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DIRECTORATE GENERAL OF CIVIL AVIATION

AERONAUTICAL STUDY – METHODOLOGY & PRACTICES

Introduction

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

Where an aerodrome operator is not able to comply with any standard stipulated in the national requirements(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.

The Aerodrome operators/applicants should consult the stakeholders, senior management and affected departments in their organizations prior to conduct of an aeronautical study.

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Objectives

- Safety and regularity of operations of aircraft is not compromised in any way.
- Ensure stakeholder collaboration and trust building.
- Assess the impact of deviations from the standards.
- Alternative means of ensuring the safety of aircraft operations.
- Estimate the effectiveness of each alternative and to recommend procedures to compensate for the deviation.

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Conduct of Aeronautical Study

- Planning of a new airport
- Planning of a new airport facility
- Licensing of an existing Aerodrome (Challenges in implementing updated regulations)

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Aeronautical studies recommended cases

Reduction in the width of a radio altimeter operating area.

- Taxiway minimum separation distances.
- Infringement to obstacle protection surface of a PAPI/ APAPI.
- Omission of location sign.
- Obstacle lighting of a objects in and outside OLS surfaces.
- Infringement by new objects or extension of existing objects.

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Framework for Aeronautical Study/ Safety Assessment

Aim of the Study - Address the safety concerns, identify safety measures

Background – Current Situation & Procedures, Areas affected, Timelines & Impact of proposed deviation on aircraft operations

Risk Assessment - Identification, analysis and elimination, and/or mitigation (SMS of Airport)

Outcome - Demonstrates proposed deviation will not pose a drop in the level of safety.

Conclusion – Results & decision on safety measures.

Monitoring - Status of the deviation, implemented recommendations effective, level of safety not compromised.

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.			

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Aim of the Study

- To address the safety concerns;
- Identify safety measures to be put in place to ensure safe aircraft operations in an aerodrome and
- Make reference to the specific Standards in the CAR which the study is meant to address.

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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 during the process:

- What is the current situation?
- Where are the areas that will be affected by the proposed deviation?
- When will the applicant able to comply with the specific standard if it is due to development of the aerodrome?
- Why is there a need to review the current processes and procedures?
- How will the proposed deviation affect the operation of aircraft at the aerodrome?

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Risk Assessment

Risk assessment 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:

- Identification of hazards and consequences; and
- Risk management.

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Identification of hazards and consequences

Hazards and its consequences should be identified and recorded in hazard-log

Eg:

- 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.

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Risk Management

- 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.

Risk Tolerability

- Intolerable – Unacceptable under the existingcircumstances.
- Tolerable – Acceptable based on risk mitigation. It may require management decision.
- Acceptable – Acceptable as is. No risk mitigation required.

- The Risk assessment methodology adopted should be consistent with that established in the aerodrome operator's SMS

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.

Risk Management

- 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.

Categories for risk control/mitigation :

- Avoidance – The operation or activity is cancelled as the risks exceed the benefits of continuing the operation or activity; 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.”
- 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; example: “To reduce the number of Code F aircraft to land or take-off from (xyz airport).”
- Segregation of exposure – Action is taken to isolate the effects of the consequences of the hazard or build-in redundancy to protect against it.

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Outcome of the Aeronautical Study/ Safety Assessment

- Demonstrate level of safety:Aerodrome operator to demonstrate 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.

- Estimate the effectiveness and mitigation: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.

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Conclusion of the Study

The aerodrome operator after taking into account all the necessary considerations, should be able to summarize and conclude the results of the aeronautical study/ safety assessment.

- A decision should be clear on any safety measures that should be adopted.
- A date to put in place all the necessary safety measures should be decided and specified.
- Aerodrome operator to show how they maintain the same level of safety with the recommended safety measures mentioned in the aeronautical study/ safety assessment.

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Evaluation and Approval Process

- A technical assessment is carried out by DGCA officials for acceptance of Aeronautically study. These assessments are 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.

- DGCA may also consult other specialists in relevant areas and while considering alternative procedures for approval of a deviation, it is important to ensure that the intent of the regulations is not overlooked.

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Monitoring of the Deviation

- 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 the level of safety is not compromised at any time.

- DGCA shall review the status of exemptions in a periodic manner.

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

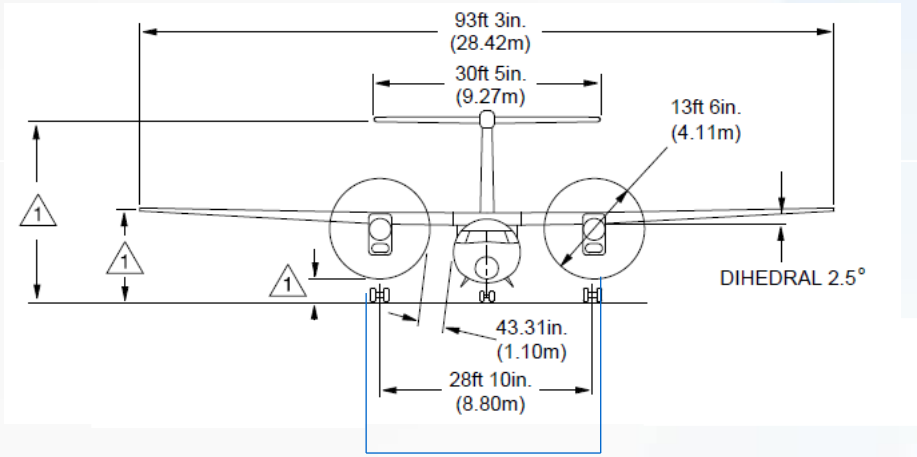
Example – Aeronautical Study

Aim of the Study – Operating of DASH-8 Q400 on Taxiway having width of 15m.

Background

- Current Situation & Procedures

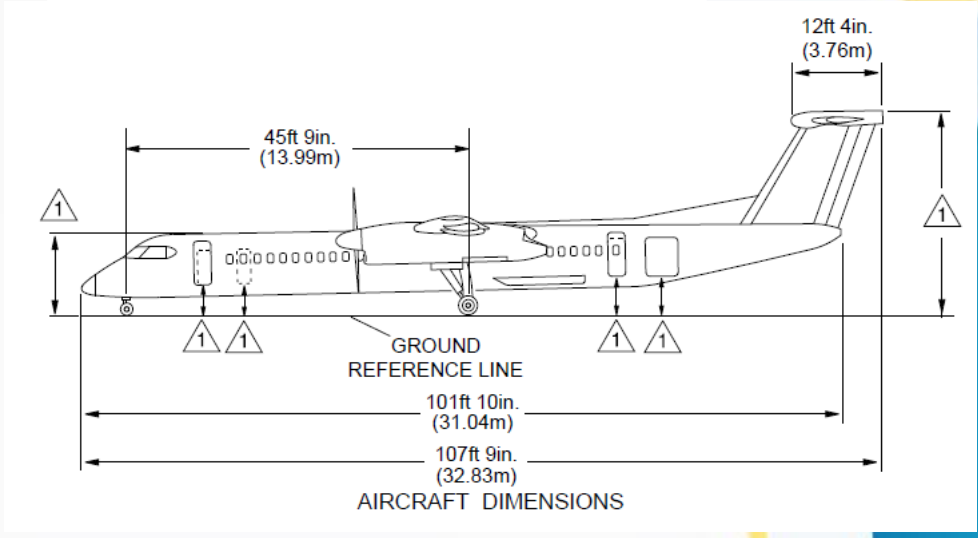
Aircraft Type	Dash 8 – Q400
Wingspan	28.42m
OMGWS*	9.65m
Wheel Base**	13.99m



9.65m

	OMGWS			
	Up to but not including 4.5 m	4.5 m up to but not including 6 m	6 m up to but not including 9 m	9 m up to but not including 15 m
Clearance	1.50 m	2.25 m	3m[ab] or 4m[c]	4m

	OMGWS			
	Up to but not including 4.5 m	4.5 m up to but not including 6 m	6 m up to but not including 9 m	9 m up to but not including 15 m
Taxiway width	7.50 m	10.5 m	15m	23m



AIRCRAFT DIMENSIONS

Example – Aeronautical Study

Areas affected – Taxiways

Timelines - Permanent

Impact of proposed deviation on aircraft operations

- **OMGWS** – 9.65m and accepted OMGWS – 9m for taxiway width 15m.
- **Taxiway Width** – OMGWS + 3m either side (9+3+3 = 15m)
- **Clearance Requirement** – 3m (Wheel Base 13.99m – less than 18m)
- Possible reduced clearance between edge of outer main wheel and paved edge by appx 30cm.

Risk Assessment

- Probability of run-off from paved surfaces related to functional requirements of taxiway dimensions, surface and shoulders.
- Risk of engine damage from ingestion related to functional requirements of protection of engines against damages from foreign objects.

Example – Aeronautical Study

Considerations

- Turbo prop aircraft operates in a slower speed on ground compared to turbo jet aircraft.
- Jet blast impact is lower
- Engine suction impacts are lesser when compared to turbo jet aircraft.

Outcome

- Based on the studies, Q400 can operate on taxiways having width of 15m.

Thank You