



Advisory Circular
[AC/AD – 07]

**Policy and Procedures for
Management of Conflicts
Between Safety and
Environmental Requirements**

Second Edition
February 2022
CIVIL AVIATION AUTHORITY OF NEPAL

RECORD OF AMENDMENTS

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FOREWORD

Nepal as a Contracting State to the Convention on International Civil Aviation has an obligation to the international community to ensure that civil aviation activities under its jurisdiction are carried out in strict compliance with the Standards and Recommended Practices contained in the nineteen Annexes to the Convention on International Civil Aviation in order to maintain the required aviation standards.

Rule 27 of Airport Certification Regulation, 2004 (First amendment 2016) requires the airport operator to establish and operate safety system for the airport operation.

Rapidly increasing traffic volumes and forecasts of continued growth into the next decades put a strain on airport capacity. At the same time, public tolerance of the environmental effects of air traffic around airports such as noise, air pollution and third party risk would appear to have decreased. These conflicting trends lead airports, airlines, air traffic control organizations and the aircraft and equipment industry to devise new technologies and innovative ways of operating airports and aircraft in order to meet both the capacity demands and the environmental limitations.

Users of this Advisory Circular are requested that the provisions of the *Civil Aviation Authority Act - 1996 (2053 B.S.)*, *CAAN Airport Certificate Regulations - 2004 (First Amendment - 2016)* and *Civil Aviation Regulation 2002, (Third Amendment 2017)* rather than this Advisory Circular, determine the requirements of, and the obligations imposed by or under, the civil aviation legislation. Users should refer to the applicable provisions when any doubt arises.

This Authority may, without any prior notice, change the content of this Advisory Circular as appropriate.



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Director General
Civil Aviation Authority of Nepal
Babar Mahal, Kathmandu, Nepal

March, 2022

Chapter 1 Introduction

1.1 Purpose

Annual passenger traffic is set to grow each year. The need to increase airport capacity in an era of decreasing public tolerance of the environmental effects such as noise, air pollution and third party risk of airports, lead actors in the air transport domain to devise new technologies and innovative ways of operating airports and aircraft. However, developments give rise to concerns about the emergence of new hazards and difficulties in containing existing hazards in and around airports. These conflicting trends lead airports, airlines, air traffic control and the aircraft and equipment industry to devise new technologies and innovative ways of operating airports and aircraft in order to meet both the capacity demands and the environmental limitations. This Advisory Circular will seek, therefore, to identify the safety parameters of these emerging trends in and around airports, outline the policy and procedures which need to be instituted.

1.2 Legislation, Standards and Technical References

Rule 27 of Airport Certification Regulation, 2004 (First amendment 2016) requires the airport operator to establish and operate safety system for the airport operation.

1.3 Requirements

1.3.1 The precise identification of the parameters of this risk may be relatively uncertain because appropriate data (accidents, incidents, audits, etc.) are not systematically collected on processes relevant to safety, specifically in and around airports. The institutional framework of accountability for safety is diffused between airport authorities, airlines, civil aviation authorities and other airport users in a way which does not facilitate an effective response to the safety issues which are emerging. A common framework for management of the risks is outlined below:

- Mandatory airport licensing including a requirement to establish, maintain and ensure adherence to safety management programme.
- Mandatory collection of data on ground-based incidents, with appropriate emphasis on organizational and corporate culture factors.
- Mandatory inclusion of third party risk in Environmental Impact Statements for airports.
- The development of common standards for the safety assessment of operations.

Chapter 2 Review of safety in and around airports

2.1 Emerging trends

Rapidly increasing traffic volumes and forecasts of continued growth into the next decades put a strain on airport capacity. At the same time, public tolerance of the environmental effects of air traffic around airports such as noise, air pollution and third party risk would appear to have decreased. These conflicting trends lead airports, airlines, air traffic control organizations and the aircraft and equipment industry to devise new technologies and innovative ways of operating airports and aircraft in order to meet both the capacity demands and the environmental limitations. Safety is not the objective of these developments; it is a mere constraint. Consequently, new hazards emerge and existing hazards become difficult to contain unless adequate attention is given to safety aspects in this combination of emerging trends. In addition, a new dimension, third party risk, presented itself as a safety concern is growing. Airports are hubs in the air transport system. Consequently, their presence causes a convergence of air traffic over the area surrounding the airport. For the population living in the vicinity of an airport this implies involuntary exposure to the risk of aircraft accidents. Although the probability of an accident per flight is very small local risk levels around airports are higher than one might expect. This is caused by the fact that, while the probability of an accident per take-off or landing is very small, the number of landings and take-offs is often very large. The resulting annual probability of an accident at a typical large airport is therefore much greater than the small probability of being involved in an aircraft accident as a passenger. In addition, accidents tend to happen during the take-off and landing phases of flight and hence close to an airport. Safety data from studies show that approach and landing phase accidents account for a significant proportion of fatal air transport accidents. This environmental effect is of growing significance to airports safety responsibility and decision making on airport development and land-use planning for airport regions.

2.2 The safety evidence

Airports play an important role in the safety of air traffic. An analysis of accidents shows some of these accidents involved at least one airport related factor in the causal chain leading up to the accident. Airport related factors in this case are taken as those factors which are specific to the airport environment but are not necessarily owned by the airport (and may thus include issues such as snow, fog, etc.). To this end, the different airport related causal factors categorized are:

- Lighting and marking (approach lighting, sign lighting, stop bar lighting, etc.)
- Runways and taxiways (runway length, obstructions, taxiway surface condition, etc.)
- Information (aerodrome hazard notifications, weather reports, runway information etc.)
- External hazards (snow, fog, turbulence, wake vortex, etc.)
- Apron and ramp (apron/ramp congestion, apron/ramp surface condition, etc.)
- ATC operations and procedures (approach procedures, communication phraseology use, separation judgment, etc.)

- Aerodrome - other (aerodrome structures, APAPI/PAPI, etc.)

All parties interacting around the airport are part of the problem and consequently part of the potential solution. Gaining further insight into the causal background of risk around airports is hampered by the fact that there is little systematic collection of accident and incident data concerning air transport incidents occurring or originating on the ground, either in ground operations or maintenance. Within the accident information which is being collected, a general lack of attention to the organizational factors and corporate culture factors in data collection taxonomies is present which further impedes deeper insight. The evidence presented here sheds light on the safety problems associated with airports and provides information on the broad categories of accident causal factors which are currently a threat to safety at airports. It is expected however that new developments and changes in traffic volume will have an influence on the nature of these accident casual factors. This briefing will examine how these factors will change as a result of new developments, in particular technological and operational, and in view of the predicted growth in traffic volume.

2.3 The institutional framework

2.3.1 The regulatory framework

Airports are regulated in accordance with ICAO standards. All domestic airports in Nepal are not licensed. The absence of licensing systems with a periodical renewal process does not facilitate strict regulatory oversight. In addition, the regulations regarding airports prescribe, in accordance with CAR - 14, Part 1, what an airport should have as equipment and infrastructure. CAAN regulate adherence to these standards. CAAN intends to make regional domestic airports licensed as well.

2.3.2 The organizational framework

Airports are complex multi-organizational systems, with diverse safety standards and practices. Frequently, there is a lack of integration amongst airport users with regard to these safety standards and practices. In view of the multi-organizational nature of risks in the operation of airports, the lack of a mechanism to integrate the safety standards and practices of the different actors in and around the airport has a detrimental effect on safety. Such a mechanism is difficult to establish since the respective actors in the overall airport organization are subject to different regulatory regimes. These include aircraft maintenance, flight operations, ground handling including fueling, security services, airside services and air traffic control. Even where some of these processes are frequently done by the same organization, they are usually subject to different management systems, different training standards and exhibit a different safety culture.

Chapter 3 Airport safety priorities

The following critical safety issues need to be addressed in order to prevent an increase in the airport-related safety deficiencies which may result from operational and technological developments.

3.1 Safety concerns resulting from operational developments

3.1.1 The wind and turbulence environment of airports

The wind and turbulence environment at airports is a matter of growing concern. Airports tend to attract corporate real estate. Offices and other buildings are increasingly being located in the immediate proximity of runways. The wind turbulence caused by these buildings has been such that in some cases aircrews have temporarily lost control of the aircraft shortly before touchdown or shortly after lift-off resulting in serious incidents. Due to the large monetary value of building space at airports, the pressure to allow such building activities will continue to grow. The current ICAO obstacle clearance criteria do not provide adequate protection. A lack of understanding of the turbulence aerodynamics and aircraft dynamic responses to turbulence upsets hampers the development of appropriate regulation.

3.1.2 Wake vortex

Wake vortex constraints govern the minimum required distance (separation) between aircraft lined up in sequence on the approach to the runway. During peak capacity operations, this distance effectively determines runway capacity and thus airport capacity. Capacity constraints lead air traffic control organizations and airports to considering a reduction in separation minima from the current minima under certain conditions. At the same time, the future arrival of Very Large Aircraft gives rise to a possibly worsening wake vortex environment at airports. These developments do increase the risk of loss-of-control accidents in the final approach and landing phase. Wake vortex modelling is currently being researched as is the use of ground based or airborne sensors to identify and locate wake vortices and the development of associated procedures. These developments would be examined with a view to developing certification standards.

3.1.3 Safety of noise abatement procedures

Environmental constraints, and in particular the noise issue, are increasingly may become the limiting factor in airport capacity. This, in turn, leads to airport operator to develop advanced arrival and departure procedures such as Continuous Descent Approaches, Reduced Flap Approaches, Delayed Gear Approaches, etc. Such procedures may bring about a reduction in safety margins and therefore need close scrutiny. In addition, there are workload concerns and error proneness concerns. Also, the pressure to maximize noise preferential runway utilization leads to the consideration of relaxed crosswind limitations by airport operator which may put aircrews close to controllability limitations. In addition, controller workload concerns with regard to the advanced procedures must be carefully considered, particularly when utilizing mixed modes.

3.2 The safety implications of new technologies

3.2.2 Enhanced and Synthetic Vision systems

Enhanced and Synthetic Vision Systems are increasingly finding their way onto civil flight decks to allow operations under reduced weather minima. Although such systems are attractive alternatives to conventional systems, verifiability may pose a safety concern. These systems offer a potential safety improvement, but when utilized to reduce operational minima may pose safety problems. A safety concern related to these technologies lies in the fact that emergency response units may have trouble locating an accident aircraft on the airport in zero visibility conditions.

3.2.3 Very Large Aircraft

The introduction of Very Large Aircraft will give rise to problems of compatibility with the existing design and infrastructure in airports. Such aircraft are likely to require more ground service equipment at stands than current aircraft. Problems of access to ground service equipment in congested airport apron environments may increase the risk of aircraft damage, which has the potential to compromise flight safety.

3.3 Disaster management plans

Air accidents frequently occur near, rather than at, airports. Therefore, integrating the activities of local and airport emergency services becomes a major issue for planning. ICAO requires major accident simulations and exercises on regular annual basis. However, this requirement does not encompass planning for potential accidents outside the airport limits. Furthermore, experience of major disasters has highlighted the importance of planning to manage the traumatic aftermath of major disasters for survivors, relatives and operational personnel. Consideration should be given to how such a scheme could be instituted in Nepal. Planning for an effective response to disaster at or near an airport places a particular requirement for co-ordination between emergency services, for both short term and long term response; it should encompass such aspects as the accessibility of potential accident sites near the airport to emergency vehicles. Experience has also shown the critical importance of effective and comprehensive debriefing following emergency exercises. Such debriefing should include all staff who have a role in the disaster response and is essential if the organization is to evaluate its preparedness and to learn how to improve its disaster planning.

Chapter 4 Managing risk

4.1 A common framework for risk management

A common, high safety standard at an airport cannot be achieved by any single actor since the level of safety at the airport is to a large extent governed by the interaction of multiple organizations. An integrated safety management system involving all organizations operating at the airport is thus required. In this system, the airport itself, the main airlines, a representative of all other airline operators, ground handling providers, refueling services, and the air traffic control work together to improve safety. To that end, parties have to establish a Terms of Reference, have regular meetings and use a common Operational Airport Information System. All participating organizations will be connected to this system and enter information on air and ground incidents into a common database. This information exchange, the regular meetings and common objectives provide the necessary premises for the early identification of safety bottlenecks, the design of achievable corrective measures and their effective implementation.

4.2 A common methodology for risk assessment

In order to promote fair competition and equally high levels of safety, there should be a common frame of reference for the assessment of new procedures and technologies with regard to safety. While current regulations provide adequate guidance for airworthiness assessments of systems, they do not adequately support the procedural aspects of the safety assessment of new technologies and advanced procedures. In fact, a commonly accepted method which specifically addresses the human operator and the procedural aspects in an appropriate manner does not yet exist.

4.3 A common framework for managing the risks to third parties

Increasing traffic volumes stretch the air transport infrastructure to its limits and require a considerable increase in available airport capacity. Increases in airport capacity usually necessitate new or improved runways and terminals, and changes in route structures and traffic distributions. Such developments bring about the need to prepare environmental impact statements that also address the issue of third party risk. This has led to considerable progress being established in methods and models for the calculation of third party risk around airports. The results of these calculations often carry a high political charge and form (part of) the basis of far-reaching and very costly infrastructural developments. In order to secure the well being of citizens, but also in support of fair competition among airports, legislation in this regard is necessary. A further reason for urgent action is the fact that apart from legislation on noise, there is still relatively little national airport legislation and in particular legislation on land use around airports. The establishment of risk tolerability criteria for land use planning purposes as well as common risk assessment methodologies would be pursued.

Chapter 5 Areas requiring further study

Effective policy making on several of the safety concerns identified in this advisory circular is impeded by a lack of essential knowledge. In order to bridge those gaps in knowledge the following issues require further study:

- The establishment of common methods and tolerability criteria for third party risk.
- The development of adequate methods and models to incorporate the role of human operator and procedural aspects in formal safety assessments.
- The safety aspects of new technologies such as enhanced and synthetic vision systems, Head Up displays for civil cockpits.
- Airport wind and turbulence environments and their dynamic effects on aircraft in take-off or landing
- The operation of safety systems in a multi-organizational environment
- Methods of analysis of organizational precursors of accidents and incidents
- Evaluation of planning for disasters

Chapter 6 Mandatory actions

In order to effectively address the safety priorities discussed above, the following actions would be required.

- Mandatory airport licensing including a requirement to establish, maintain and ensure adherence to an integrated safety management programme.
- Mandatory collection of data on ground-based incidents, with appropriate emphasis on organizational and corporate culture factors.
- Mandatory inclusion of third party risk in Environmental Impact Statements for airports.
- The development of common standards for the safety assessment of operations.