

EUROCONTROL HF Case Workarea descriptors

| ISSUE / WORKAREA | DESCRIPTOR |
|--|--|
| 1. Working environment | The ATM working environment includes the working space, general equipment and furniture used, and physical environment in which people work. |
| 1.1 Workplace layout | Layout of the working positions in the operational area including, required support equipment and furniture, accommodation of peak staffing levels and sufficient space for On-the-Job Training (OJT). |
| 1.1.1 Support equipment and furniture | Ensuring there is appropriate support equipment and furniture available for staff to perform their job tasks. |
| 1.1.2 Accommodation of peak staffing levels | Ensuring there is available space and general equipment and furniture to accommodate fluctuations in staffing levels based on forecast and actual dynamic requirements. |
| 1.1.3 Sufficient space for On-the-Job Training (OJT) | Ensuring there is available space and general equipment and furniture to accommodate On-the-Job Training Instructors (OJTIs) and trainees. |
| 1.2 Operator working position | Layout and design aspects of the Controller Working Position (CWP) other than those mentioned under input and output devices. The layout and design of the room usually includes consideration of a number of items, including (but not limited to) workplace, workstation, equipment, seating. |
| 1.2.1 Design | Design relates to ergonomic practices. Reactive ergonomics is when something needs to be fixed, and corrective action is taken. Proactive ergonomics is the process of seeking areas that could be improved and fixing the issues before they become a problem. Problems may be fixed through equipment design or task design. Equipment design changes the actual, physical devices used by people. Task design changes what people do with the equipment. Environmental design changes the environment in which people work. |
| 1.3 Physical environment | Physical factors in the environment, such as noise, lighting, thermal comfort, temperature, air quality, humidity, and personal physical comfort, that impact on human performance when they are outside the physiological comfort and tolerance range. |
| 1.3.1 Noise | Noise levels within the working environment must be at a level to promote effective communication. They must also fall below the maximum levels defined in the appropriate European directive. |
| 1.3.2 Lighting | Lighting levels and location should be sufficient to allow staff to carry out their duties effectively. Lighting levels should fall within the guidance defined in BS EN ISO 29241, 'Ergonomic requirements for office work with visual display terminals'. |
| 1.3.3 Thermal comfort | Thermal comfort is dependent on a number of factors including air temperature, relative humidity, air movement, clothing and the level of physical activity. These factors must be considered in relation to one another, and must be within acceptable limits in order to achieve thermal comfort of the staff. |
| 1.3.4 Air quality | Indoor Air Quality (IAQ) deals with the content of interior air that could affect health and comfort of building occupants. It may be compromised by microbial contaminants (mould, bacteria), chemicals (such as carbon monoxide, radon), allergens, or any mass or energy stressor that can induce health effects. Using ventilation to dilute contaminants, filtration, and source control are the primary methods for improving indoor air quality in most buildings. |
| 1.3.5 Humidity | Relative humidity impacts on personal physical comfort. |
| 1.3.6 Physical comfort | How people physically perceive and experience their working environment. |
| | |

| | |
|---|--|
| 2. Organisation and Staffing | Consists of Organisational management, People management, and Personal Factors |
| 2.1 Organisational management | Consists of Organisational design, Resource management, Transition management, and Communication and Consultation |
| 2.1.1 Organisational design | Refers to issues associated with organisational structure, including the responsibilities, authorities and accountabilities of key management and operational personnel. |
| 2.1.1.1 Reporting structure | Includes the formal and informal lines of communication and reporting between organisational roles and positions both within the hierarchical and matrix organisational structures. |
| 2.1.2 Resource management | Issues associated with the management of staff and resources. |
| 2.1.3 Transition management | Issues associated with the transition from an old to a new situation. The process to ensure acceptance and confidence in the system. This can include perception of individual situation, personal needs, motives and drives, internal and external perceived (felt) barriers, perceived conflicts. General attitudes to change, perceived ability to change, group impacts as reference system for values and feelings; cultural and language issues. |
| 2.1.3.1 Planning and organising the transition | Includes transition strategy, planning staff availability, determining the staff requirement, establishing a transition team, widening the transition team. |
| 2.1.3.2 Management of the transition team | Includes visibility and acceptability, user involvement, systems view, keeping a balance, role of users in project team. |
| 2.1.3.3 Managing the transition | Includes determining implementation date, implementation date activity levels, coaching during transition, freezing the design, document management, relationship with the supplier, relationship with the regulator. |
| 2.1.4 Communication and consultation | Two-way communication on project progress and the transition refers to issues associated with the way that information relating to relevant HF Issues is communicated within the organisation or to other organisations. |
| 2.1.4.1 Communicating project progress | Optimal two-way communication to staff |
| 2.1.4.2 Communicating about the transition | Optimal two-way communication to staff |
| 2.2 People management | Consists of Recruitment and selection, Management and leadership, and Staffing |
| 2.2.1 Recruitment and selection | The whole process from attracting and assessing the aptitude of applicants to the selection decision and employment of selected applicants for training or work. Includes Job Profile, Job Marketing, Selection methods and tools and Recruitment planning. |
| 2.2.1.1 Job profile | Includes language proficiency requirements; education and experience requirements medical requirements; and knowledge, attitude and ability requirements. |
| 2.2.1.2 Job marketing | Includes demography, job attractiveness, strategy and target groups, and media. |
| 2.2.1.3 Selection methods and tools | Includes selection strategy, development, application and infrastructure, and validation |
| 2.2.1.4 Recruitment planning | Includes cost, expertise, and time required for development and recruitment |
| 2.2.2 Management and leadership | Management values/ethics; management style/culture, leadership, commitment of leaders and managers, competence in managing the change, communication strategies and information policy and management. Also included are issues related to first-line supervision of employee performance. As well as performance monitoring, includes activities such as coaching, feedback, briefings and employee support. |
| 2.2.2.1 Supervision | Related to first-line supervision of employee performance. As well as performance monitoring, includes activities such as coaching, feedback, briefings and employee support. Effective supervision covers: <i>Planning</i> : The supervisor should ensure that sufficient staff are available and sufficient rest periods provided. <i>Monitoring</i> : The supervisor should oversee and communicate with operators and trainees on a frequent basis to ensure that operations are being effectively and safely carried out. <i>Delegating</i> : The supervisor is responsible for delegating responsibility, such as the merging and splitting of sectors, and should not perform the operator's task themselves. <i>Conflict management</i> : The supervisor is responsible for avoiding or resolving conflicts emerging between team members. |

| | |
|--|--|
| 2.2.3 Staffing | Consists of Staff levels and Staff planning |
| 2.2.3.1 Staff levels | Staff mix i.e. operations, training and administration. |
| 2.2.3.2 Staff planning | Short term, Long term, Methods and tools |
| 2.2.3.2.1 Short term staff planning | Includes Rostering and shiftwork, Fitness for duty monitoring, and Rating and recency |
| 2.2.3.2.1.1 Rostering and shiftwork | Potential impacts on health, fatigue, concentration, vigilance, stress and working patterns on shift design. Rostering is the organisation of shift patterns and includes consideration of timing of shifts (e.g. start/finish times), shift handover requirements, duration of shifts and rotation of shifts (e.g. fast/slow, retarded/advancing). Rest breaks and recovery periods (e.g. versus time on shift). Roster management refers to the flexibility that supervisors and staff have to increase, change and/or swap shifts on a day-to-day and hour-to-hour basis. |
| 2.2.3.2.1.2 Fitness for duty monitoring | Refers to issues with the monitoring of an individual's fitness for duty, relating to issues such as general well being, health/medical status, fatigue or use of alcohol, drugs or medications. Management and individuals should be responsible for ensuring that operators are fit and ready for work. Management also have a responsibility to ensure that they themselves are fit for work. Each individual should be: alert, well rested, sober, in the 'right frame of mind' (e.g. emotional state), and physically fit. |
| 2.2.3.2.1.3 Rating and recency | Rating: An authorisation entered on or associated with a licence and forming part thereof, stating special conditions, privileges or limitations pertaining to such rating. Recency issues associated with maintaining ratings and keeping endorsements valid. |
| 2.2.3.2.2 Long term staff planning | Includes training duration, staff availability, staff support, mobility and flexibility, relocation and transfer, reward structures, and social dialogue. |
| 2.2.3.2.2.1 Training duration | The length of time required to conduct the training programme effectively. |
| 2.2.3.2.2.2 Staff availability | The availability of competent training staff |
| 2.2.3.2.2.3 Staff support | Refers to situations where operational personnel need appropriate support networks or facilities to deal with personal or work-related difficulties such as employee assistance programmes. |
| 2.2.3.2.2.4 Relocation and transfer | Issues related to relocation and transfer; relocation policies; contractual and employment; family situation; housing and living, individual social and community activities; commuting policies and possibilities; social impacts on partner, job issues of partner, social dialogue. |
| 2.2.3.2.2.5 Reward structures | Remuneration, reward issues or other incentives to conduct the task effectively. Includes situations where personnel are provided with reward structures which facilitate risk-taking behaviours. |
| 2.2.3.2.2.6 Social dialogue | A social dialogue can be any communication activity involving social partners intended to influence the arrangement and development of work related issues. This can be direct relations between the social partners themselves ("bipartite") or relations between governmental authorities and the social partners ("tripartite"). Examples of social dialogue activity include mutual information, open discussion, concertation (on-going tripartite dialogue), exchange of opinions, consultation and negotiation (agreements / common opinions). |
| 2.2.3.2.2.7 Mobility and flexibility | How easily staff can move between job roles or work on different tasks within the same job role |
| 2.2.3.2.3 Methods and tools for staff planning | All appropriate staff planning tools and methods |

| | |
|--|---|
| 2.3 Personal Factors | Includes Human Capabilities and Limitations, Skills & Knowledge, Attitudes, Behaviours and Social Factors. |
| 2.3.1 Human Capabilities and Limitations | Includes Physiological Factors, Psychological factors, and Cognitive factors. |
| 2.3.1.1 Physiological | Associated with the concept of fitness for work this includes level of arousal, substance abuse, fatigue, health related conditions, comfort, ageing effects, and physical limitations, such as visual acuity, hearing ability, reaction times, strength and reach. |
| 2.3.1.1.1 Aging effects | Any age related performance issues including poorer eyesight and/or hearing, reduction in memory capacity, reduced strength, and increased fatigue. |
| 2.3.1.1.2 Comfort | Physiological contentment with the working situation enabling the individual to fully focus on the task rather than being distracted by any discomfort. |
| 2.3.1.1.3 Fatigue | The need for recuperation of the resources being used for the task in hand. Our focus is on fatigue and 'alertness' and how it affects human performance not physical or 'mental' fatigue |
| 2.3.1.1.4 Gender | Any gender discrimination issues |
| 2.3.1.1.5 Health related conditions | Issues related to health |
| 2.3.1.1.6 Level of arousal | Arousal is the state of responsiveness to sensory stimulation. Performance of a user in a system can be affected by the level of arousal. A mid-level of arousal is generally preferable |
| 2.3.1.1.7 Physical limitations | Any physical or sensory limitations which are part of the individual's normal disposition and differ from the average population, i.e. visual ability, hearing ability, strength, or reach. |
| 2.3.1.1.8 Substance abuse | The overindulgence and dependence on a drug or other chemical leading to effects that are detrimental to the individual's physical and mental health, or the welfare of others. |
| 2.3.1.2 Psychological factors | Includes stress and anxiety. |
| 2.3.1.2.1 Anxiety | A state of uneasiness or tension caused by apprehension of possible danger or a distressing experience. |
| 2.3.1.2.2 Stress | When perceived demands exceed performance capability. A subset of subjective workload where it is appraised as negative. Our main task performance focus is that of stress-induced error in high demand settings. Psychological definitions of stress focus on the stimulus environment, the response of the individual and the relationship between the person and the environment. A combination of these gives a definition such as "stress is a process by which certain environmental demands evoke an appraisal process in which perceived demand exceeds resources and results in undesirable physiological, psychological, behavioural or social outcomes" (Salas, Driskell & Hughes, 1996). Our main interest is probably acute stress, that which is sudden, novel, intense, and of relatively short duration, disrupts goal-oriented behaviour, and requires a proximate response. |

| | |
|---|---|
| 2.3.1.3 Cognitive factors | Includes Information processing capacity, memory, decision making, vigilance, attention |
| 2.3.1.3.1 Information processing capacity | The process of thinking where an individual perceives, encodes, represents, and stores information from the environment in the mind or retrieves that information including responding to any constraints or limitations on memory processes. |
| 2.3.1.3.2 Memory | The process of storing, retaining, and subsequently retrieving information |
| 2.3.1.3.3 Decision making | The outcome of the cognitive process leading to the selection of a course of action among several alternatives. Every decision making process produces a final choice. The output can be an action or an opinion. Decision making includes Situation awareness, preoccupations, risk perception, and biases. |
| 2.3.1.3.3.1 Situation awareness | Refers to “the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future”. The accurate perception of what has happened, what is currently happening, and what is therefore likely to happen next. |
| 2.3.1.3.3.2 Preoccupations | Situations where an individual's attention is focussed on non task related topics. |
| 2.3.1.3.3.3 Risk perception | The knowledge and understanding of the risks associated with a task and the related consequences in the given environment . |
| 2.3.1.3.3.4 Biases | Includes expectation bias, recency bias, frequency bias, outcome bias, hindsight bias, local rationality, and confirmation bias. |
| 2.3.1.3.3.4.1 Expectation bias | Having a strong belief or mindset towards a particular outcome. |
| 2.3.1.3.3.4.2 Recency bias | When information presented most recently is more likely to be recalled than information presented earlier |
| 2.3.1.3.3.4.3 Frequency bias | When information presented most often, seems more probable than other possible outcomes. |
| 2.3.1.3.3.4.4 Outcome bias | Actions leading to negative outcomes are judged more harshly than for neutral or positive outcomes. In other words, a good plan that results in a bad outcome will be regarded more harshly than a bad plan that results in a good outcome. |
| 2.3.1.3.3.4.5 Hindsight bias | Knowledge of the actual outcome makes it seem more probable than other possible outcomes. |
| 2.3.1.3.3.4.6 Local rationality | How people behave in a way that made sense to them at the time, i.e.: their behaviour was rational under the local circumstances. |
| 2.3.1.3.3.4.7 Confirmation bias | The tendency to search for or interpret information in a way that confirms one's preconceptions. |
| 2.3.1.3.4 Vigilance | Paying close and continuous attention and being alert to the possibility of trouble or danger. Staff vigilance may be enhanced by (but not restricted to): ensuring that sufficient rest periods are provided; ensuring that staff are fit for work; ensuring that suitable shift patterns are adhered to; and by providing a suitable working environment, e.g. suitable temperature, air flow and lighting. |
| 2.3.1.3.5 Attention | Attention is the concentrated direction of the mind to a problem or task. It is the cognitive process of selectively concentrating on one aspect of the environment while ignoring other things. Includes attention span and cognitive lockup. |
| 2.3.1.3.5.1 Attention span | Attention span is the time for which one can effectively concentrate on a specific issue, object or activity. |
| 2.3.1.3.5.2 Cognitive lockup | Also termed task fixation or tunnel vision - happens when performing under stress. |

| | |
|--|---|
| 2.3.2 Skills and Knowledge | Includes technical competency, non-technical competency, English proficiency, recovery from failure, experience and skill change. |
| 2.3.2.1 Technical competency | Technical competencies are behaviours directly related to the control of equipment and technical proficiency. Competency on the task requires a match between the operator's competencies and the competencies required to safely and effectively perform that task. |
| 2.3.2.2 Non-technical competency | Non-technical competencies are behaviours that are not directly related to the control of equipment and technical proficiency. They encompass aspects of behaviour such as cognitive skills, (e.g. situational awareness, decision-making, error management, etc.) and interpersonal skills. Competency on the task requires a match between the operator's competencies and the competencies required to safely and effectively perform that task. |
| 2.3.2.3 English proficiency | Proficiency in the English language includes the ability to produce intelligible messages in unusual situations; the ability to communicate in plain language (English) even under stress; understanding and making appropriate responses to pilot messages; adherence to ICAO phraseology; and resolving misunderstanding in communication (e.g. by understanding cultural differences). |
| 2.3.2.4 Experience | Experience is a function of the time spent performing a task and the variety of conditions of performance that have been encountered. |
| 2.3.2.5 Recovery from failure | The ability to rescue the situation from abnormal to normal after a failure event. |
| 2.3.2.6 Skill change | Proficiency or facility that is acquired or developed through training or experience. The ability to do an activity or a job well, especially because you have practised it. |
| 2.3.3 Attitudes | Includes Trust, Motivation, Complacency, Scepticism, Individual responsibility for Safety, Acceptance and Job Satisfaction. |
| 2.3.3.1 Acceptance | To consider something or someone as satisfactory or tolerable. Refers to the experience of a situation without an intention to change that situation. Does not require that change is possible or even conceivable, nor does it require that the situation be desired or approved by those accepting it. Indeed, acceptance is often suggested when a situation is both disliked and unchangeable, or when change may be possible only at great cost or risk. |
| 2.3.3.2 Complacency | Complacency refers to a discrepancy between an individual's feeling of self-satisfaction with their own performance and an unawareness of danger, trouble, or controversy. |
| 2.3.3.3 Individual responsibility for safety | A feeling of accountability for one's actions in regard to safety practices. |
| 2.3.3.4 Job satisfaction | A term used to describe how content an individual is with their job. The feelings or 'affective response' someone experiences in a job role. |
| 2.3.3.5 Motivation | Enthusiasm for doing something. The reason a person has for acting in a particular way. Motivation is a temporal and dynamic state relating to the initiation, direction, intensity and persistence of behaviour. It is the (conscious or unconscious) stimulus for action towards a desired goal, especially as resulting from psychological or social factors; the factors giving purpose or direction to human behaviour. |
| 2.3.3.6 Scepticism | An attitude of doubt toward particular equipment, objects or people. |
| 2.3.3.7 Trust | Trust refers to the level of confidence one has in events, people, or circumstances, and the belief that any actions taken are seen to be fair and reasonable. |
| 2.3.4 Behaviours | Includes Errors, Procedural Non-Compliance, and Threat and Error Management. |
| 2.3.4.1 Errors | A generic term to encompass all those occasions in which a sequence of mental or physical activities (intended or unintended) results in an undesired outcome. Alternatively, any action (or non-action) that potentially or actually results in negative system effects, where more than one possible course of action is available. (HERA definition, see EUROCONTROL, 2003). |
| 2.3.4.2 Procedural non-compliance | A conscious deviation from the organisation's procedures and working practices. |
| 2.3.4.3 Threat and Error management (TEM) | TEM proposes that threats (such as adverse weather), errors (such as a pilot selecting a wrong automation mode), and undesired aircraft states (such as an altitude deviation) are everyday events must be managed to maintain safety. |
| 2.3.5 Social factors | Includes Culture and Language |
| 2.3.5.1 Culture | Factors associated with, or impacted by national and organisational cultures. |
| 2.3.5.2 Language | Factors associated or impacted by language differences. |
| | |

| | |
|---|---|
| 3 Procedures, Roles and Responsibilities | Issues relating to Procedures, Roles and Responsibilities and Working Method. |
| 3.1 Procedures | Procedures represent the organisation's accepted working methods. A procedure is a particular course of actions intended to achieve a result. In the ATM environment, this term can be characterised as a set of activities that are performed by each person intervening in the process, according to pre-established rules, to enable a successful operation. Design availability and consistency of procedures and abnormal and emergency procedures. Issues in relation to procedures are variance in prescribed working methods and individual working practices, procedure format , positioning and procedure structure, and content realism. |
| 3.1.1 Variance in prescribed working methods and individual working practices | Intentional or unintentional non-adherence to standardised working methods at the organisational or individual level. |
| 3.1.2 Documented procedures | Includes formalised Standard Operating Procedures (SOPs) and abnormal operating procedures. |
| 3.1.3 Informal procedures | Non-documented procedures including norms of behaviour at the team and individual level. |
| 3.2 Roles | The position(s) or purpose(s) that someone has in an organisation. The typical or characteristic function performed by someone relating to the tasks that have been assigned to them. |
| 3.3 Responsibilities | Things that are your job or duty to deal with. Having responsibilities means to have a duty to make certain that particular things are done. |
| 3.4 Working Method | The way in which individuals perform their tasks. Prescribed working methods and individual working practices. |
| 3.4.1 Task | A composite of related activities (perceptions, decisions, and responses) performed for an immediate purpose, written in operator/maintainer language. ATM tasks include monitoring, searching, planning, problem solving, decision-making, predicting, communicating, discussing, coordinating, liaising, instructing, verifying, understanding, remembering, handling and structuring information, scheduling work, and managing resources. These may include some combination of visual, auditory, analytic, and/or response requirements. |
| 3.4.2 Task demand | Task demand is the amount of effort required to perform a task. It differs between people depending on their skills and experience, and is a component of perceived workload. It is influenced by high workload, time pressure, distractions, low workload, low workload/boredom and task inconvenience. |
| 3.4.2.1 Task demand and complexity (strategic) | The demand on staff can vary depending on the type of activities and/or task being planned / undertaken. For example, tasks that are very complex may require more time and attention than simpler tasks. Over time task demands can change (e.g. due to aircraft traffic increases and decreases). |
| 3.4.2.2 Task demand and complexity (tactical) | The demand on the staff member can vary on a minute-to-minute basis and can depend on the type of activities and/or tasks being undertaken (e.g. task demand may increase or decrease depending on the number of aircraft to be controlled). Decisions on appropriate staffing levels, and/or splitting / merging sectors should be based upon a good understanding of the complexity of current task demands to maintain operations safely. |
| 3.4.2.3 Task interruption / distraction | Situations of specific interruptions, distractions, problems or other events, which are not of primary task importance, interfere with the ability of the individual to perform effectively. Task interruption / distraction can be defined as something (i.e. actions / communications / cognitive mental activity) which breaks the flow pattern of ongoing activities, such as: SOPs, communications (listening, processing, responding), monitoring tasks, problem solving. Preoccupation with one task may result in the distraction from another and may in turn result in a human error. |
| 3.4.2.4 Workload | The effort invested by the actor into task performance. Workload varies as a function of ability, skill, training and experience. Workload relates to objective workload (task demand) and subjective workload (individual perceptions). |
| 3.4.2.4.1 High workload | Situations where the number or complexity of task demands exceeds the ability of the individual to perform effectively. |
| 3.4.2.4.2 Low workload | Situations where task demands are low and the level and duration of the demands is such that it can interfere with an individual's concentration and therefore task performance. |
| 3.4.2.4.3 Time pressure | Situations where the demands to complete a specific task or tasks by a specific time influences the ability of the individual to perform effectively. Staff have difficulty in completing the tasks within the time allocated. |
| 3.4.2.4.4 Boredom | An emotional state experienced during periods of lack of activities or when individuals are uninterested in the activities surrounding them. |
| 3.4.2.5 Complexity | Involving a lot of different but related parts, complicated and difficult to understand. |
| | |

| | |
|---|--|
| 4 Training and development | The systematic development of the knowledge, understanding, skill and attitude behaviour patterns required by an individual in order to adequately perform a given task |
| 4.1 Regulatory requirements | The applicable restrictions, licenses, and laws imposed by the appropriate authorities. This includes adoption & compliance, development & implementation and harmonisation of standards and schemes. |
| 4.1.1 Adoption & compliance | The fact of being taken up and accepted, and thence acting in accordance with the applicable regulatory requirements. |
| 4.1.2 Development & implementation | The process of developing material and the action of implementing it into effect. |
| 4.1.3 Harmonisation of standards and schemes | To reconcile and bring into agreement one quality standard, or formalised plan or classification system, with another. |
| 4.2 Competence requirements | A competence requirement is the specification of the knowledge and skill, and the application of that knowledge and skill, to the standards of performance required in the workplace. Competency on the task requires a match between the operator's competencies and the competencies required to safely and effectively perform that task. This includes the verification of competence, evaluation, assessment, certification, technical competencies and non-technical competencies. |
| 4.2.1 Verification of competence | Proof of ability to safely and adequately perform the task as specified. Includes Evaluation, Assessment, and Certification. |
| 4.2.1.1 Evaluation | Evaluation is used to monitor learning progress during instruction and to provide continuous feedback to both student and instructor concerning learning successes and failures. The results are typically not used to certify mastery of intended learning outcomes. |
| 4.2.1.2 Assessment | Assessment typically comes at the end of a unit of instruction. It is designed to determine the extent to which the instructional objectives have been achieved and is used primarily for certifying mastery of intended learning outcomes against a defined standard. |
| 4.2.1.3 Certification | Documentation of the successful completion of a course of training. |
| 4.2.2 Technical competencies | Technical competencies are behaviours directly related to the control of equipment and technical proficiency. |
| 4.2.3 Non-technical competencies | Non-technical competencies are behaviours that are not directly related to the control of equipment and technical proficiency. They encompass aspects of behaviour such as cognitive skills (e.g. situational awareness, decision-making, error management, etc.) and interpersonal skills. These competencies are typically taught in HF and TRM training courses. |
| 4.3 Training types | The main training types in ATM are Initial, Unit, Continuation, and Development training. |
| 4.3.1 Initial training | Initial training consists of Basic (ATCO and ATSEP), Rating and Qualification training |
| 4.3.2 Unit training | Includes Transitional, pre-OJT, and OJT training. |
| 4.3.3 Continuation training | Training given to personnel designed to augment existing knowledge and skills and/or to prepare for new technologies. It includes refresher, conversion, emergency, unusual situation, and degraded systems training. |
| 4.3.4 Development training | Includes OJTI, assessor, supervisor, safety manager, incident investigator, airspace developer, training manager, traffic flow manager, and system monitoring and control training. |
| 4.3.5 HF / Safety training | Includes safety actor training, HF training, Team Resource Management (TRM) training and Threat and Error Management (TEM) training. |
| 4.3.5.1 Safety Actor training | Includes all training related to the Safety Management System (SMS). |
| 4.3.5.2 Human Factors (HF) training | Includes all HF awareness and specialist training. |
| 4.3.5.3 Team Resource Management (TRM) training | Includes all applied HF training based on TRM, and Threat and Error Management (TEM) principles. |

| | |
|------------------------------|---|
| 4.4 Training Planning | Planning for the training programme should account for the time required, the cost, the training infrastructure, staffing issues (including numbers and continuity of instructors, roles and instructor training) and expertise needed. |
| 4.5 Training design | Training design incorporates the Training needs, Trainer's role, Training content, Training methods, Training media, Learning rate, and Mode of delivery. |
| 4.5.1 Training needs | Includes identifying the training requirements and determining who needs to be trained, and when they need to be trained. Training should be tailored to the needs of staff roles and responsibilities. It should be provided on a regular basis, as determined by safety criticality and frequency of operation. The competency of workers should be assessed to ensure the training has been effective. |
| 4.5.2 Trainer's role | The level of training, responsibility and competence required of the trainer. |
| 4.5.3 Training content | Training content is divided into subjects, themselves divided into topics that are in turn subdivided into sub-topics. This structure is used to create and classify the objectives. One general objective is linked to each subject and one or several objectives are linked to each sub-topic. Optionally a main objective is linked to a topic. |
| 4.5.4 Training methods | The relationship between the matter, the learner and the instructor (lecture, lesson/demonstration, case study, exercises, facilitation, interactive training, supervised practices, pre-simulation, simulation, briefing, debriefing, tutoring, role play etc. |
| 4.5.5 Training Media | The physical means by which an instructor or a training designer communicates a message. One media can use several supports (for instance, a Multimedia Computer (MMC) could use a diskette or CD-ROM, and video can use tape, CD or DVD). e.g. Real Equipment, High-Fidelity Simulator, Simulator (Sim), Part-Task Trainer, Other Training Device, Multimedia Computer, Network, Video , Visual Aids ,Audio Aids ,Text, etc. |
| 4.5.6 Learning rate | Learning is the acquisition of knowledge, skills and attitudes. A basic concept in learning is that a change in behaviour occurs as a result of the acquisition. Learning rate includes self-paced learning, time-restricted learning, and real time. |
| 4.5.7 Mode of delivery | Includes individualised training and group training, e-learning and problem-based learning. |
| 4.6 Training Documentation | Includes the syllabus, training plan, training event plan and assessment plan. |
| 4.6.1 Syllabus | Listing of subjects, topics, elements and items showing the training necessary to fill the training gap and achieve the course aim. It indicates time to be devoted to each part but usually neither methods nor order. |
| 4.6.2 Training plan | A document detailing an outline of the training requirements, methods of achievement and time scale for achievement. It provides an earlier and more general view than the day-to-day training programme. |
| 4.6.3 Training event plan | A document used by the instructor when preparing and providing the training. It provides the objectives of the training event and its type, a timeline, material references and additional advice for performance. |
| 4.6.4 Assessment plan | A document identifying how the assessment will be performed for each subject, topic and objective. Test performance is linked to the performance objective. |
| 4.7 Training effectiveness | Includes the evaluation of training, transfer of training, and interference from old working methods. |
| 4.7.1 Evaluation of training | To evaluate training is to determine its value and benefit to the trainees and to the organisation. To properly evaluate training requires one to think through the purposes of the training, the intended results of the training, and the purposes of the evaluation. |
| 4.7.2 Transfer of training | Positive transfer of training: An enhancement in performance that occurs when skills from a previous work environment are applicable in the new environment. Negative transfer of training: A performance decrement that occurs when skills or experiences from one working environment contribute to human error in a new environment; that is the old skills interfere with learning and using the new skills required (interference between old and new methods of operation). |
| | |

| | |
|--|---|
| 5. Teams and communication | How people work and communicate with each other on shared goals and tasks. |
| 5.1 Team interaction | The way in which individuals perform their tasks. Prescribed working methods and individual working practices. |
| 5.1.1 Team structure | The impact on the team structure (supervision, team formation, peer pressure and norms). Includes leadership which relates to the ability of an individual to influence, motivate, and enable others to contribute toward the goals of the team and their effectiveness and success within the organisation. Also includes support which relates to the assistance team members can give to the leader and each other to achieve the team goals. |
| 5.1.1.1 Peer pressure | Peer pressure is the influence that one person in a similar role or of a similar age exerts over another. |
| 5.1.1.2 Leadership | Leadership relates to the ability of an individual to influence, motivate, and enable others to contribute toward the goals of the team and their effectiveness and success within the organisation. |
| 5.1.1.3 Support | Support relates to the assistance team members can give to the leader and each other to achieve the team goals. |
| 5.1.1.4 Norms | A norm is a behaviour or a judgement rule shared and accepted by a group. Individuals that do not behave according to the norm can be excluded or marginalised from the group. Usually norms are informal rules that are not written down and are rarely openly discussed (implicit rules). However they have a powerful influence on behaviours of the group members. |
| 5.1.2 Team dynamics and relations | Issues associated with a change to team dynamics and relations (e.g. from dual controller to single controller) which can also impact conflict resolution and co-operation. |
| 5.1.2.1 Conflict resolution | The process of attempting to resolve a dispute or a conflict. Successful conflict resolution occurs by listening to and providing opportunities to meet the needs of all parties, and to adequately address interests so that each party is satisfied with the outcome. Aim is to find the win-win outcome for parties involved, compared to the win-lose dynamic found in most conflicts. |
| 5.1.2.2 Co-operation | The process of working or acting together. |
| 5.1.3 Diffusion of responsibility | Situations where responsibility for action is divided between two or more individuals and each assumes that somebody else is taking the necessary action. |
| 5.2 Communications | The timely process of passing information between people completely and accurately so that it is received and understood. |
| 5.2.1 Information requirement | Requirement to exchange information between different actors in the system (e.g. as part of collaborative decision-making). Typically this will include communications between controllers and other controllers, pilots, technical personnel, supervisors, and managers. |
| 5.2.1.1 Information exchange between actors | Includes any way of exchanging information between actors in the most optimal way. |
| 5.2.1.2 Change in communication processes | Includes verbal, non-verbal, and technologically assisted communication processes. |
| 5.2.1.3 Position Handover Processes | Formalised handover procedures between actors |
| 5.2.2 Phraseology | Issues associated with the application of standard phraseology and terminology in ATM. |
| 5.2.3 National language differences | These include dialects and accents. ATCOs are required to have proficiency in the English language. Language performance requirements can include: the ability to produce intelligible messages in unusual situations; the ability to communicate in plain language (English) even under stress; understanding and making appropriate responses to pilots' messages; adherence to ICAO phraseology; and resolving misunderstanding in communication (e.g. by understanding cultural differences). |
| 5.2.4 Communication methods | Changes in communication methods, e.g. from verbal communication to computer-mediated communication and interference between competing sources of information. |
| 5.2.4.1 From verbal communication to computer mediated communication | Changes required between verbal and computer mediated communication methods |
| 5.2.4.2 Interference between competing sources of information | Interference between different communication methods and information mediums that compete for attention from finite cognitive resources |
| | |

| | |
|--|---|
| 6 Human in System | Emphasises that the human is a key part of the system |
| 6.1 Human machine interaction | The actions, reactions, and interactions between humans and other system components. This also applies to a multi-station, multi-person configuration of system. |
| 6.1.1 Input devices | How information is entered into the system, e.g. keyboard, mouse, roller ball, touch screen or microphone. |
| 6.1.2 Output devices | How information is received from the system: mainly visual display units, but also Radiotelephony (RTF) headset and phone. Comprises not only hardware but also the way information is provided (e.g. layout of information windows on the screen, use of colour). |
| 6.1.3 Information requirements | Information to be displayed including the information content, form and timeliness. Prioritisation and categorisation of information. |
| 6.1.4 Alert signals | Alarm handling, display of alarms, alarm philosophy/policy. |
| 6.1.5 Human-Machine Interface (HMI) / Usability | <p>HMI refers to the modes by which the human user and the machine communicate information and by which control is commanded, including areas such as information presentation, displays, displayed information, formats and data elements; command modes and languages; input devices and techniques; dialog, interaction and transaction modes; timing and pacing of operations; feedback, error diagnosis, prompting, queuing and job-performance aiding; and decision aiding. HMI also defines the properties of the hardware, software or equipment which constitute the conditions for interactions.</p> <p>HMI usability is the extent to which a system allows people to achieve goals (tasks) in an effective, efficient and satisfactory way. Aspects of the system that might ensure or compromise its usability includes a number of usability principles. The equipment should match the job or task, i.e. be logically organised / laid out; and comprise consistent screens, messages, terminology, and appearance. The computer interface should provide helpful information; require an operator to recognise information rather than to recall information from memory; keep the user informed of the current status; allow the user to drive the software; the interface should provide a mechanism to 'undo' or 'exit' a function; minimise the risk of a user making a safety significant error (i.e. requires action confirmation); provide accelerators for use by more experienced operators (e.g. shortcuts); and be simple to follow.</p> |
| 6.1.6 Allocation of function between human and machine | This includes the responsibility for command and control, ability to monitor (human to technology and technology to human), responsibility for checking, and intervention. Consider the impact of changes in the allocation of function (e.g. automated tasks) on situational awareness, workload and skill change (be it enhanced or degraded). |
| 6.2 System | A set of functions designed to meet a goal or set of related objectives. Key components or automated systems are hardware, software, people, and procedures. |
| 6.2.1 System Reliability | How well the design or manufacture of equipment, plant or infrastructure achieves the intended design purpose, not relating to a technical failure of one or more components. |
| 6.2.1.1 Resilience | Ability to quickly return to a previous good condition, recovery. |
| 6.2.1.2 Robustness | Strong and unlikely to break or fail. |
| 6.2.1.3 Recovery from system failure | Degree to which system failures are immediately evident in all operating conditions and all modes of operation. Potential for an individual to mitigate the system failure. |
| 6.2.2 Automation & new technology | Automation is the independent accomplishment by a device or system of a function that was formerly carried out by a human. The level of automation refers to the extent to which tasks are under the control of the computer versus those that are under the control of the operator. Factors to consider in relation to automation include: task complexity and demand on operators, safety significance of the tasks, output of investigations / formal studies, changes in function and/or performance requirements of the system, mode awareness, timely response requirements, automation complacency, monitoring, and revision under system degradation. New technology (i.e. software tools and capabilities) that supports the operator's information processing and decision-making activities. Technology level refers to the maturity of the equipment from new/novel technology through to established equipment. |