



International Civil Aviation Organization

Safety Enhancement Implementation Group

Fourth Meeting (SEIG/4)
(Cairo, Egypt, 23-25 October 2022)

Agenda Item 2: Regional Performance Framework for Safety

DEVELOP GUIDANCE MATERIAL/SHARE BEST PRACTICES ON OCCURRENCE REPORTING FOR THE CAA PERSONNEL ON ESTABLISHING AN EFFECTIVE OPERATION OF THE MANDATORY AND VOLUNTARY REPORTING SYSTEMS

(Presented by the United Arab Emirates)

SUMMARY

This paper presents the final draft guidance material and best practices on occurrence reporting for the CAA personnel on establishing an effective operation of the mandatory and voluntary reporting systems

Action by the meeting is at paragraph 3.

REFERENCES

- Safety Management (Annex 19 to the Convention)
- Safety Management Manual (SMM) (Doc 9859)
- GCAA CAR Part X (Safety Management Systems)
- GCAA Acceptable Means of Compliance 22
- GCAA Acceptable Means of Compliance 57
- EASA REGULATION (EU) No 376/2014

1. INTRODUCTION

1.1 Following the Regional Aviation Safety Plan (MID-RASP) 2020-2022 Edition including the Safety Enhancement Initiatives (SEIs) and their respective actions endorsed by the Eighth meeting of the Regional Aviation Safety Group-Middle East (RASG-MID/8) held virtually from 15 to 22 February 2021 and its conclusions.

1.2 The United Arab Emirates has compiled and developed this draft guidance material aimed for CAA personnel on best practices for establishing effective mandatory and voluntary reporting systems.

1.3 This working paper is presented in support for goal no. 5 / Implementation of Effective SSPs and SMSs. It considers the Middle East Regional Aviation Safety Plan (MID-RASP) 2020-2022 and supports the objectives and priorities of the GASP.

2. DISCUSSION

2.1 Safety Occurrence reports are a rich source of information for States to monitor their safety performance and define acceptable safety levels. Mandatory Reports tend to highlight State High Risk categories whereas Voluntary Reports go beyond typical incident reporting because they tend to capture latent conditions and dormant hazards.

2.2 The presented material takes into consideration a compilation of guidelines and best practices for CAA personnel to reflect upon when establishing effective occurrence reporting systems, highlighting areas of focus, that ensure to collect sufficient amount of safety data to enable hazard identification and subsequent risk management, as well as enhance State safety data analysis capabilities.

2.3 Finally; as part of continuous efforts of States to establish local and international safety data and information sharing/exchange platforms, this guidance as at **Appendix A** will serve as a solid foundation for States to cooperate among each other as well as with international aviation bodies for sharing and exchanging safety data and information and ensuring harmonization among the aviation community.

3. ACTION BY THE MEETING

3.1 The meeting is invited to review as deemed necessary and encourage States to adopt this guidance material as an additional element of our continued efforts to enhance safety data analysis and identify aviation hazards through collection of safety occurrence reports.

الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY



United Arab Emirates

GM for Occurrence Reporting concerning CAA personnel on establishing an effective operation of Mandatory and Voluntary Reporting Systems

Related Documents:

- ICAO Document 9859 SMM
- ICAO Annex 19
- GCAA CAR Part X
- GCAA Acceptable Means of Compliance 22
- GCAA Acceptable Means of Compliance 57
- EASA REGULATION (EU) No 376/2014
- GCAA NPA on Civil Aviation Regulation for Occurrence Reporting

Description and Objective

It is necessary to ensure that aviation professionals report occurrences that pose a risk to aviation safety. Occurrence reporting helps improve aviation safety by ensuring that relevant safety information is reported, collected, stored, protected, exchanged, disseminated, and analyzed. Furthermore, it is not to be used to attribute blame or liability but supports continued learning to make aviation operations safe.

The purpose of this Guidance Material is to provide interpretative material and direction for the reporting of Safety Related incidents using various occurrence reporting system by persons/organizations licensed/regulated under the State Civil Aviation Authority

In addition to reporting of safety incidents to the Civil Aviation Authority, this Guidance Material also covers what qualifies to be a reportable occurrence, whose responsibility is it to report, sharing of best practices to establish an effective occurrence reporting system, what is the value of occurrence reports and how this data can be used to improve and contribute in developing a State Safety Program.

Mandatory Occurrence Reports:

The provisions in Chapter 8 of ICAO Annex 13 require the States to establish mandatory occurrence (incident) reporting systems to facilitate the collection of information on actual or potential safety deficiencies. Further to that, ICAO requirements relating to the implementation of safety

management systems (SMS) require that aviation service providers develop and maintain a formal process for effectively collecting, recording, acting on and generating feedback about hazards in operations, based on a combination of reactive, proactive and predictive methods of safety data collection. During the collection of Mandatory Reports it is a good practice to group in the following domains (Examples covered in Appendix A of this GM):

- Aircraft flight operations
- Aircraft technical, maintenance and repair
- Air navigation services and facilities
- Aerodromes and ground services.

Voluntary Occurrence Reports:

Voluntary reporting systems are established in order to facilitate collection of information on actual or potential safety deficiencies that may not be captured by the mandatory incident reporting system, from all aviation stakeholders and should be managed totally independent from all other reporting systems. The system ensures that relevant data on safety is reported, collected, stored, protected and disseminated. The system is also designed to accept anonymous reports. The following points are fundamental for the effectiveness of Voluntary Reporting Systems:

- Trust
- Non-punitive
- Ease of reporting
- Promotion
- Inclusive reporting base
- Confidentiality
- Acknowledgment

What Type of reports are collected.

The following types of occurrence classifications fall under the category of reportable occurrences and which CAAs should differentiate between when collecting and storing the data:

Accidents:

An occurrence associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such

time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down, in which:

a) a person is fatally or seriously injured as a result of:

- being in the aircraft, or
- direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or
- direct exposure to jet blast, except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

b) the aircraft sustains damage or structural failure which:

- adversely affects the structural strength, performance or flight characteristics of the aircraft, and
- would normally require major repair or replacement of the affected component, except for engine failure or damage, when the damage is limited to a single engine, (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windcreens, the aircraft skin (such as small dents or puncture holes), or for minor damages to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike (including holes in the radome); or

c) the aircraft is missing or is completely inaccessible.

Serious Incidents:

An incident involving circumstances indicating that there was a high probability of an accident and associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down.

Incident:

An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

Dangerous Goods:

Articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the Technical Instructions or which are classified according to those Instructions.

Unlawful Acts:

These are acts or attempted acts such as to jeopardize the safety of civil aviation, including but not limited to:

- unlawful seizure of aircraft,
- destruction of an aircraft in service,
- hostage-taking on board aircraft or on aerodromes,
- forcible intrusion on board an aircraft, at an airport or on the premises of an aeronautical facility,
- introduction on board an aircraft or at an airport of a weapon or hazardous device or material intended for criminal purposes,
- use of an aircraft in service for the purpose of causing death, serious bodily injury, or serious damage to property or the environment,
- communication of false information such as to jeopardize the safety of an aircraft in flight or on the ground, of passengers, crew, ground personnel or the general public, at an airport or on the premises of a civil aviation facility.

Unapproved Parts

Unapproved aircraft parts are aircraft parts not approved by civil aviation authorities for installation on type certified aircraft.

Who should report:

The following section identifies the categories of Organizations / Personnel that should be considered and addressed to submit Occurrence Reports:

- All Civil Registered Aircraft (air operators) operating in or outside the territory of State of Registry;
- All non-State air operators operating State Registered Aircraft.
- State approved or certified organizations including:
- Overseas organizations (CAR M, 21 & CAR145) as applicable; and
- Recreation aviation aircraft (Light Sport Aircraft).

- Approved Training Organizations.
- Air Navigation Service Providers.
- Certified Aerodromes
- Certified Heliports

Within the above-mentioned organizations, following categories of personnel can be included for submitting Occurrence Reports:

- Operator or commander of an aircraft, whether registered or not under the State CAA, but operated by the holder of an Air Operator Certificate or ATO certificate issued by the State CAA; or
- personnel that carry out in the State or outside State the business of designing, manufacturing, modifying or maintaining State registered aircraft, or any equipment or part thereof; or
- Personnel who sign a certificate of release to service in respect of the aircraft indicated in paragraph (a); or any equipment or part thereof; or
- Personnel declared as Air Navigation Service Provider that perform a function connected with the installation, modification, maintenance, repair, overhaul, flight checking or inspection of air navigation facilities or other services which are approved by the CAA; or
- Personnel that perform a function connected with the ground handling of aircraft, including fueling, servicing, load sheet preparation, loading, dangerous goods and towing at State Aerodromes.

It should be understood that, while the above items define those who have to report, anyone may report, should they consider it necessary. Persons should report any reportable occurrence of which they have positive knowledge, even if they have good reason to believe that appropriate details of the occurrence have already been, or will be, reported by someone else. A report should also be submitted on any occurrence that involves an unsatisfactory condition, behavior or procedure, which did not immediately endanger the aircraft but if allowed to continue uncorrected, or if repeated in other foreseeable circumstances, would create a hazard to aircraft or individuals or property.

What is the value of safety reporting for CAAs?

Occurrence reports are a core data source used to inform the CAAs decision and policy making, it also assists in setting State's Strategic Safety Objectives and safety intelligence. Making frequent use of occurrence data helps to identify safety trends, hazards, risks and issues that have the potential to impact on the safety of the whole aviation system.

Occurrence reporting data once having reached maturity levels, can also be used to support numerous academic and aviation safety related studies through the provision of analysis and de-identified datasets.

Best Practices on establishing effective Occurrence Reporting Systems

- **Reporting Timelines**

CAAs should establish reporting timelines when it comes to Mandatory Occurrence Reports, as for Voluntary Reports There is no time limitation to submit a report. However, in the interest of safety, time critical information may be reported at the earliest opportunity. The following can be considered when establishing reporting timelines for Mandatory Reports:

For Accidents and Serious Incidents: Immediate Notification to the Air Accident Investigation Authority through the duty investigator and a Mandatory Occurrence Report submitted within 24 hours containing all pertinent information about the condition and evaluation results known to the person or organization and details of the investigation and actions it intends to take to prevent similar occurrences in the future.

All other incidents: For the purpose of reducing the burden and pressure of reporting on the organizations and personnel, occurrences which did not have a significant impact on safety of aircraft operation can be considered for submission within 15 calendar days containing all pertinent information about the condition and evaluation results known to the person or organization and details of the investigation and actions it intends to take to prevent similar occurrences in the future. If additional detailed information become available after 15 calendar days then the concerned organizations shall update the submitted occurrence report.

- **Categories of reports by domains:** Please refer to Appendix A of this GM for list of Occurrence Categories by domain.

- **Reporting form criteria:**

An Occurrence Reporting form should include the following Mandatory data fields (in dropdown format with data fields standardized) to ensure data analysis activities and publishing of safety information is accurate and actual as possible:

Note: When entering, in their respective databases, information on every occurrence mandatorily reported and, to the best extent possible, every occurrence voluntarily reported,

organizations, must ensure that occurrence reports recorded in their databases contain at least the following information:

- (a) Organization name, originator's name and ID.
- (b) Aircraft Registration Mark, Flight Details/Aircraft configuration/Maintenance Incidents/Approval Reference (if relevant)
- (c) Information necessary to identify the aircraft, crew or part affected
- (d) Date, time and route or location
- (e) Classification and categorization of events;
- (f) A written short description of the incident including root cause identification, any immediate corrective measures/actions taken or planned.

Note: For any incident involving a system or component:

- (a) If monitored or protected by a warning and/or protection system (for example: fire detection/extinguishing) the incident report should always state whether such system(s) functioned properly.
- (b) Identification if its reliability is of concern as per the established reliability programme (if applicable)

SPECIFIC MANDATORY DATA FIELDS**Aircraft-related data fields**

When entering, in their respective databases, information on every occurrence mandatorily reported and, to the best extent possible, every occurrence voluntarily reported, organizations, must ensure that occurrence reports recorded in their databases contain at least the following information:

- (a) Aircraft Identification
 - (1) State of Registry
 - (2) Make/Model/Series
 - (3) Aircraft serial number
 - (4) Aircraft Registration
 - (5) Call sign
- (b) Aircraft Operation
 - (1) Operator
 - (2) Type of operation
- (c) Aircraft Description
 - (1) Aircraft Category
 - (2) Propulsion Type
 - (3) Mass Group
- (d) History of Flight
 - (1) Last Departure Point
 - (2) Planned Destination
 - (3) Flight Phase
- (e) Weather
 - (1) Weather relevant

DATA FIELDS RELATING TO AIR NAVIGATION SERVICES

When entering, in their respective databases, information on every occurrence mandatorily reported and, to the best extent possible, every occurrence voluntarily reported, organizations, must ensure that occurrence reports recorded in their databases contain at least the following information:

- (a) ATM relation
 - (1) ATM contribution
 - (2) Service affected (effect on ATM service)
 - (3) Phase of Flight (*Flight Level*)
- (b) ATS Unit Details
 - (1) Airspace and control positions

- (2) Personnel involved
- (c) Meteorological information

SEPARATION MINIMA INFRINGEMENT/LOSS OF SEPARATION AND AIRSPACE INFRINGEMENT-RELATED DATA FIELDS

When entering, in their respective databases, information on every occurrence mandatorily reported and, to the best extent possible, every occurrence voluntarily reported, organizations, must ensure that occurrence reports recorded in their databases contain at least the following information:

- (a) Airspace
 - (1) Airspace type
 - (2) Airspace class
 - (3) FIR/UIR name

AERODROME-RELATED DATA FIELDS

When entering, in their respective databases, information on every occurrence mandatorily reported and, to the best extent possible, every occurrence voluntarily reported, organizations must ensure that occurrence reports recorded in their databases contain at least the following information:

- (a) Location Indicator (ICAO indicator of the airport)
- (b) Location on the aerodrome
- (c) Information relating to any vehicle involved (company/call sign etc.)
- (d) Information relating to the Department and/or company of personnel involved

AIRCRAFT DAMAGE OR PERSONAL INJURY-RELATED DATA FIELDS

When entering, in their respective databases, information on every occurrence mandatorily reported and, to the best extent possible, every occurrence voluntarily reported, organizations must ensure that occurrence reports recorded in their databases contain at least the following information:

- (a) Severity
 - (1) Highest Damage
 - (2) Injury Level
- (b) Injuries to persons
 - (1) Number of injuries on ground (fatal, serious, minor)
 - (2) Number of injuries on aircraft (fatal, serious, minor).

- **Common Hazard Taxonomy: (See ECCAIRS – ADREP Taxonomy) for complete list of hazard taxonomies which can be embedded within the occurrence reporting system**
<https://www.icao.int/safety/airnavigation/aig/pages/adrep-taxonomies.aspx>
- a) Aims to improve Hazard Identification by taking pre-emptive action to prevent similar incidents occurring in the future.
- b) Analysis of safety data and producing safety information to enable data driven decision making (D3M).
- c) Encourage aviation industry to follow a common reporting scheme to ensure harmonization.
- d) Ease the establishment of Safety Data and Information Exchange Platforms.

What can Safety Data be used for:

- (a) Sharing and Exchange of Safety data and information on a national and international level
- (b) Detailed periodic as well as executive Safety Reports
- (c) Data Analysis and Trends
- (d) Setting State Safety Indicators / Targets / Acceptable Levels of Safety Performance
- (e) Industry Safety Performance Monitoring
- (f) Specific internal and external Data and information requests

APPENDIX A: List of example occurrence by domain

Remark: This Appendix is structured in such a way that the pertinent occurrences are linked with categories of activities during which they are normally observed, according to experience, in order to facilitate the reporting of those occurrences. However, this presentation must not be understood as meaning that occurrences must not be reported in case they take place outside the category of activities to which they are linked in the list.

I. AIRCRAFT FLIGHT OPERATIONS**A. Operation of the Aircraft**

- 1) Aircraft maneuver:
 - a) Risk of collision with an aircraft, terrain or other object or an unsafe situation when avoidance action would have been appropriate.
 - b) An avoidance maneuver required to avoid a collision with an aircraft, terrain or other object.
 - c) An avoidance maneuver to avoid other unsafe situations.
- 2) Take-off or landing incidents, including precautionary or forced landings.
- 3) Incidents such as under-shooting, over running or running off the side of runways.
- 4) Take-offs, rejected take-offs, landings or attempted landings on a closed, occupied or incorrect runway.
- 5) Inability to achieve predicted performance during take-off or initial climb.
- 6) Critically low fuel quantity or inability to transfer fuel or use total quantity of usable fuel.
- 7) Loss of control (including partial or temporary loss of control) from any cause.
- 8) Incident close to or above V1 resulting from or producing a hazardous or potentially hazardous situation (e.g. tail strike, engine power loss, rejected take-off etc.).
- 9) Go-around/Missed Approach producing a hazardous or potentially hazardous situation including rejected landing.
- 10) Unintentional significant deviation from airspeed, intended track or altitude (more than 300ft) from any cause.
- 11) Descent below decision height/altitude or minimum descent height/altitude without the required visual reference.
- 12) Loss of position awareness relative to actual position or to other aircraft.
- 13) Breakdown in communication between flight crew (CRM) or between Flight crew and other parties (cabin crew, ATC, engineering).

- 14) Heavy/hard landing - a landing deemed to require a 'heavy landing check'.
- 15) Exceedance of fuel imbalance limits.
- 16) Incorrect setting of an SSR code or of an altimeter subscale.
- 17) Incorrect programming of, or erroneous entries into, equipment used for navigation or performance calculations, or use of incorrect data.
- 18) Incorrect receipt or interpretation of radiotelephony messages.
- 19) Fuel system malfunctions or defects, which had an effect on fuel supply and/or distribution.
- 20) Aircraft unintentionally departing a paved surface.
- 21) Collision between an aircraft and any other aircraft, vehicle or other ground object.
- 22) Inadvertent and/or incorrect operation of any controls.
- 23) Inability to achieve the intended aircraft configuration for any flight phase (e.g. landing gear and doors, flaps, stabilisers, slats etc).
- 24) A hazard or potential hazard which arises as a consequence of any deliberate simulation of failure conditions for training, system checks or training purposes.
- 25) Abnormal vibration.
- 26) Operation of any primary warning system associated with manoeuvring of the aircraft e.g. configuration warning, stall warning (stick shake), over speed warning etc. unless:
 - a) the crew conclusively established that the indication was false.
 - b) provided that the false warning did not result in difficulty or hazard arising from the crew response to the warning; or
 - c) operated for training or test purposes.
- 27) GPWS/TAWS 'warning' when:
 - a) the aircraft comes into closer proximity to the ground than had been planned or anticipated; or
 - b) the warning is experienced in IMC or at night and is established as having been triggered by a high rate of descent (Mode 1); or
 - c) the warning results from failure to select landing gear or landing flap by the appropriate point on the approach (Mode 4); or
 - d) any difficulty or hazard arises or might have arisen as a result of crew response to the 'warning' e.g. possible reduced separation from other traffic. This could include warning of any Mode or Type i.e. genuine, nuisance or false.

28) GPWS/TAWS 'alert' when any difficulty or hazard arises or might have arisen as a result of crew response to the 'alert'.

29) TCAS/ ACAS RAs.

30) Jet or prop blast incidents resulting in significant damage or serious injury.

31) Taxiway incursion/Runway incursion.

32) Laser interference incidents.

33) Unstable approach reported by pilots or analyzed through FDM program.

B. Emergencies

1) Fire, explosion, smoke or toxic or noxious fumes, even though fires were extinguished.

2) The use of any non-standard procedure by the flight or cabin crew to deal with an emergency when:

- a) the procedure exists but is not used; or
- b) a procedure does not exist; or
- c) the procedure exists but is incomplete or inappropriate; or
- d) the procedure is incorrect; or
- e) the incorrect procedure is used.

3) Inadequacy of any procedures designed to be used in an emergency, including when being used for maintenance, training or test purposes.

4) An event leading to an emergency evacuation

5) Depressurization events.

6) The use of any emergency equipment or prescribed emergency procedures in order to deal with a situation.

7) An event leading to the declaration of an emergency ('Mayday' or 'Pan Pan').

8) Failure of any emergency system or equipment, including all exit doors and lighting, to perform satisfactorily, including when being used for maintenance, training or test purposes.

9) Events requiring any emergency use of oxygen by any crew member.

C. Crew Incapacitation

1) Incapacitation of any member of the flight crew, including that which occurs prior to departure if it is considered that it could have resulted in incapacitation after take-off.

2) Incapacitation of any member of the cabin crew which renders them unable to perform essential emergency duties.

D. Aircrew Fatigue

1) A physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness, circadian phase, or workload (mental and/or physical activity) that can impair a crew member's alertness and ability to safely operate an aircraft or perform safety related duties.

2) Fatigue is a major human factor hazard because it affects most aspects of a crewmember's ability to do their job. It therefore has implications for safety.

3) For example, crew member reports on fatigue due to an incident happened on the aircraft and it is believed that fatigue is considered to be the main reason for the occurrence of such incident.

E. Injury

1) An incident, which have or could have led to significant injury to passengers or crew but which are not considered reportable as an accident under ANNEX 13.

F. Meteorology

1) A lightning strike which resulted in damage to the aircraft or loss or malfunction of any essential service.

2) A hail strike which resulted in damage to the aircraft or loss or malfunction of any essential service.

3) Severe turbulence encounters resulting in injury to occupants or deemed to require a 'turbulence check' of the aircraft.

4) A wind shear encounter.

5) Icing encounter resulting in handling difficulties, damage to the aircraft or loss or malfunction of any essential service.

G. Security

1) Unlawful interference with the aircraft including a bomb threat or hijack.

2) Difficulty in controlling intoxicated, violent or unruly passengers.

3) Discovery of a stowaway.

H. Aerodrome and Aerodrome Facilities

1) Significant spillage during fueling operations.

- 2) Loading of incorrect fuel quantities likely to have a significant effect on aircraft endurance, performance, balance or structural strength.
- 3) Unsatisfactory ground de-icing / anti-icing

I. Passenger Handling, Baggage and Cargo

- 1) Significant contamination of aircraft structure, or systems and equipment arising from the carriage of baggage or cargo.
- 2) Incorrect loading of passengers, baggage or cargo, likely to have a significant effect on aircraft mass and/or balance.
- 3) Incorrect stowage of baggage or cargo (including hand baggage) likely in any way to hazard the aircraft, its equipment or occupants or to impede emergency evacuation.
- 4) Inadequate stowage of cargo containers or other substantial items of cargo.
- 5) Dangerous goods incidents.

J. Aircraft Ground Handling and Servicing

- 1) Failure, malfunction or defect of ground equipment used for test or checking of aircraft systems and equipment when the required routine inspection and test procedures did not clearly identify the problem when this results in a hazardous situation.
- 2) Noncompliance or significant errors in compliance with required servicing procedures.
- 3) Loading of contaminated or incorrect type of fuel or other essential fluids (including oxygen and potable water).

K. Other incidents

- 1) Repetitive instances of a specific type of incident which in isolation would not be considered 'reportable' but which due to the frequency at which they arise, form a potential hazard.
- 2) Bird strike that may have or may have not resulted in damage to the aircraft or loss or malfunction of any essential service.
- 3) Note: All bird strike incidents shall be reported in the Bird Strike & Wildlife Hazard module of the ROSI system.
- 4) Wake turbulence encounters.
- 5) Any other incident of any type considered to have endangered or which might have endangered the aircraft or its occupants on board the aircraft or on the ground.

II. AIRCRAFT TECHNICAL

A. Structural

Not all structural failures need to be reported. Engineering judgement is required to decide whether a failure is serious enough to be reported. The following examples can be taken into consideration:

1) Damage to a Principal Structural Element that has not been qualified as damage tolerant (life limited element). Principal Structural Elements are those which contribute significantly to carrying flight, ground, and pressurization loads, and whose failure could result in a catastrophic failure of the aircraft. Typical examples of such elements are listed for large aircrafts in EASA AMC to CS25.571 (a) “damage tolerance and fatigue evaluation of structure” and in equivalent AMC material for rotorcraft.

2) Defect or damage exceeding admissible damages to a Principal Structural Element that has been qualified as damage tolerant.

3) Damage to or defect exceeding allowed tolerances of a structural element which failure could reduce the structural stiffness to such an extent that the required flutter, divergence or control reversal margins are no longer achieved.

4) Damage to or defect of a structural element, which could result in the liberation of items of mass that may injure occupants of the aircraft.

5) Damage to or defect of a structural element, which could jeopardise proper operation of systems. See paragraph II.B. below

6) Loss of any part of the aircraft structure in flight.

B. Systems

The following generic criteria applicable to all systems are proposed:

1) Loss, significant malfunctions or defects of any system, subsystem or set of equipment when standard operating procedures, drills etc. could not be satisfactorily accomplished.

2) Inability of the crew to control the system, e.g.:

- a) uncommented actions;
- b) incorrect and or incomplete response, including limitation of movement or stiffness;
- c) runaway;
- d) Mechanical disconnection or failure.

3) Failure or malfunction of the exclusive function(s) of the system (one system could integrate several functions).

4) Interference within or between systems.

5) Failure or malfunction of the protection device or emergency system associated with the system.

6) Loss of redundancy of the system.

- 7) Any incident resulting from unforeseen behaviour of a system.
- 8) For aircraft types with single main systems, subsystems or sets of equipment: Loss, significant malfunctions or defects in any main system, subsystem or set of equipment.
- 9) For aircraft types with multiple independent main systems, subsystems or sets of equipment: The loss, significant malfunctions, or defects of more than one main system, subsystem or set of equipment
- 10) Operation of any primary warning system associated with aircraft systems or equipment unless the crew conclusively established that the indication was false provided that the false warning did not result in difficulty or hazard arising from the crew response to the warning.
- 11) Leakage of hydraulic fluids, fuel, oil or other fluids which resulted in a fire hazard or possible hazardous contamination of aircraft structure, systems or equipment, or risk to occupants.
- 12) Malfunction or defect of any indication system when this results in the possibility of misleading indications to the crew.
- 13) Any failure, malfunction or defect if it occurs at a critical phase of flight and relevant to the operation of that system.
- 14) Incidents of significant shortfall of the actual performances compared to the approved performance which resulted in a hazardous situation (taking into account the accuracy of the performance calculation method) including braking action, fuel consumption etc.
- 15) Asymmetry of flight controls; e.g. flaps, slats, spoilers etc.

C. Propulsion (including Engines, Propellers and Rotor Systems) and APUs

- 1) Flameout, shutdown or malfunction of any engine.
- 2) Over speed or inability to control the speed of any high speed rotating component (for example: Auxiliary power unit, air starter, air cycle machine, air turbine motor, propeller or rotor).
- 3) Failure or malfunction of any part of an engine or power plant resulting in any one or more of the following;
 - a) Non-containment of components/debris;
 - b) Un-controlled internal or external fire, or hot gas breakout;
 - c) Thrust in a different direction from that demanded by the pilot;
 - d) Thrust reversing system failing to operate or operating inadvertently;
 - e) Inability to control power, thrust or rpm;
 - f) Failure of the engine mount structure;
 - g) Partial or complete loss of a major part of the power plant;
 - h) Dense visible fumes or concentrations of toxic products sufficient to incapacitate crew or passengers;

- i) Inability, by use of normal procedures, to shutdown an engine;
 - j) Inability to restart a serviceable engine.
- 4) An un-commanded thrust/power loss, change or oscillation which is classified as a loss of thrust or power control (LOTIC):
- a) For a single engine aircraft; or
 - b) Where it is considered excessive for the application, or
 - c) Where this could affect more than one engine in a multi-engine aircraft, particularly in the case of a twin engine aircraft; or
 - d) For a multi engine aircraft where the same, or similar, engine type is used in an application where the event would be considered hazardous or critical.
- 5) Any defect in a life controlled part causing retirement of before completion of its full life.
- 6) Defects of common origin which could cause an in flight shut down rate so high that there is the possibility of more than one engine being shut down on the same flight.
- 7) An engine limiter or control device failing to operate when required or operating inadvertently.
- 8) Exceedance of engine parameters.
- 9) FOD resulting in damage.
- 10) Propellers and –transmission: Failure or malfunction of any part of a propeller or power plant resulting in any one or more of the following:
- a) An overspeed of the propeller;
 - b) The development of excessive drag;
 - c) A thrust in the opposite direction to that commanded by the pilot;
 - d) A release of the propeller or any major portion of the propeller;
 - e) A failure that results in excessive unbalance;
 - f) The unintended movement of the propeller blades below the established minimum in-flight low-pitch position;
 - g) An inability to feather the propeller;
 - h) An inability to command a change in propeller pitch;
 - i) An un-commanded change in pitch;
 - j) An uncontrollable torque or speed fluctuation;
 - k) The release of low energy parts.
- 11) Rotors and-transmission
- a) Damage or defect of main rotor gearbox/ attachment which could lead to in-flight separation of the rotor assembly, and / or modifications of the rotor control.
 - b) Damage to tail rotor, transmission and equivalent systems.
- 12) APUs
- a) Shut down or failure when the APU is required to be available by operational requirements, e.g. ETOPS, MEL.

- b) Inability to shut down the APU.
- c) Over speed.
- d) Inability to start the APU when needed for operational reasons.

D. Human Factors

1) Any incident where any feature or inadequacy of the aircraft design could have led to an error of use that could contribute to a hazardous or catastrophic effect.

E. Other Incidents

1) Any incident where any feature or inadequacy of the aircraft design could have led to an error of use that could contribute to a hazardous or catastrophic effect.

2) An incident not normally considered as reportable (for example, furnishing and cabin equipment, water systems), where the circumstances resulted in endangering of the aircraft or its occupants.

3) A fire, explosion, smoke or toxic or noxious fumes.

4) Any other event which could affect the safety of the aircraft/occupants of the aircraft, or people or property in the vicinity of the aircraft or on the ground.

5) Failure or defect of passenger address system resulting in loss or inaudible passenger address system.

6) Loss of pilots' seat control during flight.

III. AIRCRAFT MAINTENANCE AND REPAIR

1) Incorrect assembly of parts or components of the aircraft found during an inspection or test procedure not intended for that specific purpose.

2) Hot bleed air leak resulting in structural damage.

3) Any defect in a lift controlled part causing retirement before completion of its full life.

4) Any damage or deterioration (i.e. fractures, cracks, corrosion, delaminating, dis-bonding etc.) resulting from any cause (such as flutter, loss of stiffness or structural failure) to;

- a) Primary structure or a principal structural element (as defined in the manufacturers' Repair manual) where such damage or deterioration exceeds allowable limits specified in the Repair Manual and requires a repair or complete or partial replacement of the element;
- b) Secondary structure which consequently has or may have endangered the aircraft;
- c) The engine, propeller or rotorcraft rotor system.

5) Any failure, malfunction or defect of any system or equipment, or damage or deterioration found as a result of compliance with an Airworthiness Directive or other mandatory instruction issued by a Regulatory Authority, when;

- a) It is detected for the first time by the reporting organization implementing compliance;
 - b) On any subsequent compliance where it exceeds the permissible limits quoted in the instruction and/or published repair/rectification procedures are not available.
- 6) Failure of any emergency system or equipment, including all exit doors and lighting, to perform satisfactorily, including when being used for maintenance or test purposes.
- 7) Non-compliance or significant errors in compliance with required maintenance procedures.
- 8) Suspected unapproved Products, parts, appliances and materials (Safety Alert 05-2014).
- 9) Misleading, incorrect or insufficient maintenance data or procedures that could lead to maintenance errors.
- 10) Failure, malfunction or defect of ground equipment used for test or checking of aircraft systems and equipment when the required routine inspection and test procedures did not clearly identify the problem when this results in a hazardous situation.

IV. AIR NAVIGATION SERVICES PROVIDERS

This list is in no way exhaustive and any occurrence which is believed to be a flight safety issue shall be reported.

- 1) ACAS Event: An incident where a resolution advisory event (RA) did or may have occurred.
- 2) AIRPROX: A situation in which, in the opinion of a pilot or air traffic services personnel, the distance between aircraft as well as their relative positions and speed have been such that the safety of the aircraft involved may have been compromised.
- a) Risk of collision. The risk classification of an aircraft proximity in which serious risk of collision has existed
 - b) Safety not assured. The risk classification of an aircraft proximity in which the safety of the aircraft may have been compromised.
 - c) No risk of collision. The risk classification of an aircraft proximity in which no risk of collision has existed.
 - d) Risk not determined. The risk classification of an aircraft proximity in which insufficient information was available to determine the risk involved, or inconclusive or conflicting evidence precluded such determination.
- 3) ASMI Category A: An incident in which a reduction in required ATC separation occurs where the separation remaining is 25% or less of the required minimum, regardless of whether or not corrective action or an evasive response to avoid a collision was taken.
- 4) ASMI Category B: An incident in which a reduction in required ATC separation occurs where the separation remaining is 26% up to and including 50% of the required minimum and no ATC action is taken, or the initial action to resolve the situation was determined by the pilot or ACAS.
- 5) ASMI Category C: An incident in which a reduction in required separation occurs where:

- a) The separation remaining is 26% up to and including 50% of the required minimum and ATC resolved the situation; or
 - b) The separation remaining is 51% up to and including 75% of the required minimum and no ATC action is taken, or the initial action to resolve the situation was determined by the pilot or ACAS.
- 6) ASMI Category D: An incident in which a reduction in required separation occurs where:
- a) The separation remaining is 51% up to but not including 90% of the required minimum and ATC resolved the situation; or
 - b) The separation remaining is 76% or more and no ATC action is taken, or the pilot or ACAS resolved the situation.
- 7) ASMI Category E: An incident in which a reduction in required separation occurs where the separation remaining is 90% or more of the required minimum and ATC resolved the situation.
- 8) Airspace Penetration (CTA/CTR/SUA) without Clearance or Approval: An incident where an aircraft enters civil or military controlled airspace or SUA without clearance or proper authorization.
- 9) Apron Incident: An incident reported to ATC where the flight safety of an aircraft was or may have been affected on the apron area.
- 10) ATC Coordination Error: An incident where the coordination between ATC Sectors or units is not completed correctly, where the ATC coordination failure affected flight safety.
- 11) ATC Operational Issue: An incident, not resulting in any other category, where incorrect ATCO actions or ATC procedures affected, or may have affected flight safety.
- 12) ATS/AD Equipment Failure: An incident where there is a failure or irregularity of ATS or Aerodrome communication, navigation or surveillance systems or any other safety-significant systems or equipment which could adversely affect the safety or efficiency of flight operations and/or the provision of an air traffic control service.
- 13) Communications Failure: An incident where an aircraft experiences a total or partial communications failure.
- 14) Deviations from ATC Clearance (not including a Level Bust) : An incident where an aircraft fails to comply with any component of an ATC clearance, excluding a cleared altitude or flight level.
- 15) Emergency (other than Engine Failure or Fuel Shortage) : An incident, excluding an accident, security event, engine failure, fuel emergency or medical emergency, where a pilot declares an emergency, Mayday or Pan.
- 16) Engine Failure: An incident where a pilot reports he has experienced an engine failure during takeoff, in flight or landing, or reports that he has shut down an engine due to a technical problem.
- 17) Flight Planning Error: An incident where a flight planning error has been reported which may affect the safety of a flight.

18) FOD: An incident involving FOD detected on a runway including reported tyre bursts from aircraft which have recently operated on a runway.

- a) Category A: FOD which is likely to cause damage to an aircraft on a runway or runway shoulder;
- b) Category B: FOD which is likely to cause damage to an aircraft found within runway strip or RESA;
- c) Category C: FOD which is likely to cause damage to an aircraft on taxiways or taxiway shoulders;
- d) Category D: FOD which is likely to cause damage to an aircraft found on the taxiway strips, apron areas or elsewhere on the airfield.

19) Fuel Emergence: An incident where a pilot reports he is experiencing a minimum fuel situation which requires an emergency declaration.

20) Go-Around Event: Any go- around event, except where an aircraft intentionally goes around for training purposes.

21) Level Bust:

- a) Category A: An incident where an aircraft deviates from an assigned level by 800 feet or more, and there was no loss of separation.
- b) Category B: An incident where an aircraft deviates from an assigned level by 600 or 700 feet and there was no loss of separation.
- c) Category C: An incident where an aircraft deviates from an assigned level by 400 or 500 feet, and there was no loss of separation.
- d) Category D: An incident where an aircraft deviates from an assigned level by 300 feet or less and there was no loss of separation.

22) Loss of Runway Separation Category A: An incident in which a reduction in required runway separation occurs where:

- a) A collision is narrowly avoided; or
- b) The separation remaining is 25% or less of the required minimum, regardless of whether or not corrective action or an evasive response to avoid a collision was taken.

23) Loss of Runway Separation Category B: An incident in which a reduction in required runway separation occurs where:

- a) A significant potential for collision which may result in a time-critical corrective evasive response to avoid a collision; or
- b) The separation remaining is 26% up to and including 50% of the required minimum, and no ATC action is taken, or the initial action to resolve the situation was determined by the pilot.

24) Loss of Runway Separation Category C: An incident in which a reduction in required runway separation occurs where:

- a) There is ample time or distance to avoid a potential collision; or
- b) The separation remaining is 26% up to and including 50% of the required minimum, and ATC resolved the situation; or
- c) The separation remaining is 51% or more of the required minimum and no ATC action is taken, or the initial action to resolve the situation was determined by the pilot.

25) Loss of Runway Separation Category D: An incident in which a reduction in required runway separation occurs where:

- a) The separation remaining is 51% or more of the required minimum and ATC resolved the situation; or
- b) An aircraft is in receipt of a landing or take-off clearance, while another aircraft is on the runway, and the initial action to resolve the situation was determined by the pilot.

26) LSALT/Terrain Event: An incident where an IFR aircraft is flown below a Lowest Safe Altitude (LSALT) or an ATC Minimum Radar Vectoring Altitude (MRVA)

27) LVP Violations: An incident where an aircraft conducts an operation when RVR, Met visibility and/or cloud base conditions are below the required approach minima or the aerodrome operator minima.

28) Maneuvering Area Excursion:

- a) Category A: An incident in which an aircraft has an excursion from a runway – i.e. overruns, excursion off the side of the runway – resulting in damage to aircraft
- b) Category B: An incident in which an aircraft has an excursion from a taxiway – excursion off the side of the taxiway – resulting in damage to aircraft
- c) Category C: An incident in which an aircraft has an excursion from a runway – i.e. overruns, excursion off the side of the runway – resulting in no damage to aircraft
- d) Category D: An incident in which an aircraft has an excursion from a taxiway- excursion off the side of the taxiway – resulting in no damage to aircraft.

29) Medical Emergency: An incident where a pilot reports a medical emergency requiring a diversion or priority track or landing due to a sick or injured passenger or crew member.

30) Military Due Regard Event: An incident where actions of a military aircraft under limited civil ATC control results in a situation where flight safety in controlled airspace is or may have been compromised.

31) Non-compliance with climb gradient: An incident where an aircraft fails to comply with the published minimum departure climb gradient requirement.

32) Operator complaint or operational issue (not resulting in any other category) : An incident involving:

- a) A direct operational related complaint or query received from an operator or State; or
- b) An ATC issue with an operator

33) Runway Incursion Category A: A serious incident in which a collision is narrowly avoided.

34) Runway Incursion Category B: A runway incursion in which the separation decreases and there is a significant potential for collision, which may result in a time-critical corrective/evasive response to avoid a collision. This includes a runway incursion occurring while a departing aircraft has commenced its take-off roll or an arriving aircraft has crossed the threshold.

35) Runway Incursion Category C: A runway incursion characterized by ample time and/or distance to avoid a collision, including a runway incursion occurring while a departing aircraft has been cleared to line

up, or cleared for take-off or an arriving aircraft has been cleared to land but has not crossed the threshold.

36) Runway Incursion Category D: A runway incursion that meets the definition of a runway incursion such as the incorrect presence of a vehicle, person or aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences.

37) Runway Incursion Category E: Insufficient information or inconclusive or conflicting evidence precludes a severity assessment.

38) Runway Operation Incident An incident occurring on a runway, where operational safety was or may have been affected, excluding a runway incursion, such as

a) an aircraft conducts an operation on a runway without proper authority, e.g. conducting a take-off or landing on an operational or closed runway without a clearance; or

b) attempting a take-off or landing from a taxiway not approved for such an operation.

39) Security Event: An incident involving a security event relating to an aircraft, which may adversely affect flight safety, such as a Hijack, Bomb Warning or an unruly passenger, which results in a request for a priority diversion or landing, or the attendance to an aircraft by security personnel.

40) Taxiway Incursions

41) Technical Problem: An incident excluding a declared emergency where a pilot reports an aircraft technical problem.

42) Visual Hazard Report: An incident where a pilot or ATC unit becomes aware of a situation involving a light source, including laser, spotlights or pyrotechnics, where flight safety was or may have been compromised

43) Wake Turbulence Event: An incident relating to a pilot's report of turbulence, or its effects, from another aircraft's wake, excluding a reduction of required wake turbulence separation.

V. AERODROMES

1) Maneuvering Area Excursion - Category A - An incident in which an aircraft has an excursion from a runway – i.e. overruns, excursion off the side of the runway – resulting in damage to aircraft.

2) Maneuvering Area Excursion - Category B - An incident in which an aircraft has an excursion from a taxiway – excursion off the side of the taxiway – resulting in damage to aircraft.

3) Maneuvering Area Excursion - Category C - An incident in which an aircraft has an excursion from a runway – i.e. overruns, excursion off the side of the runway – resulting in no damage to aircraft.

4) Maneuvering Area Excursion - Category D - An incident in which an aircraft has an excursion from a taxiway – excursion off the side of the taxiway – resulting in no damage to aircraft.

5) FOD Category A - FOD which is likely to cause damage to an aircraft on runway or runway shoulder.

- 6) FOD Category B - FOD which is likely to cause damage to an aircraft found within runway strip or RESA.
- 7) Aircraft Damage Category A - Destroyed – Aircraft is unlikely to ever fly again – total write off.
- 8) Aircraft Damage Category B - Substantially Damaged – Major damage that prevents the aircraft from flight until significant maintenance is undertaken.
- 9) Aircraft Damage Category C - Minor Damage – Minor damage that prevents the aircraft from immediate flight and requires some maintenance to rectify.
- 10) Runway Incursion - Category A - A serious incident in which a collision is narrowly avoided.
- 11) Runway Incursion - Category B - A Runway Incursion incident in which the separation decreases and there is a significant potential for collision, which may result in a time critical corrective / evasive response to avoid a collision, including a runway incursion occurring while a departing aircraft has commenced its take-off roll or an arriving aircraft has crossed the threshold.
- 12) Runway Incursion - Category C - A Runway Incursion incident characterised by ample time and/or distance to avoid a collision, including a runway incursion occurring while a departing aircraft has been cleared to line up, or cleared for take-off, or an arriving aircraft has been cleared to land but has not crossed the threshold.
- 13) Runway Incursion - Category D - A Runway Incursion incident that meets the definition of a runway incursion such as the incorrect presence of a single vehicle, person or aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences.
- 14) Bird & Wildlife Hazard - Category A - An incident where a pilot experiences wildlife striking an aircraft resulting in significant damage to the aircraft and or requiring an aborted take-off, in-flight diversion, prioritized landing or resulting in an accident.
- 15) Bird & Wildlife Hazard - Category B - An incident where a pilot reports an actual or potential wildlife strike, which does not result in significant damage or adversely affect the flight.
- 16) Bird & Wildlife Hazard - Category C - An incident where dead wildlife is found on the runway when a strike has not been reported by a pilot.
- 17) Taxiway Incursion Category A: A Taxiway Incursion incident in which there is a potential for collision with an aircraft, which results in a corrective/evasive response to avoid a collision.
- 18) Taxiway Incursion Category B: A Taxiway Incursion incident that meets the definition of a taxiway incursion such as the incorrect presence of a vehicle, person or aircraft on the taxiway or within the taxiway strip with no safety consequence.

VI. REPORTABLE INCIDENT TO SPECIFIC SYSTEMS

The following subparagraphs give examples of reportable incidents resulting from the application of the generic criteria to specific systems:

1) Air conditioning/ventilation

- a) Complete loss of avionics cooling;
- b) depressurization

2) Auto-flight system

- a) Failure of the auto-flight system to achieve the intended operation while engaged
- b) Significant reported crew difficulty to control the aircraft linked to auto-flight system functioning
- c) Failure of any auto-flight system disconnect device
- d) Un-commanded auto-flight mode change

3) Communications

- a) Failure or defect of Passenger Address System resulting in loss or inaudible passenger address;
- b) Total loss of communication in flight.

4) Electrical system

- a) loss of one electrical system distribution system (AC or DC)
- b) total loss or loss or more than one electrical generation system
- c) failure of the backup (emergency) electrical generating system

5) Cockpit/Cabin/Cargo

- a) Pilot seat control loss during flight;
- b) Failure of any emergency system or equipment, including emergency evacuation signalling system, all exit doors, emergency lighting, etc.;
- c) Loss of retention capability of the cargo loading system.

6) Fire protection system

- a) Fire warnings, except those immediately confirmed as false;
- b) Undetected failure or defect of fire/smoke detection/protection system, which could lead to loss or reduced fire detection/protection;
- c) Absence of warning in case of actual fire or smoke.

7) Flight controls

- a) Asymmetry of flaps, slats, spoilers etc.;
- b) Limitation of movement, stiffness or poor or delayed response in the operation of primary flight control systems or their associated tab and lock systems;
- c) Flight control surface run away;
- d) Flight control surface vibration felt by the crew;
- e) Mechanical flight control disconnection or failure;
- f) Significant interference with normal control of the aircraft or degradation of flying qualities;

8) Fuel system

- a) fuel quantity indicating system malfunction resulting in total loss or erroneous indicated fuel quantity on board;
- b) leakage of fuel which resulted in major loss, fire hazard , significant contamination;

- c) malfunction or defects of the fuel jettisoning system which resulted in inadvertent loss of significant quantity, fire hazard, hazardous contamination of aircraft equipment or inability to jettison fuel;
- d) fuel system malfunctions or defects which had a significant effect on fuel supply and/or distribution;
- e) inability to transfer or use total quantity of usable fuel;

9) Hydraulics

- a) loss of one hydraulic system (ETOPS only)
- b) failure of the isolation system to operate
- c) loss of more than one hydraulic circuits
- d) failure of the backup hydraulic system
- e) inadvertent Ram Air Turbine extension

10) Ice detection/protection system

- a) undetected loss or reduced performance of the anti-ice/de-ice system
- b) loss of more than one of the probe heating systems
- c) inability to obtain symmetrical wing de icing
- d) abnormal ice accumulation leading to significant effects on performance or handling qualities
- e) crew vision significantly affected

11) Indicating/warning/recording systems

- a) malfunction or defect of any indicating system when the possibility of significant misleading indications to the crew could result in an inappropriate crew action on an essential system
- b) loss of a red warning function on a system
- c) For glass cockpits: loss or malfunction of more than one display unit or computer involved in the display/warning function.

12) Landing gear system /brakes/tyres

- a) Brake fire
- b) Significant loss of braking action
- c) Unsymmetrical braking leading to significant path deviation
- d) Failure of the L/G free fall extension system (including during scheduled tests)
- e) Unwanted gear or gear doors extension/retraction
- f) Multiple tyres burst

13) Navigation systems (including precision approaches system) and air data systems

- a) Total loss or multiple navigation equipment failures;
- b) Total failure or multiple air data system equipment failures;
- c) Significant misleading indication;
- d) Significant navigation errors attributed to incorrect data or a database coding error;
- e) Unexpected deviations in lateral or vertical path not caused by pilot input;
- f) Problems with ground navigational facilities leading to significant navigation errors not associated with transitions from inertial navigation mode to radio navigation mode.

14) Oxygen

- a) for pressurized aircraft: loss of oxygen supply in the cockpit;

- b) loss of oxygen supply to a significant number of passengers (more than 10%), including when found during maintenance or training or test purposes.

15) Bleed air system

- a) Hot bleed air leak resulting in fire warning or structural damage;
- b) Loss of all bleed air systems;
- c) Failure of bleed air leak detection system.