EXPLANATORY NOTE[1]

Introduction

1. As explained in the consultation document, the Agency shall assist the Commission in submitting proposals for the regulation of the operation of aeronautical products. This implies in particular that essential requirements are specified by the legislator. This document explains how Essential Requirements for the operation of aeronautical products have been drafted. It has three main objectives:

a. to explain the process of hazard risk mitigation used to draft these requirements,
b. to explain how these Essential Requirements comply with ICAO recommendations, and
c. how they anticipate the possible use of existing JAR-OPS as implementing rules.

2. As their name already indicates, essential requirements are the conditions to be fulfilled by a product, a person or an organisation to ensure as much as possible that the public is not unduly affected by their operations or activities. They address therefore the means by which risks associated to a specific activity shall be eliminated or reduced to an acceptable level, when reasonably probable. To achieve this goal hazards and associated risks must be identified and analysed to determine the requirements that are essential to mitigate the unacceptable risks. In that context it must be made clear that certification processes are not mitigating measures; they are the verification that a mitigating measure is being implemented. As far as mitigating measures are concerned, it is also important to insist that they must be proportionate to the safety objective. This means that they must not go beyond what is strictly necessary to achieve the expected safety benefit without creating undue restrictions that are not justified by that objective. To validate the results of such a "top down" approach, a "bottom up" review was made to examine why certification was imposed; which risk such certification was mitigating; and whether the means used were proportionate to the safety objective

3. In this context, the Agency together with national and JAA experts undertook a study to identify hazard areas linked with the operation of aeronautical products. These are listed in the appendix. The mitigating criteria that were introduced to mitigate each hazard, when the associated risk appeared unacceptable, and produce the essential requirements originate from ICAO Annex 6 "Operation of Aircraft" or from JAR-OPS.

4. The essential requirements apply to the operation of aeronautical products as specified in parts I, II and III of ICAO Annex 6. They cover both commercial and non commercial operations of all categories of aircraft. The details for each of the categories of aircraft, as specified in ICAO Annex 6 could later be specified in implementing rules. Furthermore, to cover the whole of parts I, II and III of ICAO Annex 6, the following fields are addressed:

- General issues
- Flight preparation
- Flight operations
- Aircraft performance and operating limitations
- Instruments and equipment
- Continuing Airworthiness
- Crew members
- Operations for commercial purposes or of large aircraft

5. As specified in the consultation document, the essential requirements have been drafted with the view to allowing alternative implementation means which could vary depending on the type of operation. They create the hook needed for direct enforcement or through secondary legislation. It would be possible therefore, to develop implementing rules based on JAR-OPS material or to build other forms of regulation, including self-regulation, in particular for non-commercial operations, depending on the answers to the questions raised in that document.

[1] For information purposes only.

Mitigation of hazards of a general type

6. The use of improper operating procedures, incorrect or insufficient documentation related to laws regulations and procedures can lead to non-compliances with local rules and procedures inducing risk of mid-air collision or controlled flight into terrain. It can also cause non-compliance with international and national standards, laws, regulations and procedures inducing several potential risks for unforeseen situations on the ground and in the air. Point 1.a develops the theoretical subject matter that should be known by all personnel involved in the operation of aircraft. This point is based on ICAO Annex 6 parts I and II paragraph 3.1 and part III sections I and II paragraph 1.1.

7. An improper procedural sequence may result in a significant reduction in safety margins. This is especially true in emergency situations, where human limitations are the most prone to appear. Point 1.b requires operating procedures to be specified for all phases of flight and for emergency situations in the form of check lists available on board the aircraft. It is based on ICAO Annex 6 paragraphs such as part I paragraph 4.2.5.

8. An essential piece of information is that concerning the local search and rescue services. If in the event of an incident necessitating the use of search and rescue services, it is clear that having knowledge of these can save many lives. That is why point 1.c was taken from ICAO Annex 6. It requires having this information available for every flight

9. Even with proper knowledge of requirements and procedures, the pilot of an aircraft, or one of them when there are several, needs to be empowered to take decisions. A lack of authority on an aircraft could lead to lack of decision making in critical situations, thus endangering the flight. Point 1.d, based on ICAO Annex 6 Parts I paragraph 4.5, part II paragraph 3.2 and Part III sections I and II paragraph 1.1.2, expands on this by making the pilot in command responsible for people and cargo on board.

10. Past history has shown that the carriage of dangerous goods can cause aircraft loss or structural failures or health damage to crew, passengers and third parties. This concern is addressed through point 1.e that limits the possibility to carry such goods. This point is based on ICAO Annex 6 paragraphs such as part I paragraph 3.3.

11. A hazard that may not be immediately apparent is the lack of necessary storage of information related to each flight, such as the flight data recorder data or paper information. This could lead to improper incident or accident investigation, which in turn could lead to the inability to prevent the recurrence of such incidents or accidents. For this reason point 1.f mandates the retentions of such data for a sufficient period of time to allow appropriate follow-up work to be completed. The requirement contained therein is based in the recommendations described for instance in JAR-OPS 3.1065

Mitigation of hazards linked with flight preparation

12. One of the first concerns one must have when preparing a flight is the availability of all facilities that enable the flight to take place safely. Undertaking a flight without an appropriate destination or alternate aerodrome being available or the necessary navigational/communication facilities being operative on the intended route, could lead to a significant reduction of flight safety margins. The intent of point 2.a is to request that this be verified before the start of the flight so as to avoid discovering the problem once airborne. This point mirrors ICAO Annex 6 paragraphs such as part II paragraph 4.1.

13. The crew and passengers need to be made aware of the emergency procedures and how to use safety equipment before take off. Giving this information when the problem occurs could be impossible. This would lead to compromising emergency evacuation procedures and drills that have lead in the past to unnecessary loss of life. Point 2.b mitigates suh risk by mandating appropriate briefing before take-off. The requirement contained therein originates from ICAO Annex 6 paragraphs such as part II paragraph 4.3.

14. Of course, the aircraft must be able to carry out the intended flight. It must be airworthy, properly equipped and have been properly maintained. A flight taking place without respecting these conditions

could face a significant reduction in flight safety margins. This risk is addressed by point 2.c, which stemms directly from ICAO Annex 6 paragraphs such as part III section III paragraph 2.4.

15. A flight entering adverse meteorological conditions could suffer loss of control, fatal damage to the aircraft, controlled flight into terrain, which could lead to the loss of the aircraft. To avoid finding itself in such a situation, the crew must have all the expected meteorological information along the planned route. The principles of ICAO Annex 6 paragraphs, such as part II paragraph 4.5, have been used to mitigate this risk in paragraph 2.d.

16. Furthermore a known cause of fatalities is the entrance into icing conditions with an aircraft that is not designed and/or equipped to do so. The purpose of point 2.e is to prevent any such flight from commencing. It reflects ICAO Annex 6 paragraphs such as part III section III paragraph 2.6.4.

17. An improper preparation of a flight could cause the lowering of flight safety margins along the route or at destination. It could also lead to diversions or emergency landings with sub-standard safety margins. The aim of point 2.f is to avoid this by mandating proper preparation before any flight is commenced. The requirement contained therein originates from ICAO Annex 6 paragraphs such as part II paragraph 4.6.

18. An inadequate calculation of the quantity of fuel necessary for an intended flight and any operational deviations could lead to an aircraft having insufficient fuel to finish safely the intended flight. This in turn could lead to a forced landing with damage to, or even loss of, the aircraft. It is therefore necessary that before any flight commences, the amount of fuel on board is sufficient for the flight and any deviation from the planned operation. This is what point 2.g mandates. It mirrors ICAO Annex 6 paragraphs such as part II paragraph 4.8.

19. In the case of flights taking place at high altitudes, it is important to have enough oxygen on board to cover normal and emergency situations. If this were not the case, a sudden depressurisation of the aircraft cabin could harm the health of crew and passengers and even cause the loss of the aircraft when such incident impairs the flight crew. Point 2.h, coming from ICAO Annex 6 paragraphs such as part II paragraph 4.9, mandates the availability of sufficient quantities of readily available oxygen for the intended flight .

Mitigation of hazards linked with the operation of an aircraft

20. During certain phases of flight or in inclement weather, any person not seated and adequately restrained faces the possibility of injury in the case of unexpected or unintended flight manoeuvres. Furthermore, in order not to endanger safety at critical phases of the flight, the crew must be at their post during take-off and landing or any critical phases of the flight, such as in inclement weather. The principles of ICAO Annex 6 paragraphs, such as part II paragraph 4.15, have been used to mitigate this risk in points 3.a, 3.b and 3.c.

21. An obvious hazard to flight safety is the inadequate separation between aircraft or between an aircraft and the ground during flight. This could lead to mid-air collisions, uncontrolled flight into terrain, loss of control due to wake turbulence and possible risk of collision on ground due to runway incursion. The purpose of point 3.d is to mitigate such risks. It reflects the operational obligations derived from ICAO Annex 2 paragraph 3.2. Of course it is not the intention to establish here the legal basis for the development of such rules, which are an aspect of the use of airspace and belong therefore to rules to be adopted for implementing the Single Sky Regulations.

22. Another hazard is the unexpected degradation of meteorological conditions during flight. If a pilot were to continue under these conditions s/he would face the risk of lowering flight safety margins along the route or at destination. That is why point 3.e requires not continuing a flight under visual flight rules or an approach under instrument flight rules if minima specified by the authorities in charge with the management of the airspace and of air traffic, are not met. This originates from ICAO Annex 6 paragraphs such as part II paragraph 4.6.

23. As explained in paragraph 13 of this note, crew and passengers need to be made aware of the emergency procedures and how to use safety equipment before take off. This is also true when an

emergency situation arises. In order to increase passenger and crew survivability they should be informed in advance of how to deal with the problem at hand because that may not be possible any more in case of emergency. This is the object of point 3.f stemming directly from ICAO Annex 6 paragraphs such as part III section III paragraph 2.11.

24. A passenger acting disruptively due to impairment or loss of mental balance caused by stress, drug or alcohol abuse, can affect the good order of the flight and jeopardise the safety of other persons on board. Furthermore, the crew faces the risk of undue diversions over hostile territory. Point 3.g stemming from the provisions JAR-OPS, gives the pilot in command the necessary powers to intervene against unruly passengers

25. To avoid the risk of runway incursion for instance, it is important that anyone that taxis an aircraft, or, in the case of a helicopter, turns the rotor under power, is aware of the related risks and can manage it if necessary. The principles of ICAO Annex 6 paragraphs, such as part II paragraph 4.17, have been used in point 3.h to impose appropriate training and qualification.

Mitigation of hazards linked with aircraft performance and operating limitations.

26. An improper use of an aircraft, outside the limits as published in its flight manual may lead to loss of control of the aircraft or even structural damage. In extreme cases, this could lead to accidents or serious incidents. Point 4.a requires aircraft to be used within the limits set out in the flight manual and that the flight manual be made available and kept up to date. It is based on ICAO Annex 6 paragraphs such as part II paragraph 5.1(a).

27. Noise and emissions have been designated as having a negative effect on the environment and on the health of persons, especially close to airfields. It is necessary therefore that aircraft do not operate outside the limits set by their environmental certification. The principles of ICAO Annex 6 paragraphs, such as part II paragraph 5.1(c), have been inserted in point 4.b to forbid environmentally harmful operations.

28. The operational capabilities of an aircraft are critical to its safety. It must not be operated beyond the limits it was designed for. If this were not the case, there would be an unacceptable risk of collision with obstacles or of runway incursions, in particular under instrument meteorological conditions. Point 4.c was developed to cater for these hazards. It stems from equivalent and more detailed regulations such as JAR-OPS Subpart F. It has to be recalled here again that the applicable distances/areas or obstacle clearances are those specified by the authorities in charge with the issuing of airport and air traffic regulations. It is not the intention to create here the legal basis for such regulations.

Mitigation of hazards linked with instruments and equipment.

29. A flight should not take place without the proper equipment. The absence or misuse of such equipment could lead to the pilot lacking references in certain meteorological conditions. This would result in the loss of orientation, the loss of control, damage to the aircraft or some of its equipment, or even collision with other aircraft or the ground. Therefore, point 5.a was developed, based on ICAO Annex 6 paragraphs, such as part III section III paragraph 4.1.1 to impose that appropriate equipment is on board and operative.

30. If ever an aircraft is to land un-intentionally in inhospitable or hostile territory, maybe with injury to persons on board, it is important, to insure passenger and crew survivability that minimum medical and survival equipment be carried on board. Furthermore, there may be events on board, such as fire, that if not controlled could lead to insufficient controllability and even loss of the aircraft. To control such events, the proper survival and emergency equipment must be on board. The purpose of point 5.b is to provide for such an obligation. It reflects ICAO Annex 6 paragraphs, such as part III section III paragraph 4.1.3.

31. Point 1.a mandates that all persons involved in the execution of a flight be familiar with applicable laws, regulations and procedures. But due to the limits of the human memory, it is necessary to have this information on board for consultation. If this were not the case, and crews were to forget the right

regulation or procedure, safety margins might be unnecessarily reduced This is the object of point 5.c, which requires the necessary documentation to be on board. It stems directly from ICAO Annex 6 paragraphs such as part III section III paragraph 4.1.3.1(d).

32. In case of an accident, it is necessary to allow for rescue teams to assist passengers and crew blocked on board quickly. Their work is very much simplified if the zones that can be used to break in are appropriately marked. Point 5.d requires this. It is based on ICAO Annex 6 paragraphs such as part II paragraph 6.1.4

Mitigation of hazards linked with continuing airworthiness.

33. An aircraft should not fly unless to the best of the owner's or operator's knowledge it is airworthy. It is obvious that flying with an aircraft that is not airworthy lowers the level of safety. It can even lead to the aircraft crashing. Point 6.a lists the main aspects to be taken into account in evaluating an aircraft's airworthiness. It reflects ICAO Annex 6 paragraphs such as part III section III paragraph 6.1.1.

34. Furthermore, before any flight, the aircraft must be inspected to see if there is anything flagrantly abnormal with the aircraft. Many accidents could have been avoided had a proper inspection of the aircraft taken place before the flight. The absence or incorrect accomplishment of this inspection is still one of the most common causes of accidents. Point 6.b, addresses this issue. It is based for example on JAR-OPS 3.890(a)(1).

35. In keeping an aircraft airworthy, it is important that a maintenance programme be developed taking into account the configuration of the particular aircraft. If this were not the case, certain items or inspections could be forgotten, therefore the wear of certain parts of the aircraft could be missed. It could, in some cases, be very detrimental to flight safety. The principles of ICAO Annex 6 paragraphs, such as part II paragraph 5.1(c), have been used to mitigate this risk in point 6.c

36. The margins of safety are greatly reduced on an aircraft that has not been maintained properly. Furthermore, the fact that this maintenance has been carried out fully and properly has to be clear for the pilot who is not necessarily competent in aircraft maintenance. Only competent persons or organisations may release the aircraft to service. This is what point 6.d mandates. It covers the intent of ICAO Annex 6 paragraphs such as part III section III paragraph 6.1.3.

37. For the same reasons, the above-mentioned release to service should contain enough information to verify that all needed tasks have been carried out, as defined in the maintenance programme. This allows to check that no tasks were forgotten and to plan future maintenance. The purpose of points 6.e and 6.f is to mitigate such risks. It is based on ICAO Annex 6 paragraphs such as part II paragraphs 8.2 and 8.5.

38. When modifying an aircraft, one must do so in the proper manner. A modification or repair not carried out properly could lead for instance to a weakening of the airframe, possibly deformation or even the loss of an aircraft. The object of point 6.g stemming directly from ICAO Annex 6 paragraphs such as part III section III paragraph 6.4 is to mandate that any change or repair be made in accordance with the applicable airworthiness requirements.

Mitigation of hazards linked with crew members

39. Aircraft are designed to be flown by a certain number of crew members. Such number is specified in the type certificate of each aircraft. Of course, less crew members would lead to extra workload which could in turn lead to an improper execution of tasks linked to the safety of the flight and lower safety margins. The purpose of point 7.a is to mitigate such risks. It reflects ICAO Annex 6 paragraphs, such as part III section III paragraph 7.2.

40. Just as for pilots, cabin crew shall also be subject to essential proficiency requirements related to physical and medical fitness, as well as training. Moreover whatever the level of competence, it can deteriorate through time. If this reduction of competence is too great, it can constitute a risk to flight

safety. This reduction can be due to lack of practice of an aircraft or certain configurations of flight. That is why Point 7.b introduces the need for cabin crew to be fit and trained to execute the their duties and to maintain such competency.

41. In order to avoid the lowering of safety margins through lack of decision making or lack of enforcement of conflicting decisions, one person must be made responsible and have authority on board the aircraft. That person is the pilot in command. Point 7.c emphasises this fact. It reflects ICAO Annex 6 paragraphs such as part III section II paragraph 7.1.2.

42. Past accidents show that in the case of an emergency, the pilot in command should undertake any appropriate action so as to secure safety without being bound by procedures or requirements that have become irrelevant in the circumstances. Point 7.d authorises any action to be taken in order to maintain safety as best as possible in such situations. This originates from ICAO Annex 6 paragraphs such as part II paragraphs 3.2 and 3.3.

43. The effects of fatigue on human performance are well known. It effects task achievement, decision making, and accuracy. It is therefore very important that flight crew members have sufficient rest periods between flights and do not fly when excessively fatigue. This is the object of point 7.e, which reflects ICAO Annex 6 paragraphs, such as part III section II paragraph 7.6.

44. Unsatisfactory crew performance due to psychoactive substances, alcohol abuse or other causes can lead to inappropriate following of procedures, flight paths, or manoeuvres. It also favours inappropriate decision making due to lowering of mental capability. Point 7.f tackles this important safety issue by forbidding the use of such substances by any crew member. It also addresses the issue of sickness that could have the same effect. This point takes into account ICAO Annex 6 paragraphs such as part III section II paragraph 1.3.

Mitigation of hazards related to operations for commercial purposes or of large aircraft

45. Commercial operators, as their name indicates, operate aircraft for mercantile purposes. They carry people or goods, or they provide services, against remuneration. As their activity is generally more intensive than that of other air operators, not least because they have to ensure sufficient commercial profitability, the associated risk is higher. Moreover, as customers are not specialised in aviation safety and cannot evaluate the risk they share in contracting with commercial operators, it is legitimate that the legislator takes over responsibility and mandate more stringent safety requirements. This also reflects the intent of ICAO Annexes.

46. Large aircraft tend to be more complex to operate than small ones. Generally one needs a certain organisation to operate and maintain them. They are operationally more limited. They carry more people or goods at the same time. They need more space, more special tools and more personnel to ensure their continuing airworthiness. Moreover, the risk of collateral damage on the ground is higher due to the size and the quantity of fuel carried by these larger aircraft.

47. As a consequence it was felt necessary to review each hazard and to examine which additional mitigating measures shall be imposed to address the case of operations for commercial purposes or of large aircraft.

48. As demonstrated by the list of hazards, the safe operation of aircraft requires a number of mitigating measures to be implemented in various fields by appropriately qualified and trained persons in a carefully co-ordinated manner. This complexity requires in turn that bodies involved in commercial operations or the operation of large aircraft put in place and maintain high performance quality management systems covering procedures, training programmes, continuing airworthiness, incident analysis, accident prevention so as to promote a real safety culture. This is the intent of point 8.a. It covers the intent of ICAO Annex 6 paragraphs, such as part III section II chapters 2, 6 and 9.

49. Concerning the availability of equipment, for the reasons of standardisation explained here above and to avoid a multiplicity of different decisions by various crews, it is necessary to develop a minimum equipment list, guaranteeing that a flight shall not take place without the equipment necessary to safely carry it out. Point 8.a.3 mandates such a minimum equipment list and explains how

it should be developed. It covers the intent of ICAO Annex 6 paragraphs, such as part III section II chapter 4.

50. There is also a need to operate in a standardised manner to provide for a comparable level of safety on every flight. For this, all flights must be carried out according to an operations manual. That also limits the risks associated to the complexity of the network of routes and airports served, the multiplicity of procedures prescribed and the variety of aircraft used. Point 8.b mandates this and covers the intent of ICAO Annex 6 paragraphs, such as part I chapters 6 and 12.

51. As already indicated in paragraph 24, passengers acting in a disruptive manner can jeopardise the good order and the safety of other persons on board. This could lead to undue diversions over hostile territory thus potentially reducing safety margins. Point 3.g of the essential requirements gives the pilot in command the power to take measures to reduce the related risk. This however may not be sufficient in commercial air transport or in large aircraft where experience has shown that appropriate procedures and training of crews can help solving these difficult situations in a satisfactory manner. That is why Point 8.c introduces the need for procedures to be established. This also reflects the intent of JAR-OPS.

52. History shows that commercial or large aircraft have become the target of terrorists. It is therefore not possible to address flight safety without focusing on security aspects. While it is not the intent to create here the legal basis for security measures, which belong to other legislative actions, it is necessary however to ensure that crew and other staff involved in the preparation and execution of commercial flight develop a security culture. This requires in turn that the operators establish appropriate procedures and put in place the related training process. Such is the aim of point 8.d, which reflects the intent of ICAO Annex 6 paragraphs, such as part I chapter 11.

53. As the responsibilities associated with commercial operations or the operation of large aircraft are more important than for other types of operations, it is even more critical that the pilot in command is clearly identified to avoid any confusion. This is made easier in this case as the organisation in charge with the management of these kind of operations can give authority to a person over others. Point 8.e tackles this issue.

54. Nobody contest that crews are key players to ensuring the safety of operations in all phases of flight. This is more evident for commercial operations or the operation of large aircraft. As already indicated here above crews can only play their role in good conditions if they are not fatigued. It is therefore crucial that measures are taken to manage fatigue and ensure appropriate limitation to flight duty time and sufficient rest before a flight is undertaken. That should be done through a careful rostering of crews' work. Such is the objective of point 8.f that covers the intent of ICAO Annex 6, as contained in part III section II chapter 7.

55. The tasks of managing the continuing airworthiness can be very heavy when the size of the aircraft or its utilisation becomes greater. One person can no longer manage all the aspects involved. The quantity of information to be processed would necessarily lead to omissions if the work were not carried out by qualified person(s). The principles of ICAO Annex 6 paragraphs, such as part I paragraph 8.1.4 have been used to mitigate this risk in point 8.g by mandating that continuing airworthiness be supervised by appropriately qualified persons or organisations. Criteria for such qualification are also specified.

APPENDIX TO EXPLANATORY NOTE

LIST OF HAZARDS

- Use of wrong operating procedures
- Incorrect or insufficient documentation related to laws, regulations and procedures
- Dangerous goods flammability, explosive, toxic, corrosive and radio-active characteristics
- Operation without anticipating the adequacy of ground facilities including communication facilities and navigation aids
- Operation without anticipating the adequacy the aircraft to the planned flight
- Lack of provision of checklist for normal and emergency situations
- Human memory limitation with regard to proper sequencing and execution of multiple tasks
- Obstacle clearance accountability conditions in the context of all flight phases
- Inadequate separation
- Airfield visual acquisition
- Transition IMC/VMC close to the ground
- Obstacle clearance following a go around in IMC conditions
- Fatigue
- Passenger and crew survivability compromised by facing emergency situations unprepared
- Passengers acting in a disruptive manner (impairment/loss of mental balance caused by e.g. drug or alcohol abuse)
- Unavailability of aerodromes and flight routes, which have been intended to be used, because of unforeseen conditions
- Adverse meteorological conditions (visibility, wind, turbulence, precipitation, icing)
- Insufficient fuel or oil during flight
- Insufficient oxygen supply, lack of oxygen in normal and emergency situation.
- Danger of incapacitated or disabled flight crew by intense aircraft acceleration (unexpected or unintended flight manoeuvres or after hard or emergency landing)
- Lack of necessary follow up information related to each flight
- Aircraft excessively loaded and/or out of balance
- Aircraft used outside its certified limits
- Lack of update of flight manual updates
- Inadequacy between aircraft take-off/landing performance and available take-off/landing distances
- Inadequacy between aircraft performance and obstacle situation
- Lack of appropriate equipment
- Lack of human qualification

- Insufficient training, complacency
- Inappropriate use of equipment
- Lack of references
- Meteorology/nature
- Unintended physical aircraft contact with (hostile) territory other than intended landing area
- Fire, smoke etc.
- Exposure of persons to ‘non standard’ (hostile) conditions
- Lack of redundancy of equipment
- Wear, corrosion, fatigue and ageing
- Human error during maintenance work
- Maintenance, modifications and repairs without the aircraft manufacturer’s type certificate data sheet and relevant specifications
- Excessive crew workload
- Lack of authority
- Unsafe flight execution
- Blind obeying to all regulations and procedures in an emergency situation
- Lack of appropriate training
- Unsatisfactory crew performance related to psychoactive substances or other causes as referred to under the Essential Requirements
- Inappropriate use of available training means
- Negative training performed on non- representative STD
- Unlawful acts to endanger the safety of aircraft, e.g. intentional degradation of equipment, systems, material
- Malicious code or cyber attack against insufficiently protected aviation systems
- Non respect of environment