

CHAPTER 5

DIRECTIONAL CONTROL SYSTEMS

EU Directive on Electromagnetic Compatibility (2004/108/EC)

Electrical and electronic equipment that may either generate or be affected by electromagnetic disturbance shall meet the requirements of EC Directive 2004/108/EC, as amended. Equipment complying with this directive should have an EC mark or CE marking in accordance with EC Directives 2004/108/EC or 93/68/EEC (with Corrigendum), as amended.

EU Directive on Electrical Equipment designed for use within certain voltage limits (2006/95/EC)

Electrical equipment designed for use with a voltage rating of between 50 and 1000 volts for alternating current and between 75 and 1500 volts for direct current shall meet the requirements of EU Directive 2006/95/EC, except for specialised electrical equipment, for use on ships, which comply with the safety provisions drawn up by international bodies in which the Member States participate.

5.1 General

5.1.1 Craft shall be provided with means for directional control of adequate strength and suitable design to enable the craft's heading and direction of travel to be effectively controlled to the maximum extent possible in the prevailing conditions and craft speed without undue physical effort at all speeds and in all conditions for which the craft is to be certificated. The performance shall be verified in accordance with annex 9.

5.1.2 Directional control may be achieved by means of air or water rudders, foils, flaps, steerable propellers or jets, yaw control ports or side thrusters, differential propulsive thrust, variable geometry of the craft or its lift-system components or by a combination of these devices.

5.1.3 For the purpose of this chapter, a directional control system includes any steering device or devices, any mechanical linkages and all power or manual devices, controls and actuating systems.

Hydraulic systems forming part of the actuating systems and associated fixed and flexible pipes and hoses are included.

5.1.4 Attention is drawn to the possibility of interaction between directional control systems and stabilisation systems. Where such interaction occurs or where dual-purpose components are fitted, the requirements of 12.5 and chapters 16 and 17 are also to be complied with, as applicable.

5.2 Reliability

5.2.1 The probability of total failure of all directional control systems shall be extremely remote when the craft is operating normally, i.e., excluding emergency situations such as grounding, collision or a major fire.

See annex 3 and annex 4 for Failure Modes and Effects Analysis (FMEA). This requirement should be adequately covered within the FMEA, although the use of the term 'Extremely Remote' should not be taken in the context of numerical probabilities described in annex 3.

5.2.2 A design incorporating a power drive or an actuation system employing powered components for normal directional control shall provide a secondary means of actuating the device unless an alternative system is provided.

The FMEA should comply with the requirements of annex 3 and annex 4. Normally compliance will be achieved by provision of redundant systems as detailed in 4.5 of annex 4, and numerical assessment will not be required. Consideration should be given to the independence of redundant systems as required by 4.5.2 of annex 4. It is recommended that FMEA's should be forwarded to MCA headquarters for advice, particularly those which comply by means of numerical assessment.

5.2.3 The secondary means of actuating the directional control device may be manually driven when the Administration is satisfied that this is adequate, bearing in mind the craft's size and design and any limitations of speed or other parameters that may be necessary.

To be considered adequate the manual force to be applied should not generally exceed 100 N.

5.2.4 The directional control systems shall be constructed so that a single failure in one drive or system, as appropriate, will not render any other one inoperable or unable to bring the craft to a safe situation. The Administration may allow a short period of time to permit the connection of a secondary control device when the design of the craft is such that such delay will not, in their opinion, hazard the craft.

This period should be kept to the absolute minimum and in any event should not exceed 5 minutes. If necessary this should be proved by an appropriate trial.

5.2.5 A failure mode and effect analysis shall include the directional control system.

5.2.6 If necessary to bring the craft to a safe condition, power drives for directional control devices, including those required to direct thrust forward or astern, shall become operative automatically, and respond correctly, within 5s of power or other failure. Back-up electrical systems may be required for the starting-up time of an auxiliary diesel according to 12.2 or an emergency diesel generator according to 12.3.6.

5.2.7 Directional control devices involving variable geometry of the craft or its lift system components shall, so far as is practicable, be so constructed that any failure of the drive linkage or actuating system will not significantly hazard the craft.

5.3 Demonstrations

5.3.1 The limits of safe use of any of the control system devices, shall be based on demonstrations and a verification process in accordance with annex 9.

5.3.2 Demonstration in accordance with annex 9 shall determine any adverse effects upon safe operation of the craft in the event of an uncontrollable total deflection of any one control device. Any limitation on the operation of the craft as may be necessary to ensure that the redundancy or safeguards in the systems provide equivalent safety shall be included in the craft operating manual.

5.4 Control position

5.4.1 All directional control systems shall normally be operated from the craft's operating station.

“Operating station” is defined in section 1.4.44.

5.4.2 If directional control systems can also be operated from other positions, then two-way communication shall be arranged between the operating station and these other positions.

5.4.3 Adequate indications shall be provided at the operating station and these other positions to provide the person controlling the craft with verification of the correct response of the directional control device to this demand, and also to indicate any abnormal responses or malfunction. The indications of steering response or rudder angle indicator shall be independent of the system for directional control. The logic of such feedback and indications shall be consistent with the other alarms and indications so that in an emergency operators are unlikely to be confused.