Single-Pilot Human Factors and Threat and Error Management

For
Approved Training Organizations

INTRODUCTION

WHY THE WORKSHOP

- Most accidents are linked *to deficiencies in human performance*.
- World wide statistics indicate that about 75% of aircraft accidents are caused by Human Factors (HF) deficiencies.
- The application of Threat and Error Management (TEM) practices requires the competent use of HF skills. This discussion is comprised of two major sections, which are Single Pilot HF and TEM.
- These topics are being discussed because there is little guidance material available that addresses the subject of teaching and assessing a practical level of HF and TEM.

OBJECTIVE

The objective of this presentation is to provide guidance to instructors about teaching a realistic level of single pilot HF and TEM.

"Although these two subjects have a theoretical knowledge component, this presentation will concentrate on the application of these skills to flying".

Contents

Single-pilot Human Factors

1. Maintain Effective Lookout
2. Assessing Effective Lookout
3. Maintain Situational Awareness
4. Assessing Situational Awareness
5. Assess Situations and Make Decisions
6. Assessing Decision-making

CONT.

7. Set Priorities and Manage Task
8. Maintain Effective Communication and Interpersonal Relationships

II. Threat and Error Management

1. Teaching TEM in a GA Environment
2. Assessing TEM in a GA Environment

SINGLE PILOT HUMAN FACTORS

WHAT ARE SINGLE PILOT HUMAN FACTORS;

- A good definition for the aviation environment: " Optimizing safe flight operations by enhancing the relationships between people, activities, and equipment."
- This simply means: "*achieving the safest outcome to flight operations by the most effective use of people and what people do when operating in the aviation environment and the equipment they use".*

CONT.

- **Single pilot human factors is composed of five (5) elements;**
  - Maintain effective look out
  - Maintain situational awareness (SA)
  - Assess situations and make decisions
  - Set priorities and manage tasks
  - Maintain effective communications and interpersonal relationships
- *"Before a person can be assessed, they must be trained"*

LINK BETWEEN HF & AIRMANSHIP

- Airmanship is not well defined and means different things to different people.
- Experience has shown that airmanship was difficult to measure accurately because *identifiable performance criteria* were not available.
- *By linking airmanship to the five elements of HF standards it is possible to more accurately determine the competency of a person*.
- The purpose of linking HF and airmanship is not to diminish the importance of airmanship but to make the measurement of it valid and reliable.

Information processing

- Pilots are required to continually process information during flight operations.
- Stimuli are collected by the sensors: eyes, ears, nose, taste buds, skin and muscles (feel) and the vestibular senses (balance mechanism), and then this information is passed to the brain.
- Some factors that may limit the construction of an accurate mental model are:
  - **Experience**: lack of experience will lead to the likelihood of not recognizing a stimulus.
  - **Stress**: may lead to single task fixation.
  - **Anomalous perception**: illusions, false signals from other people.
  - **Lack of knowledge**: can lead to a false premise

Cont.

- A decision is arrived at after the brain determines what to do about the options.
- The *working* or *short term memory* holds the information being used at the time and may call on the *long term memory* to evaluate new information.
- The brain is a single channel processor; If decisions are not prioritized correctly (the most critical decision first), the outcome could be unfavorable.

LIMITATIONS

Limitations that affect information processing and decision making are:

- Time limitations
- Mental overload, task mismanagement
- Conflicting information
- Expectations and anticipations
- Fatigue, forgetting, personality traits, stress
- Insufficient knowledge
- Emotions; confirmation bias (ignoring information that does not support the decision)
- Fixation and destination obsession

MAINTAIN EFFECTIVE LOOKOUT

- Effective lookout means seeing what is "**out there**" and assessing the information that is received before making an appropriate decision.
- Vision is the primary source of information for the pilot.

1. Seeing and Interpreting
2. Looking for Traffic
3. Alerted Search

Summary of maintaining an effective lookout

- Threats are external to the aircraft,
- The pilot must look outside the aircraft;
- Search the available visual field to detect threats that will probably appear in the peripheral vision;
- Shift vision directly to the threat and if identified as a collision risk, decide on what effective evasive action to take; and
- Manoeuvre the aircraft to mitigate the risk.

Assessing effective lookout

Assessment in general

"Assessment is the process of weighing evidence of an individuals performance against a standard".

Cont.

The evidence used must follow an established set of rules. These are:

- **Validity:** It must cover all the performance criteria for the skills and knowledge of the standard being assessed.

- **Authenticity:** It must be the individuals own work.

Cont.

- **Sufficiency:** Enough evidence must be collected to judge the individual is competent across all elements and performance criteria, all dimensions of competency.

- **Currency:** The individual is competent now and meets the current standards.

ASSESSING LOOKOUT

- Lookout is a critical facet of safe flight operations and assessment of this skill will be ongoing through out a pilots career.

- There are two main elements in effective lookout:

- Firstly: to see an object
- Secondly: to react appropriately to what has been seen.

Cont.

- The three performance criteria relevant to maintaining an effective lookout are:
  - **Maintains lookout and traffic separation using a systematic scan technique at a rate determined by traffic density, visibility, and terrain.**
  - **Maintains radio listening watch and interpret transmissions to determine traffic location and intentions; and**
  - **Performs "airspace cleared" procedure before commencing any maneuvers**.
- These three criteria must be achieved for a positive assessment of effective lookout.
- These can be achieved by monitoring head and eye movements when possible and questioning the trainee on what they see.

MAINTAIN SITUATION AWARENESS

What is Situation Awareness (SA)?

- " *The perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of the status in the near future".*
- Three levels to maintain SA:

  Level 1: Perception of the current environment

  Level 2: Interpretation of the immediate situation

  Level 3: Anticipation of the future environment

- Monitoring and gathering information from both within the cockpit and outside the aircraft achieves perception of the current environment.

CONT.

Teaching Situation Awareness

- Continued monitoring assists perception (mental model) of what is happening and what is likely to happen in the near future, which is the basis of SA, visual information is the greatest source for building and maintaining SA.
- Maintaining a good radio listening watch
- There is no value in having SA after an event

CONT.

- How to re-establish SA whenever it is lost or degraded
- Observation and questioning are the primary means of making a formative assessment of SA.

CONT.

- Instructors must include SA as part of every flight.
- Trainees must be encouraged to verbalize their observations
- Include in the aim of the lesson to primarily focus on the non-technical skills required to achieve SA.
- The instructor to maximize the ability for each trainee to recognize their initial symptoms that may lead to lost SA and to learn how to recover from lost SA.

It would not be appropriate to artificially increase workload at any time. There is in real time moderate to high workload as the trainee could be exposed to increase error(s) and unnecessary risks.

ASSESSING SITUATION AWARENESS

Assessment in general

"Assessment tools" are the resources used by an assessor to gather evidence that a person is competent.

Examples of assessment tools are;

- Pilots logbook
- Examination results
- Training and achievement records
- Evidence and observation checklist
- Specific questions or activities
- Simulation and scenarios

CONT.

These tools must be;

- **Valid:** Assess what you came to assess using an approved standard in a realistic environment;
- **Reliable:** A qualified assessor, consistent evidence gained from observation, questioning, simulation and training records, using clearly stated criteria and instructions;
- **Flexible**; Assessment conducted in an operational environment using an aircraft in realistic flight circumstances with adjustments for different situations; and
- **Fair:** Candidate's needs are identified and accommodated, any allowable adjustments catered for and appeal procedure explained.

CONT.

"The most important aspect of assessing SA is to confirm that the pilots mental model (or perception) of the environment is accurate".

Next, find out what options have been generated and whether they are realistic.

CONT.

- Assessors must determine if SA is being maintained regardless of workload.
- Assessors must continue to monitor the trainee during periods of low arousal or workload (inactivity) to ensure that an appropriate level of SA is maintained.
- Assessors must also observe the appropriate application or otherwise of knowledge, because SA can be adversely affected by a lack of knowledge.
- If a trainees SA is below the required standard, there will be a cause and it is up to the assessor to discover and record this deficiency as evidence for assessment.

ASSESS SITUATIONS and make decisions

Teaching situation assessment and decision making

- The primary area of interest is the decision making process
- Trainees must be given the opportunity to decide, and if a decision is flawed, the reasons must be clearly explained.
- The timeliness of decisions is another facet of decision making that instructors must emphasize.

CONT.

The information process;

- Receive information
- Convert information into reality
- Options are generated
- Options are analyzed; and
- A decision is made

- What is your Company's Decision Making Process?

Assessing decision - making

A good starting point for Assessors;

- The pilot has to recognize that a decision has to be made and this procedure will require the pilot to gather and process information.
- The pilots action must be observable, but some questioning may be required to obtain an accurate assessment.
- Assessors must ensure the decision is the optimal one and is implemented effectively in the time available.
- It is acceptable to make a decision on the basis that it may require revision, if the safety of the flight is not compromised and the trainee continues to re-evaluate and update that initial decision.
- An assessor must observe a pilot to determine if he is able to manage the factors that limit perception which can adversely affect information processing and decision making.

SET PRIORITIES AND MANAGE TASKS

Teaching how to set Priorities and Manage Tasks

- The adage : "*aviate, navigate and communicate*" is probably the basis of prioritization and task management.
- Task management means completing a job or operation competently in the time available.
- The brain is a single channel processor and humans can normally only manage one activity at a time.
- During flight, trainees must be encouraged to prioritized tasks to ensure that the important and safety critical actions are dealt with first.
- Another practice that instructors must stress is good organization in the cockpit and achieving an appropriate work rate.

CONT.

Factors that adversely affect a pilot's ability to operate efficiently;

- Lack of preparation (confusion, disorganization)
- Fatigue (poor decision making, errors)
- Discomfort (distraction, fatigue)
- Stress (inefficiency, distraction)
- Arousal (increased or decreased work cycles)
- Domestic stress (distraction, lack of concentration)
- Distraction (diverted attention)
- Destination or task obsession (poor decision making, press-on-itis)
- Bad health (decreased physical and psychological performance)
- Over load (fixation, tunnel vision, broken work cycles)

ASSESSING PRIORITISATION AND TASK MANAGEMENT

- An assessor must be able to assemble evidence of competence in setting priorities and managing tasks on a flight test by simply observing a pilot's work pattern and task completion. The danger is that such assessment is prone to subjectivity. Valid evidence must be obtained.
- When assessing task management the assessor must be looking for competent completion of a task in the time available.
- The assessment process will require detailed observation, information gathering and questioning because there will be a need to determine how a candidates mind is functioning while managing tasks. By obtaining this information and combining it with observations it is possible to judge a pilot's ability to competently set priorities and manage tasks.

Maintain effective communication and interpersonal relationships

Teaching Effective Communications and Interpersonal Relationships

- Communication is not limited to the radio telephone; it also involves direct verbal and non-verbal exchanges.
- Effective interpersonal relationships involves being able to get a positive or helpful rather than negative or obstructive response from individuals or groups that a pilot deals with. A major component of interpersonal relationships is effective communication.
- The first requirement for communication is a common language and "*Aviation English*".
- The instructor must be precise with their use of language.

CONT.

- The intent of the "*maintain effective interpersonal relationships*" component of the element is to make pilots aware of the need to always foster positive and cooperative relationships with persons involved with or affected by the flying operations to be performed.
- Some personal characteristics that must be evaluated are:
  - Tone and phrasing of communication
  - Openness
  - Reaction to criticism
  - Aggressiveness or lack of assertion
  - Willingness to listen
  - Respect for others; arrogance, and use of authority

ASSESSING EFFECTIVE COMMUNICATION AND INTERPERSONAL RELATIONSHIPS

Performance criteria:

- The first performance criteria for the element is: “Establishes and maintains effective and efficient communications and interpersonal relationships with all stake holders to ensure a safe outcome of the flight”.
- The second performance criteria for the element is: “Defines and explains objectives to applicable/involved stakeholders.”
- The third performance criteria for the element is: “Demonstrate a level of assertiveness that ensures the safe completion of the flight.”
- The fourth performance criteria for the element is: “Encourages passengers to participate in and contribute to the safe outcome of the flight.”

THREAT AND ERROR MANAGEMENT

Management

- Before discussing TEM specifically, the use of the word “manage” needs to be clarified. The term “manage” or “management” is used with the definition, plan, direct and control an operation or situation.
- When assessing competency standards that involve management, evidence must be sought to ensure that a plan is developed, implemented (direction) and re-evaluated (control) through out the activity.
- TEM is an operational concept applied to the conduct of a flight that is more than the traditional role of airmanship, as it provides for a structured and pro-active approach for pilots to use in identifying and managing threats and errors that may affect the safety of the flight.

CONT.

- There is some overlap between Risk Management, TEM, and HF particularly at the stage of developing and implementing plans to mitigate risks and in reviewing the conduct of flight.
- Generally risk management is the process of deciding whether or not operations can be conducted to an acceptable “level” of risk (go or no-go) safely, whereas, TEM is the concept applied to managing and maintaining the safety of a particular flight.

THREATS

- The TEM model, as originally developed by the UNIVERSITY of TEXAS, defines threats as *external events or errors that:*
  - *Occur outside the influence of the flight crew*
  - *Increase the operational complexity of the flight*
  - *Require crew attention and management if safety margins are to be maintained*
- They may be **anticipated**, **unexpected,** or they may be **latent** within the operational system.

CONT.

- An expanded definition which is equally applicable to GA is that a threat can be defined as; "*a situation or event that has the potential to impact negatively on the safety of a flight or any influence that promotes opportunity for pilot errors.*"
- This concept expands on the original definition of threats and considers the psychological state of the pilot and the limitations they may bring with them to the aircraft on any given day. The threat has the capacity to promote opportunity for increased errors, degrade SA, and poor decision making due to physiological and/or psychological impairment
- Generally, threats are considered to be **external** (e.g. bad weather) or **internal**, those the pilot or trainee bring to the operation (e.g. fatigue, complacency).

CONT.

- Pilots need good SA to anticipate and recognize threats as they occur.
- Threats must be managed to maintain normal flight safety margins.
- Some typical external threats to operations;
  - Adverse weather
  - Weight and balance
  - Density altitude
  - Runway length
  - Other traffic or obstacle
  - The condition of the aircraft

CONT.

Some typical internal threats to GA operations might be:

- Fatigue
- Complacency
- Over or under confidence
- Lack of flight discipline
- Hazardous behavior
- Impulsiveness
- Machoism
- Invulnerability
- Resignation
- Anti-authority or lack of recency and proficiency

ERRORS

The TEM model accepts that it is unavoidable that pilots, as human beings, will make errors. Errors are defined as *flight crew actions or inactions that:*

- *Lead to a deviation from crew or organizational intentions or expectations*
- *Reduce safety margins*
- *Increase the probability of adverse operational events on the ground and during flight.*

They can be classified as:

- **Handling errors**
- **Procedural errors**
- **Communication errors**

External and internal threats may lead to errors on the part of the pilot.

CONT.

While errors may be inevitable, safety of flight requires that errors that occur are identified and managed before flight safety margins are compromised. Typical errors might include:

- Incorrect performance calculations
- Inaccurate flight planning
- Non-standard communication
- Aircraft mishandling
- Incorrect systems operation or management
- Checklist error
- Failure to meet flight standards e.g. poor airspeed control

UNDESIRED AIRCRAFT STATE

Threats and errors that are not detected and managed correctly can lead to an undesired aircraft state, which could be a deviation from flight path or aircraft configuration that reduces normal safety margins. The definition of undesired aircraft state is:

"*Pilot induced aircraft position or speed deviations, misapplication of flight controls or incorrect systems configuration associated with a reduced margin of safety*".

CONT.

An undesired aircraft state *can still be recovered to normal flight* but if not managed appropriately, may lead to an outcome such as an accident or incident.

Safe flight in an aircraft requires recognition and recovery from undesired aircraft state in a very short time frame before an outcome such as loss of control, failure to achieve optimum performance or uncontrolled flight into terrain occurs.

Cont.

Examples of errors and an associated undesired aircraft state might be:

- Loss of directional control during a stall (error) resulting in an unusual aircraft attitude (state)
- Inappropriate scan of aircraft instruments (error) resulting in flight below required speed (state)
- Flying a final approach below appropriate threshold speed (error) resulting in excessive deviations from specified performance (state).

CONT.

- Good TEM requires the pilot to plan and use appropriate counter-measures to prevent threats and errors leading to an undesired aircraft state.
- Counter measures used in TEM include many standard aviation practices and may be categorized as follows:
  - **Planning counter measures**: including flight planning, briefing and contingency planning
  - **Execution counter measures**: including monitor, cross-checking work load and systems management
  - **Review counter measures**: including evaluating and modifying plans as the flight proceeds and inquiry and assertiveness to identify and address issues in a timely way.

CONT.

“Once an Undesired aircraft state is recognised, it is important to manage the undesired state through the correct remedial solution and prioritize aircraft control to return to normal flight, rather than to fixate on the error that initiated the event”.

TEM APPLICATION

TEM must be integral to every flight and includes anticipation of potential threats as well as planning of counter measure.

- The following summary is intended to assist pilots to apply **TEM** in **GA** operations;

Pre-flight:

▪Just as you perform a number of tasks on a regular basis in preparation for flight (e.g. interpreting NOTAMs and MET information, checking fuel contents), pilots must include TEM as part of routine pre-flight planning and preparation.

▪ A few minutes (or more) spent on the ground anticipating possible threats and errors associated with each flight will provide the opportunity to plan and develop counter measures. A good starting point is to ask what actions, conditions or event are likely to promote error, leading to the identification of internal and/or external threats applicable to that flight. This can reduce your workload airborne as you may have partially prepared yourself with how to deal with those threats and errors.

CONT.

In flight:

- Brief (self brief and passengers) planned procedures before take off and prior to commencing each significant flight sequence (e.g. approach to an unfamiliar aerodrome)
- Include anticipated threats and counter measures in the briefings
- Continuously monitor and crosscheck visual and instrument indications and energy state to maintain SA.
- Prioritize tasks and manage workload to avoid being over loaded and to maintain SA.

CONT.

In flight:

- When confronted by threats and/or errors a priority is to ensure the aircraft is in an appropriate configuration to optimize your ability to maintain control of the aircraft And flight path.
- Monitor the progress of every sequence and abort if necessary
- Do not fixate on threat or error management to the detriment of aircraft control
- Identify and manage any undesired aircraft state and recover to planned flight

CONT.

Post-flight:

·Take a few minutes at the end of each flight to reconsider what threats, errors and/or undesired aircraft states were encountered during the flight. Ask your self how well they were managed and what you will do differently to improve management of those threats and errors.

·Record your threats, errors and/or undesired aircraft states and discuss them with more experienced pilots to assist with the development of improved TEM strategies.

TEACHING TEM IN THE TRAINING ENVIRONMENT

- Instructors must stress to trainees that threats fall into two main groups: **Anticipated** and **Unexpected**.
- There is a third group called **Latent threats**. These threats may not be observable by pilots involved in flight operations and may need to be uncovered by safety analysis.
- Detection of anticipated threats relies mainly on knowledge and experience. As pilots learn and gain experience they will be able to predict where threats may occur.
- Prior to each flight, the instructor should discuss the proposed flight and ask the trainee to identify the obvious threats to safety.

CONT.

Some examples of threats that an instructor must be aware of with a new trainee:

- Conduct in the vicinity of aircraft on the ground
- Performance of competent pre-flight inspections
- Correct adjustments of flight controls and harness restraint
- A clear handover/takeover procedure
- Ensuring propeller clearance before engine start
- Listening before transmitting on the radio

And the aircraft has not moved yet!

As the trainee gains knowledge, experience and skills, they will learn to manage all the threats that develop.

CONT.

- Knowledge and repetition prepare a trainee to mitigate these events, but an instructor should link such training activities to the threat management component of TEM.

- Threats are also categorized in the TEM model into Environmental and Organizational threats.

·**Environmental threats** occur outside the control of the aircraft operator due to the environment in which the operation takes place and have to be managed by the pilot in the available time.

·**Organizational threats** (which are often latent) can be controlled by the operator or reduced by aviation organizations putting in place mitigations such SMS fatigue risk management system (FRMS) SOPs, checklists etc. However, the last line of defense will be the pilot.

"*Threats whether environmental or organizational must be managed or an undesirable aircraft state, incident or accident may result*".

TEACHING ERROR MANAGEMENT

- The acknowledgement that errors will occur has changed the emphasis in aviation operations to error recognition and management rather than error prevention.
- In the TEM model, errors must be observable and are classified as handling, procedural or communication errors. The point of reference that defines these classifications is “primary interaction.”
- When teaching TEM instructors must emphasize the application of HF skills. The elements of the HF manage flight standard are integral to and inseparable from TEM practices.

TEACHING UNDESIRED AIRCRAFT STATE MANAGEMENT

- Unmanaged or mismanaged threats or errors may result in an undesired aircraft sate. Some typical examples would be:
  - Taxiing too fast
  - Too fast or slow on final approach
  - Inability to maintain altitude or heading during straight and level flight.
- Highlighting undesired aircraft states as they occur, and providing guidance and advice on their prevention will enrich the trainees learning experience.
- A critical aspect that instructor must teach is the switch from error management to undesired aircraft state management.
- It is essential for a pilot to recognized when an undesired aircraft state must be managed and then to take appropriate action.

CONT.

An effective tool for both teaching TEM and debriefing after a flight is to use a simple timeline with the following formulas;

- **THREAT(T) – PILOT RESPONSE (R) – OUTCOME (O):** Either inconsequential or consequential. Inconsequential means that there was no adverse outcome i.e. no error
- **ERROR (E) – PILOT RESPONSE (R) – OUTCOME (O**): Either inconsequential or consequential. This time a consequential outcome may be a further error or undesired state.
- **UAS (U) – PILOT REAPONSE (R) – OUTCOME (O):** Either inconsequential or consequential. Once again a consequential outcome may be a further error or an undesired state.

ASSESSING TEM IN THE TRAINING ENVIRONMENT

The basic concept for assessing TEM is simple:

- Identify the threat, error, undesired aircraft state, and
- Manage the threat, error, or undesired aircraft state.

- Trainees must be questioned and their actions observed to ensure the evidence is valid, authentic, sufficient and current.
- Instructors are required to conduct formative assessments through out flight training.
- It would be impossible to assess TEM without looking at the HF component.

CONT.

- As a practical example, it would be possible to assess a number of elements from the HF and TEM standards if an assessor sets a scenario during the navigation phase that requires a precautionary search. Consider the list below:
  - **Lookout:** selection of suitable landing area, weather and terrain avoidance
  - **Situation awareness:** perception of present situation and options, action plan, potential hazard awareness, aircraft configuration and performance.
  - **Decision making:** decision to conduct precautionary search, assessment of landing area and decision to land.

Cont.

- **task prioritisation**; work management and prioritisation
- **communication**; communication with ATC, other aircrafts
- **threat management**; weather, low level operations, aircraft handling
- **error management**; recognition of any errors, counter measures, checklist use
- **undesired aircraft state**; taking appropriate action to prioritise management of UAS.

“SINGLE PILOT HF AND TEM ARE ARGUABLY A PILOT’S MOST IMPORTANT SKILLS. BY APPLYING THEM JUDICIOUSLY IT IS MORE LIKELY THAT A PILOT WILL HAVE A LONG AND SAFE FLYING CAREER".

What is Competency-Based Training and Assessment?

Competency – A dimension of human performance that is used to reliably predict successful performance on the job. Competency is manifested and observed through behaviours that mobilize the relevant knowledge, skills, and attitudes to carry out activities or tasks under specified conditions. Trainees successfully demonstrate competency by meeting the associated standard.

Performance Standard		
3	2	1
Has received training in the element, however is not able to consistently demonstrate competency to the standard required for qualification issue	Demonstrates a developing level of proficiency, and is deemed safe to conduct solo practice under direct supervision	Achieves competency to the standard required for qualification issue

CONT.

Performance Criteria – Simple, an evaluative statement on the required outcome of the competency and a description of the criteria used to judge whether the required level of performance has been achieved. A performance criterion consists of observable behavior, condition, and competency standard.

FLIGHT TRAINING Suggested flight time: 8.0 hours PIC			
MOS Reference	**Lesson Content** *(Elements & Performance Criteria)*	Performance Standard	
		Required	Achieved*
C1.1	**Communicating face-to-face**		
(a)	pronounces words clearly, using an accent that does not cause difficulties in understanding	2	
(b)	conveys information in clearly structured sentences without confusion or ambiguity	2	
(c)	uses an extensive vocabulary to accurately communicate on general and technical topics, without excessive use of jargon, slang or colloquial language	2	
(d)	speaks fluently without long pauses, repetition or excessive false starts	2	
(e)	responds to communications with actions that demonstrate that the information has been received and understood	2	
(f)	exchanges information clearly in a variety of situations with both expert and non-expert English speakers while giving and receiving timely and appropriate responses	2	
(g)	uses appropriate techniques to validate communications	2	
C2.1	**Pre-flight actions and procedures**		
(a)	complete all required pre-flight administration documentation	2	
(b)	obtain, interpret and apply information contained in the required pre-flight operational documentation, including the following:		
	(i) minimum equipment list (MEL)	2	
	(ii) maintenance release	2	
	(iii) weather forecasts	2	
	(iv) local observations	2	
	(v) Notice to Airmen (NOTAM)	2	
	(vi) Aeronautical Information Package (AIP)	2	

Why CBTA matters?

- Enables individuals to reach their highest level of operational capability while ensuring a basic level of competence as a minimum standard
- Enables individuals to cope with predictable and unforeseen situations
- Is geared towards **learning** rather than passing a **test**
- Makes full use of available training tools and methodologies
- Supports continuous learning and performance improvement

What is the aim of CBTA?

- Set a global standard
- Improve safety and performance of aviation personnel
- Provide room for innovation
- Train for the unforeseen
- Harmonize ATO and AOC training
- Integrate TEM across all aviation domains
- Pave the way for the total systems approach