

ANNEX I

Essential requirements for airworthiness referred to in Article 5

1. Product integrity: product integrity must be assured for all anticipated flight conditions for the operational life of the aircraft. Compliance with all requirements must be shown by assessment or analysis, supported, where necessary, by tests.
 - 1.a. Structures and materials: the integrity of the structure must be ensured throughout, and sufficiently beyond, the operational envelope for the aircraft, including its propulsion system, and maintained for the operational life of the aircraft.
 - 1.a.1. All parts of the aircraft, the failure of which could reduce the structural integrity, must comply with the following conditions without detrimental deformation or failure. This includes all items of significant mass and their means of restraint.
 - 1.a.1.a. All combinations of load reasonably expected to occur within, and sufficiently beyond, the weights, centre of gravity range, operational envelope and life of the aircraft must be considered. This includes loads due to gusts, manoeuvres, pressurisation, movable surfaces, control and propulsion systems both in flight and on the ground.
 - 1.a.1.b. Consideration must be given to the loads and likely failures induced by emergency landings either on land or water.
 - 1.a.1.c. Dynamic effects must be covered in the structural response to these loads.
 - 1.a.2. The aircraft must be free from any aeroelastic instability and excessive vibration.
 - 1.a.3. The manufacturing processes and materials used in the construction of the aircraft must result in known and reproducible structural properties. Any changes in material performance related to the operational environment must be accounted for.
 - 1.a.4. The effects of cyclic loading, environmental degradation, accidental and discrete source damage must not reduce the structural integrity below an acceptable residual strength level. All necessary instructions for ensuring continued airworthiness in this regard must be promulgated.
 - 1.b. Propulsion: the integrity of the propulsion system (i.e. engine and, where appropriate, propeller) must be demonstrated throughout, and sufficiently beyond, the operational envelope of the propulsion system and must be maintained for the operational life of the propulsion system.
 - 1.b.1. The propulsion system must produce, within its stated limits, the thrust or power demanded of it at all required flight conditions, taking into account environmental effects and conditions.
 - 1.b.2. The fabrication process and materials used in the construction of the propulsion system must result in known and reproducible structural behaviour. Any changes in material performance related to the operational environment must be accounted for.
 - 1.b.3. The effects of cyclic loading, environmental and operational degradation and likely subsequent part failures must not reduce the integrity of the propulsion system below acceptable levels. All necessary instructions for ensuring continued airworthiness in this regard must be promulgated.
 - 1.b.4. All necessary instructions, information and requirements for the safe and correct interface between the propulsion system and the aircraft must be promulgated.

- 1.c. Systems and equipment
 - 1.c.1. The aircraft must not have design features or details that experience has shown to be hazardous.
 - 1.c.2. The aircraft, including those systems, equipment and appliances required for type-certification, or by operating rules, must function as intended under any foreseeable operating conditions, throughout, and sufficiently beyond, the operational envelope of the aircraft, taking due account of the system, equipment or appliance operating environment. Other systems, equipment and appliance not required for type-certification, or by operating rules, whether functioning properly or improperly, must not reduce safety and must not adversely affect the proper functioning of any other system, equipment or appliance. Systems, equipment and appliances must be operable without needing exceptional skill or strength.
 - 1.c.3. The aircraft systems, equipment and associated appliances, considered separately and in relation to each other, must be designed such that any catastrophic failure condition does not result from a single failure not shown to be extremely improbable and an inverse relationship must exist between the probability of a failure condition and the severity of its effect on the aircraft and its occupants. With respect to the single failure criterion above, it is accepted that due allowance must be made for the size and broad configuration of the aircraft and that this may prevent this single failure criterion from being met for some parts and some systems on helicopters and small aeroplanes.
 - 1.c.4. Information needed for the safe conduct of the flight and information concerning unsafe conditions must be provided to the crew, or maintenance personnel, as appropriate, in a clear, consistent and unambiguous manner. Systems, equipment and controls, including signs and announcements must be designed and located to minimise errors which could contribute to the creation of hazards.
 - 1.c.5. Design precautions must be taken to minimise the hazards to the aircraft and occupants from reasonably probable threats, both inside and external to the aircraft, including protecting against the possibility of a significant failure in, or disruption of, any aircraft appliance.
- 1.d. Continuing airworthiness
 - 1.d.1. Instructions for continuing airworthiness must be established to ensure that the aircraft type certification airworthiness standard is maintained throughout the operational life of the aircraft.
 - 1.d.2. Means must be provided to allow inspection, adjustment, lubrication, removal or replacement of parts and appliances as necessary for continuing airworthiness.
 - 1.d.3. The instructions for continuing airworthiness must be in the form of a manual, or manuals, as appropriate for the quantity of data to be provided. The manuals must cover maintenance and repair instructions, servicing information, trouble-shooting and inspection procedures, in a format that provides for a practical arrangement.
 - 1.d.4. The instructions for continuing airworthiness must contain airworthiness limitations that set forth each mandatory replacement time, inspection interval and related inspection procedure.
- 2. Airworthiness aspects of product operation

- 2.a. The following must be shown to have been addressed to ensure a satisfactory level of safety for those onboard or on the ground during the operation of the product:
 - 2.a.1. The kinds of operation for which the aircraft is approved must be established and limitations and information necessary for safe operation, including environmental limitations and performance, must be established.
 - 2.a.2. The aircraft must be safely controllable and manoeuvrable under all anticipated operating conditions including following the failure of one or, if appropriate, more propulsion systems. Due account must be taken of pilot strength, flight deck environment, pilot workload and other human-factor considerations and of the phase of flight and its duration.
 - 2.a.3. It must be possible to make a smooth transition from one flight phase to another without requiring exceptional piloting skill, alertness, strength or workload under any probable operating condition.
 - 2.a.4. The aircraft must have such stability as to ensure that the demands made on the pilot are not excessive taking into account the phase of flight and its duration.
 - 2.a.5. Procedures for normal operations, failure and emergency conditions must be established.
 - 2.a.6. Warnings, or other deterrents intended to prevent exceedance of the normal flight envelope, must be provided, as appropriate to type.
 - 2.a.7. The characteristics of the aircraft and its systems must allow a safe return from extremes of the flight envelope that may be encountered.
- 2.b. The operating limitations and other information necessary for safe operation must be made available to the crew members.
- 2.c. Product operations must be protected from hazards resulting from adverse external and internal conditions, including environmental conditions.
 - 2.c.1. In particular, no unsafe condition must occur from exposure to phenomena such as, but not limited to, adverse weather, lightning, bird strike, high frequency radiated fields, ozone, etc., reasonably expected to occur during product operation.
 - 2.c.2. Cabin compartments must provide passengers with suitable transport conditions and adequate protection from any expected hazard arising in flight operations or resulting in emergency situations, including fire, smoke, toxic gases and rapid decompression hazards. Provisions must be made to give occupants every reasonable chance of avoiding serious injury and quickly evacuating the aircraft and to protect them from the effect of the deceleration forces in the event of an emergency landing on land or water. Clear and unambiguous signs or announcements must be provided, as necessary, to instruct occupants in appropriate safe behaviour and the location and correct use of safety equipment. Required safety equipment must be readily accessible.
 - 2.c.3. Crew compartments must be arranged in order to facilitate flight operations, including means providing situational awareness, and management of any expected situation and emergencies. The environment of crew compartments must not jeopardise the crew's ability to perform their tasks and its design must be such as to avoid interference during operation and misuse of the controls.

3. Organisations (including natural persons undertaking design, manufacture or maintenance)
 - 3.a. Organisation approvals must be issued when the following conditions are met:
 - 3.a.1. the organisation must have all the means necessary for the scope of work. These means comprise, but are not limited to, the following: facilities, personnel, equipment, tools and material, documentation of tasks, responsibilities and procedures, access to relevant data and record-keeping;
 - 3.a.2. the organisation must implement and maintain a management system to ensure compliance with these essential requirements for airworthiness, and aim for continuous improvement of this system;
 - 3.a.3. the organisation must establish arrangements with other relevant organisations, as necessary, to ensure continuing compliance with these essential requirements for airworthiness;
 - 3.a.4. the organisation must establish an occurrence reporting and/or handling system, which must be used by the management system under point 3.a.2 and the arrangements under point 3.a.3, in order to contribute to the aim of continuous improvement of the safety of products.
 - 3.b. In the case of maintenance training organisations, the conditions under points 3.a.3 and 3.a.4 do not apply.