awareness. The autoflight systems range from simple 2 or 3-axis control to advanced modes with vertical and lateral navigation capabilities. The multiple combinations of modes introduce further complexity.

However, automation has its limitations. In complex systems, flight crew members may lose mode awareness or fail to understand how automation reacts to their inputs across the flight phases. Such misunderstandings can result in ineffective energy management and/or deviations from the intended flight path. Additionally, over-reliance on automated systems may degrade pilots' manual flying competence and challenge their monitoring abilities, leaving them less prepared to handle scenarios requiring manual control, such as automation failures, system malfunctions, or dispatch conditions with inoperative systems.

The human performance challenges related to automation and flight guidance systems are not new and a substantial body of work has been published on the matter. As an example, in 1980, *NASA's Flight Deck Automation: Promises and Problems (*Wiener, E. L., & Curry, R. E.), first outlined both the potential and the challenges of automation. Several human performance challenges identified at the time persist, specifically the ones related to "boredom" and "automation complacency", which are even more prominent today as the latest generation of aircraft introduced additional flight guidance modes, more information and combination of automation levels for the management of the flight path, and advanced flight envelop protections.

"Boredom" and "automation complacency" may occur because most of the flight phases are so completely automated that pilots are lulled into inattention and are either bored or complacent. In the particular case of complacency, humans are likely to become so confident that the automatic systems will work effectively that they become less vigilant and/or excessively tolerant of errors in the execution of the desired performance.

Their alertness may at times falter. This is illustrated in Figure 5 below "*Two dimensions of automation: Control and Monitoring*".

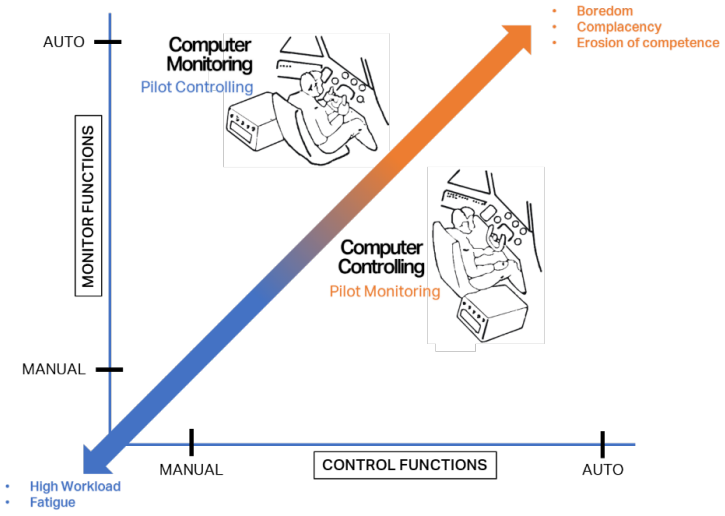


Figure 5 - "Two dimensions of automation: Control and Monitoring", Wiener and Curry, 1980

More than four decades later, these challenges have evolved into a new area of concern which is the potential degradation of the competency Flight Path Management, Manual Control. As technology continues to improve, it is essential for pilots to maintain their competencies to effectively manage the flight path to ensure safe and efficient operations in highly automated environments.

More recently, the FAA SAFO 13002 alerted on the negative effect of complacency, one of the consequences of pilots' overreliance on automation, which is a false sense of security induced by the reliable functioning of automation. Complacency can lead to a loss of situational awareness due to excessive dependence on auto flight systems.

Additionally, ICAO's Automation Study Report (ICAO Circular 361, 2024) identifies automation dependency as a continuous global safety issue, substantiated by accident and incident data, policy reviews, and research analysis. This dependency arises from several factors, including operator policies, regulatory practices, and diminished pilot confidence in manual flying skills.

The term "automation dependency" is used to describe situations where pilots fail to adequately monitor or verify automated systems, accepting automation behavior without ensuring it aligns with operational expectations. While reliance on automation is not inherently negative, indeed, appropriate use is expected, the concern lies in over-reliance without sufficient oversight.

Because automation dependency cannot be directly measured, it is inferred through:

- **Indicators**, such as poor system monitoring (e.g., airspeed, altitude) due to over-trust in automation
- **Contributors**, like policies that mandate automation use without encouraging manual flight opportunities or reinforcement training
- **Consequences**, including pilot reluctance or apprehension to hand-fly due to perceived skill degradation

These findings underscore the importance of reinforcing manual flight opportunities and balancing automation use with regular manual flight in operations to mitigate safety risks associated with automation over-dependence.

3.3. Consequences

The current operational model being heavily supported by the usage of automation, in combination with the expansion of highly sophisticated flight guidance and automation systems in the cockpit, raises concerns about the pilots' ability to maintain their competencies for effective flight path management. These concerns are addressed in Chapter 4, which elaborates on the Operator policy to promote manual flight in operations, and in Chapter 5 which proposes a competency-based approach to flight path management training.

Chapter 4. Policy

As elaborated in Chapter 2 and Chapter 3, safety data analysis in conjunction with the current operational model of the latest aircraft generation are raising concerns from States and industry regarding specifically the pilots' abilities to operate the aircraft manually. This chapter addresses these concerns by proposing operator policy recommendations to maintain the pilots' competence and confidence to effectively manage the flight path during line operations.

4.1. Philosophy

The goal of the philosophy is to provide high level guidelines for the development of the operational policies and procedures related to flight path management. The philosophy should address the current need to promote manual flight during operation while maintaining the efforts to ensure effective flight path management through automation. As a reminder, Chapter 2 Safety Data indicates that errors in using and managing the automatic flight system remain a causal factor in a significant number of accidents.

Consequently, the philosophy should cover, at least the following:

- The role of both Pilot Flying and Pilot Monitoring
- The different methods to manage the flight path (including the different combinations of manual and automation control or guidance)
- The flight crew's decision aspects on how to best manage the flight path depending on the operational and environmental contexts

In summary, the overarching philosophy **"FLY THE AIRCRAFT"** is the core principle of the operator's policy, reminding pilots that their primary responsibility is the effective flight path management, regardless of the method to manage it, manual control or through any level of automation.

This philosophy is also reflected by major manufacturers. Appendix B provides examples from Boeing and Airbus operational philosophy.

4.2. Operational and Training Policy

Based on the above-mentioned philosophy, the operator policy should encompass the following:

a. **Pilot Responsibility for flight path management**
   - Flight Path Management is the responsibility of the entire flight crew and must always remain the highest priority.
   - Each pilot must remain fully aware of the current and desired flight path and be capable of manually flying the aircraft to achieve the desired flight path if required.

b. **Integration of Automation and Manual Operations**
   - Policies should clearly define levels of automation, situational awareness, and crew communication strategies.
   - Standard Operating Procedures (SOPs) should explicitly address actions required to mitigate risks associated with automation use, ensuring pilots remain proficient in manual flight skills.

c. Continuous Training and Evaluation

- Operators should regularly train pilots on automation policies, reinforcing concepts such as system monitoring, situational awareness, and workload management.
- Training programs should incorporate manual flight scenarios during both normal and non-normal operations.
- Automation policies should be periodically reviewed and assessed against industry standards to identify areas for improvement.

4.3. Policy Regulatory Guidance

Effective Flight Path Management implementation requires alignment between operator policies (operation and training), manufacturer philosophy, and regulatory expectations. By establishing a clear and balanced automation policy, operators foster a culture that prioritizes safety, operational excellence, and continuous improvement, ensuring pilots maintain both manual and automated flight path management competencies. Automation policy should be consistently reflected in both line operations and training (initial, upgrade, and recurrent) to promote an integrated approach. Table 1 below, Automation Policy Framework for Line Operations and Training & Assessment, is adapted from EASA SIB No. 2010-33R1 / TC AC 600-006 and provides regulatory context to support this alignment.

<table>
<tr><th colspan="3">AUTOMATION POLICY
Source: EASA SIB No.: 2010-33R1 / TC AC 600-006</th></tr>
<tr><td colspan="3">Operators are recommended to prepare, in cooperation with airplane manufacturers, an Automation Policy which should in particular address the seven following topics:</td></tr>
<tr><td rowspan="3">• Philosophy
• Levels of automation
• Situational awareness
• Communication and coordination
• Verification
• System and Crew Monitoring
• Workload and System Use

Note: This is not a complete list of potential factors.</td><td>Line Operations</td><td>Training & Assessment</td></tr>
<tr><td colspan="2">Operators are encouraged to take an integrated approach by incorporating emphasis of manual flight operations into both line operations and training (initial/upgrade and recurrent). (FAA)</td></tr>
<tr><td>Operational policies should be developed or reviewed to ensure pilots have opportunities to practice manual flying in low workload conditions while clarifying automation use during high workload or precise operations. Augmented crew operations may also limit the ability of some pilots to obtain practice in manual flight operations. Policies should address limitations from augmented crew operations and ensure all pilots can maintain these skills. (Source: FAA)</td><td>An operator's training program—covering theoretical, practical, and line indoctrination—should emphasize the considerations for determining the appropriate use of manual flight versus automation. During initial type rating, pilots should be provided ample opportunities to practice manual flying in all phases of flight, fostering essential skills and confidence. Similarly, recurrent training must prioritize manual flying practice, particularly when opportunities to do so during line operations are limited.</td></tr>
<tr><td colspan="3">If an automation policy already exists, it should be assessed against the above topics to identify any needed changes. Operators should ensure that each topic is regularly reinforced in operating procedures and training programs. (Source: Transport Canada)</td></tr>
</table>

Table 1 - Recommended Automation Policy framework for line operations and training.

FAA AC 120-123

"The policy should highlight and stress that the responsibility for flight path management remains with the pilots at all times."

4.4. IATA Operator Policy Framework

It is recommended that an operator policy covers the following elements:

- **Threat and Error Management (TEM) concept, including**
  - The definitions of the Threats, Errors and Undesired Aircraft State
  - The Importance of human performance as countermeasures for threat and error management
  - The TEM model as a tool to increase safety margins in operations by providing the flight crew with strategies and tactics to manage potential threats and errors
- **Flight Path Management, automation and manual control**, including
  - The decision-making process applied to control the flight path manually or through automation based on the flight crew's:
    - analysis of the operational context, and
    - needs in terms of operational experience
  - The importance to continuously monitor, review and adapt their decision regarding the control of flight path management, if necessary
  - The necessity for the flight crew to have a clear understanding of the operator's limitations that could apply
- **Monitoring Functions** including the definitions of:
  - Monitoring
  - PF and PM roles
  - Area of Vulnerability (AOV)
  - The Prioritization of PF and PM duties depending on AOVs

Appendix C provides an example of an operator policy to be implemented in the Operations Manual.

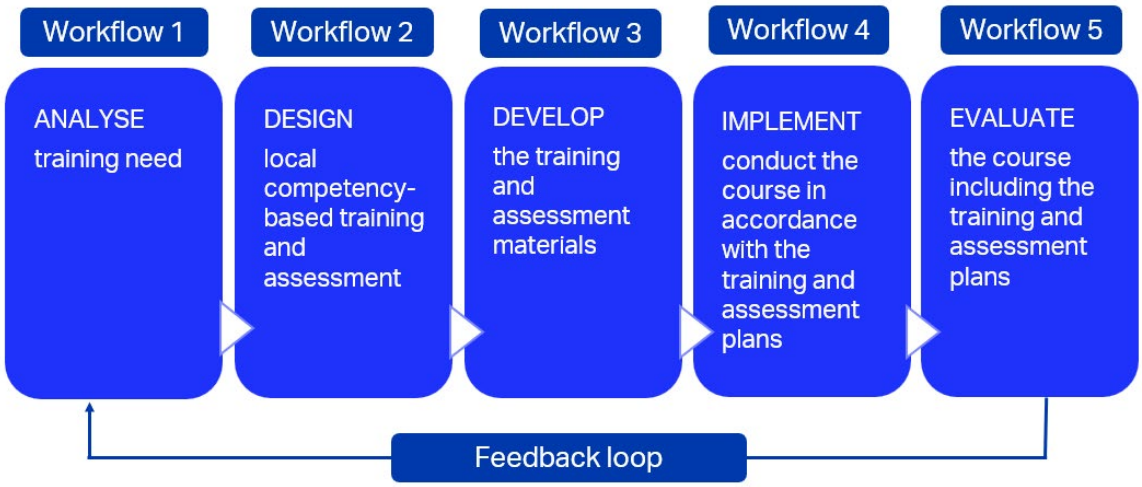
Chapter 5. CBTA for Flight Path Management Enhancement

This chapter proposes a competency-based approach to enhance the effectiveness of flight path management by the flight crew.

This chapter provides practical recommendations to the AOCs' and ATOs' training managers for the practical application of the Instructional System Design (ISD) for CBTA programs in compliance with the ICAO methodology described in ICAO Doc 9868 (*PANS-TRG),* while ensuring the integration of the industry's best practices that are part of the *IATA CBTA Guide for Flight Crew Training*.

The *IATA CBTA Guide for Flight Crew Training* elaborates in detail on how to apply the Instructional System Design and is accessible through the IATA CBTA Library on iata.org.

The ADDIE (Analyze, Design, Develop, Implement and Evaluate) model is an ISD proposed by ICAO composed of the five following workflows:



This chapter focuses specifically on the workflows 1, 2 and 3, as they relate to the design and development aspects of the program when the workflows 4 and 5 relate to the delivery and the continuous enhancement of the program.

5.1. Workflow 1: Analyze the Training Needs

The first step in the development of any CBTA program is to conduct a training needs analysis during which the purpose of the training is considered in relation to the operational, technical, regulatory, and organizational requirements applicable to the training course.

The outcome of Workflow 1 is a document called "Training Specification", which indicates the purpose of the training and details the requirements that need to be fulfilled when designing the training.

Workflow 1 Analyze Training Needs		
Inputs	**Process**	**Output**
– Training request – Task list – Operational documents – Technical documents – Regulatory documents – Organizational documents	Identify the purpose of the training required	**Training Specification**
	Identify the tasks associated with the purpose of the training	
	Identify the operational requirements	
	Identify the technical requirements	
	Identify the regulatory requirements	
	Identify the organizational requirements	
	Identify any other requirements	

5.1.1 High Level Recommendations to Apply Workflow 1

The following provides high-level guidance on how to apply the Workflow 1 process:

Identify the purpose of the training: The phase of the training to which flight path management enhancement training applies should be clearly identified (e.g., ab initio pilot training in a single-engine piston aircraft, class or type rating, operator conversion course, etc.).

Identify the tasks associated with the purpose of the training: The Aeroplane Pilot Tasks by Phase of Flight in ICAO Doc 9868 provides a consistent list of tasks and sub-tasks to support any pilot training in a multi-crew environment. This list can be easily adjusted for the single pilot operations in the context of general aviation. Appendix D contains the Aeroplane Pilot Tasks by Phase of Flight extracted from ICAO Doc 9868.

Identify the operational requirements: Specifically, the nature of the operations (e.g., Multi-Pilot Operations/Single-Pilot Operations, Commercial Air Transport, General Aviation, etc.) and the content of the operational procedures should be identified.

Identify the technical requirements: In the context of flight path management training, specific training devices such as eye tracking may be identified and used.

Identify the regulatory requirements: The AOCs and ATOs have to apply the relevant regulatory requirements.

Appendix E provides an overview of different regulatory requirements.

5.1.2 Training Specification, Example for Flight Path Management Enhancement Training

The template below contains an example of a completed training specification for a training course dedicated to the enhancement of flight path management by flight crew members already licensed and qualified on the type of aircraft. This course can be held by an Approved Training Organization (ATO) or an Operator holder of an Air Operator Certificate (AOC).

Purpose	
What is the purpose of the training?	*Pilot training course focused on the enhancement of flight path management.* *The assumptions are the following:* - *The trainees have already demonstrated the nine pilot competencies during a previous operator training (Operator Conversion Course, recurrent training and checking, …) or license skill test (or license skill check), and* *Note: The Flight Path Management Enhancement Training is delivered on the class/type of the aeroplane already endorsed on the trainees' license.*
State the phase(s) of training.	*The training course includes ground instruction and flight instruction* *Note:* ▪ *The ground instruction phase aims at delivering the knowledge necessary to demonstrate the pilot competencies sustaining safe, effective and efficient flight path management.* ▪ *The flight instruction phase aims at training and assessing the pilot competencies sustaining safe, effective and efficient flight path management.*
What qualification, if any, will the trainee achieve on successful completion of the training?	*The training course does not aim at endorsing additional qualification or rating on the license.* *The objective of the training course is that the trainees demonstrate adequate level of performance for all the competencies of the applicable adapted competency model (Multi-Crew Operation in Commercial Air Transport conditions)*
Is this a new course or a course revision? Where will the course be deployed? Will a new course footprint / curriculum be created in addition to new courseware? Will new deliverables be created?	*It is a new course as it is the first CBTA program dedicated to the enhancement of flight path management* *The course will be deployed at the ATO or at the AOC training center* *New curriculum as it is the first CBTA program dedicated to the enhancement of flight path management* *New deliverables as it is the first CBTA program dedicated to the enhancement of flight path management*
Tasks	
Describe the tasks associated with the purpose of the training	*The tasks listed in ICAO doc 9868 Aeroplane pilot tasks by phase of flight.*

	The specific tasks and maneuvers mandated by the National regulation, where applicable *The specific tasks and maneuvers recommended by ICAO or regulators. E.g.; Specialized Training Elements as described in ICAO Doc 10011,* *E.g.; Maneuvers as described in FAA AC 120-123*

Operational requirements	
Which operational procedures will be applied?	*The procedures described in the appropriate parts of:* ▪ *the Operation Manual including FCOM and FCTM*
In what operational environment will the training take place?	*Operational environment of the Operator is related to commercial air transport with multi-pilot airplanes and multi engine airplanes.* *The operator network comprises international, regional, and domestic flights for both passenger and cargo transportation.* *The operations are conducted during night and day in both VMC and IMC conditions.*
Which non-routine situations are necessary for successful completion of the training?	*The pilot should be exposed to the management of several events requiring the application of a set of abnormal and emergency procedures described in the Operation Manual including FCOM and FCTM.* *Generally, the trainees should apply their competencies to perform the tasks and to manage the threats and the errors that could happen under the conditions of Commercial Air Transport.* *Specifically, the trainees should be exposed to situations where they must detect and correct errors and must recognize and recover from safety margins reduction. Hence the training course should include non-routine situations such as, but not limited to:* • *Automation failures or mode reversion requiring manual intervention* • *Flight path deviations due to weather, Air Traffic Controller clearance, system malfunctions, …* • *Unstable approaches requiring go-around decision and execution* • *Energy mismanagement scenarios, such as high or low energy states* • *Aircraft system malfunctions affecting the automation systems, the flight guidance systems and the handling characteristics…*

What is the configuration of the working environment?	*Multi-crew cockpit environment associated with the type of aircraft operated by the trainees* *E.g., Aircraft GEN 4 Jet, B 787 cockpit*

Technical requirements	
What specific operational (or simulated operation) systems and/or equipment are necessary to achieve the purpose of the training?	*N/A, refer to Simulator equipment*
Regulatory requirements	
This step enables the course developer to identify the rules and regulations that apply to the requested training.	
Which rules and regulations are applicable?	*The ATO and the AOC must comply with the applicable National or regional Aircrew and Air Operations regulations.*
Are there any regulatory requirements that will affect the following aspects of the training design? -Duration -Content -Assessment procedures -Course approval -Other (Equipment, qualifications of instructors, trainee-to-instructor ratios, etc.)	*As the course is based on training recommendations regarding the enhancement of flight path management, there is no reference to any specific regulatory requirements related to the duration or content of the training.* *Nevertheless, the following documents provide recommendations regarding manual flying in operations that should be considered by the ATO and AOC when developing the training to enhance flight path management* ▪ *EASA, (2015) Safety Information Bulletin (SIB) No. 2010-33R1: Automation Policy – Mode Awareness and Energy State Management.* ▪ *EASA, (2013). Safety Information Bulletin (SIB) No. 2013-05: Manual Flight Training and Operations.* ▪ *FAA, (2022). Flight Path Management, AC 120-123. AFS-200.* ▪ *FAA), (2013). Manual Flight Operations, SAFO 13002. Safety Alert for Operations. Flight Standards Service.* *Assessment procedures: as per IATA competency assessment guide here:* Competency Assessment and Evaluation for Pilots, Instructors and Evaluators Guidance Material *Course approval: as per national Civil Aviation Authority procedures*

Organizational requirements	
What internal organizational requirements may impact training?	*As it is the first CBTA Pilot training course focused on the enhancement of flight path management, the organization applies the ICAO Doc 9868 (PANS TRG) requirements related to the instructional system design procedures (ADDIE model) and the competence of the personnel (course developers and instructors).*

Other requirements	
What other requirements may impact training?	*TBD*
Simulator Equipment	
What simulation requirements, if any, are necessary to achieve the training outcome?	*ICAO FSTD type VI or VII* *E.g., FTD level 1 or 2 and FFS*

Appendix F provides an example of a Training Specification for Single Pilot Operations.

5.2. Workflow 2: Design Local Competency-Based Training and Assessment

The purpose of Workflow 2 is to:

- Establish an adapted competency model that addresses the training specification identified in Workflow 1
- Design an assessment plan that will be used to assess the competence of the trainees, and
- Design the training plan that will enable the development and delivery of the training course

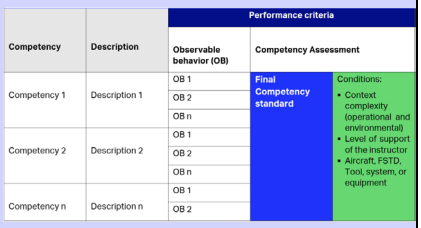
In the following paragraphs, Workflow 2 is shown in two parts:

Workflow 2 — Part 1 deals with the design of the adapted competency model.

Workflow 2 — Part 2 deals with the design of the assessment and training plans.

5.2.1 Workflow 2 - Part 1: Design the Adapted Competency Model

The outcome of Workflow 2 Part 1 is the production of an Adapted Competency Model. The process, based on the Training Specification and the pilot competency framework, permits us to define the competency standards to be achieved at the end of the training.

Workflow 2 - Part 1: Design the Adapted Competency Model		
Inputs	**Process**	**Output**
- Training Specification - IATA competency framework for Pilot or for Instructor/Evaluator	Select relevant competencies	Adapted Competency Model 
	Select, and if necessary, adapt observable behaviors	
	Determine the relevant competency standards	
	Determine the conditions under which the competencies must be trained and assessed	

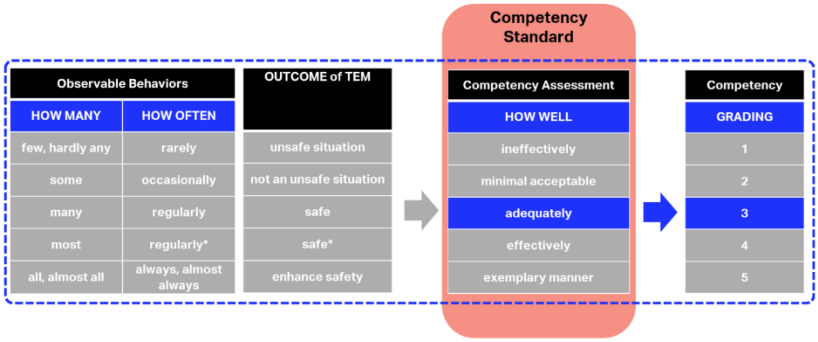
The following template elaborates on the four steps of the process supporting the design of the adapted competency model for a Flight Path Management enhancement CBTA program

Selection of the relevant competencies
Basically, in multi-crew operations, the IATA pilot competency framework applies. *Nevertheless, depending on the phase of training the AOCs and ATOs should refer to the relevant assessment guide MCO or SPO to select the competencies that are applicable to the Flight Path Management enhancement training.* *The IATA Assessment Guides for Single Pilot Operations and for Multi-Crew Operations provides the Observable Behaviors' explanation and applicability depending on the operational context. Accessible here: https://www.iata.org/contentassets/c0f61fc821dc4f62bb6441d7abedb076/competency-assessment-and-evaluation-for-pilots-instructors-and-evaluators-gm.pdf*

Selection and adaptation of the observable behaviors
Basically, in multi-crew operations, all the Observable Behaviors (OBs) from the IATA pilot competency framework apply. *Nevertheless, depending on the phase of training the AOCs and ATOs should refer to the relevant assessment guide MCO or SPO to select the OBs that are applicable to the Flight Path Management enhancement training. As an example, OB 8.4 Offers and gives assistance and OB 8.5 delegates tasks from the competency WLM are irrelevant during ab initio flight training in single pilot operations.* *The IATA Assessment Guides for Single Pilot Operations and for Multi-Crew Operations provides the Observable Behaviors' explanation and applicability depending on the operational context. Accessible here: https://www.iata.org/contentassets/c0f61fc821dc4f62bb6441d7abedb076/competency-assessment-and-evaluation-for-pilots-instructors-and-evaluators-gm.pdf*

Determining competency standards

The recommended competency standard is "adequate" (grade 3) or above for all the competencies of the AOCs and ATOs' adapted competency model.



Determining the conditions

Conditions related to the context complexity:

For most of the operator training, the competency standard should be demonstrated in different combinations of operational and environmental contexts corresponding at least to Zone IV.

Operational Context	Very Low	Low	Medium	High	Very High
Very High					
High	Zone IV				
Medium	Zone III	Zone IV			
Low	Zone II	Zone III	Zone IV		
Very Low	Zone I	Zone II	Zone III	Zone IV	

Environmental Context

Practically, during the evaluation, the context complexity varies from Zone I to Zone IV by inserting different combinations of operational and environmental threats into the flight profile.

Practical illustration of Conditions related to different context complexity corresponding to ZONE IV:

Context consistent with the operator's network and sustaining a realistic application of both normal and abnormal procedures under the following combination of complexity of operational and environmental context:

high operational context complexity (e.g., malfunction having a major impact on the flight characteristics, such as stabilizer jammed) and very low environmental complexity (e.g., VMC conditions with cross wind below 10 Knots),

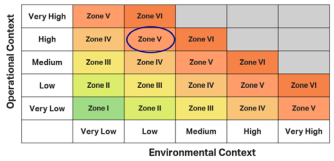
or medium operational context complexity (e.g., malfunction having a medium impact on the flight characteristics, such as flight controls in alternate law) in a low environmental complexity (e.g., ISOL CB during the phase of flight), or

very low operational context complexity (e.g., MEL item with no impact on performance nor procedures); and high environmental complexity (e.g., severe icing conditions, runway contamination having significant impact on performance)
Conditions related to tools and systems/equipment, ... *During the evaluation, the training platform is an FSTD FFS level D.*
Conditions related to the amount of support from the instructor *The evaluation is conducted without assistance from the Instructor/Evaluator*

Note: For training purposes, the operator may consider a higher zone of context complexity (e.g., Zone V and VI). This will permit placing the trainees in more demanding situations during specific maneuver training or Scenario-Based Training.

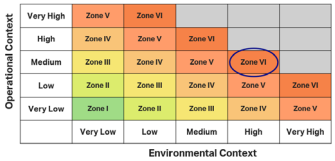
Zone V example

High operational context complexity (e.g., malfunction having a major impact on the flight characteristics, such as stabilizer jammed) and Low environmental complexity (e.g., cross wind up to 20 Kt).



Zone VI example

Medium operational context complexity (e.g., malfunction having a medium impact on the flight characteristics, such as flight controls in alternate law) in a high environmental complexity (e.g., cross wind up to the limitation).



In these Zones of higher context complexity, the instructor may support the trainee by applying the facilitation technique or providing explanations until the trainee demonstrates sufficient autonomy managing the events.

5.2.2 Workflow 2 – Part 2: Design the Training and Assessment Plan

The *IATA CBTA Guide for Flight Crew Training* provides awareness about essential definitions, concepts and best practices that facilitate the successful achievement of Workflow 2 Design local competency-based training and assessment, and specifically the following process:

Workflow 2-Part 2: Design the assessment and training plan		
Inputs	**Process**	**Output**
- Training Specification - Adapted Competency Model - Task analysis	Determine the sub-tasks and KSA from the task list and other relevant data in the training specification	**Assessment Plan** Final Competency Standard [Interim Competency Standard, where necessary] Assessment list Assessment tools **and** **Training Plan** Syllabus Composition and Structure Milestones Modules/Training Events Course schedule
	Perform a training gap analysis	
	Develop a syllabus	
	Determine the milestones, if required	
	Define interim competency standards, if required	
	Define the list of assessments that will be used to collect evidence that the final competency standard (and each interim competency standard) has been achieved	
	Develop the assessment tools	
	Design the remaining elements of the Training Plan	

The following template elaborates on the eight steps of the process supporting the design of the assessment and training plan for a Flight Path Management enhancement CBTA program.

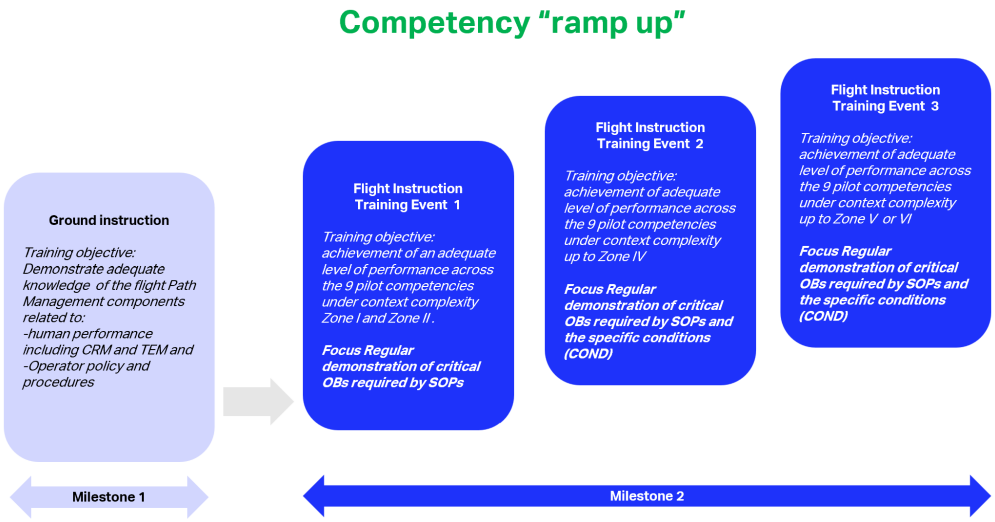
Determine the sub-tasks and KSA from the task list and other relevant data in the training specification
This step is to determine and to analyze the sub-tasks and associated KSA (Knowledge, Skill and Attitude) from the task list and other relevant data in the training specification. *Considering that:* *The next step of the process is to perform a competency-based training gap analysis* *Any CBTA program should ensure the regular demonstration of the OBs from the competency frameworks by using the relevant tasks or threats* *It had been necessary to identify the appropriate tasks and threats to enhance the flight path management by the flight crew. This identification was done through tasks and threats to OBs mapping.* ***Appendix H*** *provides a mapping Task/Threat to OBs.*

Perform a training gap analysis
Under a CBTA program, the training gap analysis should be competency-based. The recommended method to perform a competency-based training gap analysis is to apply the concept of Special Emphasis. *The concept of Special Emphasis is elaborated in detail in the IATA CBTA Guide for Flight Crew Training.* *The concept of special emphasis was applied as follows:* *The competency framework was reviewed to identify the OBs that are critical for effective flight path management.* *The assumptions were the following:* - *The trainees have already demonstrated the nine pilot competencies during a previous operator training (Operator Conversion Course, recurrent training and checking, ...)* - *The Flight Path Management Enhancement Training is delivered on the class/type of the aeroplane already endorsed on the trainees' license* - *The training course does not place the trainee in a situation where no procedure or guidance exists* - *The training course does not commit any communication with data link* *Among the 73 OBs of the pilot competency framework, a total of 33 OBs is critical for effective flight path management.* *The identification of the critical OBs for effective flight path management permit to:* *Validate that most of the pilots' competencies are solicited during flight path management, and that PRO, FPA, FPM, PSD and SAW should receive special emphasis during flight path management training as many OBs from these competencies are critical.* *Demonstration of the critical OBs is required when the flight crew:* *Operates the aircraft and applies the Standard Operating Procedures. In this case SOP means that the OB demonstration is required by the application of SOPs.* *Manages specific conditions during the flight. In this case COND means that the OB demonstration is subject to specific conditions (e.g., OB 4.2 and OB 5.1 demonstration necessitate flight path deviations)* ***Appendix G** contains the rationale regarding the criticality of the OB for effective flight path management and shows how the training gap analysis has been conducted.*

Develop a syllabus
The syllabus is the list of the training objectives that should be achieved by the end of the course. The training objectives are derived from the training gap analysis and the tasks and sub-tasks lists analysis.

As there is a strong interdependence between the assessment plan and the training plan, the course developer should elaborate a competency "ramp up" that represents the necessary steps of competency achievement towards the competency standard.

For the CBTA course for flight path management enhancement, the following "ramp up" is proposed as a consistent illustration for the design of the course:



Training of flight path management should be a combination of:

Ground instruction to ensure adequate knowledge acquisition related to human performance and CRM/TEM fundamentals, as well as operator policies and procedures related to flight path management,

and

flight instruction (includes FSTD training) to develop competencies sustaining effective flight path management in a realistic context.

Hence, the ramp up is based on ground and flight instruction. The flight instruction is composed of three Training Events where the number of critical OBs and the context complexity progressively increase:

Training Event 1 is foundational and focusses on the regular demonstration of the critical OBs that are required by the application of normal procedures (SOPs) during the conduct of a flight profile under low complexity context (limited to Zone I and Zone II).

Training Event 2 complements Training Event 1 by focusing additionally on the regular demonstration of the critical OBs that are required by the presence of specific conditions (COND) during the conduct of the flight profile under more complex context (from Zone I up to Zone IV).

Training Event 3 is an option for operators considering higher zone of context complexity (e.g., Zone V and VI). Training Event 3 places the trainees in more demanding situations during specific maneuver training or Scenario-Based Training. In these Zone of higher context complexity, the instructor may provide more support to the trainees.

***Note**. To generate specific conditions (e.g., a flight path deviation), the operator may elect to apply the "In Seat Instruction" (ISI) instructional technique. In this case, the instructor/evaluator operates in a pilot seat and purposely makes some errors that compromise effective flight path management to challenge the demonstration by the trainee of the critical OBs required by the specific conditions.*

Determine the milestones, if required
In the context of Flight Path Management enhancement for a pilot population already qualified on the type or class of aircraft, the proposed milestones are the following: *Milestone 1 corresponding to the satisfactory completion of the ground instruction,* *Milestone 2 corresponding to the demonstration of an adequate level of performance across all the competencies of the adapted competency model,*

Define interim competency standards, if required
Not applicable as the milestone 1 will be achieved by the trainees through the demonstration of adequate level of knowledge through a questionnaire.

Define the list of assessments that will be used to collect evidence that the final (and each interim) competency standard has been achieved
For this course a unique summative assessment is deemed necessary after the completion of Training Event 2 or Training Event 3. *During the summative assessment, the instructor/evaluator determines if the trainees have demonstrated the nine pilot competencies of the operator adapted competency model, based on the following performance criteria:* – *Competency Standard: Adequate level of performance (corresponding to grade 3)* – *Conditions:* ▪ *Context complexity = from Zone I to Zone IV* ▪ *Training platform = FSTD FFS level D* ▪ *Instructor support = without instructor assistance*

Develop the assessment tools
The IATA Assessment Guides for Single Pilot Operations and for Multi-Crew Operations provides the Observable Behaviors' explanation and applicability depending on the operational context. Accessible here: https://www.iata.org/contentassets/c0f61fc821dc4f62bb6441d7abedb076/competency-assessment-and-evaluation-for-pilots-instructors-and-evaluators-gm.pdf

Design the remaining elements of the Training Plan
The syllabus has already been elaborated. Then the following Training and Assessment Plan permits us to identify all the training objectives related to the flight training.

CBTA Training and Assessment Plan – Flight Path Management Enhancements

		MILESTONE 1	MILESTONE 2			
			MODULE 2			SUMMATIVE ASSESSMENT
			FORMATIVE ASSESSMENT/ TE			
		RESULT	TE 2.1	TE 2.2	TE 2.3	
Competency Development	Train & Assess		KNO WLM	KNO COM LTW WLM	KNO COM LTW WLM	KNO COM LTW WLM
	Train & Assess with Special Emphasis	KNO PRO	PRO FPA FPM SAW	PRO FPA FPM PSD SAW	PRO FPA FPM PSD SAW	PRO FPA FPM PSD SAW
	Critical OBs	OB 0.1	OB 0.2	OB 0.1	OB 0.1	OB 0.1
		OB 0.2	OB 1.2	OB 0.2	OB 0.2	OB 0.2
		OB 0.3	OB 1.3	OB 0.3	OB 0.3	OB 0.3
		OB 1.2	OB 1.4	OB 1.2	OB 1.2	OB 1.2
		OB 1.3	OB 1.5	OB 1.3	OB 1.3	OB 1.3
		OB 1.4	OB 3.1	OB 1.4	OB 1.4	OB 1.4
		OB 1.5	OB 3.4	OB 1.5	OB 1.5	OB 1.5
		OB 1.7	OB 3.5	OB 1.7	OB 1.7	OB 1.7
			OB 4.1	OB 2.7	OB 2.7	OB 2.7
			OB 4.3	OB 3.1	OB 3.1	OB 3.1
			OB 4.5	OB 3.2	OB 3.2	OB 3.2
			OB 4.6	OB 3.4	OB 3.4	OB 3.4
			OB 7.1	OB 3.5	OB 3.5	OB 3.5
			OB 7.2	OB 3.6	OB 3.6	OB 3.6
			OB 7.3	OB 4.1	OB 4.1	OB 4.1
			OB 8.7	OB 4.2	OB 4.2	OB 4.2
				OB 4.3	OB 4.3	OB 4.3
				OB 4.5	OB 4.5	OB 4.5
				OB 4.6	OB 4.6	OB 4.6
				OB 4.7	OB 4.7	OB 4.7
				OB 5.7	OB 5.7	OB 5.7
				OB 5.10	OB 5.10	OB 5.10
				OB 6.1	OB 6.1	OB 6.1
				OB 6.2	OB 6.2	OB 6.2
				OB 6.3	OB 6.3	OB 6.3
				OB 6.4	OB 6.4	OB 6.4
				OB 6.9	OB 6.9	OB 6.9
				OB 7.1	OB 7.1	OB 7.1
				OB 7.2	OB 7.2	OB 7.2
				OB 7.3	OB 7.3	OB 7.3
				OB 7.6	OB 7.6	OB 7.6
				OB 8.7	OB 8.7	OB 8.7
				OB 8.9	OB 8.9	OB 8.9
Minimum Level of Performance		PASS	*Adequate*			COMPETENT
Conditions	Function	N/A	PF/PM	PF/PM	PF/PM	PF/PM
	Training Platform	N/A	FFS	FFS	FFS	FFS
	Nature	N/A	CAT-IFR			
	Maximum Level of Complexity	N/A	ZONE I & II	ZONE I to IV	ZONE V & VI	ZONE I to IV
	Operational Context	N/A	Very Low to Low	Very Low to High	Very Low to Very High	Very Low to High
	Environmental Context	N/A	Low to Very Low	High to Very Low	Very High to Very Low	High to Very Low
	Expected Level of Instructor support	N/A	Low	Medium	High	None

5.3. Workflow 3: Develop the Training and Assessment Materials

During this step, all training and assessment materials are developed based on the adapted competency model and the training and assessment plans.

Training and assessment materials include but are not limited to training notes, exercise briefings, practical exercises, case studies, presentations, video clips, self-test quizzes, examinations, assessments, and assessment tools.

Workflow 3 is illustrated in the template below.

<table>
<tr><th colspan="3">Workflow 3: Develop the training and assessment materials</th></tr>
<tr><th>Inputs</th><th>Process</th><th>Output</th></tr>
<tr><td rowspan="2">- Adapted Competency Model
- Assessment Plan
- Training Plan</td><td>Develop educational materials to support the delivery of the course</td><td rowspan="2">Course schedule
Training event materials
(Training notes, case studies, briefings, presentations, videos, exercises, etc.)
Examinations
Practical assessments
Other assessments</td></tr>
<tr><td>Develop examinations and assessments</td></tr>
</table>

The following propose examples of training event material in the form of lesson plans for the Flight Path Management Enhancements training under a competency-based approach.

Note: More detailed guidance for the development of maneuver training, scenario-based training and line-oriented simulation is available in the IATA Guidance Material for Improving Flight Crew Monitoring available in the IATA CBTA Library.

5.3.1 Lesson plan examples

The following describes the content of a lesson plan defined in accordance with the training and assessment plan shown in paragraph 5.2.2 Design the Training and Assessment Plan (Workflow 2 – Part 2)

Appendix I provides examples of Lesson Plans' front page related to training events 1, 2 and 3 in a CBTA environment.

5.3.2 Additional Lesson Plan examples for role play (applicable to Training Events 2.2 and 2.3).

5.3.2.1 Instructor guidance regarding human performance

This part of the lesson plan specifies the desired outcome, indicates to the instructor/evaluator the critical OBs expected to be demonstrated by the trainees and a guidance for the instructor/evaluator regarding the role play.

SCENARIO #	Expected Outcome:	• Detect errors and recognize mismanaged aircraft state. • Take appropriate actions where necessary • Restore desired aircraft state • Identify and manage consequences

Critical Trainee's OBs:

- KNO - OB 0.2 - Demonstrates required knowledge of published operating instructions
- PRO – OB 1.2 - Applies relevant operating instructions, procedures, and techniques in a timely manner
- PRO – OB 1.5 - Monitors aircraft systems status
- COM - OB 2.7 - Uses appropriate escalation in communication to resolve identified deviations
- FPA - OB 3.2 - Monitors and detects deviations from the intended flight path and takes appropriate action
- FPA - OB 3.6 - Effectively monitors automation, including engagement and automatic mode transitions
- FPM - OB 4.2 - Monitors and detects deviations from the intended flight path and takes appropriate action
- FPM - OB 4.3 - Manually controls the aeroplane using the relationship between aeroplane attitude, speed and thrust and navigation signals or visual information
- FPM – OB 4.7 - Effectively monitors flight guidance systems including engagement and automatic mode transitions
- LTW – OB 5.7 - Exercises decisive leadership when required
- LTW - OB 5.10 - Applies effective intervention strategies to resolve identified deviations
- PSD – OB 6.1 - Identifies, assesses and manages threats and errors in a timely manner
- SAW – OB 7.1 - Monitors and assesses the state of the aeroplane and its systems
- SAW – OB 7.2 - Monitors and assesses the aeroplane's energy state, and its anticipated flight path.
- WLM – OB 8.7 - Monitors, reviews and cross-checks actions conscientiously
- WLM – OB 8.9 - Manages and recovers from interruptions, distractions, variations and failures effectively while performing tasks

Role Play:

- must be performed with realistic and not gross errors, leading at times to a mismanaged aircraft state.

5.3.2.2 Flight profile visualization

This part of the lesson plan provides the instructor/evaluator with the:

- Visualization of the flight profile (Figure 6 below)
- Event essential elements (TCAS)

- Nature of the error or deviation to be role played

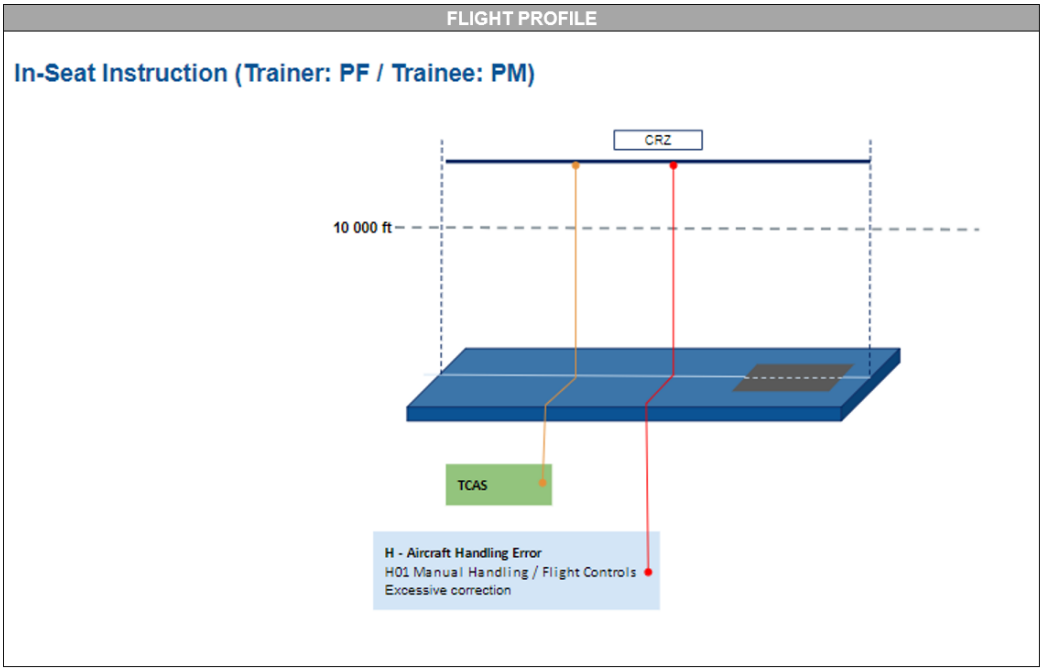


Figure 6 - Visualization of the flight profile

5.3.2.3 Instructor Guidance Regarding the Use of Automation

This part of the lesson plan provides guidance for the use of the automation by the trainees or by the instructor/evaluator.

FPV: FLIGHT PATH VECTOR - **A/P**: AUTOPILOT - **FD**: FLIGHT DIRECTOR - **A/T**: AUTO THROTTLE or AUTO THRUST		
RED: **MUST NO**T be used	GREEN: **MUST** be used	GREY: Used **AT DISCRETION**

5.3.2.4 Instructor Guidance Regarding Management of the Event

This part of the lesson plan provides specific instructions regarding role play. In the following example, the instructor/evaluator will not demonstrate OB 4.1 in order to generate an excessive correction that should be recognized by the trainee.

Time	Duration	Events		PF : Instructor			
INIT CRUISE							
		1	TCAS (AUTO FLIGHT TCAS MODE FAULT)	FPV	AP	FD	A/T
	Aircraft Handling Error - Manual Handling **Role Play** • No demonstration of "FPM - OB 4.1 - Controls the aircraft manually with accuracy and smoothness as appropriate to the situation" ○ Excessive Correction						

Appendix J provides illustrations of specific instructor guidance when "role play" is used during the Training Events TE 2.2 and TE 2.3.

5.4. Workflow 4: Implement the Course

The following paragraphs provide specific guidance to ensure an effective delivery of flight path management enhancement training by the instructors/evaluators (IEs).

Course implementation is illustrated in the template below.

Workflow 4: Implement the course in accordance with the training and assessment plans		
Inputs	**Process**	**Output**
- Adapted Competency Model - Assessment Plan - Training Plan - Course material - Facilities and equipment - Training and assessment personnel	Deliver the training according to the Training Plan	**Competent Trainees**
	Monitor trainees' progress against the interim and final competency standard	
	Provide timely and continuous feedback on performance	
	Diagnose deficiencies and provide remediation in a timely manner	
	Carry out assessments according to the Assessment Plan	

Under any CBTA program, the training should be delivered by competent instructors/evaluators.

ICAO Doc 9868 (PANS-TRG) contains provisions related to the CBTA instructor qualification and the pilot instructor competency framework.

Note: More detailed guidance for the instructor/evaluator competency development and the delivery of CBTA programs is available in the IATA Guidance Material and Best Practices for Instructor and Evaluator Training, in the IATA CBTA Library.

5.5. Workflow 5: Evaluate the course including the training and assessment plan

At the end of a period of training, feedback on performance on the job from trainees, instructors, assessors and employers is gathered to determine the effectiveness of the course in supporting the progression of learning towards competence in the workplace.

The template below illustrates the process of evaluating a course.

Workflow 5 - Evaluate the course including the training and assessment plans		
Inputs	**Process**	**Output**
– Course results – Trainee feedback – Instructor and Evaluator feedback – Audit reports	Analyze results, reports and feedback Formulate improvement actions, if required	**Course report**

Evaluation of the training and assessment plans should be based on valid and reliable evidence. This evaluation may lead to changes or improvements being made to the course.

Course results should integrate the data collected during training and assessment. Under any CBTA program, this data should be composed of the competency metrics, the observable behaviors metrics and the threat and error management (TEM) metrics. The analysis of these metrics should ensure the continuous enhancement of the program by identifying the trends regarding trainees' performance during the course delivery. The training data aspects are elaborated in Chapter 6.

Note: More detailed guidance on training data management is available in the IATA CBTA Guide for Flight Crew Training available under the IATA CBTA Library.

Appendix A – IATA Pilot Competency Framework

Competency Description	**Observable behaviors**
Application of knowledge Demonstrates knowledge and understanding of relevant information, operating instructions, aircraft systems and the operating environment.	OB 0.1 Demonstrates practical and applicable knowledge of limitations and systems and their interaction OB 0.2 Demonstrates required knowledge of published operating instructions OB 0.3 Demonstrates knowledge of the physical environment, the air traffic environment including routings, weather, airports and the operational infrastructure OB 0.4 Demonstrates appropriate knowledge of applicable legislation OB 0.5 Knows where to source required information OB 0.6 Demonstrates a positive interest in acquiring knowledge OB 0.7 Is able to apply knowledge effectively
Application of procedures and compliance with regulations Identifies and applies appropriate procedures in accordance with published operating instructions and applicable regulations.	OB 1.1 Identifies where to find procedures and regulations OB 1.2 Applies relevant operating instructions, procedures and techniques in a timely manner OB 1.3 Follows SOPs unless a higher degree of safety dictates an appropriate deviation OB 1.4 Operates aeroplane systems and associated equipment correctly OB 1.5 Monitors aircraft systems status OB 1.6 Complies with applicable regulations. OB 1.7 Applies relevant procedural knowledge
Communication Communicates through appropriate means in the operational environment, in both normal and non normal situations.	OB 2.1 Determines that the recipient is ready and able to receive information OB 2.2 Selects appropriately what, when, how and with whom to communicate OB 2.3 Conveys messages clearly, accurately and concisely OB 2.4 Confirms that the recipient demonstrates understanding of important information OB 2.5 Listens actively and demonstrates understanding when receiving information OB 2.6 Asks relevant and effective questions OB 2.7 Uses appropriate escalation in communication to resolve identified deviations OB 2.8 Uses and interprets non-verbal communication in a manner appropriate to the organizational and social culture OB 2.9 Adheres to standard radiotelephone phraseology and procedures OB 2.10 Accurately reads, interprets, constructs and responds to datalink messages in English

Competency Description	Observable behaviors
Aeroplane Flight Path Management, automation Controls the flight path through automation.	OB 3.1 Uses appropriate flight management, guidance systems and automation, as installed and applicable to the conditions OB 3.2 Monitors and detects deviations from the intended flight path and takes appropriate action OB 3.3 Manages the flight path safely to achieve optimum operational performance OB 3.4 Maintains the intended flight path during flight using automation while managing other tasks and distractions OB 3.5 Selects appropriate level and mode of automation in a timely manner considering phase of flight and workload OB 3.6 Effectively monitors automation, including engagement and automatic mode transitions
Aeroplane Flight Path Management, manual control Controls the flight path through manual control.	OB 4.1 Controls the aircraft manually with accuracy and smoothness as appropriate to the situation OB 4.2 Monitors and detects deviations from the intended flight path and takes appropriate action OB 4.3 Manually controls the aeroplane using the relationship between aeroplane attitude, speed and thrust, and navigation signals or visual information OB 4.4 Manages the flight path safely to achieve optimum operational performance OB 4.5 Maintains the intended flight path during manual flight while managing other tasks and distractions OB 4.6 Uses appropriate flight management and guidance systems, as installed and applicable to the conditions OB 4.7 Effectively monitors flight guidance systems including engagement and automatic mode transitions
Leadership and Teamwork Influences others to contribute to a shared purpose. Collaborates to accomplish the goals of the team.	OB 5.1 Encourages team participation and open communication OB 5.2 Demonstrates initiative and provides direction when required OB 5.3 Engages others in planning OB 5.4 Considers inputs from others OB 5.5 Gives and receives feedback constructively OB 5.6 Addresses and resolves conflicts and disagreements in a constructive manner OB 5.7 Exercises decisive leadership when required OB 5.8 Accepts responsibility for decisions and actions OB 5.9 Carries out instructions when directed OB 5.10 Applies effective intervention strategies to resolve identified deviations OB 5.11 Manages cultural and language challenges, as applicable

Competency Description	Observable behaviors
Problem Solving and Decision Making Identifies precursors, mitigates problems; and makes decisions.	OB 6.1 Identifies, assesses and manages threats and errors in a timely manner OB 6.2 Seeks accurate and adequate information from appropriate sources OB 6.3 Identifies and verifies what and why things have gone wrong, if appropriate OB 6.4 Perseveres in working through problems while prioritizing safety OB 6.5 Identifies and considers appropriate options OB 6.6 Applies appropriate and timely decision-making techniques OB 6.7 Monitors, reviews and adapts decisions as required OB 6.8 Adapts when faced with situations where no guidance or procedure exists OB 6.9 Demonstrates resilience when encountering an unexpected event
Situation Awareness and Management of Information Perceives, comprehends and manages information and anticipates its effect on the operation.	OB 7.1 Monitors and assesses the state of the aeroplane and its systems OB 7.2 Monitors and assesses the aeroplane's energy state, and its anticipated flight path. OB 7.3 Monitors and assesses the general environment as it may affect the operation OB 7.4 Validates the accuracy of information and checks for gross errors OB 7.5 Maintains awareness of the people involved in or affected by the operation and their capacity to perform as expected OB 7.6 Develops effective contingency plans based upon potential risks associated with threats and errors OB 7.7 Responds to indications of reduced situation awareness
Workload Management Maintain available workload capacity by prioritizing and distributing tasks using appropriate resources.	OB 8.1 Exercises self-control in all situations OB 8.2 Plans, prioritizes and schedules appropriate tasks effectively OB 8.3 Manages time efficiently when carrying out tasks OB 8.4 Offers and gives assistance OB 8.5 Delegates tasks OB 8.6 Seeks and accepts assistance, when appropriate OB 8.7 Monitors, reviews and cross-checks actions conscientiously OB 8.8 Verifies that tasks are completed to the expected outcome OB 8.9 Manages and recovers from interruptions, distractions, variations and failures effectively while performing tasks

Appendix B – OEMs Operational Philosophy

Boeing – Flight Deck Pilot Responsibilities

Boeing flight decks are designed to support the priorities of Aviate, Navigate, Communicate, and manage airplane systems. These priorities form the foundation of Threat and Error Management (TEM), a framework used to reduce the risk of threats, errors, and Undesired Airplane States (UAS).

TEM builds pilot skills and resilience through active monitoring, early risk identification, and mitigation strategies.

A common element of TEM programs is the TEM Card, a briefing and debriefing tool that helps guide the crew in risk evaluation. Boeing supports the use of TEM Cards in both flight operations and flight training.

Management of pilot startle and surprise is another component of "Aviate, Navigate, Communicate" and TEM. When encountering a startle event or non-normal situation, the model "Fly, Focus, Act" can aid pilot resilience by maintaining safety (fly the airplane), maintaining composure and observation (focus), and identifying and managing the startle event (act).

The Captain is ultimately responsible for the safe operation of the airplane. Both flight crew members are responsible for the safe conduct of the flight. Automation assists the flight crew in the efficient operation of the airplane. If the airplane does not perform as expected, the flight crew must assume positive control of the airplane.

The flight deck design assumes the pilot will:

- Respond correctly and safely to alert conditions.
- Prioritize warnings over cautions, and cautions over advisories.
- Maintain situational awareness at all times. Both pilots should monitor the flight instruments and flight mode annunciations to verify that the airplane is responding as expected. Both pilots should also anticipate what actions are needed next and how the airplane should respond.
- Use the appropriate level of automation for the situation. Assign tasks to automation in the desired state. Engage automation when workload increases, and take manual control when needed.
- Apply critical thinking and judgment. If indications are not as expected, seek confirming information and take appropriate action.

Airbus “Golden Rules”

The Airbus "Golden Rules for Pilots" are operational guidelines, based on all of the following:

- Basic flying principles
- The adaptation of these basic flying principles to modern-technology aircraft
- The provision of information about required crew coordination for the operation of Airbus aircraft.

The objective of these Golden Rules is to also take into account the principles of flight crew interaction with automated systems, and the principles of Crew Resource Management (CRM), in order to help prevent the causes of many accidents or incidents and to ensure flight efficiency.

GENERAL GOLDEN RULES The following four Golden Rules for Pilots are applicable to all normal operations, and to all unexpected or abnormal/emergency situations:

1. Fly. Navigate. Communicate: In this order and with appropriate task sharing

Fly! Navigate! Communicate! The flight crew must perform these three actions in sequence and must use appropriate task sharing in normal and abnormal operations, in manual flight or in flight with the AP engaged.

The following explains each of the three actions, and the steps associated with the performance of these actions:

- Fly

"Fly" indicates that:

– The Pilot Flying (PF) must concentrate on "flying the aircraft", to monitor and control the pitch attitude, bank angle, airspeed, thrust, sideslip, heading, etc., in order to achieve and maintain the desired targets, vertical flight path, and lateral flight path.

– The Pilot Monitoring (PM) must assist the PF and must actively monitor flight parameters, and call out any excessive deviation. The PM's role of "actively monitoring" is very important.

Therefore, both flight crewmembers must:

- Focus and concentrate on their tasks to ensure appropriate task sharing
- Maintain situational awareness and immediately resolve any uncertainty as a crew.

- Navigate

"Navigate" refers to and includes the following four "Know where ..." statements, in order to ensure situational awareness:

- Know where you are…
- Know where you should be…
- Know where you should go…
- Know where the weather, terrain, and obstacles are.

- Communicate

"Communicate" involves effective and appropriate crew communication between the:

- PF and the PM
- Flight crew and Air Traffic Control (ATC)
- Flight crew and the cabin crew
- Flight crew and the ground crew.

Communication enables the flight crew to safely and appropriately perform the flight, and enhance situational awareness. To ensure good communication, the flight crew should use **standard phraseology** and the **applicable callouts**.

In abnormal and emergency situations, the PF must recover a steady flight path, and the flight crew must identify the flight situation. The PF must then inform ATC and the cabin crew of:

- The flight situation
- The flight crew's intentions

The flight crew must therefore always keep in mind the key message:

Fly the Aircraft, Fly the Aircraft, Fly the Aircraft...

To safely and appropriately perform a flight, both flight crewmembers must have basic flying skills and must be able to fly with appropriate task sharing in all situations.

2. Use the appropriate level of automation at all times

Aircraft are equipped with several levels of automation, used to perform specific tasks.

The appropriate use of automated systems significantly helps the flight crew with, for example:

- Workload management
- Situation awareness (traffic, ATC communication, etc.)

The flight crew must, at all times, perform both of the following:

- **Determine and select** the appropriate level of automation that can include manual flight Note: The decision to use manual flight must be agreed between both pilots and must be based on an individual assessment of the pilot. This assessment should include aircraft status (malfunctions), pilot fatigue, weather conditions, traffic situation, and if the PF is familiar with the area.
- **Understand** the operational effect of the selected level of automation.

3. Understand the FMA at all times

The flight crew must confirm the operational effect of all actions on the FCU, or on the MCDU, via a crosscheck of the corresponding annunciation or data on the PFD and on the ND.

At all times, the flight crew should be aware of the following:

- Guidance modes (armed or engaged)
- Guidance targets

- Aircraft response in terms of attitude, speed, and trajectory
- Transition or reversion modes

Therefore, to ensure correct situational awareness, at all times, the flight crew must:

- Monitor the FMA
- Announce the FMA
- Confirm the FMA
- Understand the FMA

4. Take action if things do not go as expected

If the aircraft does not follow the desired vertical or lateral flight path, or the selected targets, and if the flight crew does not have sufficient time to analyze and solve the situation, the flight **crew must immediately take appropriate or required actions,** as follows:

The PF should change the level of automation:

- From managed guidance to selected guidance, or
- From selected guidance to manual flying

The PM should perform the following actions in sequence:

- Communicate with the PF
- Challenge the actions of the PF, when necessary
- Take over, when necessary

Appendix C – Example of an operator policy to be implemented in the Operations Manual

Example of implementation of the IATA Policy framework
Threat and Error Management (TEM)
Definitions Threat and error management (TEM) is a concept that assists the pilots in understanding, from an operational perspective, the interrelationship between safety and their own performance in the dynamic and challenging contexts applicable to their operations. TEM provides the pilots with tools as well as strategies and tactics to manage potential threats, to limit the risks due to errors and consequently to enhance safety margins in operations. From a human performance perspective, the pilot competencies* represent the individual and team countermeasures to the management of threats and errors and to the recognition and the recovery of potential reduction of safety margins. ***Note**: Pilot competencies are generally described in the Operator Training Manual* Implementation The pilots apply the TEM concept during all the phases of the flight from flight preparation to post flight debriefing. The pilots continuously and systematically perform a TEM assessment of the operational context of the flight. The TEM assessment may lead to a specific briefing and is a pre-requisite to all technical briefing.

Flight Path Management, Automation and Manual control
Definitions Flight Path Management refers to planning, execution, monitoring and, if necessary, correcting the guidance and control of the flight path. Manual methods, automated systems, or any combination thereof are tools to assist the pilot in managing the flight path. **Implementation** The pilots should decide the appropriate level of automation to ensure the safety of the flight and the maintenance of their skills and competence. The flight crew's decision regarding the selection of the level of automation that includes manual flying should be based on: ▪ The operating limitations ▪ The TEM assessment of the operational context ▪ The pilots' needs (pilot exposure, recent experience, crew composition…) The pilots should continuously monitor the automation or flight guidance systems, deviations from the intended flight path, and the relationship between aeroplane attitude, speed and thrust. The flight crew should review and adapt the level of automation when a potential risk of safety margins reduction has been identified. ***Note.** Operating limitations may be published in different parts of the Operations Manual.*

Monitoring

Definitions

Monitoring is a cognitive process to compare an actual to an expected state.

Monitoring is embedded in the pilot competencies which serve as countermeasures in the threat and error management model. It requires knowledge, skills and attitudes to create a mental model and to take appropriate action when deviations are recognized.

Pilot Flying (PF)	*Pilot Monitoring (PM)*
The pilot role whose primary responsibility is flight path management throughout all phases of flight.	The pilot role whose primary responsibility is to monitor and support the flight path management by the PF throughout all phases of flight.

Implementation

Pilots should manage distractions and disturbances in such a way that their primary tasks are always performed.

Cognitive resources being limited, pilots must manage their workload to achieve efficient monitoring.

Pilots exercise their competencies to anticipate and intervene, if necessary, when they detect deviations comparing an actual to an expected state.

The *Area of Vulnerability (AOV)* concept serves as guideline for prioritizing tasks, depending on the time available to detect and correct a deviation in trajectory, configuration or energy.

The three types of AOV (Low, Medium and High) indicate the segment of the flight profile where pilots should adapt the emphasis on:

- Task prioritization and distribution
- Management of task interruptions and disruptions
- Monitoring scanning pace

LOW AOV: Stable trajectory path (e.g., straight-and-level cruise flight)

The pilots have sufficient time to detect and correct potential deviations.

- The scanning frequency of the trajectory parameters is done at normal sampling rate
- Both pilots may perform secondary tasks – but not at the same time

MEDIUM AOV: Moderate responsive flight path (e.g., during climbs and descents)

The pilots have reduced time to detect and correct potential deviations.

- The scanning frequency of the trajectory parameters is done at elevated sampling rate
- Secondary tasks may be performed by the PM

HIGH AOV: Highly responsive flight path (e.g., initiating climbs/descents, within 1,000 ft of level-offs, turning, changing speed or configuration)

The pilots have very little time to detect and correct potential deviations.

- The scanning frequency of the trajectory parameters is done at high sampling rate
- All secondary tasks should be avoided. Only the PM performs mandatory secondary tasks

***Note**: Sampling rate is the frequency with which a pilot directs his visual and mental attention to the various items or indicators that represent the flight path.*

- A **normal sampling rate** is the equivalent of the scanning frequency required of a pilot when hand-flying an aircraft in straight-and-level flight. This implies a rate sufficient to reliably detect changes, to recognize factors that may affect the flight path, and to anticipate the need to shift to a higher sampling rate.
- An **elevated sampling rate** is the scanning frequency required of a pilot when hand-flying an aircraft approaching an imminent change in trajectory or energy (e.g., approaching a turn point, or a descent point, or a configuration change point).
- A **high sampling rate** is the scanning frequency required of a pilot when hand-flying an aircraft through the execution of a significant change of trajectory or energy.

Area of Vulnerability (AOV) Concept

The operator's policy and procedures should integrate the concept of Area of Vulnerability (AOV) for pilots to perform effective monitoring during periods of high workload and increased vulnerability to flight path deviations.[1]

Pilots must manage distractions and disturbances in such a way that their primary tasks (i.e., flight path management and monitoring) are always performed. Cognitive resources being limited, pilots must manage their workload to achieve effective monitoring. Pilots apply their competencies to anticipate and intervene, if necessary, when they detect deviations comparing an actual to an expected state.

"Vulnerability" indicates either the increased likelihood of a flight path deviation or the increased severity of the consequences if such a deviation occurs. Figure 7 below shows an in-flight profile example for Areas of Vulnerability (AOV) to flight path deviation. The table underneath further explains the AOVs.

Areas of Vulnerability (AOV) to Flight Path Deviation, In-Flight Profile Examples (Flight Safety Foundation)

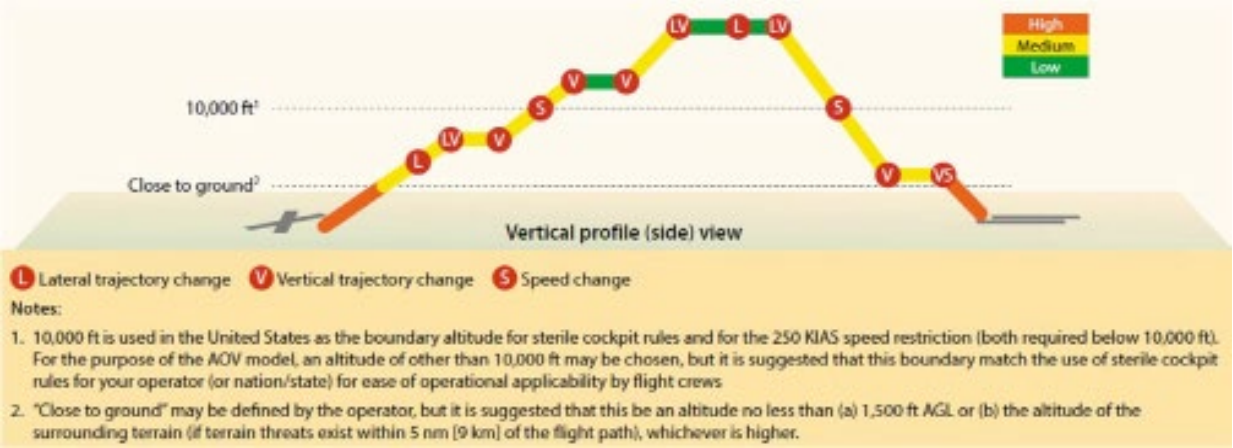


Figure 7 – Areas of Vulnerability

The three types of AOVs indicate the segments of the flight profile where the pilots (PF and PM) should allocate different levels of resource to:

- task prioritization and distribution,
- task interruptions and disruptions management, and
- monitoring scanning pace.

[1] This part is adapted from FSF (2014), A Practical Guide for Improving Flight Path Monitoring, p. 18ff.

AOV	Conditions	Examples
Low	• stable air/ground path, and • ample time to detect and correct possible deviations	• on the ground when the aircraft is stationary, and the parking brakes are set • in stable, straight-and-level cruise flight
Medium	• reduced time available to detect and correct an air/ground deviation	• on the ground during taxi segments that do not involve approaching, crossing, entering or exiting an active runway • in flight during climbs and descents • in some conditions in flight below 10,000 ft
High	• changing path or immediate and severe consequences of a path deviation, and • short time available to detect and correct a deviation	• on the ground when approaching, crossing, entering or exiting active runways, and when taxiing in confined spaces or close to obstacles • in flight when initiating climbs/descents and within 1,000 ft of level-offs, or when turning, or when changing speed or configuration • in flight when close to the ground and/or below the level of surrounding terrain

Appendix D – Aeroplane Pilot Tasks by Phases of Flight

The following table shows the aeroplane pilot tasks by phases of flight, extracted from ICAO Doc 9868 (PANS-TRG), Appendix 2 to Chapter 1.

Notes:

1. *Pilot tasks used in training may include but are not limited to the pilot tasks listed in the table below.*
2. *The assignment of PF and PM duty in the table are presented as an example.*

X. Phase of flight **X.X Tasks** **X.X.X Sub-tasks**			***Duty***
1.	***[RESERVED]***		
2.	**PERFORM AEROPLANE GROUND AND PRE-FLIGHT OPERATIONS**		
2.1	**Perform dispatch duties**		
	2.1.1	Verifies technical condition of the aeroplane, including adequate use of MEL	PF/PM
	2.1.2	Checks technical bulletins and notices	PF/PM
	2.1.3	Determines operational environment and pertinent weather	PF/PM
	2.1.4	Determines impact of weather on aeroplane performance	PF/PM
	2.1.5	Applies flight planning and load procedures	PF/PM
	2.1.6	Determines fuel requirement	PF/PM
	2.1.7	Files an ATS flight plan (if required)	PF/PM
2.2	**Provide flight crew and cabin crew briefings**		
	2.2.1	Briefs flight crew in all relevant matters	PF
	2.2.2	Briefs cabin crew in all relevant matters	PF
2.3	**Perform pre-flight checks and cockpit preparation**		
	2.3.1	Ensures the airworthiness of the aeroplane	PF
	2.3.2	Performs the cockpit preparation and briefings	PF/PM
	2.3.3	Performs FMS initialization, data insertion and confirmation	PF/PM
	2.3.4	Optimizes and checks take-off performance and take-off data calculation	PF/PM
	2.3.5	Conducts relevant briefings	PF

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
2.4	**Perform engine start**		
	2.4.1	Asks for, receives, acknowledges and checks ATC clearance	PM
	2.4.2	Performs engine start procedure	PF/PM
	2.4.3	Uses standard communication procedures with ground crew and ATC	PF/PM
2.5	**Perform taxi**		
	2.5.1	Receives, checks and adheres to taxi clearance	PM
	2.5.2	Taxis the aeroplane including use of exterior lighting	PF
	2.5.3	Complies to taxi clearance	PF/PM
	2.5.4	Maintains lookout for conflicting traffic and obstacles	PF/PM
	2.5.5	Operates thrust, brakes and steering	PF
	2.5.6	Conducts relevant briefings	PF
	2.5.7	Uses standard communication procedures with crew and ATC	PM
	2.5.8	Completes standard operating procedures and checklists	PF/PM
	2.5.9	Updates and confirms FMS data	PF/PM
	2.5.10	Manages changes in performance and departure route	PF/PM
	2.5.11	Completes de-icing/anti-icing procedures	PF/PM
2.6	**Manage abnormal and emergency situations**		
	2.6.1	Identifies the abnormal and emergency condition	PF/PM
	2.6.2	Interprets the abnormal and emergency condition	PF/PM
	2.6.3	Performs the procedure for the abnormal and emergency condition	PF/PM
2.7	**Communicate with cabin crew, passengers and company**		
	2.7.1	Communicates relevant information to cabin crew	PF
	2.7.2	Communicates relevant information to company	PF/PM
	2.7.3	Makes passenger announcements when appropriate	PF/PM

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
3.	**PERFORM TAKE-OFF**		
3.1	**Perform pre-take-off and pre-departure preparation**		
	3.1.1	Checks and acknowledges line-up clearance	PF/PM
	3.1.2	Checks correct runway selection	PF/PM
	3.1.3	Confirms validity of performance data	PF/PM
	3.1.4	Checks approach sector and runway are clear	PF/PM
	3.1.5	Confirms all checklists and take-off preparations completed	PF/PM
	3.1.6	Lines up the aeroplane on centre line without losing distance	PF
	3.1.7	Checks weather on departure sector	PF/PM
	3.1.8	Checks runway status and wind	PF/PM
3.2	**Perform take-off roll**		
	3.2.1	Applies take-off thrust	PF
	3.2.2	Checks engine parameters	PF/PM
	3.2.3	Checks airspeed indicators	PF/PM
	3.2.4	Stays on runway centre line	PF
3.3	**Perform transition to instrument flight rules**		
	3.3.1	Applies V1 procedures	PF/PM
	3.3.2	Rotates at Vr to initial pitch attitude	PF
	3.3.3	Establishes initial wings level attitude	PF
	3.3.4	Retracts landing gear	PM
	3.3.5	Maintains climb-out speed	PF
3.4	**Perform initial climb to flap retraction altitude**		
	3.4.1	Sets climb power	PF
	3.4.2	Adjusts attitude for acceleration	PF

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
	3.4.3	Selects flaps according to flap speed schedule	PF/PM
	3.4.4	Observes speed restrictions	PF
	3.4.5	Completes relevant checklists	PF/PM
3.5	**Perform rejected take-off**		
	3.5.1	Recognizes the requirement to abort the take-off	PF
	3.5.2	Applies the rejected take-off procedure	PF
	3.5.3	Assesses the need to evacuate the aeroplane	PF/PM
3.6	**Perform navigation**		
	3.6.1	Complies with departure clearance	PF
	3.6.2	Complies with published departure procedures, e.g., speeds	PF
	3.6.3	Monitors navigation accuracy	PF/PM
	3.6.4	Communicates and coordinates with ATC	PM
3.7	**Manage abnormal and emergency situations**		
	3.7.1	Identifies the abnormal and emergency condition	PF/PM
	3.7.2	Interprets the abnormal and emergency condition	PF/PM
	3.7.3	Performs the procedure for the abnormal and emergency condition	PF/PM
4.	**PERFORM CLIMB**		
4.1	**Perform standard instrument departure/en-route navigation**		
	4.1.1	Complies with departure clearance and procedures, including RNAV and RNP procedures	PF
	4.1.2	Demonstrates terrain awareness	PF/PM
	4.1.3	Monitors navigation accuracy	PF/PM
	4.1.4	Adjusts flight to weather and traffic conditions	PF
	4.1.5	Communicates and coordinates with ATC	PM

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
	4.1.6	Observes minimum altitudes	PF/PM
	4.1.7	Selects appropriate level of automation	PF
	4.1.8	Complies with altimeter setting procedures	PF/PM
4.2	**Complete climb procedures and checklists**		
	4.2.1	Performs the after-take-off items	PF/PM
	4.2.2	Confirms and checks according to checklists	PF/PM
4.3	**Modify climb speeds, rate of climb and cruise altitude**		
	4.3.1	Recognizes the need to change speed/rate of climb/cruise altitude	PF
	4.3.2	Selects and maintains the appropriate climb speed/rate of climb	PF
	4.3.3	Selects optimum cruise flight level	PF/PM
4.4	**Perform systems operations and procedures**		
	4.4.1	Monitors operation of all systems	PF/PM
	4.4.2	Operates systems as required	PF/PM
4.5	**Manage abnormal and emergency situations**		
	4.5.1	Identifies the abnormal and emergency condition	PF/PM
	4.5.2	Interprets the abnormal and emergency condition	PF/PM
	4.5.3	Performs the procedure for the and emergency abnormal condition	PF/PM
4.6	**Communicate with cabin crew, passengers and company**		
	4.6.1	Communicates relevant information to cabin crew	PF
	4.6.2	Communicates relevant information to company	PF/PM
	4.6.3	Makes passenger announcements when appropriate	PF
5.	**PERFORM CRUISE**		
5.1	**Monitor navigation accuracy**		

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
	5.1.1	Demonstrates adequate area knowledge	PF/PM
	5.1.2	Demonstrates adequate route knowledge, including RNAV and RNP routes and procedures	PF/PM
	5.1.3	Navigates according to flight plan and clearance	PF
	5.1.4	Adjusts flight to weather and traffic conditions	PF
	5.1.5	Communicates and coordinates with ATC	PM
	5.1.6	Observes minimum altitudes	PF/PM
	5.1.7	Uses all means of automation	PF
5.2	**Monitor flight progress**		
	5.2.1	Selects optimum speed	PF
	5.2.2	Selects optimum cruise flight level	PF
	5.2.3	Monitors and controls fuel status	PF/PM
	5.2.4	Recognizes the need for a possible diversion	PF/PM
	5.2.5	Creates a diversion contingency plan if required	PF/PM
5.3	**Perform descent and approach planning**		
	5.3.1	Checks weather of destination and alternate airport	PF/PM
	5.3.2	Checks runway in use and approach procedure	PF/PM
	5.3.3	Sets the FMS accordingly	PM
	5.3.4	Checks landing weight and landing distance required	PM
	5.3.5	Checks MEA, MOCA and MSA	PF/PM
	5.3.6	Identifies top of descent point	PF
	5.3.7	Conducts relevant briefings	PF
5.4	**Perform systems operations and procedures**		
	5.4.1	Monitors operation of all systems	PF/PM

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
	5.4.2	Operates systems as required	PM
5.5	**Manage abnormal and emergency situations**		
	5.5.1	Identifies the abnormal and emergency condition	PF/PM
	5.5.2	Interprets the abnormal and emergency condition	PF/PM
	5.5.3	Performs the procedure for the abnormal and emergency condition	PF/PM
5.6	**Communicate with cabin crew, passengers and company**		
	5.6.1	Communicates relevant information to cabin crew	PF
	5.6.2	Communicates relevant information to company	PF/PM
	5.6.3	Makes passenger announcements when appropriate	PF
6.	**PERFORM DESCENT**		
6.1	**Initiate and manage descent**		
	6.1.1	Starts descent according to ATC clearance or optimum descent point	PF
	6.1.2	Selects optimum speed and descent rate	PF
	6.1.3	Adjusts speed to existing environmental conditions	PF
	6.1.4	Recognizes the need to adjust the descent path	PF
	6.1.5	Adjusts the flight path as required	PF
	6.1.6	Utilizes all means of FMS descent information	PF
6.2	**Monitor and perform en-route and descent navigation**		
	6.2.1	Complies with arrival clearance and procedures, including RNAV and RNP procedures	PF
	6.2.2	Demonstrates terrain awareness	PF/PM
	6.2.3	Monitors navigation accuracy	PF/PM
	6.2.4	Adjusts flight to weather and traffic conditions	PF
	6.2.5	Communicates and coordinates with ATC	PM

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
	6.2.6	Observes minimum altitudes	PF/PM
	6.2.7	Selects appropriate level/mode of automation	PF
	6.2.8	Complies with altimeter setting procedures	PF/PM
6.3	**Replanning and update of approach briefing**		
	6.3.1	Rechecks destination weather and runway in use	PM
	6.3.2	Briefs/rebriefs about instrument approach and landing as required	PF
	6.3.3	Reprogrammes the FMS as required	PM
	6.3.4	Rechecks fuel status	PF/PM
6.4	**Perform holding**		
	6.4.1	Identifies holding requirement	PF/PM
	6.4.2	Programmes FMS for holding pattern	PM
	6.4.3	Enters and monitors holding pattern	PF
	6.4.4	Assesses fuel requirements and determines max. holding time	PF/PM
	6.4.5	Reviews the need for a diversion	PF/PM
	6.4.6	Initiates diversion	PF
6.5	**Perform systems operations and procedures**		
	6.5.1	Monitors operation of all systems	PF/PM
	6.5.2	Operates systems as required	PF/PM
6.6	**Manage abnormal and emergency situations**		
	6.6.1	Identifies the abnormal and emergency condition	PF/PM
	6.6.2	Interprets the abnormal and emergency condition	PF/PM
	6.6.3	Performs the procedure for the abnormal and emergency condition	PF/PM
6.7	**Communicate with cabin crew, passengers and company**		
	6.7.1	Communicates relevant information to cabin crew	PF

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
	6.7.2	Communicates relevant information to company	PF/PM
	6.7.3	Makes passenger announcements when appropriate	PF
7.	**PERFORM APPROACH**		
7.1	**Perform approach in general**		
	7.1.1	Executes approach according to procedures and situation	PF
	7.1.2	Selects appropriate level/mode of automation	PF
	7.1.3	Selects optimum approach path	PF
	7.1.4	Operates controls smoothly and with coordination	PF
	7.1.5	Performs speed reduction and flap extension	PF/PM
	7.1.6	Performs relevant checklists	PF/PM
	7.1.7	Initiates final descent	PF
	7.1.8	Achieves stabilized approach criteria	PF
	7.1.9	Ensures adherence to minima	PF/PM
	7.1.10	Initiates go-around if required	PF
	7.1.11	Masters transition to visual segment	PF
7.2	**Perform precision approach**		
	7.2.1	Performs ILS approach	PF
	7.2.2	Performs low visibility ILS CAT II/III approach	PF
	7.2.3	Performs PAR approach	PF
	7.2.4	Performs GPS/GNSS approach	PF
	7.2.5	Performs MLS approach	PF
7.3	**Perform non-precision approach**		
	7.3.1	Performs VOR approach	PF
	7.3.2	Performs NDB approach	PF

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
	7.3.3	Performs SRE approach	PF
	7.3.4	Performs GPS/GNSS approach	PF
	7.3.5	Performs LOC approach	PF
	7.3.6	Performs ILS back beam approach	PF
	7.3.7	Performs APV and BARO-VNAV approach	PF
	7.3.8	Performs RNP APCH and RNP AR approach	PF
7.4	**Perform approach with visual reference to ground**		
	7.4.1	Performs standard visual approach	PF
	7.4.2	Performs circling approach	PF
7.5	**Monitor the flight progress**		
	7.5.1	Ensures navigation accuracy	PF/PM
	7.5.2	Communicates with ATC and crew members	PM
	7.5.3	Monitors fuel status	PF/PM
7.6	**Perform systems operations and procedures**		
	7.6.1	Monitors operation of all systems	PF
	7.6.2	Operates systems as required	PF
7.7	**Manage abnormal and emergency situations**		
	7.7.1	Identifies the abnormal and emergency condition	PF/PM
	7.7.2	Interprets the abnormal and emergency condition	PF/PM
	7.7.3	Performs the procedure for the abnormal and emergency condition	PF/PM
7.8	**Perform go-around/missed approach**		
	7.8.1	Initiates go-around procedure	PF
	7.8.2	Navigates according to missed approach procedure	PF
	7.8.3	Completes the relevant checklists	PF/PM

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
	7.8.4	Initiates approach or diversion after the go-around	PF
	7.8.5	Communicates with ATC and crew members	PM
7.9	**Communicate with cabin crew, passengers and company**		
	7.9.1	Communicates relevant information to cabin crew	PF
	7.9.2	Communicates relevant information to company	PF/PM
	7.9.3	Makes passenger announcements when appropriate	PF
8.	**PERFORM LANDING**		
8.1	**Land the aeroplane**		
	8.1.1	Maintains a stabilized approach path during visual segment	PF
	8.1.2	Recognizes and acts on changing conditions for wind shift/wind shear segment	PF
	8.1.3	Initiates flare	PF
	8.1.4	Controls thrust	PF
	8.1.5	Achieves touchdown in touchdown zone on centre line	PF
	8.1.6	Lowers nose wheel	PF
	8.1.7	Maintains centre line	PF
	8.1.8	Performs after-touchdown procedures	PF
	8.1.9	Makes use of appropriate braking and reverse thrust	PF
	8.1.10	Vacates runway with taxi speed	PF
8.2	**Perform systems operations and procedures**		
	8.2.1	Monitors operation of all systems	PF
	8.2.2	Operates systems as required	PF
8.3	**Manage abnormal and emergency situations**		
	8.3.1	Identifies the abnormal and emergency condition	PF/PM
	8.3.2	Interprets the abnormal and emergency condition	PF/PM

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
	8.3.3	Performs the procedure for the abnormal and emergency condition	PF/PM
9.	**PERFORM AFTER-LANDING AND POST-FLIGHT OPERATIONS**		
9.1	**Perform taxi-in and parking**		
	9.1.1	Receives, checks and adheres to taxi clearance	PM
	9.1.2	Taxis the aeroplane including use of exterior lighting	PF
	9.1.3	Controls taxi speed	PF/PM
	9.1.4	Maintains centre line	PF
	9.1.5	Maintains lookout for conflicting traffic and obstacles	PF
	9.1.6	Identifies parking position	PF/PM
	9.1.7	Complies with marshaller/stand guidance	PF/PM
	9.1.8	Applies parking and engine shut-down procedures	PF
	9.1.9	Completes with relevant checklists	PF/PM
9.2	**Perform aeroplane post-flight operations**		
	9.2.1	Communicates with ground personnel and crew	PF
	9.2.2	Completes all required flight documentation	PF/PM
	9.2.3	Ensures securing of the aeroplane	PF
	9.2.4	Conducts the debriefings	PF
9.3	**Perform systems operations and procedures**		
	9.3.1	Monitors operation of all systems	PF/PM
	9.3.2	Operates systems as required	PF/PM
9.4	**Manage abnormal and emergency situations**		
	9.4.1	Identifies the abnormal and emergency condition	PF/PM
	9.4.2	Interprets the abnormal and emergency condition	PF/PM
	9.4.3	Performs the procedure for the abnormal and emergency condition	PF/PM

X. Phase of flight X.X Tasks X.X.X Sub-tasks			*Duty*
9.5	**Communicate with cabin crew, passengers and company**		
	9.5.1	Communicates relevant information to cabin crew	PF
	9.5.2	Communicates relevant information to company	PF/PM
	9.5.3	Makes passenger announcements when appropriate	PF

Appendix E – Applicable regulatory requirements

Efforts to promote manual flight and enhance Flight Path Management (FPM / FPA) have been implemented across the aviation industry by regulatory authorities, international organizations, airlines, and training organizations. These initiatives aim to address the growing dependency on automation and the associated risks, such as Loss of Control In-Flight (LOC-I).

The European Union Aviation Safety Agency (EASA) has been a strong advocate for manual flying proficiency. In 2013, EASA issued Safety Information Bulletin (SIB) 2013-05, which emphasizes the importance of maintaining manual flight skills and addresses concerns about automation over-reliance. The bulletin encourages operators to provide recurrent training focused on manual handling and to ensure that flight crews practice manual flying during non-critical phases of flight, such as take-off and landing, to maintain proficiency. EASA has also promoted integrating manual handling scenarios into Evidence-Based Training (EBT) programs to address LOC-I risks effectively.

The Federal Aviation Administration (FAA) has taken similar steps to promote manual flying. Through its Advisory Circular AC 120-123, the FAA highlights the need for operators to balance automation usage with manual flying skills. The circular encourages airlines to include manual flying scenarios in simulator training and to implement operational policies that allow pilots to practice manual flight regularly. The FAA has also issued Safety Alert for Operators (SAFO) 17007, which specifically focuses on the importance of maintaining manual flight proficiency and avoiding over-reliance on automation.

"Flight operations and pilot training should be consistent. Therefore, the policy and procedures for FPM should be clearly documented in the relevant manuals and reflected in the pilot training."
Source: FAA AC No 120-123

The International Civil Aviation Organization (ICAO) has been at the forefront of promoting manual flying through its global guidance material. ICAO's Document 9995 provides recommendations to member states and operators to maintain manual flying proficiency. It advocates for regular manual handling practice in training programs and encourages a balanced approach to automation. ICAO also emphasizes the importance of focusing on manual flight skills during recurrent training sessions.

The International Air Transport Association (IATA) has made contributions to flight path management -related safety initiatives. IATA's safety programs highlight the role of manual flight errors as contributors to accidents, as evidenced in their analysis of accident data. IATA has also organized workshops on LOC-I prevention, where manual flight techniques are emphasized. The organization encourages operators to adopt policies that promote safe manual flight and recurrent training designed to enhance manual handling skills.

Airlines worldwide have implemented internal programs to address manual flying challenges. For example, airlines such as Lufthansa and Qantas have introduced dedicated simulator training modules focusing on manual flight scenarios. These sessions often simulate adverse conditions such as turbulence, crosswinds, and engine failures to ensure pilots remain proficient in manual handling. Among others, airlines like Delta and Cathay Pacific have operational policies that allow pilots to disengage automation during appropriate flight phases to maintain manual flying competence.

Flight training organizations (FTOs) are also incorporating manual flight training into their curricula. Structured training modules now focus on manual handling skills for ab-initio pilots, with emphasis on managing flight dynamics without automation. Recurrent training scenarios increasingly include manual control challenges to improve pilot competency in both manual and automated flight modes.

Industry-wide conferences and awareness campaigns have further strengthened the focus on manual flying. Events such as the Flight Safety Foundation's International Safety Summit (ISS) provide platforms to discuss LOC-I prevention and manual flight skills. Awareness campaigns like "Fly the Aircraft First" emphasize the importance of prioritizing manual control in critical situations, encouraging operators and pilots to avoid over-reliance on automation.

Collaboration between organizations has also played a vital role in promoting manual flight. Data-sharing initiatives between ICAO, IATA, and the FAA have provided valuable insights into LOC-I incidents and accident trends, enabling the development of best practices for manual flight handling. These efforts have also informed the creation of standard operating procedures (SOPs) that prioritize manual flight when appropriate.

Modern flight simulators have advanced significantly to support manual flight training. Realistic simulations now allow pilots to practice manual control under various adverse conditions, such as abrupt aircraft control scenarios or recovery from LOC-I. This technological advancement has enhanced the realism and effectiveness of manual flying training.

However, despite technological advancements, this remains one of the areas that requires the most reinforcement. Training programs must increasingly incorporate the competency of "Aeroplane Flight Path Management, Manual Control", particularly to reduce the percentage of reliance on automatic flight. In a pilot's annual operations, less than 10% of their total flight time is performed manually in any flight phase other than take-off.

Finally, pilot-led initiatives have contributed to promoting manual flight proficiency. Professional associations like the International Federation of Air Line Pilots' Associations (IFALPA) actively advocate for recurrent manual flight training. Pilots also share knowledge and techniques through workshops, online forums, and industry events, creating a collaborative culture focused on maintaining manual flying competence.

These worldwide initiatives aim to address the critical importance of manual flight skills in Flight Path Management. By promoting balanced automation usage, enhancing training programs, and fostering a safety-focused culture, the aviation industry continues to mitigate the risks associated with automation dependency and improve overall flight safety.

This section provides an overview of the guidelines and standards set by relevant aviation authorities and international organizations, including the International Air Transport Association (IATA), the International Civil Aviation Organization (ICAO), the Federal Aviation Administration (FAA), and the European Union Aviation Safety Agency (EASA). These organizations play a critical role in establishing and maintaining safety, operational, and regulatory standards for global aviation operations. Their guidelines ensure that flight path management practices align with international safety standards, promote consistency in aviation procedures, and address emerging challenges in flight operations. Adherence to these guidelines is essential for operators to maintain compliance, uphold safety, and optimize flight performance across various jurisdictions.

2.1 Overview of Relevant Aviation Authorities or International Organizations

Different aviation entities have consistently been developing and publishing various resources aimed at balancing manual flight versus automatic flight in a safe and efficient manner. Some of the most relevant documents currently include the EASA SIB No. 2013-05 and the FAA AC 120-123. These documents emphasize the importance of manual flying, encouraging operators and Civil Aviation Authorities (CAAs) to ensure pilots maintain proficiency in manual control, especially during recurrent simulator training and when appropriate during flight

operations. The guidance underscores the need for a balanced approach to automation and manual flying, ensuring pilots are equipped to handle both scenarios effectively.

2.1.1 EASA SIB No. 2013-05 Manual Flight Training and Operations

Summary

Excessive reliance on automation has been identified as a factor in the degradation of pilots' manual flying skills. Studies, including the EASA Cockpit Automation Survey, highlight that continuous use of automation can impair pilots' ability to handle manual flight operations effectively, which are critical during automation failures or system disconnections.

Automation policies across operators in Europe vary widely, from mandating full automation to encouraging manual flying when feasible. Considering this, aviation authorities like EASA and the FAA have issued guidelines emphasizing the importance of maintaining manual flying skills through regular training and appropriate operational practices.

EASA Safety Information Bulletin (SIB) 2013-05 recommends operators integrate manual flight practice into both recurrent simulator training and line operations when appropriate. Operators are advised to establish automation policies that balance manual and automated flying, ensuring pilots can practice manual control under suitable conditions, such as low workload phases, favourable weather, and non-congested airspace.

Key recommendations include:

a. Developing operational principles and incorporating them into the operator's manual.
b. Identifying opportunities for pilots to practice manual flight skills, considering factors such as altitude, workload, traffic density, and meteorological conditions.
c. Using tools like Safety Management Systems (SMS) and Flight Data Monitoring (FDM) to evaluate the impact of manual flying on operational precision and adjust policies accordingly.

National Aviation Authorities (NAAs) and operators are encouraged to collaborate to integrate these guidelines into training programs and operational policies, ensuring that pilots retain proficiency in manual flying while understanding the conditions where automation is essential.

2.1.2 FAA SAFO 13002 Manual Flight Operations

Summary

The FAA issued this Safety Alert for Operators (SAFO) to encourage the integration of manual flight operations into training and line operations where appropriate. Recent data analyses, including incidents and accidents, indicate a rise in manual handling errors, underscoring the importance of maintaining and improving pilots' manual flying skills to ensure safe operations.

While autoflight systems enhance safety, precision, and workload management, their continuous use can lead to the degradation of pilots' ability to manually recover the aircraft from an undesired state. Operators are advised to adopt a balanced approach by providing pilots with opportunities to practice manual flying skills in conditions such as low workload phases or non-RVSM airspace.

Operational policies should clarify when automation is necessary, such as during high workload situations or precise airspace procedures. Augmented crew operations must also consider provisions for all pilots to maintain manual flying proficiency.

Key stakeholders, including directors of operations, training managers, and flight crews, are encouraged to incorporate this guidance into operational policies, ground training, flight training, and proficiency checks, ensuring pilots retain the skills necessary for manual flight operations.

2.1.3 FAA AC No: 120-123 Flight Path Management

Summary

The FAA Advisory Circular (AC) 120-123 emphasizes the importance of maintaining and developing pilots' manual flying skills in modern aviation, where autoflight systems are heavily relied upon. It provides guidance for operators and training organizations to create policies and training programs that ensure pilots remain proficient in manual flight operations.

The circular highlights that while automation improves safety, precision, and workload management, overreliance on these systems can degrade manual flying proficiency, potentially impacting a pilot's ability to respond effectively to non-normal situations or automation failures.

Operators are encouraged to balance automation usage with opportunities for manual flight practice during training and operations. The AC outlines best practices, such as including manual flying exercises in initial, recurrent, and upgrade training, and identifying phases of flight and operational conditions where manual flying can be safely practiced.

Additionally, the AC recommends integrating manual flight proficiency into Safety Management Systems (SMS) and using tools like Flight Data Monitoring (FDM) to assess and adjust policies for optimal outcomes. It stresses that operators should develop clear automation policies, ensuring pilots understand when to use automated systems and when manual flight is appropriate, to maintain overall operational safety and efficiency.

2.1.3 ICAO Doc 9868 Procedures for Air Navigation Services - Training

Summary

The document ICAO 9868, in Part 2, Appendix 1 to Chapter 1, outlines the ICAO Competency Framework, which establishes eight core competencies for pilot training and assessment. This framework includes two specific competencies related to Flight Management, distinguished as follows:

- **Aeroplane Flight Path Management, Manual Control (FPM):** Focuses on the pilot's ability to manually operate the aircraft, ensuring control and precision across various phases of flight. Controls the flight path through manual control.
- **Aeroplane Flight Path Management, Automation (FPA):** Emphasizes the appropriate and efficient use of the aircraft's automated systems, ensuring proper configuration and monitoring of autoflight systems. Controls the flight path through automation.

Each of these competencies is supported by a detailed set of Observable Behaviours (OBs), which allow for objective identification and assessment of behaviours demonstrated by trainees during training. This structured approach enhances the efficiency of evaluation, ensuring that pilots develop the necessary skills for both manual and automated aircraft operation in accordance with the international standards set by ICAO.

2.1.4 Transport Canada AC600-006, Flight Deck Automation Policy and Manual Flying in Operations and Training

Summary

Transport Canada's Advisory Circular (AC) No. 600-006, titled "Flight Deck Automation Policy and Manual Flying Skills," emphasizes the importance of balancing the use of automated flight systems with the maintenance of pilots' manual flying skills.

Key Points:

- **Purpose**: The AC serves to remind pilots and operators about the appropriate use of automation and underscores the necessity of preserving manual flying proficiency.

- **Applicability**: This guidance is relevant to all Transport Canada Civil Aviation (TCCA) employees, operators, manufacturers, training providers, pilots, flight crews, and individuals or organizations exercising privileges under an External Ministerial Delegation of Authority.

- **Background**: While modern aircraft often rely on automated systems like autopilot and autothrottle to enhance safety and reduce workload, over-reliance on such systems can lead to a decline in manual flying skills. Operators' automation policies vary, with some mandating full automation except during take-off and landing, and others encouraging manual flight under certain conditions.

- **Recommendations:**

    1. **Automation Policy:** Operators should develop or review their automation policies to ensure pilots have opportunities to practice manual flying, considering factors such as flight phase, workload, altitude, weather, traffic density, air traffic control procedures, and crew experience.
    2. **Manual Flight Operations:** Pilots should be encouraged to manually fly the aircraft when appropriate, especially in low workload conditions and non-Reduced Vertical Separation Minima (RVSM) airspace, to maintain proficiency.
    3. **Training Emphasis:** Training programs should integrate scenarios that promote manual flying skills, ensuring pilots can effectively manage the aircraft without reliance on automation.

By adhering to the guidance in AC No. 600-006, operators and pilots can achieve a balanced approach to automation usage, thereby maintaining essential manual flying competencies and enhancing overall flight safety.

Appendix F – Example of Training Specification for Single Pilot Operations

The template below contains an example of a completed training specification for a training course dedicated to the enhancement of flight path management by pilots already licensed and qualified on the class of aircraft. This course can be held by an ATO.

Purpose	
What is the purpose of the training?	*Pilot training course focused on the enhancement of flight path management.*
State the phase(s) of training.	*The training course includes ground instruction and flight instruction.* *Note:* - *The ground instruction phase aims at delivering the knowledge necessary to demonstrate the flight crew competencies sustaining safe, effective and efficient flight path management.* - *The flight instruction phase aims at training and assessing the flight crew competencies sustaining safe, effective and efficient flight path management.*
What qualification, if any, will the trainee achieve on successful completion of the training?	*The training course does not aim at endorsing additional qualification or rating on the license.* *The objective of the training course is that the trainees demonstrate an adequate level of performance for all the competencies of the applicable adapted competency model (Single Pilot Operation in General aviation conditions)*
Is this a new course or a course revision? Where will the course be deployed? Will a new course footprint / curriculum be created in addition to new courseware? Will new deliverables be created?	*It is a new course as it is the first CBTA program dedicated to the enhancement of the flight path management* *The course will be deployed at the ATO* *New curriculum as it is the first CBTA program dedicated to the enhancement of the flight path management* *new deliverables as it is the first CBTA program dedicated to the enhancement of the flight path management*
Tasks	
Describe the tasks associated with the purpose of the training	*The appropriate tasks listed in ICAO Doc 9868 Aeroplane pilot tasks by phase of flight for the Single Pilot Operations in General Aviation under VFR* *The specific tasks and maneuvers mandated by the National regulation, where applicable* *The specific tasks and maneuvers recommended by ICAO or regulators. E.g.; Specialized Training Elements as described in ICAO Doc 10011*

	E.g.; Maneuvers as described in FAA AC 120-123
Operational requirements	
Which operational procedures will be applied?	*The procedures described in the appropriate parts of:* ▪ *the Operation Manual, or* ▪ *the Aeroplane Flight Manual and Pilot Operating Handbook, or* ▪ *the Training and Procedures manual.*
In what operational environment will the training take place?	*Operational environment is related to General Aviation operations in a single engine piston, single pilot aircraft.* *The operations are conducted exclusively during day and in VMC conditions.* *The aircraft is not equipped with automation or flight guidance systems (impact on competency and OB selection)*
Which non-routine situations are necessary for successful completion of the training?	*The pilot should be exposed to the management of several events requiring the application of a set of abnormal and emergency procedures described in the:* ▪ *the Operation Manual, or* ▪ *the Aeroplane Flight Manual and Pilot Operating Handbook, or* ▪ *the Training and Procedures manual.* *Generally, the trainees should apply their competencies to perform the applicable tasks and to manage the threats and the errors that could happen under the conditions of General Aviation.* *Specifically, the trainees should be exposed to situations where they must detect and correct errors and must recognize and recover from safety margins reduction. Hence the training course should include non-routine situations such as, but not limited to:* • *Flight path deviations due to weather, Air Traffic Controller clearance, system malfunctions, …* • *Unstable approaches requiring go-around decision and execution* • *Energy mismanagement scenarios, such as high or low energy states* • *Aircraft system malfunctions affecting the handling characteristics…*
What is the configuration of the working environment?	*Cockpit of the relevant Class of aircraft (SPA)*
Technical requirements	
What specific operational (or simulated operation)	*N/A, refer to Simulator equipment*

systems and/or equipment are necessary to achieve the purpose of the training?	
Regulatory requirements	
This step enables the course developer to identify the rules and regulations that apply to the requested training.	
Which rules and regulations are applicable?	*The ATO must comply with the applicable National or regional Aircrew regulation.*
Are there any regulatory requirements that will affect the following aspects of the training design? -Duration -Content -Assessment procedures -Course approval -Other (Equipment, qualifications of instructors, trainee-to-instructor ratios, etc.)	*As the course is based on training recommendations regarding the enhancement of flight path management, there is no reference to any specific regulatory requirements related to the duration or content of the training.* *Nevertheless, the following documents provide recommendations regarding the manual flying in operations that should be considered by the ATO when developing the training to enhance flight path management* ▪ *EASA, (2015) Safety Information Bulletin (SIB) No. 2010-33R1: Automation Policy – Mode Awareness and Energy State Management.* ▪ *EASA, (2013). Safety Information Bulletin (SIB) No. 2013-05: Manual Flight Training and Operations.* ▪ *FAA, (2022). Flight Path Management, AC 120-123. AFS-200.* ▪ *FAA), (2013). Manual Flight Operations, SAFO 13002. Safety Alert for Operations. Flight Standards Service.* *Assessment procedures: as per IATA competency assessment guide here:* Competency Assessment and Evaluation for Pilots, Instructors and Evaluators Guidance Material *Course approval: as per national Civil Aviation Authority procedures*
Organizational requirements	
What internal organizational requirements may impact training?	*As it is the first CBTA Pilot training course focused on the enhancement of flight path management, the organization applies the ICAO Doc 9868 (PANS-TRG) requirements related to the instructional system design procedures (ADDIE model) and the competence of the personnel (course developers and instructors).*
Other requirements	
What other requirements may impact training?	*TBD*

Simulator Equipment	
What simulation requirements, if any, are necessary to achieve the training outcome?	*GA: ICAO FSTD type I or III*

Appendix G – Rationale regarding the criticality of the OB for effective flight path management

Assumptions
The Competencies KNO, PRO, COM, FPA, FPM, LTW, PSD, SAW & WLM have already been demonstarted during OCC or recurernt training and checking.
The FPM enheancement Training is delivered on the class/type of the aeroplane already endorsed on the trainee license (Trainee has already demostrated the nine pilot competencies on this class/type of aeroplane)
The training course does not place the trainee in a situation where no procedure or guidance exists
The training course does not commit any communication with data link

			OB applicability during flight TRG	**Critical OB**	**why**
Competenecies Trained and Assessed (TA) **KNO, COM, LTW and WLM**					
Competencies Trained and Assessed with Special Emphasis (TA-SE) **PRO, FPA, FPM, PSD and SAW**					
Application of knowledge (KNO) Demonstrates knowledge and understanding of relevant information, operating instructions, aircraft systems and the operating environment					
OB 0.1 Demonstrates practical and applicable knowledge of limitations and systems and their interaction		COND	Yes	Yes	The OB 0.1 is critical as its demonstration is a prerequisite to adress many handling, automation and procedural errors related to flight path management (e.g. detection and correction of automation setting/selection errors)
OB 0.2 Demonstrates required knowledge of published operating instructions	SOP		Yes	Yes	The OB 0.2 is critical as its demonstration is a prerequisite to adress many handling, automation and procedural errors related to flight path management (e.g. avoidance of procedural errors)
OB 0.3 Demonstrates knowledge of the physical environment, the air traffic environment including routings, weather, airports and the operational infrastructure		COND	Yes	Yes	The OB 0.3 is critical as its demonstration is a prerequisite to adress many handling, automation and procedural errors related to flight path management (e.g. avoidance of runway incursion)
OB 0.4 Demonstrates appropriate knowledge of applicable legislation.			No	N/A	
OB 0.5 Knows where to source required information			Yes	No	The OB 0.4 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 0.6 Demonstrates a positive interest in acquiring knowledge			Yes	No	The OB 0.6 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 0.7 Is able to apply knowledge effectively			Yes	No	The OB 0.7 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
Application of procedures and compliance with regulations (PRO) Identifies and applies appropriate procedures in accordance with published operating instructions and applicable regulations					
OB 1.1 Identifies where to find procedures and regulations			Yes	No	The OB 1.1 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 1.2 Applies relevant operating instructions, procedures and techniques in a timely manner	SOP		Yes	Yes	The OB 1.2 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (handling error: rotation rate at take-off)
OB 1.3 Follows SOPs unless a higher degree of safety dictates an appropriate deviation	SOP		Yes	Yes	The OB 1.3 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (procedural error: incorrect performance calculation by flight crew because SOP flow not respected)
OB 1.4 Operates aircraft systems and associated equipment correctly	SOP		Yes	Yes	The OB 1.4 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g. automation setting/selection error: wrong FMS data insertion)
OB 1.5 Monitors aircraft systems status	SOP		Yes	Yes	The OB 1.5 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g. FMA status, aircraft capabilities)
OB 1.6 Complies with applicable regulations			Yes	No	The OB 1.6 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 1.7 Applies relevant procedural knowledge		COND	Yes	Yes	The OB 1.7 is critical as specifc procedural knowledge generally applies to flight path management (e.g. missed approach during circling etc.)
Communication (COM) Communicates through appropriate means in the operational environment, in both normal and non-normal situations					
OB 2.1 Determines that the recipient is ready and able to receive information			Yes	No	The OB 2.1 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 2.2 Selects appropriately what, when, how and with whom to communicate			Yes	No	The OB 2.2 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 2.3 Conveys messages clearly, accurately and concisely			Yes	No	The OB 2.3 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 2.4 Confirms that the recipient demonstrates understanding of important information			Yes	No	The OB 2.4 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 2.5 Listens actively and demonstrates understanding when receiving information			Yes	No	The OB 2.5 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 2.6 Asks relevant and effective questions			Yes	No	The OB 2.6 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 2.7 Uses appropriate escalation in communication to resolve identified deviations		COND	Yes	Yes	The OB 2.7 is critical to detect and correct the flight path management deviations or to recognize and recover from an undesired aircarft state
OB 2.8 Uses and interprets non-verbal communication in a manner appropriate to the organizational and social culture			Yes	No	The OB 2.8 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 2.9 Adheres to standard radiotelephone phraseology and procedures			Yes	No	The OB 2.9 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
~~OB 2.10 Accurately reads, interprets, constructs and responds to datalink messages in English~~			No	N/A	

Aeroplane flight path management — automation (FPA) Controls the flight path through automation					
OB 3.1 Uses appropriate flight management, guidance systems and automation, as installed and applicable to the conditions	SOP		Yes	Yes	The OB 3.1 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g.; automation selection error: descente mode FPA instead of V/S)
OB 3.2 Monitors and detects deviations from the intended flight path and takes appropriate action		COND	Yes	Yes	The OB 3.2 is critical to detect and correct the flight path management deviations or to recognize and recover from an undesired aircarft state
OB 3.3 Manages the flight path to achieve optimum operational performance			Yes	No	The OB 3.3 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 3.4 Maintains the intended flight path during flight using automation whilst managing other tasks and distractions	SOP		Yes	Yes	The OB 3.4 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g; automation setting/selection error during communication with ATC)
OB 3.5 Selects appropriate level and mode of automation in a timely manner considering phase of flight and workload	SOP		Yes	Yes	The OB 3.5 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g; automation setting error: managed mode instead of selected mode during non precision approach)
OB 3.6 Effectively monitors automation, including engagement and automatic mode transitions		COND	Yes	Yes	The OB 3.6 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g.; procedural error: missing cross verification of the FMA - V/S instead of Altitude capture)
Aeroplane flight path management — manual control (FPM) Controls the flight path through manual control					
OB 4.1 Controls the aircraft manually with accuracy and smoothness as appropriate to the situation	SOP		Yes	Yes	The OB 4.1 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g.; manual handling error)
OB 4.2 Monitors and detects deviations from the intended flight path and takes appropriate action		COND	Yes	Yes	The OB 4.2 is critical to detect and correct the flight path management deviations or to recognize and recover from an undesired aircarft state
OB 4.3 Manually controls the aeroplane using the relationship between aeroplane attitude, speed and thrust, and navigation signals or visual information	SOP		Yes	Yes	The OB 4.3 is critical as its demonstration is necessary to avoid, to detect and to correct errors having an impact on the flight path mangement (e.g.; manual handling error)
OB 4.4 Manages the flight path to achieve optimum operational performance			Yes	No	The OB 4.4 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 4.5 Maintains the intended flight path during manual flight whilst managing other tasks and distractions	SOP		Yes	Yes	The OB 4.5 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g; handling error during communication with ATC)
OB 4.6 Uses appropriate flight management and guidance systems, as installed and applicable to the conditions	SOP		Yes	Yes	The OB 4.6 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g; FMGS setting error: managed mode instead of selected mode during non precision approach manually flown)
OB 4.7 Effectively monitors flight guidance systems including engagement and automatic mode transitions		COND	Yes	Yes	The OB 4.7 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g.; procedural error: pilot erroneous follows FD orders while flying manually during a reversion mode V/S instead of Altitude capture)
Leadership and teamwork (LTW) Influences others to contribute to a shared purpose, Collaborates to accomplish the goals of the team					
OB 5.1 Encourages team participation and open communication			Yes	No	The OB 5.1 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 5.2 Demonstrates initiative and provides direction when required			Yes	No	The OB 5.2 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 5.3 Engages others in planning			Yes	No	The OB 5.3 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 5.4 Considers inputs from others			Yes	No	The OB 5.4 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 5.5 Gives and receives feedback constructively			Yes	No	The OB 5.5 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 5.6 Addresses and resolves conflicts and disagreements in a constructive manner			Yes	No	The OB 5.6 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 5.7 Exercises decisive leadership when required		COND	Yes	Yes	The OB 5.7 is critical as its demonstration supports the immediate correction of errors and/or the effective recognition and recovery of safety margins reductions (e.g.; one of the trainee impose to the other trainee a last minute deviation to avoid unnessary weather penetration)
OB 5.8 Accepts responsibility for decisions and actions			Yes	No	The OB 5.8 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 5.9 Carries out instructions when directed			Yes	No	The OB 5.9 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 5.10 Applies effective intervention strategies to resolve identified deviations		COND	Yes	Yes	The OB 5.10 is critical as its demonstration supports errors prevention and/or correction and recognition and recovery of safety margins reductions (e.g.; on)
OB 5.11 Manages cultural and language challenges, as applicable			Yes	No	The OB 5.11 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM

Problem-solving — decision-making (PSD) Identifies precursors, mitigates problems, and makes decisions					
OB 6.1 Identifies, assesses and manages threats and errors in a timely manner		COND	Yes	Yes	The OB 6.1 is critical as safe and effective flight path management relies heavily on the timely management of threats and errors (e.g.; automation setting error timely detected and corrected)
OB 6.2 Seeks accurate and adequate information from appropriate sources		COND	Yes	Yes	The OB 6.2 is critical as its demonstration supports the validation of the precursors that could compromize safe and effective flight path management (e.g.; cross check different weather data reports to mitigate adverse weather effects on the flight path)
OB 6.3 Identifies and verifies what and why things have gone wrong, if appropriate		COND	Yes	Yes	The OB 6.3 is critical as its demonstration supports the validation of the contributing factors that could compromize safe and effective flight path management (e.g.; undestanding why an automation mode is inoperative permits to anticipate further degradation of automation)
OB 6.4 Perseveres in working through problems whilst prioritizing safety		COND	Yes	Yes	The OB 6.4 is critical as the safe and effective flight path management is the primary task of both PF and PM
OB 6.5 Identifies and considers appropriate options			Yes	No	The OB 6.5 not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 6.6 Applies appropriate and timely decision-making techniques			Yes	No	The OB 6.6 not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 6.7 Monitors, reviews and adapts decisions as required			Yes	No	The OB 6.7 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
~~OB 6.8 Adapts when faced with situations where no guidance or procedure exists~~			No	N/A	
OB 6.9 Demonstrates resilience when encountering an unexpected event		COND	Yes	Yes	The OB 6.9 is critical as the trainees should be able to recognize, absorb and adapt to any disruption having an impact on the flight path management (e.g.; trainee(s) manages the flight path with an all engine failure at low altitude, ...)
Situation awareness and management of information (SAW) Perceives, comprehends and manages information and anticipates its effect on the operation					
OB 7.1 Monitors and assesses the state of the aeroplane and its systems	SOP		Yes	Yes	The OB 7.1 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g. fuel imbalance having an impact on handling characteristics)
OB 7.2 Monitors and assesses the aeroplane's energy state, and its anticipated flight path	SOP		Yes	Yes	The OB 7.2 is critical as the energy management has a direct impact on the flight path management (e.g.; poor energy management can lead to unstable approach)
OB 7.3 Monitors and assesses the general environment as it may affect the operation	SOP		Yes	Yes	The OB 7.3 is critical as its demonstartion is necessary to ensure safe flight path management (e.g.; weak monitoring of the general environement can lead to reduction of safety margins such as unnecessary weather penetartion, operation outside aircraft limitations etc)
OB 7.4 Validates the accuracy of information and checks for gross errors			Yes	No	The OB 7.4 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 7.5 Maintains awareness of the people involved in or affected by the operation and their capacity to perform as expected			Yes	No	The OB 7.5 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 7.6 Develops effective contingency plans based upon potential risks associated with threats and errors		COND	Yes	Yes	The OB 7.6 is critical as its demonstration supports a proactive hazard identification that could impact the flight path management and also because demonstration of OB 7.6 supports further demonsatrtion of OB 6.1 (critical)
OB 7.7 Responds to indications of reduced situation awareness			Yes	No	The OB 7.7 is not critical as it has already been demonstrated on the same class of aeroplane under VFR and does not adress new specific tasks or TEM under IFR
Workload management (WLM) Maintains available workload capacity by prioritizing and distributing tasks using appropriate resources					
OB 8.1 Exercises self-control in all situations			Yes	No	The OB 8.1 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 8.2 Plans, prioritizes and schedules appropriate tasks effectively			Yes	No	The OB 8.2 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 8.3 Manages time efficiently when carrying out tasks			Yes	No	The OB 8.3 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 8.4 Offers and gives assistance			Yes	No	The OB 8.4 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 8.5 Delegates tasks			Yes	No	The OB 8.5 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 8.6 Seeks and accepts assistance, when appropriate			Yes	No	The OB 8.6 is not critical as it has already been demonstrated on the same class/type of aeroplane and does not adress new specific tasks or TEM
OB 8.7 Monitors, reviews and cross-checks actions conscientiously	SOP		Yes	Yes	The OB 8.7 is critical as its demonstration supports the avoidance or the detection and correction of procedural errors having an impact on the flight path mangement (e.g.; abnormal check list error leading to the downgrade of flight control laws)
OB 8.8 Verifies that tasks are completed to the expected outcome			Yes	No	The OB 8.8 is not critical as it has already been demonstrated on the same class of aeroplane under VFR and does not adress new specific tasks or TEM under IFR
OB 8.9 Manages and recovers from interruptions, distractions, variations and failures effectively while performing tasks		COND	Yes	Yes	The OB 8.9 is critical as its demonstration supports the avoidance or the detection and correction of errors having an impact on the flight path mangement (e.g; the trainee(s) does not interrupt the abnormal check list and misses to follow the glide slope at the FAP)

Appendix H – Task/Threat to OB Mapping

Color codes indicate which competencies for the task are:

- **I**rrelevant (red): OB demonstration is not supposed to be demonstrated during the sub-task realization
- **R**elevant (green): OB demonstration is required during the sub-task realization
- **C**onditional (yellow): OB demonstration depends on the operational and environmental context

	Flt Phase or Threat	Task	KNO	PRO	COM	FPA	FPM	LTW	PSD	SAW	WLM
Task	2. PERFORM AEROPLANE GROUND AND PRE-FLIGHT OPERATIONS	2.1 Perform dispatch duties	C	R	C	I	I	C	C	C	C
Task		2.2 Provide flight crew and cabin crew briefings	C	C	R	I	I	C	C	C	C
Task		2.3 Perform pre-flight checks and cockpit preparation	C	R	C	I	I	C	C	R	R
Task		2.4 Perform engine start	C	R	C	I	I	C	C	I	R
Task		2.5 Perform taxi	C	C	C	I	R	C	C	C	R
Task		2.6 Manage abnormal and emergency situations	C	C	R	I	I	C	R	C	R
Task		2.7 Communicate with cabin crew, passengers and company	C	R	C	I	I	C	C	I	C
Task	3. PERFORM TAKE-OFF	3.1 Perform pre-take-off and pre-departure preparation	C	I	C	I	R	C	C	C	C
Task		3.2 Perform take-off roll	C	I	I	I	R	I	C	R	R
Task		3.3 Perform transition to instrument flight rules	C	I	I	I	R	I	C	C	R
Task		3.4 Perform initial climb to flap retraction altitude	C	C	C	R	R	C	C	C	C
Task		3.5 Perform rejected take-off	C	R	R	R	R	I	I	R	R
Task		3.6 Perform navigation	C	I	C	R	R	C	C	C	C
Task		3.7 Manage abnormal and emergency situations	C	I	C	R	R	C	R	C	R

	Flt Phase or Threat	Task	KNO	PRO	COM	FPA	FPM	LTW	PSD	SAW	WLM
Task	4. PERFORM CLIMB	4.1 Perform standard instrument departure/en-route navigation	C	C	C	R	R	C	C	C	C
Task		4.2 Complete climb procedures and checklists	C	R	R	R	R	C	I	C	R
Task		4.3 Modify climb speeds, rate of climb and cruise altitude	C	C	C	R	R	C	C	C	C
Task		4.4 Perform systems operations and procedures	C	R	C	R	R	C	C	C	C*
Task		4.5 Manage abnormal and emergency situations	C	C	R	R	R	C	R	C	R
Task		4.6 Communicate with cabin crew, passengers and company	C	C	C	R	R	C	C	I	C
Task	5. PERFORM CRUISE	5.1 Monitor navigation accuracy	C	R	C	R	R	C	C	C	R
Task		5.2 Monitor flight progress	C	R	C	R	R	C	C	C	R
Task		5.3 Perform descent and approach planning	C	C	C	R	R	C	C	C	R
Task		5.4 Perform systems operations and procedures	C	R	C	R	R	C	C	C	C*
Task		5.5 Manage abnormal and emergency situations	C	C	C	R	R	C	R	C	R
Task		5.6 Communicate with cabin crew, passengers and company	C	R	C	R	R	C	C	I	C
Task	6. PERFORM DESCENT	6.1 Initiate and manage descent	C	C	C	R	R	C	C	C	C
Task		6.2 Monitor and perform en-route and descent navigation	C	C	C	R	R	C	C	C	C
Task		6.3 Replanning and update of approach briefing	C	C	C	R	R	C	C	C	R
Task		6.4 Perform holding	C	R	C	R	R	C	C	C	R
Task		6.5 Perform systems operations and procedures	C	R	C	R	R	C	C	C	C*
Task		6.6 Manage abnormal and emergency situations	C	C	C	R	R	C	R	C	R
Task		6.7 Communicate with cabin crew, passengers and company	C	C	C	R	R	C	R	I	C

	Flt Phase or Threat	Task	KNO	PRO	COM	FPA	FPM	LTW	PSD	SAW	WLM
Task	7. PERFORM APPROACH	7.1 Perform approach in general	C	R	C	R	R	C	C	C	R
Task		7.2 Perform precision approach	C	C	R	R	R	C	C	R	C
Task		7.3 Perform non-precision approach	C	C	R	R	R	C	C	R	R
Task		7.4 Perform approach with visual reference to ground	C	R	R	R	R	C	C	R	R
Task		7.5 Monitor the flight progress	C	R	C	R	R	C	C	C	R
Task		7.6 Perform systems operations and procedures	C	R	C	R	R	C	C	C	C
Task		7.7 Manage abnormal and emergency situations	C	C	C	R	R	C	R	C	R
Task		7.8 Perform go-around/missed approach	C	R	R	R	R	C	C	C	R
Task		7.9 Communicate with cabin crew, passengers and company	C	C	C	R	R	I	C	I	C
Task	8. PERFORM LANDING	8.1 Land the aeroplane	C	I	C	R	R	I	C	R	R
Task		8.2 Perform systems operations and procedures	C	R	C	R	R	C	C	C	C
Task		8.3 Manage abnormal and emergency situations	C	I	C	C	C	C	R	C	R
Task	9. PERFORM AFTER-LANDING AND POST-FLIGHT OPERATIONS	9.1 Perform taxi-in and parking	C	R	C	I	R	C	C	C	R
Task		9.2 Perform aeroplane post-flight operations	C	C	C	I	I	C	C	C	C
Task		9.3 Perform systems operations and procedures	C	R	C	I	I	C	C	C	C*
Task		9.4 Manage abnormal and emergency situations	C	C	C	I	I	C	R	C	R
Task		9.5 Communicate with cabin crew, passengers and company	C	C	C	I	I	C	C	I	C

	Flt Phase or Threat	Threat	KNO	PRO	COM	FPA	FPM	LTW	PSD	SAW	WLM
Threat	E01 Meteorology	E01.01 Thunderstorm - Low	R	R	R	–	–	C	R	R	C
Threat	E01 Meteorology	E01.01 Thunderstorm - Very High	R	R	R	–	–	R	R	R	R
Threat	E07 Terrain	E07 Terrain - Low	R	R	C	–	–	C	C	R	C
Threat	E07 Terrain	E07 Terrain - Very High	R	R	C	–	–	C	C	R	C
Threat	A - Airline Threats	A01 Aircraft Malfunction - Low	R	R	R	–	–	R	R	R	R
Threat	A - Airline Threats	A01 Aircraft Malfunction - High	R	R	R	–	–	R	R	R	R
Threat	E01 Meteorology	E01.03 Wind - Low	C	C	C	–	–	C	C	C	C
Threat	E01 Meteorology	E01.03 Wind - Med	C	R	C	–	–	C	C	C	C
Threat	E01 Meteorology	E01.03 Wind - High	R	R	R	–	–	C	C	R	C
Threat	E01 Meteorology	E01.03 Wind - Very High	R	R	R	–	–	C	C	R	C
Threat	E01 Meteorology	E01.03 Wake turbulence - Med	I	I	I	–	–	I	I	R	R
Threat	E01 Meteorology	E01.03 Wake turbulence - High	I	I	I	–	–	I	I	R	R
Threat	E01 Meteorology	E01.03 Windshear - Low	R	C	R	–	–	C	R	R	C
Threat	E01 Meteorology	E01.03 Windshear - Med	C	C	R	–	–	C	I	R	R
Threat	E01 Meteorology	E01.03 Windshear - High	C	C	R	–	–	C	I	R	R
Threat	E01 Meteorology	E01.03 Windshear - Very High	C	C	R	–	–	C	I	R	R
Threat	E01 Meteorology	E01.04 Icing Conditions - Low	R	R	C	–	–	C	C	R	R
Threat	E01 Meteorology	E01.04 Icing Conditions - Med	R	R	R	–	–	C	C	R	R
Threat	E01 Meteorology	E01.04 Icing Conditions - High	R	R	R	–	–	C	R	R	R
Threat	A - Airline Threats	A04 Cabin Event - Low	C	C	C	–	–	C	C	C	C
Threat	A - Airline Threats	A04 Cabin Event - Med	C	C	R	–	–	C	C	C	R
Threat	A - Airline Threats	A04 Cabin Event - High	C	C	R	–	–	R	R	C	R
Threat	A - Airline Threats	A04 Cabin Event - Very High	C	C	R	–	–	R	R	R	R
Threat	E05 Airport facilities	E04.01 Birds - Low	R	I	R	–	–	C	R	C	C
Threat	E05 Airport Facilities	E05.01 Poor signage/lighting, faint markings, rwy/txy closures - Low	I	I	I	–	–	C	I	I	I
Threat	E05 Airport Facilities	E05.01 Poor signage/lighting,	I	I	I	–	–	C	I	R	I

	Flt Phase or Threat	Threat	KNO	PRO	COM	FPA	FPM	LTW	PSD	SAW	WLM
		faint markings, rwy/txy closures - Med									
Threat	E05 Airport Facilities	E05.01 Poor signage/lighting, faint markings, rwy/txy closures - Med	I	I	I	–	–	I	I	R*	I
Threat	E05 Airport facilities	E05.02 Contaminated runways, taxiways, poor braking action - Low	R	R	C*	–	–	C	C	C	R
Threat	E05 Airport facilities	E05.02 Contaminated runways, taxiways, poor braking action - Med	R	R	C*	–	–	C	C	C	R
Threat	E05 Airport facilities	E05.02 Contaminated runways, taxiways, poor braking action - High	R	R	R	–	–	C	R	C	R
Threat	E05 Airport facilities	E05.02 Contaminated runways, taxiways, poor braking action - Very High	R	R	R	–	–	C	R	C	R
Threat	E09 Traffic	E08.01 Aircraft - Low	C	C	C	–	–	C	C	C	C
Threat	E09 Traffic	E08.01 Aircraft - Med	C	R	C	–	–	C	C	R	C
Threat	E09 Traffic	E08.01 Aircraft - High	C	R	R	–	–	C	I	R	R
Threat	E09 Traffic	E08.01 Aircraft - Very High	C	R	R	–	–	C	I	R	R
Threat	E01 Meteorology	E01.02 Poor Visibility / IMC - Low	R	R	C*	–	–	C	C	R	R
Threat	E01 Meteorology	E01.02 Poor Visibility / IMC - Med	R	R	C*	–	–	C	C	R	R
Threat	E01 Meteorology	E01.02 Poor Visibility / IMC - High	R	R	R	–	–	C	R	R	R
Threat	E01 Meteorology	E01.02 Poor Visibility / IMC - Very High	R	R	R	–	–	C	R	R	R

Appendix I – Examples of Lesson Plans' front page related to training events 1, 2 & 3 in a CBTA environment

Lesson Plan	Module 2	Training Event 2.1	M2 -FSTD number

Session Preparation	Briefing	Session	Debriefing
01:00	01:00	04:00	01:00

Flight Profile
Part 1: From take-off to landing. Several times. Part 2: From take-off to landing. Several times.

Conditions		
Training Platform	ICAO FSTD level VII	
Instructor support	Low (instructional method: Discover with assistance)	
Operational context	Nature:	CAT - IFR
	Complexity:	Very Low to Low
Environmental context	Nature:	Reflecting the operator network
	Complexity:	Low to Very Low

Performance			
TA-SE (Trained and Assessed with Special Emphasis)		**TA** (Trained and Assessed)	
PRO	Adequate (Grade 3)	KNO	Adequate (Grade 3)
FPA	Adequate (Grade 3)	WLM	Adequate (Grade 3)
FPM	Adequate (Grade 3)		
SAW	Adequate (Grade 3)		

Critical OBs [to be regularly demonstrated (very often)]	
KNO	OB 0.2 |
PRO	OB 1.2 | OB 1.3 | OB 1.4 | OB 1.5 |
FPA	OB 3.1 | OB 3.4 | OB 3.5 |
FPM	OB 4.1 | OB 4.3 | OB 4.5 | OB 4.6 |
SAW	OB 7.1 | OB 7.2 | OB 7.3 |
WLM	OB 8.7 |

Preparation
Refer to: FCOM / FCTM

Lesson Plan	Module 2	Training Event 2.2	M2 -FSTD number

Session Preparation 01:00	Briefing 01:00	Session 04:00	Debriefing 01:00

Flight Profile
Part 1: From ground and preflight operations, take-off, climb to cruise phase, descent approach to landing. Part 2: From take-off to landing. Several times.

Conditions		
Training Platform	ICAO FSTD level VII	
Instructor support	Medium (instructional method: facilitation)	
Operational context	Nature:	CAT - IFR
	Complexity:	Very Low to High
Environmental context	Nature:	Reflecting the operator network
	Complexity:	High to Very Low

Performance			
TA-SE (Trained and Assessed with Special Emphasis)		**TA** (Trained and Assessed)	
PRO	Adequate (Grade 3)	KNO	Adequate (Grade 3)
FPA	Adequate (Grade 3)	COM	Adequate (Grade 3)
FPM	Adequate (Grade 3)	LTW	Adequate (Grade 3)
PSD	Adequate (Grade 3)	WLM	Adequate (Grade 3)
SAW	Adequate (Grade 3)		

Critical OBs [to be regularly demonstrated (very often)]	
KNO	OB 0.1 | OB 0.2 | OB 0.3
PRO	OB 1.2 | OB 1.3 | OB 1.4 | OB 1.5 | OB 1.7 |
COM	OB 2.7 |
FPA	OB 3.1 | OB 3.2 | OB 3.4 | OB 3.5 | OB 3.6 |
FPM	OB 4.1 | OB 4.2 | OB 4.3 | OB 4.5 | OB 4.6 | OB 4.7 |
LTW	OB 5.7 | OB 5.10 |
PSD	OB 6.1 | OB 6.2 | OB 6.3 | OB 6.4 | OB 6.9 |
SAW	OB 7.1 | OB 7.2 | OB 7.3 | OB 7.6 |
WLM	OB 8.7 | OB 8.9 |

Preparation
Refer to: FCOM / FCTM

Lesson Plan	Module 2	Training Event 2.3	M2 -FSTD number

Session Preparation	Briefing	Session	Debriefing
01:00	01:00	04:00	01:00

Flight Profile
Part 1: From ground and preflight operations, take-off, climb to cruise phase, descent approach to landing. Part 2: From take-off to landing. Several times.

Conditions		
Training Platform	ICAO FSTD level VII	
Instructor support	High (instructional method: explanation)	
Operational context	Nature:	CAT - IFR
	Complexity:	Very Low to Very High
Environmental context	Nature:	Reflecting the operator network
	Complexity:	Very High to Very Low

Performance			
TA-SE (Trained and Assessed with Special Emphasis)		**TA** (Trained and Assessed)	
PRO	Adequate (Grade 3)	KNO	Adequate (Grade 3)
FPA	Adequate (Grade 3)	COM	Adequate (Grade 3)
FPM	Adequate (Grade 3)	LTW	Adequate (Grade 3)
PSD	Adequate (Grade 3)	WLM	Adequate (Grade 3)
SAW	Adequate (Grade 3)		

Critical OBs [to be regularly demonstrated (very often)]	
KNO	OB 0.1 | OB 0.2 | OB 0.3
PRO	OB 1.2 | OB 1.3 | OB 1.4 | OB 1.5 | OB 1.7 |
COM	OB 2.7 |
FPA	OB 3.1 | OB 3.2 | OB 3.4 | OB 3.5 | OB 3.6 |
FPM	OB 4.1 | OB 4.2 | OB 4.3 | OB 4.5 | OB 4.6 | OB 4.7 |
LTW	OB 5.7 | OB 5.10 |
PSD	OB 6.1 | OB 6.2 | OB 6.3 | OB 6.4 | OB 6.9 |
SAW	OB 7.1 | OB 7.2 | OB 7.3 | OB 7.6 |
WLM	OB 8.7 | OB 8.9 |

Preparation
Refer to: FCOM / FCTM

Appendix J – Illustration of specific instructor guidance when "role play" is used during TE 2.2 and TE 2.3

SCENARIO #1	Expected Outcome:	• Detect errors and recognize mismanaged aircraft state. • Take appropriate actions where necessary • Restore desired aircraft state • Identify and manage consequences

Critical Trainee's OBs:

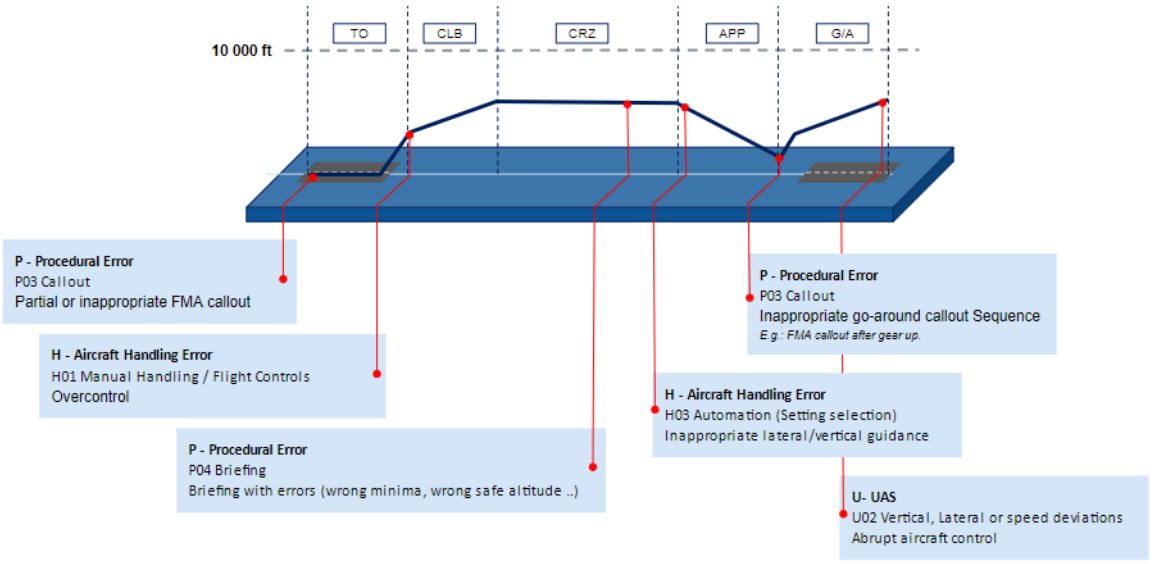
- KNO - OB 0.2 - Demonstrates required knowledge of published operating instructions
- PRO – OB 1.2 - Applies relevant operating instructions, procedures and techniques in a timely manner
- PRO – OB 1.5 - Monitors aircraft systems status
- COM - OB 2.7 - Uses appropriate escalation in communication to resolve identified deviations
- FPA - OB 3.2 - Monitors and detects deviations from the intended flight path and takes appropriate action
- FPA - OB 3.6 - Effectively monitors automation, including engagement and automatic mode transitions
- FPM - OB 4.2 - Monitors and detects deviations from the intended flight path and takes appropriate action
- FPM – OB 4.7 - Effectively monitors flight guidance systems including engagement and automatic mode transitions
- LTW - OB 5.10 - Applies effective intervention strategies to resolve identified deviations
- PSD – OB 6.1 - Identifies, assesses and manages threats and errors in a timely manner
- SAW – OB 7.1 - Monitors and assesses the state of the aeroplane and its systems
- SAW – OB 7.2 - Monitors and assesses the aeroplane's energy state, and its anticipated flight path.
- WLM – OB 8.7 - Monitors, reviews and cross-checks actions conscientiously
- WLM – OB 8.9 - Manages and recovers from interruptions, distractions, variations and failures effectively while performing tasks

Role Play:

- must be performed with realistic and not gross errors, leading at times to a mismanaged aircraft state

FLIGHT PROFILE

In-Seat Instruction (Trainer: PF / Trainee: PM)



FPV: FLIGHT PATH VECTOR - **A/P**: AUTOPILOT - **FD**: FLIGHT DIRECTOR - **A/T**: AUTO THROTTLE or AUTO THRUST		
RED: **MUST NO**T be used	GREEN: **MUST** be used	GREY: Used **AT DISCRETION**

Time	Duration	Events	PF : Instructor
INIT TAKEOFF			
		1 TAKEOFF	FPV AP FD A/T
	Procedural Error - Call out - Partial or inappropriate FMA call out **Role Play** ● No demonstration of "PRO - OB 1.3 - Follows SOPs unless a higher degree of safety dictates an appropriate deviation" ○ After Takeoff Thrust setting: Deviate from SOPs - Partial Call out ○ Passing 100 kts: Deviate from SOPs - No Call out		
		2 AFTER TAKEOFF	FPV AP FD A/T
	Aircraft Handling Error - Flight Control overcontrol **Role Play** ● No demonstration of "FPM - OB 4.1 Controls the aircraft manually with accuracy and smoothness as appropriate to the situation" ○ Controls manually the aircraft with a lot of inputs leading to difficulty to follow FD and some unsmoothness inputs		
		3 CLIMB	FPV AP FD A/T
	Aircraft Handling Error - Flight Control overcontrol **Role Play** ● No demonstration of "FPM - OB 4.1 Controls the aircraft manually with accuracy and smoothness as appropriate to the situation" ○ Controls manually the aircraft with a lot of inputs leading to difficulty to follow FD and some unsmoothness inputs		
		4 CRUISE	FPV AP FD A/T
		5 DESCENT PREPARATION	FPV AP FD A/T

	Procedural Error - Briefing **Role Play** ● No demonstration of "OB 1.3 - Follows SOPs unless a higher degree of safety dictates an appropriate deviation" ○ Inappropriate briefing sequence - e.g. Briefing starts with Missed Approach Procedure … ○ Wrong data: QNH value - Inappropriate Safe Altitude - Inappropriate minima for the selected approach …

		6	DESCENT	FPV	AP	FD	A/T
	Aircraft Handling Error - Automation **Role Play** ● No demonstration of "OB 3.1 Uses appropriate flight management, guidance systems and automation, as installed and applicable to the conditions" ○ Use of V/S instead of appropriate Descent mode, leading to a high speed ○ Fixed Speed strategy associated to a managed Descent						

		7	APPROACH	FPV	AP	FD	A/T
	Aircraft Handling Error - Flight Control overcontrol **Role Play** ● No demonstration of "FPM - OB 4.1 Controls the aircraft manually with accuracy and smoothness as appropriate to the situation" ○ Controls manually the aircraft with a lot of inputs leading to difficulty to follow FD and some unsmoothness inputs						

		8	GO-AROUND	FPV	AP	FD	A/T
	Procedural Error - Call out - Partial or inappropriate FMA call out **Role Play** ● No demonstration of "PRO - OB 1.3 - Follows SOPs unless a higher degree of safety dictates an appropriate deviation" ○ Partial Call out ○ Call out "flaps 1" instead of the appropriate configuration ○ Forget to request "landing gear up" **UAS - Aircraft Handling Error - Speed Deviations** **Role Play** ● No demonstration of "PRO - OB 1.2 - Applies relevant operating instructions, procedures and techniques in a timely manner" ● No demonstration of "FPM - OB 4.1 Controls the aircraft manually with accuracy and smoothness as appropriate to the situation" ○ Controls manually with abrupt input leading to overspeed with flaps not retracted						

	END OF SCENARIO

SCENARIO #2	Expected Outcome:	• Detect errors and recognize mismanaged aircraft state. • Take appropriate actions where necessary • Restore desired aircraft state • Identify and manage consequences

Critical Trainee's OBs:

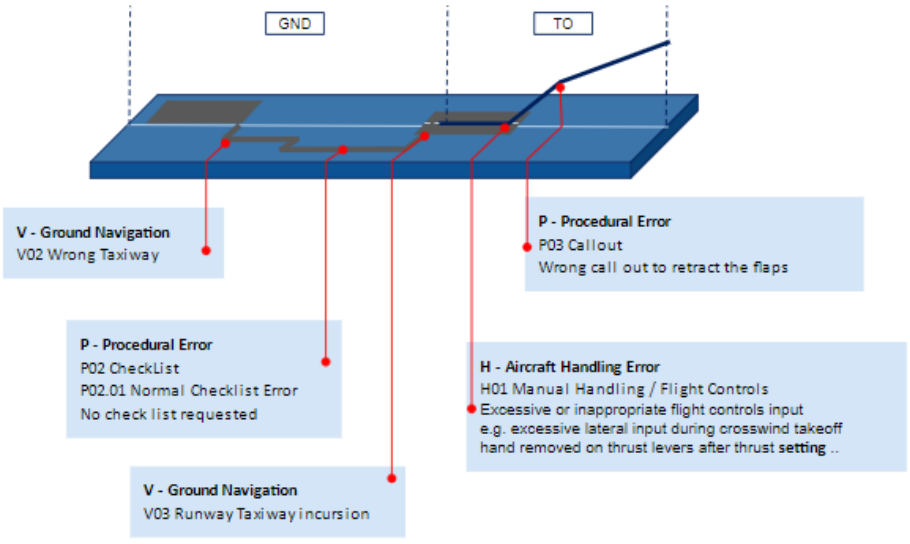
- KNO - OB 0.2 - Demonstrates required knowledge of published operating instructions
- PRO – OB 1.2 - Applies relevant operating instructions, procedures and techniques in a timely manner
- PRO – OB 1.5 - Monitors aircraft systems status
- COM - OB 2.7 - Uses appropriate escalation in communication to resolve identified deviations
- FPM - OB 4.2 - Monitors and detects deviations from the intended flight path and takes appropriate action
- FPM – OB 4.7 - Effectively monitors flight guidance systems including engagement and automatic mode transitions
- LTW – OB 5.7 - Exercises decisive leadership when required
- LTW - OB 5.10 - Applies effective intervention strategies to resolve identified deviations
- PSD – OB 6.1 - Identifies, assesses and manages threats and errors in a timely manner
- SAW – OB 7.1 - Monitors and assesses the state of the aeroplane and its systems
- SAW – OB 7.2 - Monitors and assesses the aeroplane's energy state, and its anticipated flight path.
- SAW- OB 7.3 - Monitors and assesses the general environment as it may affect the operation
- WLM – OB 8.7 - Monitors, reviews and cross-checks actions conscientiously

Role Play:

- must be performed with realistic and not gross errors, leading at times to a mismanaged aircraft state

FLIGHT PROFILE

In-Seat Instruction (Trainer: PF / Trainee: PM)



FPV: FLIGHT PATH VECTOR - **A/P**: AUTOPILOT - **FD**: FLIGHT DIRECTOR - **A/T**: AUTO THROTTLE or AUTO THRUST		
RED: **MUST NO**T be used	GREEN: **MUST** be used	GREY: Used **AT DISCRETION**

Time	Duration		Events	PF: Instructor			
INIT GATE							
		1	COCKPIT PREPARATION - PUSH BACK - ENGINE START	FPV	AP	FD	A/T
		2	TAXI OUT - TAXIWAY	FPV	AP	FD	A/T
	Ground Navigation - Wrong Taxiway **Role Play** ● No demonstration of SAW - OB 7.3 - Monitors and assesses the general environment as it may affect the operation" ○ Unintentionally taxi to a wrong taxiway without safety impact (authorized for this type of aircraft, no opposite aircraft ...)						
		3	TAXI OUT	FPV	AP	FD	A/T
	Procedural Error - Normal Checklist **Role Play** ● No demonstration of "PRO - OB 1.3 - Follows SOPs unless a higher degree of safety dictates an appropriate deviation" ○ Forget to request the appropriate checklist						
		4	LINE UP	FPV	AP	FD	A/T
	Ground Navigation Error - Runway Incursion **Role Play** ● No demonstration of "SAW - OB 7.3 - Monitors and assesses the general environment as it may affect the operation" ○ Continue taxi without reducing the groundspeed when approaching the runway						
		5	TAKEOFF	FPV	AP	FD	A/T

	Aircraft Handling Error - Manual Handling/Flight Controls **Role Play** ● No demonstration of "PRO - OB 1.2 - Applies relevant operating instructions, procedures and techniques in a timely manner" & "PRO - OB 1.3 - Follows SOPs unless a higher degree of safety dictates an appropriate deviation" "OB 4.1 - Controls the aircraft manually with accuracy and smoothness as appropriate to the situation" ○ Lateral deviation vs center line ○ Hand removed from the thrust levers before "V1 - 10 kts" ○ Very low rate of rotation

		6	AFTER TAKEOFF	FPV	AP	FD	A/T
	Procedural Error - Callout **Role Play** ● No demonstration of "OB 1.3 - Follows SOPs unless a higher degree of safety dictates an appropriate deviation" ○ Forget call out "Landing Gear Up"						

	END OF SCENARIO