



CIVIL AVIATION PUBLICATION

AGA 06

AERONAUTICAL STUDIES

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CHAPTER 1

GENERAL

1.1 OVERVIEW

This CAP recommends and explains parts of a typical aeronautical study. By comprehensively addressing all the suggested parts, the Aerodrome Operator should be able to complete an aeronautical study to assess the viability of solution to an aeronautical problem. An aeronautical problem may refer to an issue related to the following:

- (a) Operational regulations such as a lack of procedures, insufficient maintenance programmes and competence issue; or
- (b) Design regulation such as the terrain of an object penetrating the Obstacle Limitation Surface (OLS), insufficient strip and Runway End Safety Area (RESA) (dimensions and/or quality), insufficient runway/taxiway separation and lack of or wrongly designed visual aids.

Appendix 1 to this CAP 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 requirements have been taken into consideration and documented in the aeronautical study. However, not all the requirements found in Appendix 1 will be applicable to every aeronautical study conducted. The Aerodrome Operator should therefore examine each requirement carefully to determine what is applicable.

1.2 APPLICABILITY

This CAP applies to all aerodromes and heliports that are required to be certified or licensed under CAR AGA 1, 2 and 3.

1.3 REFERENCES

- ▷ CAR AGA 1, 2 and 3
- ▷ Annex 14 Volume I – Aerodromes (Eighth Edition July 2018)
- ▷ Annex 14 Volume II – Heliports (Fourth Edition July 2013)
- ▷ ICAO Doc 9774 - Manual on Certification of Aerodromes (First Edition 2001)
- ▷ ICAO Doc 9981 – PANS Aerodromes (Second Edition 2016)
- ▷ CAR DEF – Definitions
- ▷ CAP GEN 01 - Safety Management Systems



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CHAPTER 2

INTRODUCTION

2.1 Aeronautical Study

An aeronautical study is a study of an aeronautical problem to identify possible solutions and to select a solution that is acceptable without degrading safety. A comprehensive aeronautical study allows both the Aerodrome Operator and the CAA-B to be convinced that safety of aircraft operations is not compromised in any way.

An aeronautical study is most frequently undertaken during the planning of a new airport or new airport facility, or during the certification of an existing aerodrome or subsequently, when the Aerodrome Operator applies for an exemption, as a result of development or a change in the aerodrome operational conditions from specific standard or recommended practice contained in CAR AGA 1, 2 and 3.

Aerodrome Operators should consult with their stakeholders, senior management and affected divisions/departments in their organisations prior to the conduct of an aeronautical study. These consultations would 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 organisation before it is submitted to the CAA-B for consideration or acceptance.

Aerodrome Operators should note that the CAA-B may choose to participate in the conduct of an aeronautical study as an observer where appropriate.

The objectives of an aeronautical study are as follows:

- (a) To study the impact of any deviations from CAR AGA 1, 2 and 3
- (b) To present credible 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.



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CHAPTER 3

A TYPICAL AERONAUTICAL STUDY

3.1 Parts of an Aeronautical Study

An aeronautical study submitted to the CAA-B for determination of acceptability should comprise of the following parts:

- (a) Aim of the Study;
- (b) Background;
- (c) Safety Assessment;
- (d) Recommendations;
- (e) Conclusion; and
- (f) Monitoring of the deviation.

3.2 Aim of the Aeronautical Study

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 at an aerodrome; and
- (c) Make reference to the specific SARP in the CAR AGA 1, 2 and 3 which the study is meant to address.
- (d) An example to illustrate this would be as follows:

“The aim of this aeronautical study is to address the operation of Code 4F aircraft in a code 4E airport (name of airport) and to put in place (list of safety measures) necessary to ensure safe operation of Code 4F aircraft in (name of airport) with reference made to (reference to specific SARP)...”

3.3 Background

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 subsection. A 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 Aerodrome Operator 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?
- (f) An example to illustrate this would be as follows:

“Currently, (name of airport) is a Code 4E airport with some Code 4F capabilities. These Code 4F capabilities includes (list of the Code 4F capabilities)... (name of airport) is required to handle Code 4F aircraft by (proposed date) and the following (list of affected areas) will be affected. Development of the (affected areas) is proposed to commence on (proposed date) and to be completed by (proposed date). By then, (name of airport) will be upgraded to a Code 4F airport.

Upgrading (name of airport) from Code 4E to Code 4F airport requires the reviewing (name of processes and procedures that need to be reviewed) to ensure safe aircraft operation. In addition, during this development, operation of aircraft at (name of airport) will be affected in the following ways.....”

3.4 Safety Assessment

A safety assessment is the identification, analysis and elimination, and/or mitigation of risk to an acceptable level of safety. This should be in accordance with the Aerodrome Safety Management System (SMS) that is required to be put in place by the Aerodrome Operator - a key aerodrome certification requirement. A safety assessment usually consists of the following:

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

There is no standard methodology to conduct a safety assessment and it is up to the Aerodrome Operator to determine the appropriate methodology for each aeronautical study, depending on the size, 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.

Note: Refer to CAP GEN 01 - Safety Management Systems

3.4.1 Identification of Hazard and Consequences

- (a) Hazards and its consequences should be identified and recorded in a hazard log. Aerodrome Operators have to exercise caution when identifying the hazards and their consequences. Stating a hazard as its consequence would disguise the nature of the hazard and at the same time, interfere with identifying other important consequences. An example would be:

“Operation of Code 4F aircraft in a Code 4E airport” and “Wingtip collision in parking bays”.

- (b) The former is a hazard whereas the latter is one of its consequences. The associated risk and control/mitigation measures should also be recorded in the hazard log when information is available. This log should be constantly updated throughout the aeronautical study life-cycle.
- (c) Appendix 2 of this CAP contains a sample hazard log. The Aerodrome Operator may use this to formulate its own hazard log to suit the aeronautical study.

3.4.2 Risk management

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

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. Some examples to assess the probability and severity of a consequence occurring are provided in Appendix 3 to this CAP.

A risk assessment matrix should be developed. This matrix provides a relationship between the probability and severity of a consequence of a hazard occurring. The risk indexes (combinations of the risk probability values and the risk severity values) should be placed in a risk tolerability table. Appendix 3 also gives an example of risk assessment matrix and risk tolerability.

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 illustrate this would be as follows:

“To prohibit Code 4F aircraft to land or take-off from (name of airport), which is a Code 4E airport with some Code 4F capability.”

- (b) Reduction - the frequency of the operation or activity is reduced, action is taken to reduce the magnitude of the consequences of the accepted risk; An example to illustrate this would be as follows:

“To reduce the number of Code 4F aircraft to land or take-off from (name of 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.

An example to illustrate this would be as follows:

“To ensure (name of airport) staff liaise with the Aeronautical Information Services (AIS) on the promulgation of aerodrome circulars with the necessary aerodrome information to (names of aircraft operators) and (names of other airports) within (fixed period of time) stated in their new process and/or new procedures.”

3.5 Recommendations

To allow the Aerodrome Operator and the CAA-B to be convinced and assured 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.

The Aerodrome Operator should also ensure that the affected parties are well informed of such changes. The notification procedure including process flow, time frame and different means of notification such as the Aeronautical Information Publication (AIP) and Notice to Airmen (NOTAM) should be included in the study.

An example to illustrate this would be as follows:

“The following are some of the operating procedures/restrictions or other measures as well as their measured effectiveness, which could be adopted to ensure safe aircraft operations in (name of airport): (Name of the operating procedures/restrictions or other measures and their corresponding measured effectiveness)

The notification procedure to the affected parties is as follows:

(Description of the notification procedure including process flow, time frame and different means of notification)

3.6 Conclusion

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, 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 they maintain the same level of safety with the recommended safety measures mentioned in the aeronautical study.

An example to illustrate this would be as follow:

“The results of this aeronautical study have concluded that (name proposed deviation) will indeed pose a drop in the level of safety. However, by adopting (type of safety measures), this drop in the level of safety can be safely addressed. These safety measures will be put in place on (proposed date) to address the proposed deviation. With these safety measures put in place, (to explain how to maintain the same level of safety)...”



3.7 Monitoring of the Deviation

After the completion of the aeronautical study, 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. An example would be as follows:

“(Name of the Aerodrome Operator) will monitor the deviation’s status (fixed period of time) and ensure the safety measures has been effectively carried out and the level of safety is not compromised at any time. (Name of the Aerodrome Operator) will review the safety assessment process, if required...”

For temporary deviations, the Aerodrome Operator should also notify the CAA-B after the deviation has been corrected.

3.8 Submission of an Aeronautical Study to the CAA-B

The Aerodrome Operator should note the guidance provided in this CAP and use the suggested checklist provided in Appendix 1 to ensure that any aeronautical study submitted to the CAA-B for consideration of acceptance is thoroughly conducted and documented.



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APPENDIX 1

CHECKLIST FOR AN AERONAUTICAL STUDY

Note: The purpose of this Appendix is to provide Aerodrome Operators with a suggested check sheet for reviewing of an aeronautical study. Aerodrome Operators may use this check sheet as a guide for the development of an aeronautical study tailored to his individual situation. The suggested check sheet for reviewing of an aeronautical study is as shown below.

CHECKLIST FOR AERONAUTICAL STUDY	YES	NO	REMARKS
1. Aim of the study including all safety concerns, identify safety measures, and make reference to specific SARPs in AGA 1,2 and 3;			
2. Consultation with stakeholders, senior management team and divisions/departments affected			
3. The study is approved by a Accountable Manager of the organization			
4. Background information on the current situation;			
5. Proposed date for complying with SARPs, 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. Recommendation (including operating procedures/restrictions or other measures to address safety concerns) of the aeronautical study and how the proposed deviation will not degrade the level of safety;			
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 the CAA-B once the temporary deviation has been corrected.			



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APPENDIX 2

EXAMPLE RISK LOG

Hazard Identified	Associated Risk (consequences)	Existing Mitigation Measures in Place	Current Level of Risk	Mitigation Measures	Revised Level of Risk	Action by and When
Operation of code 4F aircraft in (name of airport) code 4E airport using runway for landing and take-off	<ul style="list-style-type: none"> - wing tip collision at (parking bay number) - loss of control of aircraft during pushback/towing operations 	Nil	3C	<ul style="list-style-type: none"> - Use of wing walkers - Aircraft to taxi at (speed value) - Training of staff for pushback towing operations - Restrictions on other aircraft movements within (parking bay number) 	2D	<ul style="list-style-type: none"> - Conduct trials to study the effectiveness of the implementation - Resulting risk index 2E - Residual risk tolerability: Acceptable

Note: The levels of risk matrix is in CAP GEN 01 – Safety Management Systems paragraph 2.2.2



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APPENDIX 3

RISK MATRIX TABLES

Using the following matrix from CAR GEN 01, risks can be categorised according to an assessment of their potential severity and probability. While an assessment matrix methodology is recommended, other equivalent methods of depicting risk tolerance are available. The risk assessment matrix may be customised to reflect the context of each service provider’s organisational structure, its aviation activities and may be subject to agreement by the CAA-B.

Example of a Safety Risk (Index) 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

An example of Risk severity definitions is given below:

Aviation definition	Meaning	Value
Catastrophic	Aircraft / Equipment destroyed. Multiple deaths.	A
Hazardous	A large reduction in safety margins, physical distress or a workload such that organisations cannot be relied upon to perform their tasks accurately or completely. Serious injury or death to a number of people. Major equipment damage.	B
Major	A significant reduction in safety margins, a reduction in the ability of organisations to cope with adverse operating conditions as a result of an increase in workload, or as a result of conditions impairing their efficiency. Serious incident. Injury to persons.	C
Minor	Nuisance. Operating limitations. Use of emergency procedures. Minor incident.	D
Negligible	Little consequence.	E

An example of Risk probability definitions, i.e. likelihood of an occurrence, is given below.

Qualitative definition	Meaning	Value
Frequent	Likely to occur many times (has occurred frequently)	5
Occasional	Likely to occur sometimes (has occurred infrequently)	4
Remote	Unlikely, but may possibly occur (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

An example of Risk Tolerability is given below

Risk Index	Safety Risk Description	Recommended Action
5A, 5B, 5C, 4A, 4B, 3A	INTOLERABLE	Take immediate action to mitigate the risk or stop the activity. Perform priority safety risk mitigation to ensure additional or enhanced preventative controls are in place to bring down the safety risk index to tolerable.
5D,5E, 4C, 4D, 4E,3B, 3C, 3D 2A, 2B, 2C	TOLERABLE	Can be tolerated based on the safety risk mitigation. It may require management decision to accept the risk.
3E, 2D, 2E, 1A, 1B, 1C 1D, 1E	ACCEPTABLE	Acceptable as is. No further safety risk mitigation required.



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