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CIVIL AVIATION AUTHORITY OF THE PHILIPPINES

Advisory Circular

002-2023

COMPETENCY-BASED TRAINING AND ASSESSMENT (CBTA) FOR FLIGHT CREW

First Issue

Flight Standards Inspectorate Service
Licensing and Certification Department
Training Organization Certification and Inspection Division
Civil Aviation Authority of the Philippines
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Teaching and assessing non-technical skills for single-pilot operations

Applicability

This Advisory Circular (AC) applies to all pilots, but particularly to:

- Instructors
- Pilot Examiners
- Other training and checking pilots

Purpose

This AC provides guidance to instructors when teaching non-technical skills for single-pilot operations. Although this subject has a theoretical knowledge component, this AC concentrates on the application of non-technical skills in the flying environment. Every flight crew license, rating and endorsement flight test, proficiency check, and flight review includes assessments of these skills.

For further information

For further information, contact Civil Aviation Authority of the Philippines (CAAP) Training Organization Certification and Inspection Division (TOCID) at Telephone Number (02) 79442160.

Status

This is an initial issuance of this AC.

Approved/Disapproved:

CAPTAIN MANUEL ANTONIO L. TAMAYO
Director General

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Contents

SECTION 1 Reference Material

1.1 Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

Acronym	Description
AC	Advisory circular
AOC	Air Operator's Certificate
ATC	Air traffic control
ATS	Air traffic services
CAAP	Civil Aviation Authority of the Philippines
EGPWS	Enhanced ground proximity warning system
FAA	Federal Aviation Administration (of the USA)
HF	Human factors
ICAO	International Civil Aviation Organization
LOSA	Line operations safety audit
NOTAM	Notice to airmen
NTS	Non-technical skills
SOP	Standard operating procedure
TAWS	Terrain awareness and warning system
TCAD	Traffic collision alerting device
TCAS	Traffic alert and collision avoidance system
TEM	Threat and error management
VFR	Visual flight rules

1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below.

Term	Definition
Airmanship	The consistent use of good judgement and well-developed skills to accomplish flight objectives (International Civil Aviation Organization definition).
Airspace cleared procedure	A procedure that is performed before all turns and maneuvers. A commonly used technique for this procedure is: when turning left, 'clear right, clear ahead, clear left-turning left'; or when turning right, 'clear left, clear ahead, clear right-turning right' If an object is closing and remains on a line of constant bearing (stays at the same point on the windscreen), a collision will occur if avoiding action is not taken.
Behavioral markers	A short, precise statement describing a single non-technical skill or competency. They are observable behaviors that contribute to

	competent or not yet competent performance within a work environment.
Error	Actions or inactions by the pilot that lead to deviations from organizational or pilot intentions or expectations. When undetected, unmanaged or mismanaged, errors may lead to undesired aircraft states
Flight environment	The environment internal and external to the aircraft that may affect the outcome of the flight. The aircraft's internal environment can include, but is not limited to, aircraft attitude and performance, instruments, observations, flight controls, equipment, warning and alerting devices, cockpit physical and interpersonal climate and conditions, crew members, aircraft position, procedures, publications, checklists and automation. The external environment may include, but is not limited to, airspace, meteorological conditions, terrain, obstacles, the regulatory framework, other stakeholders and operating culture.
Formative assessment	Formative evaluation monitors learning progress during instruction and provides continuous feedback to both trainee and instructor concerning learning success and failures.
Human factors	The minimization of human error and its consequences by optimizing the relationship within systems between people, activities and equipment.
Judgment	An opinion formed after analysis of relevant information.
Leadership	The ability of the pilot in command to induce the trainee member(s) to use their skills and knowledge to pursue a defined objective.
Manage(ment)	To plan, direct and control an operation or situation.
Non-technical skills	Specific human factors competencies, such as lookout, situation awareness, decision making, workload management and communications.
Safe(ly)	Means that a maneuver or flight is completed without injury to persons, damage to aircraft or breach of aviation safety regulations, while meeting the standards specified by the Civil Aviation Authority of the Philippines (CAAP).
Safest outcome	Means that the maneuver or flight is completed with minimum damage or injury under the prevailing circumstances.

Situation awareness	The accurate perception of available information about yourself, the aircraft and the environment in which it is being flown, the comprehension of their meaning, and the projection of their status in the near future; or more simply, knowing what is going on around you and being able to predict what could will happen.
Stakeholder	Any person involved with, or affected by the flying operations to be performed.
Standard operating procedure	Any procedure included in the operator's operations manual. procedure
Stress(ors)	Disturbing physiological or psychological influences on human performance that may impact adversely on the safe conduct of a flight or situation.
Summative assessment	A summative evaluation is conducted at the end of a course of training and determines if the instructional objectives (competency standards) have been achieved.
Technical skills	The manipulative and knowledge skills a pilot employs when operating an aircraft.
Threat	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
Threat and Error management	The process of detecting and responding to threats and errors to ensure that the ensuing outcome is inconsequential, i.e. the outcome is not an error, further error or undesired state.
Undesired aircraft state	Pilot-induced aircraft position or speed deviations, misapplication of flight controls, or incorrect systems configuration associated with a reduced margin of safety.
Violation	Intentional deviation from rules, regulations, operating procedures or standards.

1.3 References

Regulations

Regulations are available on the Civil Aviation Authority of the Philippines website https://www.caap.gov.ph/

Term	Definition
Part 02	Flight crew licensing
Part 03	Approved Training Organizations (ATO)
Part 03 and 08	ATO, Multi-crew pilot flight training, and recurrent training

General References

Federal Aviation Administration (FAA) Advisory Circular 90-48D: Pilots' Role in Collision Avoidance,
Federal Aviation Administration (USA), 19 April 2016.

Procedures and Air Navigation Services-Training. International Civil Aviation Organization PANS-OPS), Document 9868-2006

Civil Aviation Safety Authority (CASA) Advisory Circular 61-08: Teaching and assessing non-technical skills for single-pilot operations, August 2022.

SECTION 2 Introduction

Effective threat and error management (TEM) is reliant on the application of good human factors (HF) knowledge. Worldwide statistics indicate that about 75% of aircraft accidents are caused by HF deficiencies. These deficiencies may involve a variety of factors, including:

- poor lookout
- poor situation awareness
- poor decision-making
- lack of task organization
- insufficient communication
- failure to recognize threats to safety
- commission of errors.

The International Civil Aviation Organization (ICAO) has acknowledged the need for guidance related to the teaching and assessment of HF and TEM, and recommends that these subjects should be introduced into all pilot training.

2.1 Link between human factors and airmanship

2.1.1 Human factors is concerned with 'optimizing safe flight operations by enhancing the relationships between people, activities and equipment'. This means achieving the safest outcome for flight operations through the most effective use of people, and the procedures and equipment they use in the aviation environment.

2.1.2 Traditionally, such skills as the consistent use of good judgement and flight discipline, as well as a high state of situation awareness, have been associated with airmanship—knowledge was gained through experience and a process of 'infusion'. Experience has shown that airmanship was difficult to measure accurately because identifiable performance criteria were not available. Linking airmanship to HF and non-technical skills (NTS) is, in effect, bringing science to the often-nebulous concept of airmanship. By linking airmanship to the performance criteria in the NTS competencies and HF competencies, it is possible to more accurately evaluate a person's competency.

2.1.3 For example, it is deemed good airmanship for a pilot on a navigation exercise to continually identify potential forced landing areas along the route. But how can this be objectively measured? If an assessor observed the pilot maintaining an adequate lookout, identifying potential forced landing areas along the route, demonstrating that they are maintaining situation awareness by keeping track of, for example, surface wind direction and velocity, visibility, aircraft performance, and applying this information for realistic contingency planning that then underpinned effective decision-making in a simulated engine failure, then the assessor could assess the pilot on their competency in these observable skills.

2.1.4 The purpose of linking HF and NTS to airmanship is not to diminish the importance of airmanship, but to make the measurement of it valid and reliable.

2.2 Competency-based training

2.2.1 In a competency-based training system, a person must be assessed by weighing evidence of their competence against published standards. The evidence must be valid, authentic, sufficient and current. However, before a person can be assessed, they must be trained. Therefore, it is essential that flight training organizations develop techniques and material for teaching HF and NTS, and ensure that their assessors have methods and tools to assess competency during flight tests.

2.2.2 Instructors must recognize and appreciate the importance of HF knowledge and NTS and make them an integral part of training; and assessors must be prepared to incorporate HF principles into flight tests. This requires diligence in the preparation of training plans by instructors and assessment plans by flight examiners.

2.2.3 The requirement for NTS training and assessment is addressed through elements and performance criteria in:

- NTS1.1 – Maintain effective lookout (Chapter 4 of this AC)
- NTS1.2 – Maintain situation awareness (Chapter 5 of this AC)
- NTS1.3 – Assess situations and make decisions (Chapter 6 of this AC)
- NTS1.4 – Set priorities and manage tasks (Chapter 7 of this AC)
- NTS1.5 – Maintain effective communications and interpersonal relationships (Chapter 8 of this AC)

2.2.4 A pilot would be expected to demonstrate knowledge of human performance limitations in these units, including physiological, psychological and ergonomic aspects. For example, some knowledge aspects that underpin the application of NTS include:

- Fatigue
- Illusion
- Drug and alcohol management
- General health
- Knowledge of the functions of the eyes and ears

2.3 Assessment

2.3.1 Assessment is the process of weighing evidence of an individual's performance against established standards of:

- **Validity:** it must cover all the performance criteria for the skills and knowledge of the standard being assessed
- **Authenticity:** it must be the individual's own work
- **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 and meets the current standard.

2.3.2 An assessment against 'all dimensions of competency' means that the assessment is not narrowly based on a task, but embraces all aspects of performance and represents an integrated and holistic approach to the assessment. The assessment process must take into account the following:

- Task skills
- Management and contingency skills
- Role skills
- Transfer skills.

For example, instead of just assessing a 30° banked turn against the specified standard, it may be more realistic to observe the candidate performing the maneuver during a precautionary search (a contingency) where the turn is used to position the aircraft to observe and assess the landing surface (a role).

2.3.3 By assessing all dimensions of competency, the skill is being applied to a new circumstance (transfer of skill), while managing a somewhat complex undertaking. This approach combines knowledge, understanding, problem solving, technical skills and application into the assessment.

2.3.4 Assessment tools are used by an assessor to gather evidence that a person is competent. Examples of assessment tools include:

- CAAP flight test forms
- Pilot's logbooks
- Examination results
- Training and achievement records
- Instructions for assessors and candidates
- Evidence and observation checklists
- Specific questions or activities
- Simulation and scenarios.

2.3.5 These tools (and their application) must be:

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

2.3.6 Single-pilot HF and TEM are arguably a pilot's most important skills. By applying them judiciously it is more than likely that a pilot will have a long and safe flying career. Accordingly, assessors must adopt the concept of assessing these competencies and prepare themselves by learning a structured and evidence-based approach to assessment.

SECTION 3 Information processing

3.1 Introduction

3.1.1 Pilots are required to continuously process information during flight operations. This processing occurs during all phases of flight from the moment planning begins until the pilot signs the maintenance release or flight technical log after a flight. It is necessary for instructors to apply the principles of information processing to assist trainees with lookout, situation awareness, decision-making, task management and communications.

3.1.2 Stimuli are collected by the body—eyes (sight), ears (hearing), nose (smell), taste buds (taste), skin and muscles (feel), and the vestibular and somatosensory systems (balance and proprioception)—and the information is passed to the brain. The information is analyzed and interpreted (perception) and stored in the sensory memory for a short time (one to five seconds) until it is replaced by new information.
This sensory memory forms the basis of perception—failure to receive information or analyze it appropriately may result in poor situation awareness.

3.1.3 Some factors that may impair accurate perception are:

- **Lack of experience**: likelihood of not recognizing a stimulus
- **Stress**: may lead to single task fixation
- **Anomalous perception**: illusions, false signals from other people or proprioceptive sense
- **Lack of knowledge**: can lead to a false premise.

3.1.4 After stimuli have been perceived and the person has interpreted and comprehended its meaning and developed options to respond, they are in a position to make a decision. The decision-making process involves memory to recall stored information that is applicable to the situation. The working (or short-term memory) holds 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' and can only deal with one decision at a time. Therefore, if the decisions are not prioritized correctly (the most critical decision first), the outcome could be unfavorable.

3.1.5 Instructors must be aware of the many limitations that affect information processing and decision-making so as to assist in the development of a trainee's skills in these disciplines. Some of the limitations are:

- Time constraints
- Mental overload
- Task mismanagement
- Conflicting information
- Expectations and anticipation
- Fatigue
- Insufficient knowledge
- Forgetting requirements or information
- Emotional state
- Confirmation bias (ignoring information that does not support the decision)

- Personality traits
- Failure to seek or apply feedback
- Stress
- Fixation or destination obsession

SECTION 4 Maintain effective lookout

4.1 Introduction

4.1.1 Effective lookout means seeing what is 'out there' and assessing the information that is received before making an appropriate decision.

4.1.2 Vision is the primary source of information for a pilot. The aircraft attitude, position, physical hazards and other traffic seen by the pilot are processed by the brain and used to build up situation awareness. Therefore, it is important for an instructor to effectively train a pilot how to best use vision to maintain safety.

4.1.3 In this context, lookout must not be thought of as just 'scanning the skies' to locate other traffic; it also involves looking at the internal and external environment of the aircraft. Inside an aircraft, vision is used to interpret flight instruments, flight controls and aircraft systems. Externally, vision is used to observe and interpret weather, terrain, aircraft attitude and position.

4.2 Teaching effective lookout

4.2.1 Instructors should guide trainees through the multitude of factors that can adversely affect vision and lookout, such as:

- The amount of ambient light
- Window posts
- Cleanliness and crazing of windscreens
- Other physiological and psychological concerns.

4.2.2 Workload mismanagement during busy periods can lead to excessive 'head in the cockpit' with less time spent looking outside the aircraft. Instructors should warn trainees about such situations during theoretical training and highlight such incidents when they occur during flight training.

During flight, training instructors should stress the importance of ensuring the windscreen and eyewear are clean and free of crazing. Trainees should be taught to move their head to see beyond window posts and any other obstructions e.g. pilots or passengers in the adjacent seat.

4.2.3 To maintain an effective lookout, the pilot should be taught to:

- Understand that collision threats are external to the aircraft
- Take time to look outside the aircraft
- Recognize that threats will probably appear in the peripheral vision and search the available visual field with emphasis on 60° left/right of center and 20° above/below the horizon
- shift vision 10°–15° at a time, pausing between each movement

- focus directly on a threat and, if it appears static in the windscreen, identify it as a collision risk and decide on effective evasive action
- maneuver the aircraft to mitigate the risk of collision.

4.2.4 Pilots must realize that maintaining an effective lookout takes time and that HF deficiencies can reduce the chance of a threat being detected and avoided. The factors affecting lookout are not errors or poor airmanship, but are limitations of the human visual and information processing systems, which are present to various degrees in all humans. Nonetheless, effective training can improve the effectiveness of a pilot's lookout technique.

Looking for traffic

4.2.5 A great deal of a pilot's time must be spent looking for and sighting air traffic in order to avoid possible conflict. By employing an effective scanning technique and understanding how to enhance visual detection of other traffic, a pilot is more likely to reduce the likelihood of collision. The instructor should teach the pilot an effective scanning technique that provides the maximum opportunity to see traffic.

4.2.6 Size and contrast are the two primary factors that determine the likelihood of detecting other aircraft. Size is the more important parameter and as general aviation aircraft are usually small, the problem of detecting aircraft is exacerbated.

4.2.7 The FAA (*AC 90-48C*) details a scanning technique that involves moving the eyes in sectors of 10° at a speed of one second per sector. Using this approach, scanning a 180° horizontal / 30° vertical sector would take a minimum of 54 seconds. United States military research has found that it takes a pilot 12.5 seconds to avoid a collision after target detection. Therefore, it can be deduced that considerable time gaps exist where traffic may not be detected during a normal scan period. Also, such a structured and disciplined scanning technique may be difficult to achieve. Pilots must develop an effective scan that provides maximum opportunity to see traffic.

4.2.8 Passengers may also be used to help improve lookout. Trainees should be taught to ask their passengers to advise them if they sight anything that may be a threat or could compromise safety.

4.2.9 An instructor must provide and demonstrate an acceptable lookout technique, and ensure that trainees practice and apply the technique and, most importantly, **see all other traffic that is a threat to flight safety**. For example, an 'airspace cleared' procedure (or equivalent expression) should be used at all times when an aircraft maneuvers in flight under the visual flight rules (VFR).

4.2.10 Instructors must ensure that this or a similar practice is always used before turning an aircraft. Instructors must religiously employ the procedure themselves and then monitor trainees to confirm that they are not only looking for, but also seeing, any traffic or other hazards that may compromise flight safety.

Alerted search

4.2.11 An alerted search involves visual scanning when air traffic information has been provided and a pilot is, in effect, told where to look. The likelihood of detecting other traffic is eight times greater under these circumstances than during an un-alerted scan.

4.2.12 Alerted search information may be provided by air traffic services (ATS) or other pilots. Other technologies that provide similar information include:

- transponders
- automatic dependent surveillance broadcast (ADS-B)
- radar (both airborne and ground installations)
- traffic collision alerting devices (TCAS)
- traffic alert and collision avoidance systems (TCAS).

4.2.13 Technology such as radar altimeters and enhanced ground proximity warning systems (EGPWS)/terrain awareness and warning systems (TAWS) can also enhance situation awareness and alerted awareness of hazardous terrain.

4.2.14 Instructors must demonstrate the benefits of alerted searching—listening to and interpreting radio transmissions in the circuit area provides an ideal opportunity for an instructor to teach these aspects to a trainee. Pilots should be instructed on the benefits of using autopilot to permit greater visual scanning.

Seeing and interpreting

4.2.16 Throughout training, instructors must teach and then assess a trainee's ability to observe what is happening around them and to apply that knowledge to ensure safety.

4.2.17 Not only is seeing important, but accurately interpreting what is seen is equally vital. Instructors may assume that a trainee interprets what they see in the same way as the instructor, but this may not always be the case. Instructors should spend time explaining the logic of their interpretation.

For example, on a navigation flight, instructors should ensure that trainees choose potential forced landing areas along a route. The trainee must be shown how to select suitable areas, ensure adequate length and surface conditions and be guided about how to avoid unsuitable terrain. Then on future trips, the trainee should be questioned to see if they are correctly interpreting and applying the information.

4.2.18 Other factors that the instructor should consider teaching the trainee are to see and interpret:

- aircraft attitude
- indications of adverse weather
- wind strength and direction from clouds, blowing dust, smoke, trees and wind lanes in water
- terrain and wind effects
- other air traffic
- reduced visibility
- smoke, shadows and dust
- any other visual cues that contribute to better situation awareness.

4.3 Assessing effective lookout

4.3.1 Instructors and flight examiners have the task of assessing the ability of trainees to maintain an effective lookout. Their roles are slightly different:

- an instructor is required to conduct formative assessments during training to determine how well a trainee is learning
- the flight examiners must conduct a summative assessment at the conclusion of training to determine if the trainee is competent to be granted a license, rating or endorsement.

4.3.2 Lookout is a critical facet of safe flight operations, and assessment of this skill will be ongoing throughout a pilot's flying career. Therefore, it is important for the assessor to 'get it right'.

4.3.3 The assessor should be looking for competency in two main elements of effective lookout—the first is to see an object[6] and the second is to react appropriately to what has been seen. In reacting appropriately, the pilot should be able to determine if the object is a threat and take mitigating action (more commonly known as 'avoiding').

4.3.4 The three performance criteria relevant to demonstrating 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 interprets transmissions to determine traffic location and intentions
- performs an 'airspace cleared' procedure before commencing any maneuvers.

4.3.5 The assessor should ensure that the trainee covers the field of view from the cockpit, and varies the scan rate to accommodate the threats.

Congested airspace

4.3.6 Airspace congestion is usually encountered during busy stages of a flight, such as departure and approach. These high workload periods often focus a trainee's attention inside the cockpit.

4.3.7 The pilot should pay extra attention to other traffic when operating in congested airspace. Assessors should watch the trainee during these phases of flight to ensure that tasks are prioritized and managed to ensure a good lookout is maintained.

This can be achieved by monitoring head and eye movement when possible, and questioning the trainee about what they see. Ask the trainee to verbalize their lookout.

4.3.8 Additionally, the assessor must monitor the trainee for an appropriate reaction to any traffic information received by radio transmissions, TCAD or TCAS.

Questions such as "where do you think other traffic will be coming from?" will assist in making this determination.

Hazardous terrain

4.3.9 When operating close to, or in, hazardous terrain (e.g. mountains and valleys), or during periods of reduced visibility, greater effort must be directed outside the aircraft. Assessors should monitor the trainee's performance and assess any decisions they make to reduce the chances of collision with terrain or other aircraft.

4.3.10 Questioning should be used to determine if the trainee is aware of the current threats and whether a plan has been made to address them. The assessor should ask the trainee what they are seeing and whether they have recognized the possible associated hazards. These assessments must occur throughout the flight, regardless of workload.

Clearing procedure

4.3.11 Pilots must always clear the airspace around them before maneuvering the aircraft. This 'clearing procedure' must be used to locate other aircraft as well as any terrain, weather or other hazards that may compromise safety.

4.3.12 Assessors should observe whether the trainee always uses an acceptable procedure and whether threats are seen and identified.

4.3.13 Given the physiological limitations of 'see and avoid', it may be appropriate to supplement continued lookout with other actions (e.g. establish vertical separation). To achieve this, assessors must closely monitor the airspace and maintain a good lookout so that they can identify any threats that are missed by the trainee.

4.3.14 Pilots of slow-flying aircraft must also demonstrate awareness of the possibility of undetected faster aircraft approaching from the rear quarter and how that poses a constant risk to flight safety.

Limitations of vision

4.3.15 Assessors should ensure that trainees are aware of, and take into account, the limitations of vision.[7] These limitations include aspects such as blind spots, threshold of acuity, accommodation (focusing on an object), empty field myopia, focal traps, night vision acclimatization, visual field narrowing and cockpit workload. Notwithstanding the trainee's awareness of vision limitations, the assessor should determine that the pilot sights threats to safety and takes appropriate mitigating action.

SECTION 5 Maintain situation awareness

5.1 Introduction

5.1.1 Historically, situation awareness has usually been referred to after an event, as in 'the aircraft crashed because the pilot lost situation awareness'. Situation awareness is sometimes seen as a cause rather than a set of behaviors that enhance safety.

5.1.2 As it applies to aviation, situation awareness is defined as "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"

5.2 Teaching situation awareness

5.2.1 In the normal course of flight training, trainees are shown how to monitor flight instruments, aircraft systems, aircraft attitude and performance, along with location and the environment. Instructors need to explain how this information is applied by the pilot to develop accurate situation awareness.

5.2.2 Trainees must be taught to monitor, gather and interpret appropriate information from both inside and outside the aircraft. This continual monitoring helps the pilot to develop an accurate perception (mental model) of what is happening and what is likely to happen in the near future, which is the basis of situation awareness.

5.2.3 Instructors should explain to trainees the importance of maintaining a good radio listening watch and, during initial training, explain how correct interpretation of radio-telephony transmissions will enable the trainee to anticipate other traffic and likely air traffic instructions.

5.2.4 During training, instructors must include situation awareness as part of every flight. This could be achieved by stressing the importance of continually monitoring the total environment and updating options as situations change. Trainees must be encouraged to verbalize their observations so that the instructor is also informed and able to make assessments.

5.2.5 The instructor may need to plan how they will conduct situation awareness instruction and possibly create scenarios to enable the learning to occur; however, it is likely that during the normal course of a flight, situations will evolve that present trainees with the opportunity to apply and demonstrate their situation awareness.

5.2.6 As training progresses, the instructor must observe the trainee's performance and, if necessary, develop scenarios to improve, challenge and assess situation awareness.

5.2.7 A more formal process to ensure situation awareness becomes a core part of the training plan may be to include the aim of lesson(s) to primarily focus on the nontechnical skills required to achieve situation awareness. This can only be performed once the trainee has demonstrated competence to manage aircraft systems and to handle the aircraft to the acceptable

standard so that they have sufficient additional capacity to take on further responsibilities and a higher workload.

Timing of situation awareness

5.2.8 Although situation awareness is an ongoing process, it is also bound by time and space. Instructors need to highlight to trainees that there is no value in gaining situation awareness after the event. Timely information gathering and interpretation is essential to establishing and maintaining accurate situation awareness.

For example, if a pilot is in the circuit pattern and does not realize that the aircraft ahead is slower, it is likely that safe aircraft separation will be compromised. If the pilot's situation awareness (information gathering and interpretation) lags the aircraft's position and performance, the consequences could range from simply embarrassing to catastrophic.

Re-establishing situation awareness

5.2.9 Although the NTS1.2 element of competency is titled 'Maintain situation awareness', instructors must also teach trainees how to re-establish situation awareness whenever it is lost or degraded. If a trainee is distracted from the task of navigation and becomes uncertain of their position, they must know how to regain situation awareness.

5.2.10 This process may involve gathering information, reviewing the aircraft heading and airspeed, and using this information to find a dead (also deduced) reckoning position and then fix the aircraft's position. This procedure is part of navigation training, but it is also a practical demonstration of re-establishing situation awareness. Instructors must monitor a trainee's situation awareness. If they establish that it is not adequate, they must alert the trainee to the fact and give advice on how to re-establish sufficient situation awareness.

5.2.11 It is the instructor's responsibility to maximize a trainee's ability to recognize the indications that they have lost situation awareness and no longer have an accurate awareness of the current situation and environmental circumstances.

Examples of degraded situation awareness include:

- if a trainee (or instructor) becomes aware that they require air traffic control (ATC) to read back clearances more often than normal, or they are starting to miss radio calls altogether
- degraded work cycles leading to fixation or tunnel vision where the trainee spends too much time on one part of a work cycle (e.g. extended focus on a checklist item to the detriment of radio calls and lookout).

An example of re-establishing degraded situation awareness is when a trainee makes a late turn onto base leg after realizing that the aircraft ahead is slow and that delaying the base turn would mitigate the potential conflict.

5.2.12 It is also the instructor's role to maximize the trainee's ability to recover from lost or degraded situation awareness.

For example, during the pre-flight brief the instructor could brief the trainee that one of the lesson's aims is for the trainee to start to recognize lost situation awareness.

One means to teach this is to expose the trainee to a higher workload—initially within the training area—to prompt the loss of situation awareness. As the trainee starts to display signs of degraded performance, the instructor should alert the trainee by referring to the indicators of degraded performance. This can be achieved by questioning the trainee about what they are experiencing to elucidate an understanding of what is different about their

5.2.13 **CAUTION:** Instructors must give careful consideration to how, when and where they conduct such activities as there is the possibility that workload will be excessively increased for both trainee and instructor. It would not be appropriate to artificially increase workload at any time there is a real time moderate-to-high workload, as the trainee could be exposed to increased error(s) and unnecessary risk.

5.3 Assessing situation Awareness

5.3.1 The most important aspect of assessing situation awareness is to confirm that the pilot's mental model (or perception) of the environment is accurate. The next step is to find out what options the pilot has identified and assess whether they are realistic. In other words, the assessor must see if the 'what ifs' complement the mental model and provide a basis for an accurate and timely decision (if one is required).

5.3.2 Depending on the pilot's perception and options, there may be no need to proceed to the next step of making a decision, as situation awareness is a dynamic process— further action only needs to be taken if a perceived situation compromises flight safety.

For example, if there are thunderstorms in the area but they do not conflict with the intended track and the effects of the storm will not affect the flight, no decision or action would be needed.

However, it would indicate a lack of situation awareness if the pilot did not consider the storms and the associated hazards in their planning.

Objective and responsive assessment

5.3.3 Observation and questioning are the primary means used by an assessor to make a formative assessment of situation awareness. Questions such as "what do you think could happen if...?" or "what would you do if...?" can be used to assess a trainee's situation awareness.

5.3.4 If the assessor determines that a trainee's situation awareness is deficient, they should provide guidance on how to improve situation awareness.

5.3.5 Assessment must be conducted throughout a pilot's training. The assessor should use the results to modify the training plan as appropriate.

5.3.6 Assessors may gain an intuitive feeling that a trainee's situation awareness does not meet the required competency standard; however, feelings cannot be used as a basis for an adverse assessment. Evidence must be obtained to support such an assessment—if a trainee's situation awareness 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.

5.3.7 As an aid to diagnosis, the limits of a trainee's situation awareness can be explored through the creation of different scenarios.

Assumed level of knowledge

5.3.8 As situation awareness can be adversely affected by a lack of knowledge, assessors must observe the pilot applying appropriate knowledge for any given situation.

For example:

- unfamiliarity with air traffic separation rules could result in unsatisfactory descent planning when opposing traffic is present
- deficiencies in aircraft systems knowledge (e.g. fuel system mismanagement) could lead to unsatisfactory outcomes.

5.3.9 If a pilot's lack of knowledge contributes to poor situation awareness, the assessor should record the problem and provide appropriate feedback to the trainee. In some cases, lack of adequate knowledge (and its potential effect on situation awareness) may be enough reason for an assessor to deem that a trainee has not achieved competency in non-technical skills.

High workload

5.3.10 During periods of high workload it is possible that information may be overlooked. Assessors must determine if situation awareness is being maintained, regardless of workload.

For example, if the trainee is busy during an approach into a very active terminal area, radio transmissions may be missed or instructions forgotten. A possible cause for this reduced situation awareness is failure to recall the information received (i.e. short-term memory breakdown causing faulty perception), which can lead to failure to take appropriate action.

Low workload

5.3.11 Assessors must also monitor the trainee during periods of low arousal or workload (inactivity) to ensure that an appropriate level of situation awareness is maintained. During a long navigation leg that is proceeding according to plan, a trainee may relax and stop thinking about what is happening and what could happen.

It would be appropriate to confirm that situation awareness is being maintained by the use of questions such as:

- "where would you divert to now if a passenger became seriously ill?"
- "if you suffered an engine failure where would you land?"
- "what is our endurance now?"

Specific scenarios

5.3.12 In the normal course of a flight test, it is likely that many opportunities to assess situation awareness will occur. Despite this, if an assessor wants to investigate a specific situation, they may need to develop a scenario to test the trainee's situation awareness. This may require the assessor and pilot to use imagination and practice good communications skills.

For example, if the assessor wants to explore the trainee's ability to maintain situation awareness under a high workload, they could create an artificial workload interspersed with distractions. Such a scenario may require some time and thought but, once developed, the scenario could be refined, adapted and used for other flight tests.

SECTION 6 Assess situations and make decisions

6.1 Introduction

6.1.1 Although the NTS1.3 unit is titled 'Assess situations and make decisions', the primary area of interest is the decision-making process. By applying situation awareness, a pilot may arrive at a number of options of 'what could happen' and the next step is to make a decision that leads to actions that achieve the optimum outcome.

6.1.2 In daily life people are always making decisions—usually sub-consciously. However, in the aviation environment, incorrect or inappropriate decisions can have tragic consequences. Therefore, it is important for pilots to understand and be able to apply the decision-making process, and to be aware of the need to make timely and optimum decisions.

6.2 Teaching situation awareness

6.2.1 Trainees must be given the opportunity to make decisions. The trainee should be encouraged to refer to information sources (such as meteorological reports, notices to airmen (NOTAMs), radio transmissions and visual observations) as the basis for decision-making.

6.2.2 It is quite normal for an instructor to make decisions during flight, but it may be of more benefit to ask the trainee for their opinions. This will help the assessor to monitor progress and target the flight training.

For example, if the weather is marginal before a flight, rather than cancelling the sortie, the instructor should ask the trainee (who probably is very eager to fly) whether or not it would be prudent to undertake the flight.

6.2.3 During flight training there will be opportunities to observe, assess and improve a trainee's decision-making. Instructors must be conscious of the times when a trainee is required to make a decision. They must then determine if the trainee has made an acceptable decision in the time available.

6.2.4 If a trainee makes a defective decision, the assessor should:

- point out any faults
- explain the reasoning that was used to reach such a determination
- explain how considerations and logic should be applied to reach an acceptable decision.

Although this may seem to be a laborious procedure, it is an improvement on the traditional method of simply revealing to a person that they made a wrong judgment and telling them what they should have done, without analyzing why the mistake was made and offering guidance to help them improve their decision-making skills.

6.2.5 When teaching decision-making, instructors must remember that individuals have different emotional attitudes, learning rates, thought processes, analytical skills, aspirations and cultural backgrounds that may influence how this skill is taught. Therefore, instructors must be flexible, imaginative and innovative in developing ways of passing on decision-making skills to pilots.

Timeliness of decision-making

6.2.6 The primary goal of teaching decision-making skills is for pilots to be able to make correct or correctable decisions in a timely manner.

For example:

- a mishandled landing may require a quick decision to go around to prevent damage to the aircraft
- the decision to divert because of adverse weather or fuel shortage on a navigation flight may have a 'deadline' for when a decision needs to be made.

6.2.7 The timeframe for making decisions may vary, but the information process will be the same. That is:

- receive information
- convert information into reality
- generate options
- analyze options
- make a decision.

6.2.8 In the second example provided above, the situation is dynamic, variable, emotive and subject to bias. Such aspects of decision-making make the process more difficult and susceptible to errors, the result of which could be an incorrect or 'non-decision'.

6.2.9 To give a trainee practice at this type of complex decision-making, instructors may have to develop scenarios for different stages of flight training.

For example, the instructor may develop a scenario for a simulated engine failure or partial power loss in a single-engine aircraft:

- The decision-making related to a simulated engine failure is a relatively clear outcome that requires well-rehearsed decisions, checklists and actions to set up a forced landing.
- The decision-making for a partial power loss is more subjective, potentially offering more time and providing the trainee with more options.

The latter scenario provides a richer training environment for decision-making as it offers the trainee a number of options, and opportunities for unrehearsed decision-making, both of which can be discussed in the debrief (e.g. why the trainee chose a specific course of action and what were their considerations for reaching this conclusion).

Automatic decision-making

6.2.10 With increased experience and exposure to known operating conditions and a specific aircraft type, the familiarity with various situations increases and the pilot's information processing will become more automated—this is the natural outcome of a positive transfer of learning.

6.2.11 This familiarity also translates to an environment in which decision-making may not be fully tested in the latter stages of training as the local operating conditions are so well known and rehearsed that the trainee continues to have spare capacity to deal with any simulated scenarios the instructor may wish to impose, many of which have been previously experienced.

6.2.12 Higher cognitive demands are potentially created any time a trainee experiences something new or unknown. Instructors should ensure that they consider trainee familiarity with existing situations and look for opportunities to expose the trainee to new situations, in order to assess their ability to manage the flight, maintain situation awareness and make sound decisions.

For example, if the trainee has conducted a large part of their training under conditions of clear weather, the first flight in which they are required to deal with marginal weather—even with considerable training experience in the same area and aircraft—could impose significantly increased workload with the potential for degraded performance and higher cognitive demands when making decisions.

6.3 Assessing decision-making

6.3.1 Normal flight training provides ample opportunities for instructors to conduct formative assessments of decision-making skills; however, it may be necessary to create scenarios to analyze a trainee's ability to manage complex decision-making.

6.3.2 Complex decision-making may be more difficult for a flight examiner to assess on a flight test because of the limited timeframe and reduced opportunity. Nevertheless, a pilot's competence to make complex decisions must be assessed on a flight crew licensing flight test.

Decision-making process

6.3.3 The ongoing process of acquiring situation awareness, if working correctly, will provide the pilot with a perspective from which to derive any number of options and ultimately determine the best action to follow. The pilot must recognize that a decision has to be made. Problems must be identified and the assessor will use observation and questioning to determine the facts.

6.3.4 The pilot must analyze problems and propose solutions (options). This will require the pilot to gather and process information. The pilot's actions must be observable, but some questioning may be required to obtain an accurate assessment.

6.3.5 On the basis of the options identified and evaluated, the pilot must make a decision. Assessors must ensure the decision is the optimal one and is implemented effectively in the time available.

6.3.6 The pilot then must monitor progress against their plan and re-evaluate as circumstances change, even if it is to confirm the desired outcome.

For an obvious decision such as a 'go around' after a mishandled landing, the action and results will be very evident. In such a case, the assessor should ensure that the pilot recognized the mishandled landing soon enough and did not delay the recovery action.

More complicated decisions may require greater analysis by both the pilot and the assessors. A complex problem may require a decision that does not lead to the optimum result immediately, but could be modified at a later time.

6.3.7 It is acceptable for the pilot 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. This situation could occur where a decision is made during flight planning, which may have to be modified after the pilot becomes airborne
(e.g. operational requirements, insufficient information available or changed weather conditions).

Management of factors affecting information processing

6.3.8 An assessor must observe a pilot's ability to manage factors that can adversely affect information processing and decision-making. An example would be a pilot who is prepared to press on in bad weather or other adverse circumstances, in an attempt to reach a destination.

6.3.9 Flight examiners and instructors should consider developing scenarios where bad weather, operational requirements or fuel shortage would make it impossible to safely proceed to the destination. In such a case the trainee would be obliged to make a decision not to proceed; and to take appropriate action that ensures safe flight.

6.3.10 While it is a challenge to assess a pilot's decision-making competence on a flight test, if the examiner prepares for the test by creating complex scenarios, the task of evaluating a pilot's decision-making competency will be achievable.

SECTION 7 Set priorities and manage tasks

7.1 Introduction

7.1.1 Task management means completing a job or operation competently in the time available. If the workload is high and many tasks have to be completed, they must be prioritized in a logical and efficient sequence.

7.1.2 The adage *aviate, navigate, communicate* forms a sound basis for prioritization and task management. Many people are able to process information in a well-organized and logical manner, but some are not able to operate efficiently in a confined and, at times, demanding and busy environment without additional guidance and direction.

7.2 Teaching how to set priorities and manage tasks

7.2.1 The brain is a single-channel (linear) processor—humans can normally only manage one activity at a time. Instruction to ensure competent task management must begin at the commencement of a pilot's flight training. Many things that experienced pilots take for granted must be pointed out and explained to the novice as proficiency in 'simple' tasks will allow for more efficient workload management.

For example:

- When a pilot is first introduced to the cockpit, they must be shown how to adjust their harness and seat, and reach and touch controls and switches.
- If rudder pedals are not correctly adjusted, a pilot could have trouble using the brakes effectively, which could make taxiing and aircraft control on the ground more difficult and could potentially divert a pilot's attention from other tasks.

Prioritization

7.2.2 During flight training, trainees must be encouraged to prioritize tasks to ensure that the important and safety-critical actions are dealt with first. The requirement to *aviate*—to maintain control of the aircraft—must be the pilot's first concern.

7.2.3 Correct prioritization requires that timely correction of an undesired aircraft state takes precedence over concentrating on why an error may have occurred. Instructors must alert trainees to instances of incorrect prioritization and offer a more appropriate solution.

Questions such as "is there anything else we should or could be doing now?" or "what is more important?" may prompt a pilot to prioritize correctly.

7.2.4 Instructors must stress the importance of good organization in the cockpit—this is particularly applicable to the requirement to *navigate*. Judicious selection and storage of charts, flight plans, computers, publications and writing implements should streamline navigation tasks.

7.2.5 When dealing with a major system malfunction at the same time as ATS is requesting information, the choice is simple: deal with the malfunction first. Unfortunately, there is a tendency—especially for inexperienced pilots—to prioritize ATS communications over dealing with the malfunction, as if it were a response to 'authority'. Irrespective of whether a minor or major problem arises, the pilot must be taught that their first priority is survival, which requires maintaining control of the aircraft and the situation. During flight training an instructor must develop and use appropriate scenarios to provide valuable and potentially lifesaving guidance.

Workload management

7.2.6 Instructors should explain how rationalizing workloads helps to complete tasks more efficiently, which in turn results in greater safety. The pilot should be taught to recognize factors that may adversely affect their ability to operate efficiently, including:

- **lack of preparation:** confusion, disorganization
- **fatigue:** poor decision making, errors
- **discomfort:** distraction, fatigue
- **stress:** inefficiency, distraction
- **arousal:** increased or decreased work cycles
- **distraction:** diverted attention, lack of concentration
- **non-use of automation:** increased work
- **destination or task obsession:** poor decision making, desire to 'press on'
- **bad health:** decreased physical and psychological performance
- **overload:** fixation, tunnel vision, broken work cycles.

7.3 Assessing prioritization and task management

7.3.1 Assessment of a pilot's competence to set priorities and manage tasks should be made with reference to the non-technical skills standards. The assessment process will require close observation, information gathering and questioning by the assessor, because they will need to determine how a candidate's mind is functioning while managing tasks. By obtaining this information and combining it with other observations, the assessor will be able to judge a pilot's ability to competently set priorities and manage tasks.

7.3.2 An assessor should observe a pilot's work pattern and task completion to evaluate the pilot's competence to set priorities and manage tasks on a flight test. Valid evidence must be obtained to substantiate the assessment.

For example, if a pilot is told by ATS to 'expedite take-off' and does so before completing pre take-off checks, then the assessor could reasonably deem the pilot to be not competent at prioritizing tasks. The pilot would not have met the 'take-off aeroplane' standard and could compromise safety. The correct action would have been for the pilot to advise ATS that they were not ready for take-off.

7.3.3 When assessing task management, the assessor must look for competent completion of a task in the time available. In particular, the assessor should seek confirmation that the pilot can manage multiple tasks (although not an excessive workload) in a logical order. It may be necessary for the assessor to create scenarios to support this evaluation.

7.3.4 Instructors must be aware of factors affecting workload management and look for evidence of such factors impairing the trainee's performance. Once identified, instructors must advise trainees on methods for developing and applying countermeasures or strategies to manage these inhibiters to efficient workload management.

SECTION 8 Maintain effective communications and interpersonal relationships

8.1 Introduction

8.1.1 Communication is a two-way process; it involves the accurate transmission, receipt and interpretation of information. Communication includes using aircraft radio communication systems, as well as direct verbal and non-verbal exchanges.

8.1.2 A major component of interpersonal relationships is effective communication. It involves the pilot being able to get a positive and helpful, rather than negative and obstructive, response from individuals or groups they deal with. This ensures the effective transfer of information that may be crucial to maintaining situation awareness and safety of flight.

8.1.3 The intent of the NTS1.5 competency element is to make sure pilots always foster positive and cooperative relationships with people involved with, or affected by, their flying operations. Affected people may include:

- an instructor
- other pilots
- a refueller
- a maintenance engineer
- an air traffic controller
- a farmer who owns the airfield where the aircraft will land.

This does not mean that instructors must teach manners or 'how to be nice', but they must provide guidance on achieving positive outcomes.

8.2 Teaching effective communications and interpersonal relationships

8.2.1 'Aviation English' is the use of standardized, abbreviated, precise and agreed terminology and phraseology. Pilots are expected to use aviation English and will gain knowledge and experience in its use as their flight training progresses.

8.2.2 There is a tendency for instructors to take the communication process for granted, without considering some of the deeper implications of not communicating clearly, or failing to consciously train novice pilots to communicate effectively. Instructors should be precise with their use of language and take care to not use slang or colloquial speech.

8.2.3 Instructors should make their trainees aware of the consequences of poor communication skills and emphasize the safety issues that can result from miscommunication.

8.2.4 During flight training there will be many opportunities to observe and judge the effectiveness of a trainee's communication skills. Instructors should monitor and develop a pilot's communication skills throughout flight training, pointing out when communications are confusing, ambiguous or out of context. They should suggest ways to modify and improve the communication. Instructors should take extra care when teaching trainees for whom English is not the first language.

For example, saying "raise the nose" may result in a backwards head movement rather than increasing the aircraft's nose attitude/angle of attack.

8.2.5 The instructor should observe the pilot's interaction with others and the results of these activities. If the instructor detects inadequacies, they should advise the trainee and suggest strategies to improve performance. Potential deficiencies in communication style include:

- poor tone or phrasing of communications
- lack of openness
- poor reaction to criticism
- aggressiveness or lack of assertion
- unwillingness to listen
- disrespect to others
- arrogance
- incorrect use of authority.

For example, an aggressive, brusque or demanding tone of voice during a radio transmission could encourage an adverse response from another airspace user, and instructors must identify these issues when they occur. Failure to discuss and rectify this sort of problem could have a negative influence on a pilot's future performance.

As another example, during a multi-leg navigation flight that involves refueling, an instructor could watch the interaction between the trainee and fuel agent. The trainee should aim to complete the operation with minimum delay and safety risk.

Late arrival of either the aircraft or fuel agent may cause inconvenience (and annoyance), and would present an ideal opportunity for the instructor to observe how the trainee manages such a situation. If the operation was completed without any problems, there would be no need to take any remedial action.

However, if the instructor detected problems with the trainee's interaction with the fuel agent,
they should provide guidance to the trainee. When appropriate, the trainee must be guided on any action that could have been handled in a way that avoided conflict or other negative responses.

8.3 Assessing effective communications and interpersonal relationships

8.3.1 The first performance criterion for NTS1.5 is to 'establish and maintain effective and efficient communications and interpersonal relationships with involved stakeholders to ensure the optimum safe outcome of the flight'

8.3.2 The instructor should evaluate the pilot's ability to 'establish communication'; that is, to make the effort to communicate or interact. The instructor should assess the pilot's:

- tone of voice
- ability to use a non-aggressive approach

- willingness to listen
- body language (when applicable)
- assertiveness.

These traits apply both to communications and interpersonal relationships and should be assessed by observing the reaction of the other person(s) involved.

8.3.3 The instructor must use evidence-based assessment. They should look for brevity of language, use of standard phraseology and whether the trainee was able to quickly elicit a positive reaction from the person with whom they were dealing.

Examples of feedback on negative communication include:

- "you did not communicate effectively because the air traffic controller asked you twice to clarify your request"
- "you got into an argument with the engineer when discussing the aircraft's serviceability".

8.3.4 The second performance criterion for NTS1.5 is to 'define and explain objectives to involved stakeholders'

8.3.5 The instructor can assess performance against this criterion by observing a pilot's cockpit communications and interaction with the instructor. A trainee who states their intention and explains how they will achieve the desired objectives could be assessed as communicating and interacting well with the instructor.

8.3.6 Assessment of communication and interpersonal skills should not be limited to the cockpit—instructors must make a holistic assessment of this aspect of a trainee's performance.

8.3.7 The third performance criteria for NTS1.5 is to 'demonstrate required level of assertiveness that ensures the optimum completion of the flight.'

8.3.8 To achieve the required standard of competence, skill and knowledge by the end of flight training, the pilot should have been able to demonstrate sufficient assertiveness to ensure that operational safety was maintained during the completion of a task.

For example, if the pilot of another aircraft reports intentions inbound to an aerodrome that is inappropriate or unsafe, an instructor must expect a competent pilot to negotiate or suggest alternatives. When faced with a more time critical situation there may be a need to change the normal tone of voice and style of the transmission to maximize the priority and gain the attention necessary to deal with the situation. Accepting the status quo could result in an unsafe outcome, which would be unacceptable.