F

GUIDANCE MATERIAL:

SAFETY OBJECTIVE CLASSIFICATION SCHEME

Safety Objective Classification Scheme (SOCS) specifies the maximum acceptable frequency of occurrence of a hazard per reference unit (flight hour, operational hour, per sector, etc.) taking into account the severity of the worst credible hazard effect (amongst all hazard effects).

Safety Objectives are qualitative or quantitative statements that define the maximum frequency at which a hazard can be tolerated to occur.

An example of quantitative Safety Objective Classification Scheme (SOCS) is given below (Table F-1).

Table F-1: quantitative SOCS

Note that all numbers and units in the example are fictitious.

Maximum Acceptable frequency of occurrence of Hazard (Safety Objective) [Per Operational-hour]	Severity Class of the Worst Credible hazard effect [as per ESARR4]
SO < 10^{-7}	SC1
10^{-7} < SO < 10^{-5}	SC2
10^{-5} < SO < 10^{-4}	SC3
10^{-4} < SO < 10^{-3}	SC4
10^{-3} < SO < 10^{-1}	SC5

An example of a Qualitative Safety Objective Classification Scheme is given below (Table F-2).

Table F-2: qualitative SOCS

Maximum acceptable frequency of hazard occurrence (Safety Objective)	Severity Class of the Worst Credible hazard effect [as per ESARR4]
EXTREMELY RARE	SC1
RARE	SC2
OCCASIONAL	SC3
LIKELY	SC4
NUMEROUS	SC5

- A Safety Objective Classification Scheme can be defined either at ANS/ATM Organisation level or at Programme or Functional level. Consequently, an ANSP/ATMSP can have many SOCS.

- Each SOCS is defined for the purpose of a specific (sub-)system under safety assessment and is applicable only for this specific (sub-)system.

- The ANSP/ATMSP has then the responsibility to ensure that these SOCS all together are consistent with the organisation Risk Classification Scheme (RCS, See Guidance Material E of FHA – Chapter 3).

Example: Background of aircraft airworthiness Safety Objective Classification Scheme

The approach of deriving such a scheme is based on the historically derived accident rate for aviation and the arbitrary assumption for the contribution of airworthiness equipment failure conditions to that rate, as well as the assumptions about the number of failure conditions that could generate the accident. (For airworthiness, failure condition can be considered as similar to “SAM-hazard” at the equipment-only and overall ATM levels)

JAR 25.1309 Scheme is based on following:

[JAR 25.1309]

“Historical evidence indicated that the probability of a serious accident due to operational and airframe-related causes was approximately one per million hours of flight. Furthermore, about 10 percent of the total were attributed to Failure Conditions caused by the aeroplane's systems. It seems reasonable that serious accidents caused by systems should not be allowed a higher probability than this in new aeroplane designs. It is reasonable to expect that the probability of a serious accident from all such Failure Conditions be not greater than one per ten million flight hours or 1×10^{-7} per flight hour for a newly designed aeroplane. The difficulty with this is that it is not possible to say whether the target has been met until all the systems on the aeroplane are collectively analysed numerically. For this reason it was assumed, arbitrarily, that there are about one-hundred potential Failure Conditions in an aeroplane which could be Catastrophic. The target allowable Average Probability per Flight Hour of 1×10^{-7} was thus apportioned equally among these Failure Conditions, resulting in an allocation of not greater than 1×10^{-9} to each. The upper limit for the Average Probability per Flight Hour for Catastrophic Failure Conditions would be 1×10^{-9} which establishes an approximate probability value for the term "Extremely Improbable". Failure Conditions having less severe effects could be relatively more likely to occur.”

By adopting the order of magnitude of 10^{-2} between the severity classes, JAR 25.1309 specifies maximum tolerable rate of occurrence of single Failure Condition of certain severity:

Catastrophic	10^{-9} and less/ fh
Hazardous effect	$10^{-7} – 10^{-9}$/ fh
Major effect	$10^{-5} – 10^{-7}$/ fh
Minor effect	$10^{-3} – 10^{-5}$/ fh

A similar approach could be developed for ATM environment by making some different assumptions about the contribution of ATM in the aviation accident risk and the number of ATM hazards that could generate accidents. Units to be used for expressing the probabilities should be considered as well, since flight hour may not be suitable for ATM systems in continuous use.