IATA Annual Safety Report - 2023
Addendum and Appendices

Addendum A - Fatality Risk

Definition

In 2015, IATA added another measure of air carrier safety to its annual Safety Report: fatality risk. This measure seeks to answer the following question: what was the exposure of a passenger or crew member to a catastrophic accident, where all people on board perished?

The equation to calculate the fatality risk is Q = V/N, where:

- N is the number of flights or sectors conducted during the period
- V is the total number of "full-loss equivalents" among the N flights or sectors

The full-loss equivalent for a given flight is the proportion of passengers and crew who do not survive an accident. For example:

- If a flight lands safely, the full-loss equivalent is zero.
- If a flight results in an accident in which all passengers and crew are killed, the full-loss equivalent is one.
- If a flight results in an accident in which half of passengers and crew are killed, the full-loss equivalent is 0.5.

V is the sum of all full-loss equivalents calculated for all N flights. In other words, the fatality risk rate (Q) is the sum of the individual accident full-loss equivalents divided by the total number of flights.

Examples

The following tables illustrate two examples:

Case 1: There were a total of four accidents during the period:

Accident	% of People-Onboard Who Perished	Full-Loss Equivalent
#1	0%	0
#2	100%	1
#3	50%	0.5
#4	50%	0.5
Total Full-Loss Equivalent		2
Number of Sectors		3,000,000
Fatality Risk		0.00000067
Fatality Risk (normalized per 1 million sectors)		0.67

In Case 1, there were a total of four accidents out of three million sectors. Of these four accidents, one had no fatalities, one was a complete hull loss with all on board killed, and two in which half on board perished. In total, there were two full- loss equivalents out of three million sectors, which equates to 0.67 full-loss equivalents per million sectors. In other words, the exposure of all passengers and crew who flew on those sectors to a catastrophic accident was 1 in 1.5 million flights.

Case 2: There were a total of six accidents:

Accident	% of People-Onboard Who Perished	Full-Loss Equivalent
#1	0%	0
#2	10%	0.1
#3	20%	0.2
#4	50%	0.5
#5	30%	0.3
#6	40%	0.4
Total Full-Loss Equivalent		1.5
Number of Sectors		3,000,000
Fatality Risk		0.0000005
Fatality Risk (normalized per 1 million sectors)		0.50

In Case 2, there were a total of six accidents out of three million sectors. Of these six accidents, five experienced some fatalities, but there was no complete full loss. The total of the full-loss equivalents was 1.5. This equates to a fatality risk of

0.50 per million sectors. The exposure, in this case, was of one catastrophic accident per two million flights.

When comparing the above cases, the risk of perishing on a randomly selected flight is lower in Case 2 even though there were more accidents with fatalities. Case 1 had fewer fatal accidents, but they were more severe. Therefore, the odds of a passenger or crew losing their life on a given flight (fatality risk) is higher in Case 1 than in Case 2.

Considerations

It is important to note that the calculation of fatality risk does not consider the size of the airplane, how many people were on board, or the length of the flight. Rather, what is key is the percentage of people, from the total carried, who perished. It does not consider whether the accident was on a long-haul flight on a large aircraft where 25% of the passengers did not survive, or on a small commuter flight with the same ratio. The likelihood of perishing is the same.

Fatality risk, or full-loss equivalent, can easily be mistaken to represent the number of fatal accidents (or the fatal accident rate). Although fatality risk only exists once there is a fatal accident, they are not the same. While a fatal accident indicates an accident where at least one person perished, the full-loss equivalent indicates the proportion of people on board who perished.

Fatality risk provides a good baseline for comparison between accident categories. For example, Loss of Control — In-flight (LOC-I) is known to have a high fatality risk, but a low frequency of occurrence. Runway Excursion, on the other hand, has a low fatality risk, but a higher frequency of occurrence. It is possible, therefore, for the Runway Excursion category to have the same fatality risk as LOC-I if its frequency of occurrence is high enough so that the generally small full-loss equivalent for each individual accident produces the same total full-loss equivalent number as LOC-I (per million sectors).

Appendix 1 – Definitions

Abnormal Disembarkation: Passengers and/or crew exit the aircraft via boarding doors (normally assisted by internal aircraft or exterior stairs) after an aircraft incident or accident and when away from the boarding gates or aircraft stands (e.g., onto a runway or taxiway); only in a non-life-threatening and non-catastrophic event.

Accident: IATA defines an accident as an event where ALL of the following criteria are satisfied:

- Person(s) have boarded the aircraft with the intention of flight (either flight crew or passengers).
- The intention of the flight is limited to normal commercial aviation activities, specifically scheduled/charter passenger or cargo service. Executive jet operations, training, and maintenance/test flights are excluded.
- The aircraft is turbine-powered and has a certificated Maximum Takeoff Weight (MTOW) of at least 5,700 kg (12,540 lb.).
- The aircraft has sustained major structural damage that adversely affects the structural strength, performance or flight characteristics of the aircraft and would normally require major repair or replacement of the affected component exceeding $1 million USD or 10% of the aircraft's hull reserve value, whichever is lower, or the aircraft has been declared a hull loss.

Accident Classification: Process by which actions, omissions, events, conditions, or a combination thereof, that led to an accident are identified and categorized.

Aircraft: Involved aircraft, used interchangeably with airplane(s).

Cabin Safety-related Event: Accident involving cabin operational issues (e.g., passenger evacuation, onboard fire, decompression, ditching) that requires actions by the operating cabin crew.

Captain: Involved pilot responsible for the operation and safety of the aircraft during flight time.

Commander: Involved pilot, in an augmented crew, responsible for the operation and safety of the aircraft during flight time.

Crew member: Anyone on board a flight who has duties connected with the sector of the flight during which the accident happened. It excludes positioning or relief crew, security staff, etc. (see definition of "Passenger" below).

Evacuation (Land): Passengers and/or crew evacuate the aircraft via escape slides/slide rafts, doors, emergency exits or gaps in the fuselage (usually initiated in life-threatening and/or catastrophic events).

Evacuation (Water): Passengers and/or crew evacuate the aircraft via escape slides/slide rafts, doors, emergency exits or gaps in the fuselage and into or onto water.

Fatal Accident: Accident where at least one passenger or crew member is killed or later dies of their injuries, resulting from an operational accident. Events such as slips, trips and falls, food poisoning, or injuries resulting from turbulence or involving onboard equipment, which may involve fatalities, but where the aircraft sustains minor or no damage, are excluded.

Fatality: Passenger or crew member who is killed or later dies of their injuries resulting from an operational accident. Injured persons who die more than 30 days after an accident are excluded.

Fatality Risk: Sum of full-loss equivalents per 1 million sectors, measuring the exposure of a passenger or crew member to a non-survivable accident. A full-loss equivalent is related to the per- centage of people on board who perished. Refer to Addendum A for additional information.

Full-Loss Equivalent: Number representing the equivalent of a catastrophic accident where all people onboard died. For an individual accident, the full-loss equivalent is a value between 0 and 1, representing the ratio between the number of people who perished and the number of people on board the aircraft. In a broader context, the full-loss equivalent is the sum of each accident's full-loss equivalent value. Refer to Addendum A for additional information.

Hazard: Condition, object or activity with the potential of causing injuries to persons, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

Hull Loss: Accident in which the aircraft is destroyed or substantially damaged and is not subsequently repaired for whatever reason, including a financial decision of the owner.

Hull Loss/Nil Survivors: Accident resulting in a complete hull loss with no survivors (used as a Cabin End State).

IATA Accident Classification System: Refer to Appendix 2 of this document.

IATA Regions: I ATA determines the accident region based on the operator's home country as specified in the operator's Air Operator Certificate (AOC). For example, if a Canadian-registered operator has an accident in Europe, this accident is counted as a 'North American' accident. For a complete list of countries assigned per region, consult the following table:

IATA REGIONS

Region	Country
AFI	Angola
	Benin
	Botswana
	Burkina Faso
	Burundi
	Cameroon
	Cape Verde
	Central African Republic
	Chad
	Comoros
	Congo
	Congo, Democratic Republic of
	Côte d'Ivoire
	Djibouti
	Equatorial Guinea
	Eritrea
	Eswatini
	Ethiopia
	Gabon
	Gambia
	Ghana
	Guinea
	Guinea-Bissau
	Kenya
	Lesotho
	Liberia
	Madagascar
	Malawi
	Mali
	Mauritania
	Mauritius
	Mozambique
	Namibia
	Niger
	Nigeria
	Rwanda
	São Tomé and Príncipe

Region	Country
	Senegal
	Seychelles
	Sierra Leone
	Somalia
	South Africa
	South Sudan
	Tanzania, United Republic of
	Togo
	Uganda
	Zambia
	Zimbabwe
ASPAC	Australia[1]
	Bangladesh
	Bhutan
	Brunei Darussalam
	Cambodia
	Fiji
	India
	Indonesia
	Japan
	Kiribati
	Korea, Republic of
	Lao People's Democratic Republic
	Malaysia
	Maldives
	Marshall Islands
	Micronesia, Federal States of
	Myanmar
	Nauru
	Nepal
	New Zealand[2]
	Pakistan
	Palau
	Papua New Guinea
	Philippines
	Samoa
	Singapore

Region	Country
ASPAC	Solomon Islands
	Sri Lanka
	Thailand
	Timor-Leste
	Tonga
	Tuvalu
	Vanuatu
	Vietnam
CIS	Armenia
	Azerbaijan
	Belarus
	Georgia
	Kazakhstan
	Kyrgyzstan
	Moldova, Republic of
	Russian Federation
	Tajikistan
	Turkmenistan
	Ukraine
	Uzbekistan
EUR	Åland Islands
	Albania
	Andorra
	Austria
	Belgium
	Bosnia and Herzegovina
	Bulgaria
	Croatia
	Cyprus
	Czechia
	Denmark[3]
	Estonia
	Finland
	France[4]
	Germany
	Greece
	Holy See

Region	Country
EUR	Hungary
	Iceland
	Ireland
	Israel
	Italy
	Kosovo
	Latvia
	Liechtenstein
	Lithuania
	Luxembourg
	Malta
	Monaco
	Montenegro
	Netherlands[5]
	North Macedonia
	Norway
	Poland
	Portugal
	Romania
	San Marino
	Serbia
	Slovakia
	Slovenia
	Spain
	Svalbard and Jan Mayen
	Sweden
	Switzerland
	Türkiye
	United Kingdom[6]
LATAM/CAR	Antigua and Barbuda
	Argentina
	Bahamas
	Barbados
	Belize
	Bolivia
	Bonaire, Saba, St. Eustatius
	Brazil

Region	Country
LATAM/CAR	Chile
	Colombia
	Costa Rica
	Cuba
	Dominica
	Dominican Republic
	Ecuador
	El Salvador
	Grenada
	Guatemala
	Guyana
	Haiti
	Honduras
	Jamaica
	Mexico
	Nicaragua
	Panama
	Paraguay
	Peru
	Saint Kitts and Nevis
	Saint Lucia
	Saint Vincent & the Grenadin
	Suriname
	Trinidad and Tobago
	Uruguay
	Venezuela
MENA	Afghanistan
	Algeria
	Bahrain
	Egypt
	Iran, Islamic Republic of
	Iraq
	Jordan
	Kuwait
	Lebanon
	Libya
	Morocco
	Oman
	Palestinian Territories
	Qatar
	Saudi Arabia
	Sudan
	Syrian Arab Republic
	Tunisia
	United Arab Emirates
	Yemen
NAM	Canada
	United States of America[7]
NASIA	China (People's Republic of)[8]
	Korea, Democratic People's Republic of
	Mongolia

[1]Australia includes:
Christmas Island
Cocos (Keeling) Islands
Norfolk Island
Ashmore and Cartier Islands
Coral Sea Islands
Heard Island and McDonald Islands

[2]New Zealand includes:
Cook Islands
Niue
Tokelau

[3]Denmark includes:
Faroe Islands
Greenland

[4]France includes:
French Guiana
French Polynesia
French Southern Territories
Guadaloupe
Martinique
Mayotte
New Caledonia
Saint-Barthélemy
Saint Martin (French part)
Saint Pierre and Miquelon
Reunion
Wallis and Futuna

[5]Netherlands include:
Aruba
Curacao
Netherlands Antilles
Sint Maarten

[6]United Kingdom includes:
Akrotiri and Dhekelia
Anguilla
Bermuda
British Indian Ocean Territory
British Virgin Islands
Cayman Islands
Falkland Islands (Malvinas)
Gibraltar
Montserrat
Pitcairn
Saint Helena, Ascension and Tristan da Cunha
South Georgia and the South Sandwich Islands
Turks and Caicos Islands
British Antarctic Territory
Guernsey
Isle of Man
Jersey

[7]United States of America include:
American Samoa
Guam
Northern Mariana Islands
Puerto Rico
Virgin Islands, U.S.
United States Minor Outlying Islands

[8]China includes:
Chinese Taipei
Hong Kong (SAR), China
Macao (SAR), China

Incident: Occurrence, other than an accident, associated with the operation of an aircraft that affects or could affect the safety of operation.

In-flight Security Personnel: Individual who is trained, authorized and armed by the state and is carried on board an aircraft and whose intention is to prevent acts of unlawful interference.

Investigation: Process conducted for accident prevention, which includes the gathering and analysis of information, the drawing of conclusions (including the determination of causes) and, when appropriate, the making of safety recommendations.

Investigator in Charge: Person charged, based on their qualifi- cations, with the responsibility for the organization, conduct and control of an investigation.

Involved: Directly concerned, or designated to be concerned, with an accident or incident.

Level of Safety: How far safety is to be pursued in a given context, assessed with reference to an acceptable risk, based on the current values of society.

Major Repair: A repair that, if improperly done, might appreciably affect the mass, balance, structural strength, performance, power plant operation, flight characteristics, or other qualities affecting the airworthiness of an aircraft.

Non-operational Accident: Includes accidents resulting from acts of deliberate violence (e.g., sabotage, war) and accidents that occur during crew training, demonstrations and test flights. Violence is believed to be a matter of security rather than flight safety. Crew training, demonstrations and test flights are considered to involve special risks inherent with these types of operations. Also included in this category are:

- Non-airline-operated aircraft (e.g., military or government- operated, survey, aerial work or parachuting flights).
- Accidents where there was no intention of flight.

Normal Disembarkation: Passengers and/or crew exit the aircraft via boarding doors during normal operations.

Occurrence: Any unusual or abnormal event involving an aircraft, including, but not limited to, an incident.

Operational Accident: Accident that is believed to represent the risks of normal commercial operation; generally, an accident that occurs during normal revenue operations or a positioning flight.

Operator: Person, organization or enterprise engaged in, or offering to engage in, aircraft operations.

Passenger: Anyone on board a flight who, as far as may be determined, is not a crew member. Apart from normal revenue passengers, this includes off-duty staff members, positioning and relief flight crew members, etc., who have no duties connected with the sector of the flight during which the accident happened. Security personnel are included as passengers as their duties are not concerned with the operation of the flight.

Person: Any involved individual, including airport and Air Traffic Service (ATS) personnel.

Phase of Flight: The phase of flight definitions developed and applied by IATA are presented in the table on the following page.

Rapid Deplaning: Passengers and/or crew rapidly exit the aircraft via boarding doors and a jet bridge or stairs, as a precautionary measure.

Risk: Assessment, expressed in terms of predicted probability and severity, of the consequence(s) of a hazard, taking as reference the worst foreseeable situation.

Safety: State in which the risk of harm to persons or property is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management.

Sector: Operation of an aircraft between takeoff at one location and landing at another (other than a diversion).

Serious Injury: Injury sustained by a person in an accident and which meets one of the following:

- Requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received.
- Results in a fracture of any bone (except simple fractures of fingers, toes or nose).
- Involves lacerations that cause severe hemorrhage or nerve, muscle or tendon damage.
- Involves injury to any internal organ.
- Involves second or third-degree burns, or any burns affecting more than 5% of the surface of the body.
- Involves verified exposure to infectious substances or injurious radiation.

Serious Incident: Incident involving circumstances indicating that an accident nearly occurred. Note: the difference between an accident and a serious incident lies only in the result.

Substantial Damage: Damage or structural failure, which adversely affects the structural strength, performance or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component.

Notes:

- Bent fairing or cowling, dented skin, small punctured holes in the skin or fabric, minor damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wing tips are not considered "substantial damage" for the purpose of this Safety Report.
- The ICAO Annex 13 definition is unrelated to cost and includes many incidents in which the financial consequences are minimal.

Unstable Approach: Approach where the IATA ACTG has knowledge about vertical, lateral or speed deviations in the portion of the flight close to landing. Note: this definition includes the portion immediately prior to touchdown and in this respect the definition might differ from other organizations. However, accident analysis gives evidence that a destabilization just prior to touchdown has contributed to accidents in the past.

PHASE OF FLIGHT DEFINITIONS

Flight Planning (FLP) This phase begins when the flight crew initiates the use of flight planning information facilities and becomes dedicated to a flight based upon a route and airplane; it ends when the crew arrives at the aircraft for the planned flight or the crew initiates a 'Flight Close' phase.

Preflight (PRF) This phase begins with the arrival of the flight crew at an aircraft for the flight; it ends when a decision is made to depart the parking position and/or start the engine(s). It may also end by the crew initiating a 'Post-flight' phase. Note: the PRF phase assumes the aircraft is sitting at the point at which the aircraft will be loaded or boarded, with the primary engine(s) not operating. If boarding occurs during this phase, it is done without any engine(s) operating. Boarding with any engine(s) operating is covered under 'Engine Start/Depart'.

Engine Start/Depart (ESD) This phase begins when the flight crew take action to have the aircraft moved from the parked position and/or take switch action to energize the engine(s); it ends when the aircraft begins to move under its own power or the crew initiates an 'Arrival/Engine Shutdown' phase. Note: the ESD phase includes the aircraft engine(s) start-up whether assisted or not and whether the aircraft is stationary with more than one engine shutdown prior to 'Taxi-out' (i.e., boarding of persons or baggage with engines running); it includes all actions of power back to position the aircraft for Taxi-out.

Taxi-out (TXO) This phase begins when the crew moves the aircraft forward under its own power; it ends when thrust is increased for 'Takeoff' or the crew initiates a 'Taxi-in' phase. Note: this phase includes taxi from the point of moving under the aircraft's own power, up to and including entering the runway and reaching the Takeoff position.

Takeoff (TOF) This phase begins when the crew increases the thrust for lift-off; it ends when an 'Initial Climb' is established or the crew initiates a 'Rejected Takeoff' phase.

Rejected Takeoff (RTO) This phase begins when the crew reduces thrust to stop the aircraft before the end of the Takeoff phase; it ends when the aircraft is taxied off the runway for a 'Taxi- in' phase or when the aircraft is stopped and engines shutdown.

Initial Climb (ICL) This phase begins at 35 feet above the runway elevation; it ends after the speed and configuration are established at a defined maneuvering altitude or to continue the climb for cruising. It may also end by the crew initiating an 'Approach' phase. Note: maneuvering altitude is that needed to safely maneuver the aircraft after an engine failure occurs, or predefined as an obstacle clearance altitude. ICL includes such procedures applied to meet the requirements of noise abatement climb or best angle/rate of climb.

En Route Climb (ECL) This phase begins when the crew establishes the aircraft at a defined speed and configuration, enabling the aircraft to increase altitude for cruising; it ends with the aircraft establishing a predetermined constant initial cruise altitude at a defined speed or by the crew initiating a 'Descent' phase.

Cruise (CRZ) This phase begins when the crew establishes the aircraft at a defined speed and predetermined constant initial cruise altitude and proceeds in the direction of a destination; it ends with the beginning of the 'Descent' phase for an approach or by the crew initiating an ECL phase.

Descent (DST) This phase begins when the crew departs the cruise altitude for an approach at a destination; it ends when the crew initiates changes in aircraft configuration and/or speeds to facilitate a landing on a specific runway. It may also end by the crew initiating an ECL or CRZ phase.

Approach (APR) This phase begins when the crew initiates changes in aircraft configuration and/or speeds enabling the aircraft to maneuver to land on a specific runway; it ends when the aircraft is in the landing

configuration and the crew is dedicated to land on a specific runway. It may also end by the crew initiating a 'Go-around' phase.

Go-around (GOA) This phase begins when the crew aborts the descent to the planned landing runway during the APR phase; it ends after speed and configuration are established at a defined maneuvering altitude or to continue the climb for the purpose of cruise (same as the end of ICL).

Landing (LND) This phase begins when the aircraft is in the landing configuration and the crew is dedicated to touch down on a specific runway; it ends when the speed permits the aircraft to be maneuvered by means of taxiing for arrival at a parking area. It may also end by the crew initiating a GOA phase.

Taxi-in (TXI) This phase begins when the crew begins to maneuver the aircraft under its own power to an arrival area for parking; it ends when the aircraft ceases moving under its own power with a commitment to shut down the engine(s). It may also end by the crew initiating a TXO phase.

Arrival/Engine Shutdown (AES) This phase begins when the crew ceases to move the aircraft under its own power and a commitment is made to shut down the engine(s); it ends with a decision to shut down ancillary systems to secure the aircraft. It may also end by the crew initiating an ESD phase. Note: the AES phase includes actions required during a time when the aircraft is stationary with one or more engines operating while ground servicing may be taking place (i.e., deplaning persons or baggage with engine(s) running and/or refueling with engine(s) running).

Post-flight (PSF) This phase begins when the crew commences the shutdown of ancillary systems of the aircraft to leave the flight deck; it ends when the flight and cabin crew leave the aircraft. It may also end by the crew initiating a PRF phase.

Flight Close (FLC) This phase begins when the crew initiates a message to the flight-following authorities that the aircraft is secure and the crew is finished with the duties of the past flight; it ends when the crew has completed these duties or begins to plan for another flight by initiating a FLP phase.

Ground Servicing (GDS) This phase begins when the aircraft is stopped and available to be safely approached by ground personnel for the purpose of securing the aircraft and performing the duties applicable to the arrival of the aircraft (i.e., aircraft maintenance); it ends with completion of the duties applicable to the departure of the aircraft or when the aircraft is no longer safe to approach for the purpose of ground servicing (e.g., prior to crew initiating the TXO phase). Note: the GDS phase was identified by the need for information that may not directly require the input of flight or cabin crew. It is acknowledged as an entity to allow placement of the tasks required of personnel assigned to service the aircraft.

Appendix 2 - Accident Classification Taxonomy

1. LATENT CONDITIONS

Definition: Conditions present in the system before the accident and triggered by various possible factors.

Latent Conditions (deficiencies in…)	Examples
Design	❖ Design shortcomings ❖ Manufacturing defects
Regulatory Oversight	❖ Deficient regulatory oversight by the state or lack thereof
Management Decisions	❖ Cost cutting ❖ Stringent fuel policy ❖ Outsourcing and other decisions, which can impact operational safety
	❖ From the Regulator
	❖ From the Operator
	❖ From Service Provider level including ATC, ANSPs, De-icing, etc…
Safety Management	Absent or deficient: ❖ Safety policy and objectives ❖ Safety risk management (including hazard identification process) ❖ Safety assurance (including Quality Management) ❖ Safety promotion
	❖ From the Regulator
	❖ From the Operator
	❖ Service Provider level including ATC, ANSPs, De-icing, etc…
Change Management	❖ Deficiencies in monitoring change; in addressing operational needs created by, for example, expansion or downsizing ❖ Deficiencies in the evaluation to integrate and/or monitor changes to establish organizational practices or procedures ❖ Consequences of mergers or acquisitions
	❖ From the Regulator
	❖ From the Operator
	❖ From Service Provider level including ATC, ANSPs, De-icing, etc…
Selection Systems	❖ Deficient or absent selection standards
Operations Planning and Scheduling	❖ Deficiencies in crew rostering and staffing practices ❖ Issues with flight and duty time limitations ❖ Health and welfare issues

1. LATENT CONDITIONS (CONT'D)

Latent Conditions (deficiencies in…)	Examples
Technology and Equipment	❖ **See the following breakdown**
	❖ Technology & Equipment (available safety equip not installed) on the aircraft
	❖ Technology & Equipment (available safety equip not installed) – Air Navigation Service Providers
	❖ Technology & Equipment (available safety equip not installed) – to airport facilities
Flight Operations	**See the following breakdown**
	Deficient or absent: ❖ Standard operating procedures (SOPs) ❖ Operational instructions and/or policies ❖ Company regulations ❖ Controls to assess compliance with regulations and SOPs
	❖ Omitted training, language skills deficiencies, qualifications and experience of flight crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Cabin Operations	**See the following breakdown**
	Deficient or absent: ❖ SOPs ❖ Operational instructions and/or policies ❖ Company regulations ❖ Controls to assess compliance with regulations and SOPs
	❖ Omitted training, language skills deficiencies, qualifications and experience of cabin crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Ground Operations	See the following breakdown
	Deficient or absent: ❖ SOPs ❖ Operational instructions and/or policies ❖ Company regulations ❖ Controls to assess compliance with regulations and SOPs
	❖ Omitted training, language skills deficiencies, qualifications and experience of cabin crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices

1. LATENT CONDITIONS (CONT'D)

Maintenance Operations	See the following breakdown
	Deficient or absent: ❖ SOPs ❖ Operational instructions and/or policies ❖ Company regulations ❖ Controls to assess compliance with regulations and SOPs Includes deficiencies in technical documentation, unrecorded maintenance and the use of bogus parts/unapproved modifications
	Omitted training, language skills deficiencies, qualifications and experience of maintenance crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Dispatch	See the following breakdown
	Deficient or absent: ❖ SOPs ❖ Operational instructions and/or policies ❖ Company regulations ❖ Controls to assess compliance with regulations and SOPs
	Omitted training, language skills deficiencies, qualifications and experience of flight crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Flight Watch	❖ Flight Watch/ Flight Following
Latent Conditions - Other	❖ Not clearly falling within the other latent conditions

Note: All areas such as Training, Ground Operations or Maintenance include outsourced functions for which the operator has oversight responsibility.

2. THREATS

Definition: An event or error that occurs outside the influence of the flight crew, but which requires crew attention and management if safety margins are to be maintained.

Mismanaged threat: A threat that is linked to or induces a flight crew error.

Environmental Threats	Examples
Meteorology	See the following breakdown
	❖ Thunderstorms
	❖ low visibility/Instrument Meteorological Conditions (IMC)
	❖ Wind/wind shear/gusty turbulence
	❖ Icing conditions
	❖ Hail
Cold Weather	❖ Including but not limited to snow, sleet (rain and snow mixed), freezing rain, freezing drizzle and low-level ice crystals.
Meteorology - Other	❖ May include heavy rain (not due to thunderstorm or convection), volcanic ash (airborne or deposited at the aerodrome), sand or dust (including storms thereof), extreme heat, and space weather events)
Lack of visual reference	❖ Darkness/black hole effect ❖ Environmental situation, which can lead to spatial disorientation
Air Traffic Services	❖ Tough-to-meet clearances/restrictions ❖ Reroutes ❖ Language difficulties ❖ Controller errors ❖ Failure to provide separation (air/ground)
Navigational Aids	See the following breakdown
	❖ Lack or unavailable (flight crew are aware of it)
	❖ Malfunction, or uncalibrated (Navaids are not working properly and flight crew are not aware of it)
Loss of separation	❖ Loss of separation between airborne aircraft occurs whenever specified separation minima in controlled airspace are breached. Source Skybrary
Communication	See the following breakdown
	❖ Use of non-standard phraseology or Language difficulties / competency.
Birds/Foreign Objects	See the following breakdown
	❖ Birds
	❖ Foreign objects, FOD

2. THREATS (CONT'D)

Environmental Threats	Examples
Airport Facility	See the following breakdown
	Poor signage/lighting, faint markings, rwy/txy closures
	Contaminated runways, taxiways, poor braking action
	Trenches/ditches, intruding structures
	Airport perimeter control/fencing / Wildlife control
	Foreign Object (FOD) Runway
	Inadequate Runway End Safety Areas (RESA)
Terrain/Obstacles	Self-explanatory
Traffic	See the following breakdown
	Aircraft striking other aircraft (anywhere except on the runway
	Ground vehicles hitting aircraft (anywhere except on the runway
Runway Surface Incursion	See the following breakdown
	❖ Aircraft
	❖ Vehicle
	❖ Wildlife
	❖ Other – Drones, Balloons, Bins, etc…
Environmental threats - Other	Not clearly falling within the other environmental threats
Airline Threats	**Examples**
Aircraft Malfunction / SCF-NP	❖ See the following breakdown
	❖ Landing gear/ tires
	❖ Brakes
Flight Controls	❖ See the following breakdown
	❖ Primary flight controls
	❖ Secondary flight controls
Structural Failure	❖ Failure due to flutter, overload ❖ Corrosion/fatigue ❖ Engine separation
Avionics, Flight Instruments	❖ All avionics except autopilot and the Flight Management System (FMS) ❖ Instrumentation, including standby instruments ❖ ACAS/TCAS Failure, Transponder Failure, ADS-B, GPS ❖ Lack or unavailable of such instruments

2. THREATS (CONT'D)

Airline Threats	Examples
Autopilot/FMS	❖ Self-explanatory
Hydraulic System Failure	❖ Self-explanatory
Electrical Power Generation Failure	❖ Loss of all electrical power, including battery power leading to limitations in/or total loss of aircraft control
Aircraft Malfunction - Other	❖ Not clearly falling within the other aircraft malfunction threats
MEL / CDL Items	❖ Minimum Equipment List (MEL) / Configuration Deviation List (CDL) items with operational implications
Operational Pressure	❖ Operational time pressure ❖ Missed approach/diversion ❖ Other non-normal operations
Cabin Events	❖ Cabin events (e.g., unruly passenger) ❖ Cabin crew errors ❖ Distractions/interruptions
Ground Events	❖ Aircraft loading events Fueling errors ❖ Agent interruptions ❖ Improper ground support ❖ Improper deicing/anti-icing
Dispatch/Paperwork	❖ Dispatch/paperwork issues including but not limited to load sheet errors ❖ Crew scheduling events ❖ Late paperwork changes or errors
Maintenance Events	❖ Aircraft repairs on ground ❖ Maintenance log problems ❖ Maintenance errors
Dangerous Goods	❖ Carriage of articles or substances capable of posing a significant risk to health, safety or property when transported by air
Manuals / Charts / Checklists	❖ Incorrect/unclear chart pages or operating manuals ❖ Checklist layout/design issues
Aircraft Malfunction	❖ See the following breakdown
Engine Failure/ SCF-PP	❖ Uncontained engine failure
Aircraft Fire / Smoke (cockpit / Cabin / Cargo)	❖ Fire due to aircraft systems or Other fire causes.
	❖ Cockpit and E&E (electronics equipment)
	❖ Cargo
	❖ Passenger Cabin and Crew Rest
	❖ Engine and APUs
	❖ Landing gear
	❖ External service vehicles and/or equipment

2. THREATS (CONT'D)

Airline Threats	Examples
Electronic Flight Bags	❖ The flight crew applies the correct input, but the system does not perform as required, example software bugs.
Incorrect performance calculation from service providers	❖ Self-explanatory
Airline Threats - Other	❖ Not clearly falling within the other airline threats
Psychological/ Physiological Threats	Examples
Fatigue	❖ Crewmember unable to perform duties due to fatigue.
Optical illusion/visual misperception	❖ Something that deceives the eye by appearing to be other than it is.
Spatial disorientation & spatial/ somatogravic illusion	❖ The **somatogravic** illusion is a vestibular illusion which is prevalent during high accelerations/decelerations when a pilot has no clear visual reference.
Crew Incapacitation	❖ Crewmember unable to perform duties due to physical or psychological impairment.

3. FLIGHT CREW ERRORS

Definition: An observed flight crew deviation from organizational expectations or crew intentions.

Mismanaged error: An error that is linked to or induces additional error or an undesired aircraft state.

Aircraft Handling Errors	**Examples**
Manual Handling/ Primary Flight Controls	❖ Hand flying vertical, lateral, or speed deviations ❖ Approach deviations by choice (e.g., flying below the glide slope) ❖ Missed runway/taxiway, failure to hold short, taxi above speed limit ❖ Incorrect flaps, speed brake, autobrake, thrust reverser or power settings
Incorrect Automation Settings and/or Selections	❖ Incorrect altitude, speed, heading, auto throttle settings, mode executed, or entries. Controls the aircraft flight path through automation, including appropriate use of flight management system(s) and guidance.
Systems / Radios / Instruments	❖ Including but not limited to Incorrect packs, altimeter, fuel switch settings, or radio frequency dialed ❖ Wrong Altimeter Reference Settings (QNH, QFE)
Aircraft Handling Errors - Other	❖ Not clearly falling within the other errors
Procedural Errors	Examples
Standard Operating Procedures Adherence	See the following breakdown
	❖ Intentional
	❖ Unintentional
	❖ Unknown
Checklist	See the following breakdown
	❖ Normal Checklist (errors)
	❖ Abnormal Checklist (error)
Callouts	❖ Omitted departure, takeoff, approach, or handover briefing; items missed. ❖ Briefing does not address expected situation
Briefings	❖ Checklist performed from memory or omitted ❖ Wrong challenge and response ❖ Checklist performed late or at wrong time ❖ Checklist items missed
Documentations	❖ Incorrect weight and balance information/ fuel information
	❖ Incorrect Automatic Terminal Information Service (ATIS) / clearance
	❖ Misinterpreted items on paperwork
	❖ Incorrect or missing log book entries
No Go Around	❖ No go around after destabilization on approach ❖ No go around after a bounced landing ❖ No Go-Around after instructed by ATC ❖ No Go-Around- Other

3.FLIGHT CREW ERRORS (CONTD)

Procedural Errors	Examples
Crew Response	See the following breakdown
	❖ Lack of response or acknowledgement to warnings and/or alerts
	❖ Inadequate response to warnings and/or alerts
Electronic Flight Bag	❖ The system is working correctly, but flight crew misapplies EFB provided information or incorrect inputs.
Incorrect performance calculation from flight crew	Self-explanatory
Procedural Errors - Others	Self-explanatory
Crew to External communication	See the following breakdown
	❖ With Air Traffic Control
	❖ With Cabin Crew
	❖ With Ground Crew
	❖ With Dispatch
	❖ With Maintenance
Pilot to Pilot	See the following breakdown
	Pilot to Pilot from the same aircraft
	Pilot to Pilot from the other aircraft
Other Procedural	❖ Administrative duties performed after top of descent or before leaving active runway ❖ Incorrect application of MEL

4. UNDESIRED AIRCRAFT STATES (UAS)

Definition: A flight-crew-induced aircraft state that clearly reduces safety margins; a safety-compromising situation that results from ineffective error management. A UAS is **recoverable**.

Mismanaged UAS: A UAS that is linked to or induces additional flight crew errors.

Undesired Aircraft States	Breakdown
Aircraft Handlining	❖ Abrupt aircraft control
	❖ Vertical, lateral or speed deviations
	❖ Operation outside aircraft limitations
	❖ Unstable Approach
	❖ Continued landing after unstable approach
	❖ Abnormal Runway Contact
	❖ Rejected takeoff after V_1
	❖ Controlled flight toward terrain
	❖ Aircraft Upset (Roll, Spin, Stall, etc…)
	❖ Aircraft Handling - Other
	❖ Continued landing after unstable approach
Ground Navigation	❖ Proceeding toward wrong taxiway/runway
	❖ Wrong taxiway, ramp, gate or hold spot
	❖ Runway/Taxiway incursion
	❖ Ramp movements, including when under marshalling
	❖ Loss of aircraft control while on the ground
	❖ Taxiway Excursion
	❖ Ground Navigation - Other
Air Navigation	❖ Landing on the Wrong Runway at the Correct Airport
	❖ Attempt to Land/Take-off on/from Taxiways
	❖ Unnecessary Weather Penetration
	❖ Unauthorized Airspace Penetration
	❖ Air Navigation – Other
Incorrect Aircraft Configuration	❖ Auto Brakes, Ground Spoilers
	❖ Systems (fuel, electrical, hydraulics, pneumatics, air conditioning, pressurization/instrumentation)
	❖ Landing Gear
	❖ Flight Controls/Automation
	❖ Engine
	❖ Weight and Balance
	❖ Aircraft Configuration – Other

5. FLIGHT CREW COUNTERMEASURES

Here thought is given to what could have avoided the accident. The last part of the classification process, therefore, is to apply a coding to flight crew countermeasures. As the name implies, the taxonomy is "flight crew centred. The following list includes countermeasures that the flight crew could have taken to prevent the accident. Countermeasures from other areas, such as ATC, ground operations personnel, maintenance staff are not considered at this time.

Countermeasure	Definition	Example Performance
Application of Knowledge	Demonstrates knowledge and understanding of relevant information, operating instructions, aircraft systems and the operating environment	❖ OB 0.1 Demonstrates practical and applicable knowledge of limitations and systems and their interaction ❖ OB 0.2 Demonstrates required knowledge of published operating instructions ❖ OB 0.3 Demonstrates knowledge of the physical environment, the air traffic environment including routings, weather, airports and the operational infrastructure ❖ OB 0.4 Demonstrates appropriate knowledge of applicable legislation ❖ OB 0.5 Knows where to source required information ❖ OB 0.6 Demonstrates a positive interest in acquiring knowledge ❖ OB 0.7 Is able to apply knowledge effectively
Application of Procedures and Compliance with Regulations	Identifies and applies appropriate procedures in accordance with published operating instructions and applicable regulations	❖ OB 1.1 Identifies where to find procedures and regulations ❖ OB 1.2 Applies relevant operating instructions, procedures and techniques in a timely manner ❖ OB 1.3 Follows SOPs unless a higher degree of safety dictates an appropriate deviation ❖ OB 1.4 Operates aeroplane systems and associated equipment correctly ❖ OB 1.5 Monitors aircraft systems status ❖ OB 1.6 Complies with applicable regulations. ❖ OB 1.7 Applies relevant procedural knowledge

5. FLIGHT CREW COUNTERMEASURES (CONTD)

Countermeasure	Definition	Example Performance
Communication	Communicates through appropriate means in the operational environment, in both normal and non normal situations	❖ OB 2.1 Determines that the recipient is ready and able to receive information ❖ OB 2.2 Selects appropriately what, when, how and with whom to communicate ❖ OB 2.3 Conveys messages clearly, accurately and concisely ❖ OB 2.4 Confirms that the recipient demonstrates understanding of important information ❖ OB 2.5 Listens actively and demonstrates understanding when receiving information ❖ OB 2.6 Asks relevant and effective questions ❖ OB 2.7 Uses appropriate escalation in communication to resolve identified deviations ❖ OB 2.8 Uses and interprets non-verbal communication in a manner appropriate to the organizational and social culture ❖ OB 2.9 Adheres to standard radiotelephone phraseology and procedures ❖ OB 2.10 Accurately reads, interprets, constructs and responds to datalink messages in English
Aeroplane Flight Path Management, Automation	Controls the flight path through automation	❖ OB 3.1 Uses appropriate flight management, guidance systems and automation, as installed and applicable to the conditions ❖ OB 3.2 Monitors and detects deviations from the intended flight path and takes appropriate action ❖ OB 3.3 Manages the flight path safely to achieve optimum operational performance ❖ OB 3.4 Maintains the intended flight path during flight using automation while managing other tasks and distractions ❖ OB 3.5 Selects appropriate level and mode of automation in a timely manner considering phase of flight and workload ❖ OB 3.6 Effectively monitors automation, including engagement and automatic mode transitions

5. FLIGHT CREW COUNTERMEASURES (CONTD)

Countermeasure	Definition	Example Performance
Aeroplane Flight Path Management, Manual Control	Controls the flight path through manual control	❖ OB 4.1 Controls the aircraft manually with accuracy and smoothness as appropriate to the situation ❖ OB 4.2 Monitors and detects deviations from the intended flight path and takes appropriate action ❖ OB 4.3 Manually controls the aeroplane using the relationship between aeroplane ❖ attitude, speed and thrust, and navigation signals or visual information ❖ OB 4.4 Manages the flight path safely to achieve optimum operational performance ❖ OB 4.5 Maintains the intended flight path during manual flight while managing other tasks and distractions ❖ OB 4.6 Uses appropriate flight management and guidance systems, as installed and applicable to the conditions ❖ OB 4.7 Effectively monitors flight guidance systems including engagement and automatic mode transitions
Leadership and Teamwork	Influences others to contribute to a shared purpose Collaborates to accomplish the goals of the team	❖ OB 5.1 Encourages team participation and open communication ❖ OB 5.2 Demonstrates initiative and provides direction when required ❖ OB 5.3 Engages others in planning ❖ OB 5.4 Considers inputs from others ❖ OB 5.5 Gives and receives feedback constructively ❖ OB 5.6 Addresses and resolves conflicts and disagreements in a constructive manner ❖ OB 5.7 Exercises decisive leadership when required ❖ OB 5.8 Accepts responsibility for decisions and actions ❖ OB 5.9 Carries out instructions when directed ❖ OB 5.10 Applies effective intervention strategies to resolve identified deviations ❖ OB 5.11 Manages cultural and language challenges, as applicable

5. FLIGHT CREW COUNTERMEASURES (CONTD)

Countermeasure	Definition	Example Performance
Problem-Solving and Decision Making	Identifies precursors, mitigates problems; and makes decisions	❖ OB 6.1 Identifies, assesses and manages threats and errors in a timely manner ❖ - OB 6.2 Seeks accurate and adequate information from appropriate sources ❖ OB 6.3 Identifies and verifies what and why things have gone wrong, if appropriate ❖ OB 6.4 Perseveres in working through problems while prioritizing safety ❖ OB 6.5 Identifies and considers appropriate options ❖ OB 6.6 Applies appropriate and timely decision-making techniques ❖ OB 6.7 Monitors, reviews and adapts decisions as required ❖ OB 6.8 Adapts when faced with situations where no guidance or procedure exists ❖ OB 6.9 Demonstrates resilience when encountering an unexpected event
Situation Awareness and Management of Information	Perceives, comprehends and manages information and anticipates its effect on the operation	❖ OB 7.1 Monitors and assesses the state of the aeroplane and its systems ❖ OB 7.2 Monitors and assesses the aeroplane's energy state, and its anticipated flight path. ❖ OB 7.3 Monitors and assesses the general environment as it may affect the operation ❖ OB 7.4 Validates the accuracy of information and checks for gross errors ❖ OB 7.5 Maintains awareness of the people involved in or affected by the operation and their capacity to perform as expected ❖ OB 7.6 Develops effective contingency plans based upon potential risks associated with threats and errors ❖ OB 7.7 Responds to indications of reduced situation awareness

5. FLIGHT CREW COUNTERMEASURES (CONTD)

Countermeasure	Definition	Example Performance
Workload Management	Maintain available workload capacity by prioritizing and distributing tasks using appropriate resources	❖ OB 8.1 Exercises self-control in all situations ❖ OB 8.2 Plans, prioritizes and schedules appropriate tasks effectively ❖ OB 8.3 Manages time efficiently when carrying out tasks ❖ OB 8.4 Offers and gives assistance ❖ OB 8.5 Delegates tasks ❖ OB 8.6 Seeks and accepts assistance, when appropriate ❖ OB 8.7 Monitors, reviews and cross-checks actions conscientiously ❖ OB 8.8 Verifies that tasks are completed to the expected outcome ❖ OB 8.9 Manages and recovers from interruptions, distractions, variations and failures effectively while performing tasks

6. END STATE

Definition: An end state is a reportable event. It is unrecoverable

End State	Definition
Controlled Flight into Terrain	❖ In-flight collision with terrain, water, or obstacle without indication of loss of control.
Loss of Control — In-flight	❖ Loss of aircraft control while inflight.
Runway Damage	❖ Any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, person or wildlife on the surface designated for the landing and takeoff of aircraft and resulting in damage.
Mid-Air Collision	❖ Collision between aircraft in flight.
Runway Excursion	❖ A veer off or overrun off the runway surface Sub-categories: ❖ **Runway Excursion Overrun:** Overrun off the runway surface ❖ **Runway Excursion Lateral:** Veer off the runway surface
In-flight Damage	❖ Damage occurring while airborne, including: weather-related events, technical failures, bird strikes and fire/smoke/fumes Sub-category ❖ **Collision with Obstacle(s) during Take-Off and Landing (CTOL):** Collision with obstacle(s) during takeoff or landing while airborne.
Ground Damage	❖ Damage occurring while on the ground, including: ○ Occurrences during (or as a result of) ground handling operations ○ Damage while taxiing to or from a runway in use (excluding a runway collision, Ref. S03) ○ Foreign object damage (Not on the runway i.e on taxiway) ○ Fire/smoke/fumes ○ Taxiway Excursion Sub-categories: ❖ **Taxiing Damage:** Damage while taxiing to or from a runway in use (excluding a runway collision) ❖ **Ramp Damage:** Occurrences during (or as a result of) ground handling operations
Off or Partial Off Runway Touchdown	❖ A touchdown off the runway surface Sub-categories: ❖ **Undershoot** (Used for occurrences on landing flare) ❖ **Overshoot** ❖ **Lateral Touchdown** (landing gear touchdown either the left or right of the runway surface)
Hard Landing	❖ Any hard landing resulting in substantial damage

6. END STATE (CONT'D)

End State	Definition
Landing Gear	❖ Any gear-up landing/collapse resulting in substantial damage Sub-categories: ❖ **Gear Up Landing** ❖ **Gear Collapse**
Tail Strike	❖ Tail strike on take-off or landing resulting in substantial damage Sub-categories: ❖ **Tail Strike on Takeoff** ❖ **Tail Strike on Landing or Go-around**
Off Airport Landing / Ditching	❖ Any controlled landing outside of the airport area and intentional
Fuel Exhaustion	❖ The state in which the aircraft has become devoid of useable fuel. Source ATSB
Any Other End State	❖ Any other accident where: • Information available at the ACTF meeting was not enough to determine the accident end state. For example: a) Aircraft is missing b) The investigation is still ongoing and the ACTF is unable to assign an end state classification c) The aircraft crashed but no report is available ❖ The End State does not fit into other categories

Appendix 3 – ICAO Regions

The listing of States in each of the ICAO regions, visit the ICAO Safety Report Appendix 1

Appendix 4 – Regional Aviation Safety Group (RASG) Regions

Visit RASGs pages on ICAO Website

IATA Annual Safety Report 2023

International Air Transport Association

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