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AERODROME COMPATIBILITY STUDIES PANS-AGA

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Aerodrome compatibility

A methodology and procedure to assess the **compatibility between aeroplane operations and aerodrome infrastructure** and operations when an aerodrome accommodates an aeroplane that exceeds the certificated characteristics of the aerodrome.

A compatibility study **should be performed collaboratively between affected stakeholders:** the aerodrome and aeroplane operators, ground handling agencies as well as the various air navigation service providers (ANSPs).





The following steps describe the **arrangement, to be appropriately documented, between the aeroplane and aerodrome operators** for the introduction of an aeroplane type/subtype new to the aerodrome:

- a) the **aeroplane operator submits a request to the aerodrome operator** to operate an aeroplane type/subtype new to the aerodrome;
- b) the **aerodrome operator identifies possible means of accommodating the aeroplane** type/subtype including access to movement areas and, if necessary, considers the feasibility and economic viability of upgrading the aerodrome infrastructure; and
- c) the **aerodrome operator and aircraft operator discuss the aerodrome operator's assessment**, and whether operations of the aeroplane type/subtype can be accommodated and, if permitted, under what conditions.



The following procedures should be included in the aerodrome compatibility study:

- a) **identify the aeroplane's physical and operational characteristics;**
- b) identify the **applicable regulatory requirements;**
- c) establish the **adequacy of the aerodrome infrastructure and facilities** vis-à-vis the requirements of the new aeroplane;
- d) identify the **changes required** to the aerodrome;
- e) **document** the compatibility study; and
- f) perform the required **safety assessments** identified during the compatibility study.



The result of the compatibility study should enable decisions to be made and should provide:

- a) the aerodrome operator with the **necessary information in order to make a decision** on allowing the operation of the specific aeroplane at the given aerodrome;
- b) the aerodrome operator with the necessary information in order to make a decision on the **changes required to the aerodrome infrastructure and facilities to ensure safe operations** at the aerodrome with due consideration to the harmonious future development of the aerodrome; and
- c) the State with the information which is necessary for **its safety oversight and the continued monitoring of the conditions** specified in the aerodrome certification.



Impact of aeroplane characteristics On the aerodrome infrastructure

Introducing new types of aeroplanes into existing aerodromes may have an impact on the aerodrome facilities and services, in particular, when the **aeroplane characteristics exceed the parameters that were used for planning the aerodrome.**

The **aerodrome reference code provides a starting point** for the compatibility study and may not be the sole means used to conduct the analysis and to substantiate the aerodrome operator's decisions and the State's safety oversight actions.

Table 1-1. Aerodrome reference code
(see 1.6.2 to 1.6.4)

Code element 1		Code element 2		
Code number (1)	Aeroplane reference field length (2)	Code letter (3)	Wingspan (4)	Outer main gear wheel span ^a (5)
1	Less than 800 m	A	Up to but not including 15 m	Up to but not including 4.5 m
2	800 m up to but not including 1 200 m	B	15 m up to but not including 24 m	4.5 m up to but not including 6 m
3	1 200 m up to but not including 1 800 m	C	24 m up to but not including 36 m	6 m up to but not including 9 m
4	1 800 m and over	D	36 m up to but not including 52 m	9 m up to but not including 14 m
		E	52 m up to but not including 65 m	9 m up to but not including 14 m
		F	65 m up to but not including 80 m	14 m up to but not including 16 m

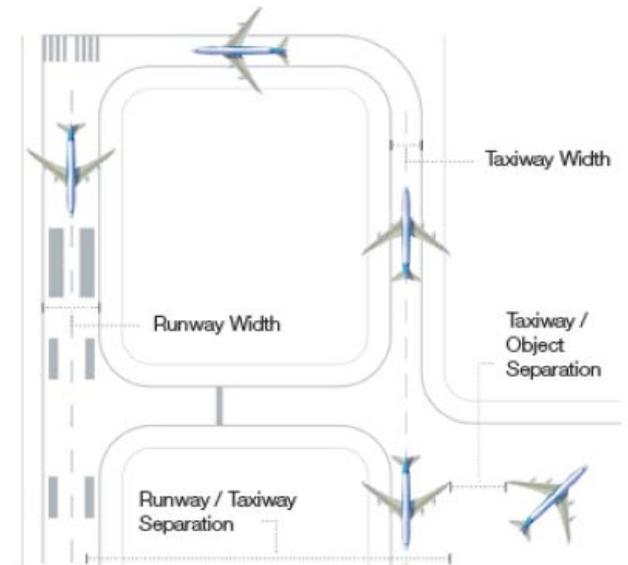
a. Distance between the outside edges of the main gear wheels.

Note.— Guidance on planning for aeroplanes with wingspans greater than 80 m is given in the Aerodrome Design Manual (Doc 9157), Parts 1 and 2.

Consideration of the aeroplane's physical characteristics

The aeroplane's physical characteristics may influence the aerodrome **dimensions, facilities and services in the movement area.**

- The fuselage length may have an impact on:
 - a) the dimensions of the movement area (taxiway, holding bays and aprons), passenger gates and terminal areas;
 - b) the aerodrome category for RFF;
- The wingspan may have an impact on:
 - a) taxiway/taxilane separation distances (including runway/taxiway separation distances);
 - b) the dimensions of the OFZ;
 - c) the location of the runway-holding position (due to the impact of the wingspan on OFZ dimensions);
 - d) the dimensions of aprons and holding bays;





Consideration of the aeroplane's operational characteristics

The following list of aeroplane ground servicing characteristics and requirements may affect the available aerodrome infrastructure:

- a) ground power;
- b) passengers embarking and disembarking;
- c) cargo loading and unloading;
- d) fuelling;
- e) pushback and towing;
- f) taxiing and marshalling;
- h) aeroplane maintenance;
- i) RFF;
- j) equipment areas;
- k) stand allocation; and
- l) disabled aircraft removal.

Runway end safety area (RESA)

A RESA is primarily intended to **reduce the risk of damage to an aeroplane undershooting or overrunning the runway.**

Consequently, a RESA will **enable an aeroplane overrunning to decelerate, and an aeroplane undershooting to continue its landing.**





Challenges

Identification of specific issues related to runway overruns and undershoots is complex.

There are a number of variables that have to be taken into account, such as:

- meteorological conditions;
- type of aeroplane;
- load factor;
- available landing aids;
- runway characteristics;
- overall environment,
- human factors.



When reviewing the RESA, the following aspects have to be taken into account:

- a) the nature and **location of any hazard** beyond the runway end;
- b) the **topography and obstruction** environment beyond the RESA;
- c) the **type of aeroplanes** and level of traffic at the aerodrome and actual or proposed changes to either;
- d) **overrun/undershoot causal factors**;
- e) **friction and drainage** characteristics of the runway which have an impact on runway susceptibility to surface contamination and aeroplane braking action;
- f) **navigation and visual aids** available;
- g) **type of approach**;



- h) **runway length and slope**, in particular, the general operating length required for take-off and landing versus the runway distances available, including the excess of available length over that required;
- i) the **location of the taxiways and runways**;
- j) **aerodrome climatology**, including predominant wind speed and direction and likelihood of wind shear; and
- k) **aerodrome overrun/undershoot and veer-off history**.



Potential solutions

- a) **restricting the operations** during adverse hazardous meteorological conditions (such as thunderstorms);
- b) **defining**, in cooperation with aeroplane operators, **hazardous meteorological conditions and other factors relevant to aerodrome operating procedures** and publishing such information appropriately;
- c) **improving an aerodrome's database of operational data, detection of wind data**, including wind shear and other relevant meteorological information, particularly when it is a significant change from an aerodrome's climatology;

d) ensuring that **accurate and up-to-date meteorological information**, current runway conditions and other characteristics are detected and notified to flight crews in time, particularly when flight crews need to make operational adjustments;

e) **improving runway surfaces** in a timely manner and/or the means of recording and indicating necessary action for runway improvement and maintenance (e.g. friction measurement and drainage system), particularly when the runway is contaminated;

f) **removing rubber build-up on runways** according to a scheduled time frame;



- g) **repainting faded runway markings and replacing inoperative runway surface lighting** identified during daily runway inspections;
- h) **upgrading visual and instrument landing aids** to improve the accuracy of aeroplane delivery at the correct landing position on runways (including the provision of ILSs);
- i) **reducing declared runway distances** in order to provide the necessary RESA;



- j) installing suitably positioned and designed **arresting systems** as a supplement or as an alternative to standard RESA dimensions when necessary;
- k) **increasing the length of a RESA** and/or **minimizing the potential obstruction in the area beyond the RESA**; and
- l) **publishing provisions**, including the provision of an arresting system, in the AIP.





Runway strips

A runway strip is an area enclosing a runway and any associated stopway.

Its purpose is to:

- a) **reduce the risk of damage to an aeroplane running off the runway** by providing a cleared and graded area which meets specific longitudinal and transverse slopes, and bearing strength requirements; and
- b) **protect an aeroplane flying over it during landing**, balked landing or take-off by providing an area which is cleared of obstacles, except for permitted aids to air navigation.



Particularly, the graded portion of the runway strip is provided to **minimize the damage to an aeroplane in the event of a veer-off during a landing or take-off operation.**

It is for this reason that objects should be located away from this portion of the runway strip unless they are needed for air navigation purposes and are frangible mounted.

Challenges

Where the requirements on runway strips cannot be achieved, the **available distances, the nature and location of any hazard beyond the available runway strip, the type of aeroplane and the level of traffic at the aerodrome should be reviewed.**



Operational restrictions may be applied to the type of approach and low visibility operations that fit the available ground dimensions, while also taking into account:

- a) runway excursion history;
- b) friction and drainage characteristics of the runway;
- c) runway width, length and transverse slopes;
- d) navigation and visual aids available;
- e) relevance in respect of take-off or aborted take-off and landing;
- f) scope for procedural mitigation measures; and
- g) accident report.

An **analysis of lateral runway excursion reports** shows that the causal factor in aeroplane accidents/incidents is not the same for take-off and for landing.

Therefore, **take-off and landing events may need to be considered separately.**



Lateral deviation from the runway centre line during a balked landing with the use of the digital autopilot as well as manual flight with a flight director for guidance have shown that the **risk associated with the deviation of specific aeroplanes is contained within the OFZ.**

The lateral runway excursion hazard is clearly linked to **specific aeroplane characteristics, performance/ handling qualities and controllability** in response to such events as aeroplane mechanical failures, pavement contamination and crosswind conditions.

This type of hazard comes under the category for which **risk assessment is mainly based on flight crew/aeroplane performance and handling qualities.**

Certified limitations of the specific aeroplane is one of the key factors to be considered in order to ensure that this hazard is under control.

Potential solutions

- a) **improving runway surface conditions** and/or the means of recording and indicating rectification action, particularly for contaminated runways, having knowledge of runways and their condition and characteristics in precipitation;

- b) ensuring that **accurate and up-to-date meteorological information is available** and that **information on runway conditions and characteristics is passed to flight crews in a timely manner**, particularly when flight crews need to make operational adjustments;



c) improving the aerodrome operator's knowledge of **recording, prediction and dissemination of wind data**, including wind shear, and any **other relevant meteorological information**, particularly when it is a significant feature of an aerodrome's climatology;

d) **upgrading the visual and instrument landing aids** to improve the accuracy of aeroplane delivery at the correct landing position on runways; and

e) in consultation with aeroplane operators, formulating any **other relevant aerodrome operating procedures or restrictions and promulgating such information appropriately**.





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