Australian Government
Civil Aviation Safety Authority

ADVISORY CIRCULAR

AC 119-12 v1.0

Human factors principles and non-technical skills training and assessment for air transport operations

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For Flight Operations Regulations commencing on 2 December 2021

> Advisory Circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.
>
> **Advisory Circulars should always be read in conjunction with the relevant regulations.**

Audience

This advisory circular (AC) applies to:

- holders of air operator's certificates (AOCs) that are subject to the conditions of Part 119 of CASR
- flight crew
- air crew
- cabin crew
- operational safety critical personnel.

A reader is not necessarily required to completely read this AC; they may choose to refer to specific sections when developing their own program. Using the example programs described within the appendices will assist an operator to develop their own program.

Purpose

CASA recognises that this AC will apply to operators with widely differing capabilities. This AC provides advice in the form of guidance material (GM) and, where relevant, suggests an acceptable means of compliance (AMC) with Part 119 of the *Civil Aviation Safety Regulations 1998* (CASR) pertaining to the requirement for human factors and non-technical skills (HF and NTS) training programs. The intention is to translate the regulatory requirements into language that is easily understood and, where necessary, expand the information to ensure the intent of the legislation is clear. Any AMC outlined will allow an air operators certificate (AOC) holder to satisfy CASA of the regulatory requirement if they choose to use and follow the AMC material; however, they may also propose alternative means of compliance to the AMC if they so desire. This alternative means will need to be assessed and found acceptable for the purpose by CASA.

For further information

For further information, contact CASA's Flight Standards Branch (telephone 131 757).

> Unless specified otherwise, all subregulations, regulations, divisions, subparts and parts referenced in this AC are references to the *Civil Aviation Safety Regulations 1998 (CASR)*.

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Status

This version of the AC is approved by the Manager, Flight Standards Branch.

Version	Date	Details
v1.0	November 2020	This AC replaces AC SMS-3(1) - Non-technical skills training and assessment for regular public transport operations to AC 119-12 Human factors principles and non-technical skills training and assessment for air transport operations

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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
CASA	Civil Aviation Safety Authority
CASR	*Civil Aviation Safety Regulations 1998*
CRM	Crew Resource Management
FOQA	Flight Operations Quality Assurance
HF	Human Factors
ICAO	International Civil Aviation Organization
LOSA	Line Operations Safety Audit
NTS	Non-Technical Skills
SMS	Safety Management System

1.2 Definitions

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

Term	Definition
Assessment	The process of observing, recording, and interpreting individual knowledge and performance against a required standard.
Air crew member	A crew member for a flight of an aircraft (other than a flight crew member) who carries out a function during the flight relating to the safety of the operation of the aircraft, or the safety of the use of the aircraft.
Behavioural marker	A single non-technical skill or competency within a work environment that contributes to effective or ineffective performance.
Behavioural marker system	An organised set of competency descriptors, collectively representing the domain of non-technical skills required for successful performance in a specified role.
Cabin crew member	A crew member who performs, in the interests of the safety of an aircraft's passengers, duties assigned by the operator or the pilot in command of the aircraft but is not a flight crew member.

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Term	Definition
Cognitive task analysis	An analysis applied to modern work environments such as supervisory control where the work is characterised more by mental tasks such as situation assessment, decision making, and response planning and execution.
Competency	A combination of skills, knowledge and attitudes required to perform a task to the prescribed standard.
Crew resource management (CRM)	A team training and operational philosophy with the objective of ensuring the effective use of all available resources to achieve safe and efficient flight operations.
Facilitator	A person who enables learning in a student-centred environment by guiding participants through discussions, interactions, structured exercises and experiences.
Flight crew member	A crew member who is a pilot or flight engineer assigned to carry out duties essential to the operation of an aircraft during flight time.
Human factors (HF)	The minimisation of human error and its consequences by optimising the relationships within systems between people, activities and equipment.
Learning outcome	A concrete action that a student demonstrates as a result of learning. A learning outcome can be a demonstration of knowledge, a skill, or an attitude. Generally, learning outcomes are assessed at the course and/or program levels.
Line-oriented flight training (LOFT)	Refers to aircrew training which involves a full mission simulation of situations which are representative of line operations, with special emphasis on situations which involve communications, management and leadership.
Line operational safety audit (LOSA)	A behavioural observation data gathering technique, which aims to capture data on the performance of flight crews during normal operations.
Non-technical skills (NTS)	The mental, social, and personal-management abilities that complement the technical skills of workers and contribute to safe and effective performance in complex work systems. They include competencies such as decision-making, workload management, team communication, situation awareness, and stress management.
Operational safety-critical personnel	Refers to: (a) personnel carrying out, or responsible for, safety-related work, including: (i) personnel carrying out roles that have direct contact with the physical operation of aeroplanes, rotorcraft or Part 131 aircraft used in the operator's Australian air transport operations, aerial work operations or balloon transport operations; and (ii) personnel carrying out roles that have operational contact with personnel who operate aeroplanes, rotorcraft or Part 131 aircraft used in those operations; and (iii) personnel described as operational safety-critical personnel in the operator's exposition or operations manual; but (b) does not include personnel who are employed or engaged by the operator (whether by contract or other arrangement) and are engaged in: (i) the provision of continuing airworthiness management services for

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Term	Definition
	aeroplanes, rotorcraft or Part 131 aircraft used in the operator's Australian air transport operations, aerial work operations or balloon transport operations; or (ii) carrying out maintenance on an aeroplane, rotorcraft, Part 131 aircraft or aeronautical product on behalf of an approved maintenance organisation.
Safety culture	An enduring set of beliefs, norms, attitudes, and practices within an organisation concerned with minimising exposure of the workforce and the general public to dangerous or hazardous conditions. In a positive safety culture, a shared concern for, commitment to, and accountability for safety is promoted.
Safety management system (SMS)	A systematic approach to managing safety, including the necessary organisational structures, accountabilities, policies and procedures.
Safety-related work	Any task or role that has the potential to influence the safe conduct of aviation operations, through error identification, error mitigation, and/or responses to emergency situations. Aviation occupations engaged in safety-related work would include flight crew, cabin crew, aircraft and crew dispatchers, load control staff, and planning and management roles, such as safety management and flight operations.
Task analysis	The analysis of how a task is accomplished, including a detailed description of both manual and mental activities, task duration, frequency, allocation, complexity, environmental conditions, necessary clothing and equipment, and any other unique factors involved in or required for one or more people to perform a given task. Information from a task analysis is used for purposes such as personnel selection and training, the design of tools, equipment and automated systems, and the refinement of procedures such as checklists and decision support processes.
Training	The process of bringing a person to an agreed standard of proficiency by practice and instruction.
Training needs analysis	The identification of training needs at employee, departmental, or organisational level, in order for the organisation to perform effectively.

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1.3   References

Regulations

Regulations are available on the Federal Register of Legislation website https://www.legislation.gov.au/

Document	Title
Part 61 of CASR	Flight crew licensing
Part 119 of CASR	Australian air transport operators - certification and management
Part 121	Australian air transport operations - larger aeroplanes
Part 133	Australian air transport operations - rotorcraft
Part 135	Australian air transport operations - smaller aeroplanes
CASR dictionary	

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International Civil Aviation Organization documents

International Civil Aviation Organization (ICAO) documents are available for purchase from http://store1.icao.int/

Document	Title
	Annex 6 Parts I, II & III of ICAO's Standards and Recommended Practices to the Convention on International Civil Aviation
Doc 9859 AN/460	Annex 19 to the Convention on International Civil Aviation "Safety Management"
	Safety Management Manual

Advisory material

CASA's advisory circulars are available at http://www.casa.gov.au/AC

CASA's Civil Aviation Advisory Publications are available at http://www.casa.gov.au/CAAP

Document	Title
AC 119-10	Guide to the preparation of operations manuals and expositions.
AC 119-01	Safety Management Systems for Air Transport Operators
AC 61-08	Teaching and assessing non-technical skills for single-pilot operations
CAAP 5.59a-1	Competency Based Training and Assessment in the Aviation Environment

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2 Introduction

2.1.1 This AC provides guidance for operators when developing an HF and NTS program. It discusses the underlying principles. It further discusses the development of content, implementing a program and evaluating the effectiveness of the operator's program.

2.1.2 This AC has been structured in a similar fashion to the way an organisation may want to structure their HF and NTS training program. The first four sections in this document contain broad information relevant to all HF and NTS programs. Sections four to eight discuss elements of an HF and NTS training program in further detail. Two appendices provide examples of an HF/NTS program of operators of different size and complexity.

2.1.3 For individuals and teams to perform effectively in safety-critical environments, they must be proficient in technical skills (such as manipulation of aircraft controls, arming aircraft doors, marshalling, loading baggage, refuelling), and non-technical skills (NTS), such as communication, decision making, maintaining situation awareness and managing stress.

2.1.4 NTS training is a generic term which encompasses the host of practical human performance awareness, knowledge and skills training programmes that currently exist. In contrast to knowledge-based human factors courses, NTS training uses a contemporary approach to provide personnel with the understanding and skills required to manage all available resources (including themselves) more safely and effectively.

2.1.5 This publication uses the term NTS to denote the mental, social and personal management abilities that contribute to safe and efficient operations. NTS training is one example of applied human factors training.

2.1.6 Although NTS are sometimes referred to as "human factors", using the label "HF" to describe "NTS" can be confusing because "human factors" refers to a field of knowledge that involves optimising the relationship between a human operator and their environment. The broad domain of human factors (or ergonomics) is an applied science that considers physical, cognitive and organisational aspects of human interaction with their environment.

2.1.7 The International Civil Aviation Organization (ICAO) and leading aviation safety organisations have identified "system" related activities as the greatest contributor to improved aviation safety. This includes safety management systems (SMS), human factors (HF) and "data-driven oversight".

2.1.8 Part 119 of CASR requires air transport operators to have a program for training and assessing operational safety-critical personnel in human factors principles and non-technical skills (regulation 119.175 of CASR). This is representative of a systems approach to HF and is reflective of the broader CASRs.

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2.2   HF principles

2.2.1   Training in HF principles provides personnel with knowledge of HF principles and their application in ensuring safe and efficient operations. It includes the three aspects of human interaction with their environment - physical, cognitive and organisational. Training in HF principles also provides an "awareness" level of knowledge for a broad range of human factors topics, establishing a foundation of knowledge for other safety risk management activities, including NTS training.

2.3   NTS

2.3.1   NTS, sometimes referred to as NOTECHS, are the cognitive, social and self-management skills that complement the technical skills of workers and contribute to safe and effective task performance. They are essential for optimising safety and performance during routine work conditions, as well as for managing critical situations or emergencies.

2.3.2   Examples of cognitive skills are situation awareness (attending to changes in the work environment) and decision-making. Social or interpersonal skills include communication, teamwork, and leadership. Skills in self-management (personal adaptation) include the management of stress and fatigue, being able to manage and sustain one's motivational levels and other emotional reactions, as well as having/accessing the resources to prevent performance decline.

2.4   Crew resource management (CRM)

2.4.1   When undertaking HF and NTS training, operators may continue to use other titles and terms such as crew resource management (CRM) or team resource management.

2.4.2   Historically, the most widely used strategy to train non-technical skills in aviation is known as CRM training. Because many safety-related occupations within aviation do not work as "crews", the label "NTS training" was introduced as a more general and inclusive term for this form of training. NTS training and CRM training can be considered synonymous.

3   HF and NTS program considerations

3.1   Scalability and complexity

3.1.1   The aviation industry is characterised by a diverse range of operating environments and activities. An HF and NTS program must be appropriate for the size of the organisation, and the nature and complexity of its operations. For legislation that is "outcome-based", the responsibility and opportunity for delivering a suitable program lies with the operator. Scalability considerations include the:

–   size of the organisation's workforce
–   organisational structure
–   nature and number of interfaces
–   nature and number of locations
–   resources available.

3.1.2   Operators should carry out an analysis of its activities to determine the appropriate level of resources to manage an HF and NTS program. This should include the determination of the organisational structure required to manage the program and would include considerations of who will be responsible for managing and maintaining the program.

3.1.3   While the requirements for an HF and NTS program are the same regardless of the size of the organisation, large sophisticated organisations may need an HF and NTS department with a dedicated team of people. In contrast, at the other end of the scale, a smaller organisation may only need the services of an HF and NTS coordinator on a part time or contractual basis[1].

3.1.4   Provided suitable standards are achieved and maintained, operators may wish to consider the following options in relation to maximising training efficiencies:

–   Using a "mixed" employee group in training to reduce disruption and to encourage the exchange of ideas and concepts between different work groups.
–   Share training resources with other operators.
–   Negotiating the use of a larger operator's training programs and resources or implementing an "off-the-shelf" training product.
–   Conducting modular training over an extended period to minimise employee downtime and disruption to operations (taking into consideration issues of knowledge erosion over time).
–   Utilising an external service provider if internal expertise in training delivery is limited (See Section 3.4 of this AC).

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[1] Also refer to AC 119-10 – Guide to the preparation of operations manuals and expositions.

3.2   Integration with a safety management system

3.2.1   Where applicable, safety management system (SMS) processes should support a risk-based approach to HF and NTS training. An SMS can provide valuable input, though training needs analysis (chapter 5), into shaping HF and NTS training to meet operational needs and improve performance[2].

3.3   Integration with a training and checking system

3.3.1   Wherever practicable, an HF and NTS training program should be integrated into the organisation's existing training and checking system. For example, NTS could be integrated into existing initial and recurrent training requirements. This would be particularly valuable when assessing skills, attitudes and behaviours.

3.3.2   For flight crew this could involve assessing NTS during simulator and/or line proficiency checks. Such integration might involve redevelopment of the existing training program and the training manual, with the advantage that the need for stand-alone HF and NTS training will be reduced.

3.3.3   Part 61 of CASR already requires NTS to be assessed during tests and proficiency checks. Integrating HF and NTS with a training and checking system will foster opportunities of efficiency.

3.4   Using a third-party HF and NTS training provider

3.4.1   An operator may consider using a third-party HF and NTS training provider for some aspects of HF and NTS training or assessment as opposed to conducting the training and assessment itself. The operator and the applicable key personnel remain responsible for the implementation and performance of the HF and NTS training program.

3.4.2   Regardless of who provides the training or assessment, HF and NTS training needs to be applicable to the operator as determined by the training needs analysis (TNA: refer to section 5). External providers should be thoroughly briefed prior to the commencement of training to promote an understanding of the unique aspects of the operational environment and organisational and safety culture of the operator.

3.4.3   External providers should provide evidence that they have relevant knowledge and experience of HF and NTS and training and assessment.

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[2] Also refer to AC 119-01 – Safety Management Systems for Air Transport Operators.

3.5   HF and NTS training for contractors

Where an external provider is used for the provision of HF and NTS training, the operator remains responsible for determining that the contractor training is suitable. It is recommended that operators detail how the contractor assessment will be conducted.

3.6   Steps to develop an HF and NTS program

3.6.1   There are four steps to develop an effective HF and NTS program. These steps, which are explained in section 5 - 8 of this AC, are:

   a.   Identify the training needs.
   b.   Develop the training content.
   c.   Deliver the program requirements.
   d.   Evaluate the program effectiveness.

Figure 1: Steps to develop an HF and NTS program

4 Program governance

4.1 Definition

4.1.1 Governance is the overall framework within an organisation that supports the making of decisions to meet the organisation's goals and objectives. Program governance refers to the rules and procedures that are used to control its delivery and provides the overall framework for making decisions. This decision framework comprises roles and responsibilities, approval processes, work deliverables, and the workflow that ties the overall decision-making steps together.

4.1.2 Program governance also includes the processes that allow a program governance board to maintain control and oversight of the program.

4.2 Program objectives

4.2.1 Objectives are brief, high-level statements of desired achievements. These should be either process or outcome based. They give direction to the organisation and should be consistent with the organisation's safety policy[3].

4.2.2 Operators should define objectives for their HF and NTS training program. The objectives should reflect the strategic achievements or desired outcomes related to safety concerns around HF and NTS specific to the organisation's operational context. They may be integrated into the objectives defined as part of the operator's SMS (refer to section 3.2) or training and checking system (refer to section 3.3). The objectives should also consider any outcomes of previous evaluations of the operator's HF and NTS program.

4.2.3 As an example, some objectives for a HF and NTS program[4] could be:

- to produce measurable evidence of improvement in safety at the organisational level
- to ensure that all identified personnel have undertaken the required HF and NTS training within the required timeframe.

4.3 Responsibilities

4.3.1 Accountabilities, authorities, and responsibilities relating to HF and NTS programs should be defined and documented and all staff, irrespective of level or position, should understand their responsibilities. Organisations with an implemented SMS will have this feature embedded.

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[3] Also refer to *AC 119-01 – Safety Management Systems for Air Transport Operators*
[4] Also, refer to *SMS for Aviation – A Practical Guide: Safety Policy and Objectives* (Booklet 2) available on the page titled 'Safety management system resource kit' on CASA's website.

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4.3.2   The accountable manager[5], irrespective of other duties, will have responsibility for allocating the necessary resources for training and execution of the training.

4.3.3   An HF and NTS program manager/coordinator should be identified and may be identified by various titles. This role does not need to be a unique position, and the responsibilities of the HF and NTS program manager/coordinator may be undertaken as a secondary role by, for example, the head of training and checking or the safety manager.

4.3.4   The HF and NTS program manager/coordinator, irrespective of other duties, will have responsibility for:

- planning and facilitation of the HF and NTS program
- coordinating the promotion of operator requirements through induction and recurrent training
- identifying ongoing HF and NTS training requirements to support the program objectives.

4.3.5   Irrespective of other duties, facilitators, will have responsibility for maintaining their currency in HF and NTS training (refer to section 7.5) and for delivering the HF and NTS program as outlined by the operator.

4.4   Record keeping

4.4.1   Operators must maintain records[6] relating to their HF and NTS Program. This includes the identified training needs, analysis, evaluations, and training records for facilitators and participants. It may be done separately or as part of another system, for example, as part of and training and checking system or an SMS.

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[5] For the purpose of this AC, the accountable manager and chief executive officer (as defined in Part 119 of CASR) are synonymous.
[6] Also refer to Subpart 119.J—Records and documents of CASR.

5 Identifying training needs

5.1.1 To understand what training is required to be included in an HF and NTS program, an operator should consider the objectives of the training program (refer to section 4.2), which outlines the outcome desired and the competencies of personnel. A comparison of these two conditions will ultimately determine who needs training and what they need training in. This comparison is often referred to as a training needs analysis (TNA)[7].

5.2 Program participants

5.2.1 Understanding the roles and responsibilities of the personnel that are required to participate in the HF and NTS program (as outlined in Part 119.180 and 119.185 of CASR) should help further define the training competencies. Operators might consider:

- the types of operations undertaken
- the work environment (e.g. office, flight line, aircraft)
- not limiting the scope to operational safety-critical personnel only.

5.2.2 Contract staff performing safety-critical functions will need to comply with the same requirements as permanent staff in safety-critical roles in accordance with the guidance in this AC.

5.3 Identifying competencies

5.3.1 Once the personnel requiring HF and NTS training have been identified, the operator should then determine their required HF and NTS competencies, even if training is provided by a third-party provider. The operator should consider any relevant known risks (e.g. incidents involving a break down in flight crew communication) to ensure they are appropriately incorporated into the training.

5.3.2 Operators with an implemented SMS may choose to undertake more detailed analysis of what HF and NTS competencies their personnel require. This analysis should be undertaken by someone who:

- is familiar with the nature and objectives of HF and NTS training
- has current knowledge of the job requirements and context of the roles being analysed
- understands the human factors associated with the safety events in their organisation.

5.3.3 By identifying issues in a workplace or work role, using "in-house" sources of information, the currency, credibility and value of the HF and NTS program are likely to be strengthened. Routine sources of information could be items such as job

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[7] For more information on TNA, also refer to AC 119-01 – Safety Management Systems for Air Transport Operators, and SMS for Aviation – A Practical Guide: Safety Promotion (Booklet 5) available on the page titled 'Safety management system resource kit' on CASA's website.

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assessments, audit reports, technical training program evaluations, appraisal systems and SMS outputs (e.g. occurrence reports, line-oriented safety audits (LOSA), flight operations quality assurance (FOQA)) can be useful to identify relevant information within the organisation.

5.4   Tools to identify training needs

5.4.1   There are a number of tools and techniques that an operator might choose to use to help examine existing information or to generate new information to assist in the identification of training needs. These tools vary in their sophistication from basic to quite complex. Broadly, these tools can be categorised into three types: event-based, questioning, and observation. Table 1 shows some examples of each type:

Table 1: Popular types of tools and techniques used to identify important non-technical skills

Type	Tools/Techniques
Event-based analyses (examining safety reports to identify patterns)	• Accident/incident analysis in one's own or similar operations. • Analysis of confidential reporting systems.
Questioning techniques (seeking information directly from workers)	• Interviews: structured, unstructured and semi-structured. • Focus groups. • Questionnaires and surveys.
Observational techniques (watching individuals and teams at work)	• Direct: observation by trainer/researcher not engaged in the work at hand. • Participant: observation by a co-worker. • Remote (e.g. video and audio recordings).

5.4.2   It is recommended that multiple sources of information and multiple tools/techniques be used in efforts to identify required competencies. Observational techniques have the added benefit of being useful when developing assessment measures. Some more complex operators may further benefit from the use of more complex analytical tools, such as occupation analysis and cognitive task analysis. Normally, specialists would be engaged to undertake these sorts of analyses.

6 Developing training content

6.1 How to develop training content

6.1.1 Once the operator has identified their required competencies, they should develop training content to address the needs. The content of an operator's HF and NTS program should aim to meet the objectives established for the HF and NTS program (refer to section 4.2). This can be integrated with other training development, such as those outlined within the operator's SMS. Most operators will choose to integrate HF principles into their NTS training program rather than having a separate program for each.

6.1.2 CASA has developed a suite of modules for HF and NTS training. These modules are detailed in a workbook and videos available on Safety Behaviours: Human Factors for Pilots from [CASA's website](#). As a starting point, operators could include these modules in their HF and NTS training program. The breakdown of these modules, and their relevance to different stages of training are outlined at 6.3 and 6.4 of this AC.

6.2 Depth of content

6.2.1 Training programs usually include multiple phases of training. For example, common phases of training include orientation training[8] initial or awareness training, conversion training, upgrade training and recurrent or refresher training. With respect to HF and NTS training, the depth of training (developmental phases) and teaching methods will vary across phases and should be tailored to suit to the size, nature, and complexity of the organisation.

6.2.2 The outputs from a training needs analysis (TNA) should assist in the selection of HF and NTS topics to meet the operator's needs. The content of NTS training should have direct relevance to the operational safety issues encountered by participants.

6.2.3 Due to the "systems" nature of HF, the topics covered in HF and NTS programs are interrelated. This means that even if a topic is not identified through a TNA, that topic may still provide relevant background knowledge to support other topics identified in the TNA. Operators should ensure that core topics are not omitted from their HF and NTS training program if they are required to support other relevant topics.

6.2.4 Additionally, competency may not be achieved through attendance, participation, assessment in a single training activity, but may require and benefit significantly from being integrated into other aspects of training and operations. Such integration would incorporate the key principles detailed in the following sections.

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[8] Also referred to as induction training.

6.3   Knowledge

6.3.1   This phase provides basic knowledge and the formation or consolidation of attitudes likely to promote appropriate safety behaviours in the workplace and more advanced understanding of important concepts. The focus of the knowledge phase is the development of practical knowledge relevant to skilled performance. This is typically provided through training in HF principles.

6.3.2   There are substantial training resources available that have been tailored for the aviation industry. For example, CASA has developed Safety Behaviours: Human Factors for Pilots, which contains training material specifically designed to support the implementation of HF principles training for air transport operators. The most relevant sections of this toolkit for training in HF principles include:

- [Resource booklet 1 Introduction](#)
- [Resource booklet 2 Safety culture](#)
- [Resource booklet 3 Human performance](#)

6.3.3   If it is relevant to the operations undertaken by the operator, the operator should also include information about design and automation. The most relevant section in this toolkit to incorporate design and automation for training in HF principles is:

- [Resource booklet 10 Design and automation](#)

6.3.4   Teaching methods commonly used to achieve the knowledge phase include pre-course readings, presentations, practical exercises, detailed case studies and documentaries.

6.4   Skills

6.4.1   This phase ensures that personnel have the skills required to perform tasks as desired. It builds on the knowledge gained from the previous phase to develop the ability to practically apply the knowledge. This is typically provided through training in NTS.

6.4.2   To be retained, skills (and concepts covered in previous training phases) must be regularly reinforced, typically via refresher training. They can also be refreshed by integrating HF principles and NTS into other training programs, such as those outlined within the operator's SMS if applicable.

6.4.3   The most relevant sections of the safety behaviours toolkit for training in NTS include:

- [Resource booklet 4 Communication](#)
- [Resource booklet 5 Teamwork](#)
- [Resource booklet 6 Situational awareness](#)
- [Resource booklet 7 Decision making](#)
- [Resource booklet 8 Threat and error management](#)
- [Resource booklet 9 Human information processing](#)

   Note: Also refer to UK CAA CAP 737: Flightcrew human factors handbook.

6.4.4   Teaching methods commonly used to achieve the skills phase typically include
classroom-based learning with practical exercises and detailed case studies. When
using a case study from within their organisation, operators should consider the
relevance of the scenario (i.e. is it still valid?), the contributing factors in the event (i.e.
does it contain issues identified in the training?), and the culture of the organisation (i.e.
the event is used as a learning exercise, not to apportion blame).

6.5   Attitudes and behaviours

6.5.1   The knowledge and skills developed through the HF and NTS training program aim to
establish and foster specific attitudes and behaviours in personnel. The attitude is
formed by the knowledge gained regarding HF and NTS combined with the individual's
feelings and values. These attitudes, combined with the organisational culture,
translates into achieving the desired behaviours. These behaviours should be
encouraged and reinforced through normal daily operations, and through other periodic
training and checking activities.

7 Training requirements

7.1 HF and NTS training program overview

7.1.1 The HF and NTS training program should define the training methods, objectives, and resources related to HF and NTS training within the context of the organisation.

7.1.2 Theory training and assessment is best is suited to provide an overview of HF principles and an introduction to NTS. Such training could be conducted through traditional classroom delivery and other methods such online training, virtual classroom or self-study methods.

7.1.3 Practical NTS training and assessment for flight crew could be incorporated in flight and/or into simulator training or systematic observation of on-the-job performance by specialist trainers with the goal of enhancing skills. Though the use of high-fidelity simulation is common with larger operators, there is compelling evidence to suggest that the use of low-fidelity simulation affords inexpensive and effective approaches to skills-based training which may be of value to smaller, less complex operations.

7.1.4 Practical NTS training for cabin crew and other operational safety-critical personnel could be incorporated into existing initial and ongoing training and checks, and technical tasks. For example, training and assessing aircrew in winching operations could focus on the technical task of operating the winch, but would also include NTS, such as communications and teamwork requirements to safely complete the task.

7.2 Duration of HF and NTS training

7.2.1 Operators should define the duration of the HF and NTS training based on their TNA and business requirements. In determining an appropriate duration, operators should consider the most effective way to deliver the training to the required personnel. Training could be delivered in a single consolidated training event, especially for induction training, or over a longer period via separate modules.

7.2.2 Where HF and NTS training or assessment requirements are integrated into existing technical training, operators should ensure that the nature and duration of the training is suitable.

7.3 Training delivery

7.3.1 <u>Knowledge Training</u> – Operators should consider what training and assessment methods are most appropriate for the nature of their operations. Knowledge training could be completed via:

- – a traditional classroom setting
- – online training
- – virtual classroom

- self-paced learning
- case study briefings / presentation
- a combination of any of the above.

7.3.2 <u>Delivery to different occupational groups</u> – HF and NTS knowledge training provides a valuable opportunity to bring together participants with different experience, backgrounds, knowledge, beliefs and opinions. Such diversity is generally considered to have many advantages (including increased mutual understanding) and operators should consider including difference occupational group in a HF and NTS training course. Where appropriate, members of extended or dispersed teams may be involved in combined training, reinforcing the "one team/crew concept" and increasing mutual understanding and respect. It is possible that not all team members are part of the same organisation. For example, aerodrome staff, fuellers, ATC or contracted ground handlers.

7.4 Facilitators

7.4.1 The way training is facilitated and identifying the right people to become facilitators is essential to the acceptance and success of HF and NTS training programs by participants.

7.4.2 Generally, delivery of HF and NTS training benefits from "peer" facilitators who also have undergone specialised HF and NTS training. Peer facilitators know the operational context, they speak the language, and they are usually someone respected by the cohort being trained. Facilitators with recent or current operational experience usually understand the professional and safety cultures of their organisation.

7.4.3 HF and NTS facilitators are not necessarily required to hold formal qualifications in HF or NTS. They should, however, have an interest (the right attitude and behaviours) in HF and NTS, possess suitable communication, instructional and presentation skills, and hold sufficient operational experience to facilitate conversations around operational issues (the right knowledge and skills).

7.4.4 Facilitators may require additional training to ensure they:

- have sufficient depth of knowledge in human factors to respond with authority to related questions that may arise during HF and NTS training
- understand the principles underlying effective facilitation and the training of small groups
- present course material in a variety of ways and conduct exercises, administer activities and maintain discussions.

7.4.5 Operators should define facilitator currency requirements to ensure they maintain suitable instructional skills and relevant HF and NTS knowledge to deliver HF and NTS training.

7.4.6   If the operator chooses to use a third-party provider to deliver their HF and NTS training, they should ensure that the third-party provider's facilitators are suitably qualified and experienced, know the operational context and speak the language used by the cohort being trained[9].

7.5   Assessing HF and NTS program participants

7.5.1   Operators should consider conducting both theoretical and practical assessments for HF and NTS. Ideally, a practical assessment of NTS should be integrated into the routine performance evaluation activities and processes established for technical skills. This evaluation is best conducted in the actual or simulated workplace e.g. aircraft, cabin, hangar, ramp etc.

7.5.2   Where practical elements have been incorporated into classroom training, facilitators could assess participants through observation of the participant's interaction and/or participation in group activities or discussions. Another technique is direct assessment of practical skills, which includes task-based evaluation, process creation (checklists) and completion (performance).[10]

7.6   Using behavioural markers

7.6.1   Behavioural markers in aviation are commonly used in training and assessing HF and NTS. While behavioural markers are not essential for the assessment of NTS, incorporating behavioural markers into technical training is an effective method to assess NTS and the outcomes of an HF and NTS program.

7.6.2   Behavioural markers were initially developed as a by-product of CRM training. They are descriptions of observable, non-technical behaviours that are present in teams or individuals, which contribute to superior or substandard performance within the work environment. As they outline behaviours, they generally describe an action(s) that an employee would perform, which is an example of their approach, in this case, to safety when conducting a work-related task. They are not an attitude or personality trait, with a demonstrated, causal relationship to performance. Not all behavioural markers have to be present in all situations.

7.6.3   Behavioural markers can be incorporated into practical, technical training and assessment to assess a participant's NTS and behaviours as they apply to the technical task. They are usually structured into a set of categories with various sub-components.

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[9] Relevant resources include the CASA publications on Teaching and Assessing Single-Pilot Human Factors and Threat and Error Management (AC 61-08 Competency Based Training and Assessment in the Aviation Environment (AC 5.59a–1(0)), and Safety Behaviours: Human Factors for Pilots (refer to Reference section). See also the UK CAA publication on The Crew Resource Management Instructor (CRMI) and Crew Resource Management Instructor Examiner (CRMIE) Accreditation Framework.
[10] Also refer to UK CAA Standards Document 29: Guidance on the requirements for the training and testing of Human Factors for Flight crew under EASA Part ORO and EASA Part FCL.

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7.6.4   Line operations safety audit (LOSA[11]) is a well-known safety tool that utilises a behavioural maker system to support an understanding of flight crew behaviour and its situational context during normal operations. Where in place, LOSA is a useful program that can be used to support development and continuous improvement of an operator's HF and NTS program.

7.6.5   Less complex operators may not need to use a stand-alone behavioural marker system but could instead simplify appropriate markers for their own use and integrate them into existing activities where possible.

7.7   HF and NTS training currency

7.7.1   The operator's HF and NTS training program should state that operational safety-critical personnel are required to have completed initial HF and NTS training in accordance with regulation 119.180 and 119.185 of CASR. They also require details on such training to be included in the operator's operations manual/exposition.

7.7.2   Operators should determine their currency requirements for both HF and NTS knowledge and practical training and assessment. An operator's currency requirements may differ across different types of safety critical personnel, and the operator should consider the function and roles of each position when determining an appropriate interval between training and assessment events.

7.7.3   A simple currency schedule, at the operator's discretion, where all knowledge training content is required to be covered and assessed at defined intervals (i.e. once every two years) might suffice. Alternatively, operators may choose other currency schedules, such as a cyclic training and assessment schedule. A cyclical training schedule would cover a sub-set of the course content at more frequent intervals with the intent that all content is covered over an extended period (e.g. annual refresher training where all course content is covered over a three-year period).

7.7.4   The operator's training program should detail the required actions if safety-critical personnel become uncurrent including the limitations on the performance of safety critical duties.

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[11] International Civil Aviation Organization. (2002). *Line Operations Safety Audit (LOSA)* (Doc 9803 AN/761). Montreal: ICAO.

8 Continuous improvement

8.1 Evaluating HF and NTS programs

8.1.1 Continuous improvement can be a very useful tool in what is known as "washback", in which operators use the data from the evaluation of the program to feed back into the design, improving it, tweaking it, adjusting it to not only make it more suitable, but also more up-to-date, economic (time and cost saving), and effective.

8.1.2 Maintaining and continuously improving the HF and NTS program is an ongoing journey as the organisation itself and the operational environment will be constantly changing. Operators should evaluate their HF and NTS programs by determining whether their objectives have been achieved. This evaluation should consider "Where are we at present?" and "Where do we want to be?".

8.1.3 Where possible, the evaluation of an HF and NTS program's effectiveness should be conducted as part of the operator's SMS assurance processes. It should be based on recognised and systematic sources of information, such as pre- and post-training surveys examining the safety-related attitudes and behaviours of employees, as well as operational or simulator performance data.

8.1.4 One useful framework for evaluating the effectiveness of an HF and NTS program consists of four parts:

- the **reaction** of students – what they thought and felt about the training
- degree of **learning** – the resulting increase in knowledge and skills
- **behaviour** change – the extent learning is being applied back on the job, and
- **organisational results** – the effects on the business or the operating environment due to the participant's performance.

8.1.5 All four parts should be measured to determine the extent of learning outcomes. The challenge of such an evaluation is that complexity and cost of measurement tends to increase as more components are adopted. For each part, operators should consider:

- **Reactions –** Participants' reactions to the training can be gauged via a simple questionnaire. This typically involves simple questions about interest in the training, its relevance, quality of presentation and materials, its effectiveness, and general comments about any aspect of the course.
- **Learning –** This refers to how well the concepts were understood and retained – have the participants acquired the relevant knowledge and skills? This can be assessed using pre- and post-course administration of a knowledge quiz, through practical examples and evaluation tasks during HF and NTS training.
- **Behaviour –** Evaluations at this level assess whether knowledge and skills learnt in training transfer to on-the-job behaviour. A widely used technique for assessing non-technical skills in flight crew is the use of observational rating scales using behavioural markers such as LOSA (also, refer to section 7.6).

– **Organisational results –** This is typically measured by an operator's achievement towards the objectives of the HF and NTS program. Activities which can provide information about this include analyses of organisational safety data, safety surveys conducted on a periodical basis, and outcomes of behavioural markers or LOSA programs.[12]

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[12] Also refer to AC 119-01 – Safety Management Systems for Air Transport Operators.

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Appendix A

Sample HF and NTS training program:
Operator X133 or X135

A.1 Sample program for training and assessment in human factors principles and non-technical skills (119.175)[13]

A.1.1 Scope

Sample Aviation Part 133 or Part 135 air transport operations:

- Sample Aviation has <10 staff which complies with the maximum number of staff permitted by the micro-damp exemption.
- Sample Aviation's headquarters and main operating base are collocated, and additional operational facilities are located at a number of locations.
- The manual applies to VH registered aircraft only.
- The exposition is to contain (or refer to) a completed Compliance Matrix
- Part 133 operations will focus on the following kinds of aircraft:
    - Robinson R22/R44
    - Airbus AS350
- Part 135 operations will focus on the following kinds of aircraft:
    - Cessna 182/ 206/ 210
    - Beechcraft Baron BE55/ BE58
    - Piper PA-31 Navajo (x 2).

A.1.2 Content to be inserted in key personnel responsibilities section

CEO responsibilities:

- 119.130 (1) (e) (HF/NTS training):
    - The CEO is responsible for ensuring that training and checking of the operator's operational safety-critical personnel (other than flight crew) conducted is done so in accordance with the Operator X133/X135 exposition.

HOTC responsibilities:

- 119.150 (2)(c) (for HF/NTS training only):
    - The HOTC is responsible for ensuring that training and checking of flight crew conducted by or for the operator is done so in accordance with the operator's exposition

Human factors principles and non-technical skills (HF/NTS) training program:

- 119.130(1)(e), 119.150(2)(c)
- 119.175, 119.180, 119.185
- 119.205(1)(h)

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[13] "X" references in the program are intended to be references to the operator's exposition.

A.1.3   Program objectives

Operator X133/X135 requires all safety-critical personnel to undergo the HF/NTS training program.

The objective of this program is to enhance HF knowledge and NTS skills for all safety-critical personnel that conduct safety sensitive aviation activities (SSAA) for Operator X133/X135.

The program includes and initial and recurrent training course that will be provided by "HFNTS Pty Ltd".

A.1.4   Program responsibilities

- 119.130(1)(e), 119.150(2)(c):
    – Refer to section X.X.X for program responsibilities. The CEO has assigned management of responsibilities for the HF/NTS program to the HOTC.

A.2   Record keeping

Records of completion and currency will be tracked in operator's currency tracking system.

A.3   Personnel required to undergo the HF/NTS training program

A.3.1   Flight crew

- 119.180(3):
    – All personnel as defined by 119.180(2) must not carry out their duty unless they have completed the HF/NTS initial training course and meet currency requirements under section XXX.

A.3.2   Other operational safety-critical personnel

- 119.185(3):
    – Any safety-critical personnel other than those defined in section X.4.2 must be compliant with the HF/NTS training program within 3 months after being appointed to their position.

A.3.3   Training program

	Initial training course	Recurrent training course
Recency	As per section 1.3	annually
Delivery method	Face-to face or online through "HFNTS Pty Ltd"	
Instructor qualifications	Refer to section X.X third party provider	
Instructor student ratio	12-1	
Duration	2 days	1 day

	Initial training course	Recurrent training course
Assessment method	Written exam	
Record of completion	Records of completion and currency will be tracked in operator's currency tracking system.	
Course modules (example only)	• History of human factors and CRM training • Threat and error management • Communication • Conflict resolution • Cultural factors • Leadership and teamwork • Fatigue and fatigue management	• Stress and stress management • Information processing • Workload management • Automation • Situational awareness • Decision making • The anatomy of an accident

A.3.4　Program evaluation/continuous improvement

The CEO and the HOTC are responsible for reviewing the HF/NTS program content annually and considering whether it remains applicable to Operator X133/X135 operations. Any areas identified for improvement or changes are to be made in accordance with the Operator X133/X135 change management procedures.

A.3.5　HF/NTS third party provider

Operator X133/X135 uses "HFNTS Pty Ltd" as the provider for the HF/NTS program. The HOTC will review the delivery of the program annually and confirm it meets the requirements of this section.

Appendix B

Sample HF and NTS training program: XXXX Airlines

B.1 Sample program for training and assessment in human factors principles and non-technical skills (119.175)

This appendix is reserved for a sample program for a smaller air transport operator conducting air transport operations between major capital cities and regional communities under Part 135 of CASR using aircraft such as the BAE Jetstream 41 (multi-crew), Fairchild Metro (multi-crew) and PA-31 Navajo (single pilot), with a management team of less than 10 and around 60 full and part time staff.