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# **AERODROME ADVISORY CIRCULAR**

F. No. AV 20011/19/17-AL

**Subject: Guidance on Conducting Aeronautical Studies and Safety Assessment**

## **1 Introduction**

- 1.1 An aeronautical study is a study of an aeronautical problem to identify possible solutions and select a solution that is acceptable without degrading safety. A comprehensive aeronautical study allows the aerodrome operator and the DGCA to be convinced that safety and regularity of operations of aircraft is not compromised in any way.
- 1.2 Where an aerodrome operator is not able to comply with any standard stipulated in the CAR, appropriate safety assessment and/ or aeronautical studies shall be conducted to assess the impact of deviations from the standards. The purpose of such studies is to present alternative means of ensuring the safety of aircraft operations, to estimate the effectiveness of each alternative and to recommend procedures to compensate for the deviation.
- 1.3 An aeronautical study is mostly undertaken during the planning of a new airport or new airport facility, or during the licensing of an existing aerodrome. This circular provides guidance for conduct of Aeronautical study/ safety assessment during these phases.
- 1.4 Subsequently, when the aerodrome operator applies for changes due to development or an alteration in the aerodrome operational conditions, it is carried out in 3 phases. The detailed procedures can be accessed in AD AC 01 of 2012 (*Process for communicating with the DGCA on the planning, construction and commissioning of changes to airport infrastructure, and major maintenance programmes*)

- 1.5 In case of any deviation or non-compliance from a specific Standard contained in the CAR, the aerodrome operator is required to seek exemption from DGCA. The detailed procedure for seeking exemptions are contained in CAR Section 4 Series B Part IV. *(Exemption procedure for non-compliance at aerodromes.)*
- 1.6 Aerodrome operators/applicants should consult the stakeholders, senior management and affected departments in their organizations prior to the conduct of an aeronautical study. These consultations allow the proposed deviation to be viewed from different perspectives and the different parties involved would be aware of the proposed deviation. The aeronautical study should also be approved by the senior management of the organization before it is submitted to the DGCA for acceptance.
- 1.7 The purpose of this circular is to provide supplementary guidance to aerodrome operators and applicants applying for an aerodrome license on the conduct of aeronautical studies. It provides guidance on what is acceptable to the DGCA to demonstrate compliance with regulatory requirements.
- 1.8 It is important to note that this circular on its own does not change, create, amend or permit deviations from regulatory requirements nor does it establishes minimum standards.

## **2 Objectives**

- 2.1 The objectives of an aeronautical study / Safety assessment are:
  - (a) to study the impact of deviations from the Standards
  - (b) to present alternative solutions to ensure the level of safety remains acceptable;
  - (c) to estimate the effectiveness of each alternative; and
  - (d) to recommend operating procedures/restrictions or other measures to compensate for the deviation.
  - (e) to periodically review such measures for their dependability.
- 2.2 As per ICAO guidelines normally aeronautical studies are recommended in the following cases:
  - a) reduction in the width of a radio altimeter operating area
  - b) taxiway minimum separation distances
  - c) infringement to obstacle protection surface of a PAPI/ APAPI
  - d) omission of location sign
  - e) obstacle lighting of a objects in and outside OLS surfaces
  - f) Infringement by new objects or extension of existing objects.  
(GSR-751- MoCA (Height Restrictions for Safeguarding of Aircraft Operations) Rules, 2015

### **3 Aeronautical Study/ Safety Assessment Framework**

3.1 An aeronautical study/ Safety assessment submitted to the DGCA for determination of acceptability should comprise the following parts:

- (a) aim of the Study;
- (b) background;
- (c) risk Assessment;
- (d) outcome of the Aeronautical study/ Safety assessment;
- (e) conclusion and
- (f) monitoring of the deviation.

#### 3.2 Aim of the Study

3.2.1 The aim of the study should be explicitly stated. It should:

- (a) address the safety concerns;
- (b) identify safety measures to be put in place to ensure safe aircraft operations in an aerodrome and
- (c) make reference to the specific Standards in the CAR which the study is meant to address.

#### 3.3 Background

3.3.1 Information on the current situation faced by the aerodrome operator, current procedures that have been put in place and other relevant details should be clearly stated and explained in this sub-section. Clear explanation should be provided, particularly on the following:

- (a) what is the current situation?
- (b) where are the areas that will be affected by the proposed deviation?
- (c) when will the applicant be able to comply with the specific standard if it is due to development of the aerodrome?
- (d) why is there a need to review the current processes and procedures?
- (e) how will the proposed deviation affect the operation of aircraft at the aerodrome?

#### 3.4 Risk Assessment

3.4.1 Risk assessment is the identification, analysis and elimination, and/or mitigation of risks to an acceptable level of safety. This should be in accordance with the Aerodrome Safety Management System (SMS) that is required to be prepared by the aerodrome operator. A safety assessment usually consists of the following:

- (a) Identification of hazards and consequences; and
- (b) Risk management.

3.4.2 In the case of change proposal as described in AD AC 01 of 2012, the Hazard Identification and Risk management should be carried out as described therein.

3.4.3 However, in case of application for permanent exemption, the risk management (quantitative assessment) as part of Aeronautical Study/ Safety Assessment should be carried out using tools such as Collision Risk Model (CRM), wherever applicable, along with qualitative assessment of the risk to ensure the acceptable level of safety.

3.4.4 There is no standard methodology to conduct a risk assessment and it is up to the aerodrome operator to determine the appropriate methodology for each aeronautical study/ safety assessment, depending on the size and complexity of the situation and the severity of the safety implications. However, the methodology adopted should be consistent with that established in the aerodrome operator's SMS.

#### Identification of hazards and consequences

3.4.5 Hazards and its consequences should be identified and recorded in hazard-log. Aerodrome operators have to exercise caution when identifying the hazards and their consequences as stating a hazard as its consequence would disguise the nature of the hazard and at the same time, interfere with identifying other important consequences.

3.4.6 An example would be "Operation of Code E aircraft in a Code C airport" and "Wingtip collision in parking bays". The former is a hazard whereas the latter is one of its consequences. The associated risks and control/mitigation measures should also be recorded in the hazard log when information becomes available. This log should be constantly reviewed and updated throughout the aeronautical study life-cycle.

3.4.7 Appendix C of this circular contains a sample hazard log. The aerodrome operators may use this template to formulate their own hazard log to suit the aeronautical study / safety assessment.

#### Risk Management

3.4.8 Risk is the assessment, expressed in terms of predicted probability and severity, of the consequence(s) of a hazard taking as reference to the worst predictable situation. Risk management is the identification, analysis and elimination, and/or mitigation of such risk identified to an acceptable level.

3.4.9 The probability and severity of the consequence identified can be qualitative or quantitative. The aerodrome operator is free to use any method appropriate to the aeronautical study, but in accordance with the risk management methodology established in the aerodrome operator's SMS. A sample to assess the probability and severity of a consequence occurring are provided at Appendix B.

a) **Intolerable** – Unacceptable under the existing circumstances.

b) **Tolerable** – Acceptable based on risk mitigation. It may require management decision.

c) **Acceptable** – Acceptable as is. No risk mitigation required.

3.4.10 Risk control/mitigation measures should be developed to address the potential hazard or to reduce the risk probability or severity of the consequence when the risk is classified to be tolerable to a level acceptable by the aerodrome operator. There are three broad categories for risk control/mitigation and they are as follows:

a) **Avoidance** – the operation or activity is cancelled as the risks exceed the benefits of continuing the operation or activity;  
An example: "To prohibit Code F aircraft to land or take-off from (xyz airport), which is a Code 4E airport with some Code 4F capabilities."

b) **Reduction** – The frequency of the operation or activity is reduced, or action is taken to reduce the magnitude of the consequences of the accepted risks; and  
An example: "*To reduce the number of Code F aircraft to land or take-off from (xyz airport).*"

c) **Segregation of exposure** – Action is taken to isolate the effects of the consequences of the hazard or build-in redundancy to protect against it.

d) An example: "*To ensure (xyz airport) staff liaise with the AIS on the promulgation of necessary aerodrome information to aircraft operators and other airports for fixed period of time stated in their new process and/or new procedures.*"

### 3.5 Outcome of the Aeronautical Study/ Safety Assessment

- 3.5.1 It demonstrates to DGCA that the proposed deviation will not pose a drop in the level of safety, the aerodrome operator should recommend operating procedures/restrictions or other measures that will address any safety concerns. In addition, the aerodrome operator should estimate the effectiveness (through trials, surveys, simulations etc.) of each recommendation listed so as to identify the best means to address the proposed deviation.
- 3.5.2 Every airport operator should create a baseline or an initial hazard-log. Hazard identification then becomes an ongoing activity and hazard logs be continuously reviewed and updated. The hazard/ risk outcome of every aeronautical study/safety assessment should also be included in the log.
- 3.5.3 The aerodrome operator should also ensure that the affected stakeholders are informed of such changes. The notification procedure including process flow, time frame and different means of notification such the Aeronautical Information Publication (AIP) and Notice to Airmen (NOTAM) should be included in the study.

### 3.6 Conclusion of the Study

- 3.6.1 The aerodrome operator after taking into account all the necessary considerations listed above, should be able to summarize and conclude the results of the aeronautical study/ safety assessment, and come to a decision on any safety measures that should be adopted. The aerodrome operator should also specify a date to put in place all the necessary safety measures and show how they maintain the same level of safety with the recommended safety measures mentioned in the aeronautical study/ safety assessment.
- 3.6.2 Appendix A to this circular contains a suggested checklist with the requirements to be included in an aeronautical study. The checklist can be used by the aerodrome operator as a guide to ascertain that all of the requirements have been taken into consideration and documented in the aeronautical study.

### 3.7 Evaluation of the Proposal for Grant of Permission

- 3.7.1 The documentation prepared and submitted after undergoing the above process shall submitted to DGCA. The technical assessment would be carried out by DGCA officials for acceptance.
- 3.7.2 Technical analysis is generally pertinent in situations where the cost of correcting a problem that violates a Standard is excessive and where the unsafe effects of the problem can be overcome by a procedural means which offers both practical and reasonable solutions.

3.7.3 In conducting a technical analysis, inspectors will draw upon their practical experience and specialized knowledge. They may also consult other specialists in relevant areas. When considering alternative procedures for approval of a deviation, it is important to ensure that the intent of the regulations is not overlooked.

3.7.4 The checklist at Appendix A may be used by the aerodrome inspector to ascertain that all of the requirements have been taken into consideration and documented in the aeronautical study/safety assessment.

### 3.8 Monitoring of the Deviation

3.8.1 After the completion and acceptance of the study/safety assessment, the aerodrome operator should monitor the status of the deviation and ensure that the implemented recommendations have been effectively carried out, and that the level of safety is not compromised at any time. This assessment is to allow feedback into the safety assessment process, if required.

3.8.2 DGCA shall review the status of exemptions at the time of renewal of license, the aerodrome operator shall submit the details of progress made during the currency of license regarding compliance of such requirements and adequacy of mitigation measures employed to ensure safety and regularity of flight operations.

3.8.3 For temporary deviations, the aerodrome operator should also notify DGCA after the deviation has been corrected.

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**Checklist for Aeronautical Study/ Safety Assessment**

This appendix provides aerodrome operators as well as Aerodrome Inspectors with a suggested checklist for reviewing of an aeronautical study. An aerodrome operator may use this checklist as a guide for developing an aeronautical study tailored to its individual situation.

The suggested checklist for reviewing of an aeronautical study is as shown below:

CHECKLIST FOR AERONAUTICAL STUDY/ SAFETY ASSESSMENT	YES	NO	REMARKS
1. Aim of the study including (a) address safety concerns, (b) identify safety measures, and (c) make reference to specific standards in CAR;			
2. Consultation with stakeholders, senior management team and divisions/ departments affected;			
3. The study is approved by a senior executive of the organization;			
4. Background information on the current situation;			
5. Proposed date for complying with the standard, if the deviation is due to development of the aerodrome;			
6. Safety assessment including (a) identification of hazards and consequences and (b) risk management;			
7. The safety assessment used in the study (e.g. hazard log, risk probability and severity, risk assessment matrix, risk tolerability and risk control/mitigation);			
8. Recommendations (including operating procedures/restrictions or other measures to address safety concern) of the aeronautical study.			
9. How the proposed deviation will not pose a drop in the level of safety; details			
9. Estimation of the effectiveness of each recommendation listed in the aeronautical study;			
10. Notification procedure including process flow, time frame and the publication used to promulgate the deviation;			
11. Conclusion of the study;			
12. Monitoring of the deviation; and			
13. Notification to DGCA once the temporary deviation has been corrected.			

## Risk Probability & Severity, Risk Assessment Matrix and Risk Tolerability

*NOTE: This appendix provides aerodrome operators with a suggested risk probability & severity and risk assessment matrix to be included in an aeronautical study. Aerodrome operators may use this as a guide for developing their own risk probability & severity and risk assessment matrix tailored to his individual situation.*

### Risk Probability

PROBABILITY OF OCCURRENCE		
LIKELIHOOD	MEANING	VALUE
Frequent	Likely to occur many times (has occurred frequently)	5
Occasional	Likely to occur sometimes (has occurred infrequently)	4
Remote	Unlikely to occur, but possible (has occurred rarely)	3
Improbable	Very unlikely to occur (not known to have occurred)	2
Extremely Improbable	Almost inconceivable that the event will occur	1

### Risk Severity

SEVERITY OF OCCURRENCE		
SEVERITY	MEANING	VALUE
Catastrophic	<ul style="list-style-type: none"> <li>— Equipment destroyed</li> <li>— Multiple deaths</li> </ul>	A
Hazardous	<ul style="list-style-type: none"> <li>— A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely</li> <li>— Serious injury</li> <li>— Major equipment damage</li> </ul>	B
Major	<ul style="list-style-type: none"> <li>— A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency</li> <li>— Serious incident</li> <li>— Injury to persons</li> </ul>	C
Minor	<ul style="list-style-type: none"> <li>— Nuisance</li> <li>— Operating limitations</li> <li>— Use of emergency procedures</li> <li>— Minor incident</li> </ul>	D
Negligible	<ul style="list-style-type: none"> <li>— Few consequences</li> </ul>	E

## Risk Assessment Matrix

Risk probability	RISK SEVERITY				
	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent 5	5A	5B	5C	5D	5E
Occasional 4	4A	4B	4C	4D	4E
Remote 3	3A	3B	3C	3D	3E
Improbable 2	2A	2B	2C	2D	2E
Extremely improbable 1	1A	1B	1C	1D	1E

## Risk Tolerability

RISK INDEX	TOLERABILITY	SUGGESTED CRITERIA
3A, 4A, 4B, 5A, 5B, 5C	Intolerable	Unacceptable under the existing circumstances.
1A, 2A, 2B, 2C, 3B, 3C, 3D, 4C, 4D, 4E, 5D, 5E	Tolerable	Acceptable based on risk mitigation. It may require management decision.
1B, 1C, 1D, 1E, 2D, 2E, 3E	Acceptable	Acceptable as is. No risk mitigation required.

**Appendix C**

**Hazard Log**

This appendix provides aerodrome operators with a suggested hazard log for safety assessment of an aeronautical study. This template has been taken from DGCA SSP circular 01 of 2012. This log should be constantly updated throughout the aeronautical study life-cycle.

A sample hazard log for safety assessment of an aeronautical study is as shown below:

ID	ORIGINATOR	SOURCE	LOCATION (ICAO) INDICATOR	DATE ADDED TO HAZLOG	FUNCTIONAL AREA	HAZARD DISCRIPRION	WORST CREDIBLE EFFECT AND REASON	EXISTING CONTROL

OUTCOME PRE- MITIGATION			ADDITIONAL RISK CONTROL (Risk Mitigation Strategy)	OUTCOME POST -MITIGATION			ACTION	OWNER	DEADLINE	STATUS AND COMPLETI ON DATE	REVIEW PERIOD.
Severity	Likelihood	Risk tolerable?		Severity	Likelihood	Risk tolerable					