Trinidad and Tobago
Civil Aviation Authority

TTCAA Advisory Circular

SUBJECT: GUIDANCE MATERIAL ON CONDUCTING AERONAUTICAL STUDIES AND RISK ASSESSMENT.

TTCAA Advisory Circular TAC- AD007

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Contents

1. PURPOSE

This document provides guidance to aerodrome operators on the conduct of Aeronautical Study and risk assessment where the aerodrome is unable to meet Trinidad and Tobago Civil Aviation Regulations No.12 requirements and need to identify alternative measures to achieve an equivalent or acceptable level of safety. Although this document relates to aerodromes, the principles contained in it may be applied more widely in circumstances where requirements cannot be met and an alternative means of compliance is proposed.

2. REGULATORY REFERENCES CODES:

- Trinidad and Tobago Civil Aviation Regulation No.12
- ICAO Annex 14 – Volume I and Volume II as amended
- ICAO Doc 9774 AN//969 Manual on Certification of Aerodromes.
- ICAO Doc 9859 AN/474 Safety Management Manual (SMM)
- ICAO Annex 15
- ICAO Annex 6

3. INTRODUCTION

a) Trinidad and Tobago Civil Aviation Authority (Aerodromes and Heliport) Regulation as amended contains basic provisions on the use of Aeronautical Studies as a means to identify alternative measures to achieve an equivalent or acceptable level of safety by means other than full compliance with a specific requirement.

b) It is acknowledged that there could be some other cases where full compliance with requirements cannot be achieved, and for which a deviation from a regulatory requirement will have to be sought. A safety case based on the same principles as an Aeronautical Study should accompany any application for an exemption and or deviation.

c) It is important to note that the preferred option must always be to seek compliance with the requirements. In order to achieve an equivalent or acceptable level of safety by other means, one must usually establish mitigating measures that affect the efficiency and usability of the aerodrome.

4. DEFINITION

ICAO Doc 9774 defines an aeronautical study as:

"a study of an aeronautical problem to identify possible solutions and select a solution that is acceptable without degrading safety.

5. RESPONSIBILITY OF CONDUCTING AERONAUTICAL STUDY

If the aerodrome cannot meet the requirements, it needs to conduct Aeronautical studies and Risk Assessment which will address an alternative means of compliance. Consequently,

the responsibility of justifying an application by means of an Aeronautical Study rests with the aerodrome operator.

6. PARTICIPANTS IN THE AERONAUTICAL STUDY

Both aerodrome and flight operational expertise is needed. In some cases ATS and/or PANS - OPS expertise must be involved. Finally, depending on the complexity of the issue, specialists on risk analysis may have to be brought in to assess the degree of risk resulting from the aeronautical study.

7. STEPS OF AN AERONAUTICAL STUDY

7.1. An Aeronautical Study implies a systematic and documented approach to a problem. Thus it consists of certain steps, notably:

- A description of problems and objectives.
- Selection of procedures, methods and data sources.
- Identification of undesired events.
- An analysis of causal factors, severity and likelihood.
- A description of risk.
- Identification of possible mitigating measures
- An estimation of the effectiveness of mitigating measures
- Choice of mitigating measures
- Presentation of results.

7.2. *A description of problems and objectives*:

The first step of any risk analysis is to define the deviation and the objective of the exercise. The case study will be to identify the safety implications of not complying (in full) with a certain requirement or requirements. The objective will be to identify suitable mitigating measures, which will address these safety implications. Thus, it is important to understand which hazards and scenarios the requirement(s) in question are designed to protect against.

7.3. Procedures, methods and data sources:

A main issue is whether the study shall follow a quantitative or qualitative approach. The answer will to a large extent dependent upon the data-sources available. A qualitative approach based on common sense and qualified expert opinion will probably, in many cases, yield results that are far better than nothing, and better than a quantitative approach based on a limited set of unrepresentative or unreliable data. Even if it is possible to carry out a quantitative approach, qualified expert opinion is necessary, particularly in the conduct of hazard identification and risk analysis.

7.4. Identification of hazards:

Hazards are any situation or condition that has the potential to cause damage or harm. The basic question one must ask is: **what can go wrong, and where?**

Examples of 'what' include, but are not limited to:

- Aircraft colliding with terrain, aircraft, vehicles or objects.
- Aircraft landing in front of the runway threshold (landing short)
- Aircraft running off the far end of the runway or veering off the side of the runway.
- Aircraft colliding with, or ingesting wildlife or foreign Objects debris
  Examples of 'where' include, but are not limited to:
- During flight (approach, landing, balked landing, take-off, climb-out)
- On the ground (Runway, taxiway, apron, strips, RESAs, or outside these areas)

The key is to identify hazards that the requirement in question is designed to protect against.

7.5. An analysis of causal factors, severity and probability

Causal factors the basic questions are:

- why can it go wrong,
- what is the consequence if it does go wrong and
- how likely is it that it will go wrong?

Examples of 'why' include, but are not limited to:

- Lack of guidance (non-visual aids, lights, markings, signs, charts)
- Confusing guidance (non-visual aids, lights, markings, signs, and charts).
- Inaccurate obstacle surveys and obstacle publications
- Inaccurate aeronautical data
- Insufficient protected areas (strips and RESAs)
- Insufficient separation distances
- Insufficient surface widths
- Insufficient maintenance programmes

In some cases these factors can contribute to an accident and in other cases they can increase the consequences of an incident so that it becomes an accident.

7.6. Safety Risk Probability (How likely is it that it will occur?)

This is a probability issue. How often is it likely to occur within a certain number of movements? The Table below also extracted from ICAO doc 9859 – Safety Management Manual gives the probability levels and their descriptions.

Meanin		
Frequent	Likely to occur many times (has occurred frequently)	5
Occasional	Likely to occur sometimes (has occurred frequently)	4
Remote	Unlikely to occur, but possible (has occurred rarely)	3

Improbable	Very unlikely to occur (not known to have occurred)	2
Extremely	Almost inconceivable that the event will occur	1

7.7. S*afety Risk Severity*

What are the (potential) consequences if it occurs?
The severity of the occurrence is better described by using the table below extracted from ICAO doc 9859 – Safety Management Manual

Severity of occurrence	Meaning	Value
Catastrophic	— Equipment destroyed — Multiple deaths	**A**
Hazardous	— 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 — Serious injury — Major equipment damage	**B**
Major	— A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of 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 consequences	**E**

7.8. Risk Assessment

a) Risks are the potential adverse consequences of a hazard, and are assessed in terms of their severity and probability.
b) Thus, for each hazard resulting from the non-compliance, one can now describe the risk by placing the combination of severity and probability in the Risk Assessment Matrix shown below. If the risk comes out as medium or above, risk reduction measures must be identified.

7.9. Risk Assessment Matrix

Risk probability	Catastr	Hazardous	Major	Minor	Negligible
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

a) As can be seen from the risk classification matrix, risk reduction measures can aim towards either reducing the likelihood of an occurrence, or reducing the probability of an occurrence.

b) The first priority should always be to seek measures that will reduce the likelihood of an occurrence (i.e. accident prevention). When contemplating mitigating measures, it is always necessary to look to the intent of the requirement that is not (fully) complied with.

Examples of mitigating measures include, but are not limited to:

i. Publication in the AIP as a minimum. (This is an ICAO Annex 15 Standard and is also necessary in order that the airlines can take their precautions, as they are obliged to do according to ICAO Annex 6.)

ii. Aerodrome operational procedures are in some cases relevant. One example is to restrict traffic on a parallel taxiway if runway/taxiway or taxiway/taxiway separation distance is insufficient.

iii. Infrastructure and/or additional visual and/or non-visual aids.

iv. Operational restrictions that might be necessary. These may include restrictions on all-weather operations, increased spacing between aircraft (in the air or on the ground).

v. Restrictions on aircraft operators that might be necessary, such as:

- Operations restricted to operators/crew who can demonstrate special competence;
- Requirements that aircraft carry special equipment or certifications;
- Requirements that operator sets for special wind limits.

c) Mitigating measures usually means reduced usability for an aerodrome. Safety

and usability is a balancing act.

7.10. Estimating the effect of mitigating measures

The mitigating measures should be fed back into the consideration listed earlier in order to evaluate their relevance and effectiveness in reducing risk

7.11. Choice of mitigating measures

If one or more measures enable the risk to be sufficiently reduced, one can recommend a choice, bearing in mind that the preferred option should be accident prevention, and prepare the final report. Thus the final description should recommend mitigating actions and list the consequences and their probabilities when these are taken into account

8. Presentation of results

8.1. The work shall be documented in such a way that it is possible to see what has been done. The steps referred to above should be identifiable.

Other key issues:

a) What essential assumptions, presuppositions and simplifications have been made?
b) Any uncertainty about the results due to the choice of and availability of methods, procedures and data sources should be discussed.

8.2. The results of the study should emphasize which undesired event contributes the most to risk, and factors influencing these undesired events. Recommendations for measures to mitigate risk, their character and their estimated effect shall be stated.

1. TAC – AD007 Approval by Director General

This TAC-ADD007 - Aeronautical Study and Risk assessment results is approved by the Director-General for use as guidance by the Aviation Industry.

TAC – AD007 Approved by

Original signed by Francis Regis

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Director-General of Civil Aviation

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