HUMAN FACTORS

DEFINITIONS AND USAGE NOTES

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Commercial Aviation Safety Team
COMMON TAXONOMY TEAM
International Civil Aviation Organizaion

The Human Factors Taxonomy is a high-level categorization of a set of concepts that describe an individual's performance in relationship to the environment.

RECORD OF REVISIONS

Date	Version	Section	Revision
10/2012	1.7	Document	Formatted document and made minor editorial changes
9/2011	1.6	Document	Document Creation

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INTRODUCTION

The International Civil Aviation Organization (ICAO) and the Commercial Aviation Safety Team (CAST), which includes Government officials and aviation industry leaders, have jointly chartered the CAST/ICAO Common Taxonomy Team (CICTT). The team was charged with developing common taxonomies and definitions for aviation accident and incident reporting systems. The common taxonomies and definitions are intended to improve the aviation community's capacity to identify and focus on common safety issues. CICCT includes experts from several air carriers, aircraft manufacturers, engine manufacturers, pilot associations, regulatory authorities, transportation safety boards, ICAO, and members from Canada, European Union, France, Italy, Japan, Netherlands, United Kingdom, and United States. CICTT is co-chaired by a representative from ICAO and a representative from CAST.

To accomplish its objectives, CICTT has developed the following:

- International Standard for Aircraft Make, Model and Series Groupings
- International Standard for Engine Make, Model and Submodel Groupings
- Human Factors
- Aviation Occurrence Categories
    - System/Component Failure or Malfunction (Powerplant) (SCF-PP) Subcategory
- Phase of Flight
- Positive Taxonomy

It is important to note that CICTT does not expect governments, international organizations, and corporations to immediately change internally maintained data systems, taxonomies, or definitions. The intent of the establishment of a common taxonomy is to first provide the aviation industry with a set of defined and agreed upon taxonomies that will aid in the investigation and mitigation of high risk safety events. The second intent is to provide these "target" taxonomies and definitions as industry standards so that as organizations make plans for, and implement new safety systems, the common taxonomies and definitions can be adopted.

The Human Factors Taxonomy is a high-level categorization of human factors concepts. The structure of the taxonomy includes a main category definition to identify the overall human factors concept, and subcategories to further define more specific concepts that are mutually exclusive but related to the main concept. The structure of the taxonomy was developed to support the mapping of common human factors concepts identified as in use across the aviation industry as well as aid organizations in the categorization and analysis of their internally maintained data sources.

In reference to the development of this taxonomy, the term "human factors" is defined as a set of concepts that describe an individual's performance in relationship to the environment. These factors include psychological, physical, procedural, cognitive, organizational, and environmental concepts, all of which include characteristics that may influence how an

individual performs in the working environment. The current version of this taxonomy focuses on flight operations as the targeted working environment. It should also be noted that the taxonomy is designed to be used as a general reference for both positive and negative influences a given factor may have on an individual's performance.

Another important element of the human factors taxonomy design is that it permits multiple categories to be associated with a single identified safety event. For example, the occurrence of a safety event may be associated with an individual's decision making, level of fatigue and operational experience. Multiple categorizations allow each human factors concept to be investigated as part of a set of factors that may have contributed to the occurrence of the identified safety event.

This version of the Human Factors Common Taxonomy focuses on the human factors of flight operations. Future updates will cover other aircraft operations. Contact points for all CICTT work is as follows:

CICTT@intlaviationstandards.org

ENVIRONMENTAL/SYSTEM DESIGN *(ENVR)*

Factors related to the interaction of flight crew and the operating environment, operating conditions, and system design.

Includes the following subcategories:

- **Operating Environment/Design:** Factors related to the infrastructure features of the environment setting, such as airport or aircraft design, navigational coverage or characteristics of a system.
- **Physical Environment:** Factors related to the physical characteristics of the work setting, such as terrain or runway surface.
- **Environmental Conditions:** Factors related to the environmental conditions, weather, or other phenomena.
- **Task Environment/Design:** Factors related to the physical workspace environment, such as aircraft design, features and functioning, adequate warnings and alarms or exposure to noise and vibration.

Usage Notes:

- This category is used to capture external factors that can affect flight crew performance such as the characteristics of an environment, infrastructure, or system that induce an operator error or support or impede the completion of a task.
- Operating Environment/Design includes characteristics of the operating environment or features of the infrastructure including en route navigational coverage or availability; approach aid coverage and availability; availability and accuracy of meteorological services; air traffic operating procedures; radar services and coverage; communication system coverage and availability; airport facilities; and airport layout and design, including systems or infrastructure associated with lighting, signage, markings, ground support, rescue support and security.
- Physical Environment is used to capture physical characteristics that contribute to flight crew error such as hazardous terrain, obstruction on the runway or airport area such as an object, animal, or substance, or hazardous runway/taxiway conditions such as wet, snow, or ice covered.
- Environmental Conditions are external factors that affect the flight and include temperature, humidity, or pressure issues, turbulence, convective weather, wind, ceiling, visibility, precipitation, and light conditions such as a dark night or flat light.
- Task Environment/Design is referenced when the characteristics of the physical workspace induces an operator error or enhances performance. Examples include enhanced aircraft design, improved accessibility to aircraft performance, poor access to equipment or controls, poor workspace lighting, excessive noise or vibration, nonfunctional controls or displays, or insufficient alarms and warnings.

EXPERIENCE/KNOWLEDGE *(KNOW)*

Factors related to experience, qualifications and training, and knowledge.

Includes the following subcategories:

- **Experience:** Factors related to experience, e.g., level of exposure; amount of time in aircraft.
- **Qualifications/Training:** Factors related to training, including recency of training and documented status or proficiency level.
- **Knowledge:** Factors related to knowledge of the position, aircraft, procedures, etc.

Usage Notes:

- This category includes factors related to experience, qualifications and training, and knowledge.
- Experience includes total and recent flight experience and amount of time spent operating an aircraft. This category includes type and level of exposure a pilot has experienced or acquired over time.
- Qualification/Training includes total and recent instruction and training received, recurrent instruction/training, type of instruction/training received, or lack of training. Also included in this category are the documented status, rating of the operator, and current certifications.
- Knowledge includes knowledge of procedures, aircraft equipment, meteorological condition, regulatory requirements, geographic area, and aeronautical knowledge, transfer of knowledge, and reading comprehension.

ORGANIZATIONAL OVERSIGHT *(ORGN)*

Factors related to the organizational oversight, support, and monitoring of company programs, policies, and personnel.

Includes the following subcategories:

- **Oversight:** Factors related to the oversight, support, and monitoring of personnel and company policies.
- **Operational Planning/Scheduling/Resource Management:** Factors related to the operational planning or management of resources.
- **Policy/Procedures:** Factors related to the policies and procedures set forth by the company/organization.
- **Culture:** Factors related to the working atmosphere, climate, or norms that influence safety practices.
- **Training Program:** Factors related to the adequacy, effectiveness, and completeness of the company's training program.
- **Documentation/Record Keeping:** Factors related to the documentation of company records.
- **Enforcement:** Factors related to the enforcement actions of the company and its adherence to company enforcement policies.
- **Safety Program:** Factors related to the availability, adequacy, and adherence to a company safety program.

Usage Notes:

- This category is used to capture factors related to characteristics, behaviors, and norms relating to the organizational/oversight of the company.
- Oversight includes oversight/supervision of personnel, oversight/supervision of operations, oversight/supervision of maintenance, equipment monitoring, parts and tools tracking, document revision tracking, and oversight of regulatory compliance.
- Operational Planning/Scheduling/Resource Management refers to the availability or adequacy of personnel, equipment, facilities, or documents and information, scheduling of personnel, crew pairing, equipment scheduling, maintenance scheduling, and task scheduling.
- Policy/Procedures refers to the availability and adequacy of the company's policies and procedures. Examples include new policies, procedures, or out of date procedures or policies.
- Culture includes standard operating practices, pressures, or demands from the company to perform or meet operational goals and timelines, and organizational structures and policies that affect the working environment.
- Training program refers to the company's training program, including course curriculums, instruction, instructors, course evaluations, adequate recurrent training program, and adequate remedial training program.

- Documentation/Record Keeping includes company records and documentation such as operation records, personnel records, testing records, and maintenance records.
- Enforcement refers to the actions and policies of the company regarding personnel performance, operational procedures, regulatory requirements, equipment requirements, and company/organizational policies.
- Safety Program considers the availability, adequacy, and adherence to the company's safety program.

PERCEPTUAL *(PERC)*

Factors related to false perceptions or degradation of sensory input.

Includes the following subcategories:

- **Situational Awareness:** Factors related to a person's cognitive awareness of the aircraft in relation to operational and environmental conditions.
- **Spatial Disorientation/Illusions:** Factors related to a person's perception of the orientation of the aircraft including, but not limited to, the false perception of one's vestibular or visual cues.

Usage Notes:

- This category includes factors relating to an individual's awareness of their working environment as well as their sense of body position or aircraft attitude. Behaviors related to situational awareness include an individual's perception of the conditions or changes in their operational environment and are often described in relation to decision making or actions. Behaviors related to spatial disorientation are typically cited as the result of false perception and perceptual phenomenon.
- Situational Awareness includes the loss or incomplete perception of, or change to, elements present in an individual's operational environment. This factor may be related to an individual's limited perceptions of their operational environment as well as their ability to maintain a high level of vigilance of a range of elements.
- Spatial Disorientation/Illusions includes false perception of the aircraft's attitude or orientation. This factor may include vestibular illusions that can include, but are not limited to, coriolis vestibular illusion, giant-hand vestibular illusion, somatogravic/acceleration vestibular, graveyard spin, and the leans.
- Spatial Disorientation/Illusions can also include visual illusions such as black hole illusions, landing visual illusions, geometric perspective visual illusion, or autokinesis visual illusion.

PHYSICAL/SENSORY *(PHYS)*

Factors related to a person's physical or sensory characteristics, abilities, limitations, or behaviors.

Includes the following subcategories:

- **Physical Characteristics:** Factors related to a person's physical characteristics, anthropometrics, and physical limitations.
- **Sensory Ability/Limitation**: Factors related to a person's sensory abilities and limitations, not including psychological or visual/vestibular illusions.
- **Impairment/Incapacitation:** Factors contributing to the impairment or incapacitation of a person's facilities due to medical, physiological or substance-induced conditions. This excludes visual and vestibular illusions.
- **Health/Fitness:** Factors related to a person's general health, fitness, and lifestyle.
- **Fatigue/Alertness:** Factors related to both mental and physical fatigue that leads to diminished productivity, alertness, or efficiency.

Usage Notes:

- This category is used to address physical and sensory characteristics, as well as adverse physiological conditions that can affect operator performance such as illness, health, fatigue, and alertness.
- Physical Characteristics include personal body measurements such as size, reach, strength, weight, and limitations that are outside the normal anthropometric design standards.
- Sensory Ability/Limitation pertains to visual function, the use of corrective lenses, color vision, hearing ability, vestibular function, and tactile function.
- Impairment/Incapacitation includes factors due to illness, injury, alcohol, illicit drugs, prescription medication, over the counter medication, hypoxia/anoxia, hyperventilation, carbon monoxide, neurological, cardiovascular, toxic fumes, motion sickness, decompression/diving, or other loss of consciousness.
- Health/Fitness includes physical fitness, diet such as poor nutrition, fasting, etc., use of medication/drugs, use of alcohol, smoking, or a predisposing condition.
- Fatigue/Alertness refers to factors such as lack of sleep, disruption in circadian rhythm, jetlag, or rest/duty periods. This factor includes both mental fatigue as well as physical symptoms of fatigue.

PROCEDURAL/TASK PERFORMANCE *(PROC)*

Factors related to the act of completing procedures, tasks, utilizing equipment, or performing operational tasks.

Includes the following subcategories:

- **Planning/Preparation:** Factors related to the planning or preparation of operational tasks.
- **Inspection:** Factors related to inspection procedures.
- **Documentation/Record Keeping Tasks:** Factors related to documentation usage, including the completion or use of flight paperwork.
- **Information/Equipment Utilization:** Factors related to the utilization, configuration, or interaction with a system.
- **Monitoring:** Factors related to the behavior of systematic monitoring of the operational environment, including task and equipment monitoring.
- **Workload Management:** Factors related to the management of workload/tasks.
- **Communication:** Factors related to communication between crewmembers and other groups.
- **Coordination:** Factors related to the coordination between crewmembers.
- **Violations:** Factors related to intentional behavior related to completion of required procedures or tasks.
- **Action/Inaction:** Factors related to a nonintentional behavior related to an action, series of actions, or the lack of action.

Usage Notes:

- This category includes situations in which a flight crewmember failed to follow a procedure, plan, or coordinate with others or made an unintentional error in aircraft handling and technique.
- Planning/Preparation is used for performance calculations, weight and balance calculations, weather planning, flight planning, navigational planning, and fuel planning.
- Inspection includes preflight inspection, post maintenance inspection, and scheduled and routine maintenance inspections.
- Documentation/Record Keeping Tasks includes errors related to use of flight logs and manifest, use of aircraft logs, maintenance logs, pilots logs, Minimum Equipment List (MEL), and Hazardous Material (HAZMAT).
- Information/Equipment Utilization includes aircraft handling and control, use of automation, use of equipment and systems, use of manuals, checklists, and charts, use of policy and procedures, and use of available resources.
- Monitoring includes task monitoring, monitoring equipment/instruments, monitoring communications, monitoring other person/crewmember, monitoring other aircraft, and monitoring environment. Examples include failure to monitor automation, displays, or instruments.

- Workload Management is used for task scheduling, task load shedding, task allocation, and task overload.
- Communication includes, but is not limited to, lack of communication, accuracy of communication, use of phraseology, language or accent interference, misinterpretations or misunderstandings of communication and readback issues. This factor includes both positive and negative behaviors associated with an individual's communication with others.
- Coordination/Teamwork includes factors related to but not limited to Crew Resource Management (CRM) techniques, crew/duty change-over behaviors, and ability of crew to work as a team. This factor includes both positive and negative behaviors associated with an individual's coordination with others.
- Violations include intentional acts related to completion of required tasks, work-arounds, aviation regulation violations, and other willful disregard for rules or regulations. This factor relates to intentional actions or inactions or behaviors related to requirements associated with task completion.
- Action/Inaction are nonintentional behaviors such as incorrect action selection, incorrect action performance, incorrect action sequence, delayed action, lack of action, forgotten action/omission, incomplete action, or unnecessary action. Note this factor can relate to a range of behaviors and should be used if a behavior is not specifically referenced in the other procedural factors.

PSYCHOLOGICAL *(PSYC)*

Factors related to thinking or acting such as learning, memory, personality, or attitudes (not including physiological issues).

Includes the following subcategories:

- **Attention/Distraction:** Factors related to an individual to maintain attention or to be distracted from their operation or task.
- **Cognitive Limitation:** Factors related to a person's mental or cognitive limitations, e.g., the operational demand exceeds the mental capabilities of the operator.
- **Information Processing/Decision Making:** Factors related to the ability to process available information, and how it is applied in the decision-making process and assessment of risk.
- **Mental/Emotional State:** Factors related to an individual's mental or emotional state of well-being.
- **Personality/Attitude:** Factors related to personality or attitudes of the pilot/flight crew.

Usage Notes:

- This category includes nonobservable states including psychological factors and cognitive limitations. Care should be taken when assigning these categories since some judgments are generally subjective.
- Attention/Distraction includes attention, channelized attention, and distraction from tasks. Examples include failure to pay attention, lack of focus on tasks, individual ability to remain on task and likelihood to become distracted.
- Cognitive Limitation includes cognitive overload, memory limit, and operational exceedance.
- Information Processing/Decision Making includes, but is not limited to, identification, interpretation, and prioritization of visual or auditory data; understanding and comprehension of information; and judgment, expectation, assumption, and assessment of operational risks. Examples include use of operational decision points such as decision to reject a takeoff or decision to execute a go-around.
- Mental/Emotional State includes, but is not limited to, personal stress, anxiety, boredom, apprehension, and denial.
- Personality/Attitude includes issues of self-confidence, confidence, or reliance on equipment; complacency, motivation, or response to pressures; and personality issues such as being aggressive, assertive, or lacking assertiveness.