

**ETHIOPIAN CIVIL AVIATION AUTHORITY
AERODROME SAFETY AND STANDARDS
DIRECTORATE**

**CRITERIA AND ASSOCIATED GUIDELINES ON THE USE OF
PAVEMENTS BY AIRCRAFT WITH AN ACN HIGHER THAN THE
REPORTED PCN**

JULY 2013

Ethiopian Civil Aviation Authority

This Advisory circular on criteria and associated guidelines on the use of pavements by aircraft with an ACN higher than the reported PCN has been prepared by Aerodrome Safety and Standard Directorate to aid the Ethiopian Airport Enterprise on regulating the use of pavements on the aerodrome where the airport use aircraft operation with an ACN higher than the reported PCN.

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It is important to note that this Advisory circular on criteria and associated guidelines on the use of pavements by aircraft with an ACN higher than the reported PCN is applicable to all Ethiopian Aerodromes.

The Director General of Ethiopian Civil Aviation Authority has here approved this guidance by the power given on proclamation No.616/2008 in July, 2013 to be implemented by EAE. The guidance can be amended from time to time upon introduction of new methods and techniques through the International Civil Aviation Organization (ICAO).



Ethiopian Civil Aviation Authority

**Advisory Circular
ECAA-AC-AGA 007**

July, 2013

**CRITERIA AND ASSOCIATED GUIDELINES ON THE USE OF PAVEMENTS BY
AIRCRAFT WITH AN ACN HIGHER THAN THE REPORTED PCN**

1. GENERAL

This Advisory Circular (AC) contains information about standards, practices and procedures that the Authority has found to be an Acceptable Means of Compliance (AMC) with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Authority. When new standards, practices or procedures are found to be acceptable, they will be added to the appropriate Advisory Circular.

2. PURPOSE

This Implementing Standard (IS) provides guidance to aerodrome operators on establishing criteria to regulate the use of a pavement by an aircraft with an Aircraft Classification Number (ACN) higher than the Pavement Classification Number (PCN) reported.

3. REFERENCES

- a) Aerodrome Standards in Ethiopia (MOIS)
- b) Aerodrome Design Manual ICAO Doc 9157 - Part 3 (Pavements)

4. DESCRIPTION OF TERMS

Aircraft Classification Number (ACN)

A number expressing the relative effect of an aircraft on a pavement for a specified standard sub-grade category

***Note:** The airplane manufacturer provides the official computation of an ACN value. Computation of the ACN requires detailed information on the operational characteristics of the airplane such as maximum aircraft center of gravity, maximum ramp weight, wheel spacing, tire pressure, and other factors.*

Pavement Classification Number (PCN)

A number expressing the bearing strength of a pavement for unrestricted operations

***Note:** The PCN numerical value is determined from an allowable load rating. An allowable load rating is determined by applying the same principles as those used for pavement design. The process for determining the allowable load rating takes factors such as frequency of operations and permissible stress levels into account. Allowable load ratings are often stated in terms of airplane gear type and maximum gross airplane weight, as these variables are used in the pavement design procedure.*

Flexible Pavement

Pavements designed and constructed using asphalt concrete placed on granular base and sub base of aggregate material or alternative composite material

Rigid Pavement

Pavements designed and constructed using cement concrete material and normally act as slab in load response conditions

Composite pavement structures

A composite pavement structure is created when an existing pavement structure is overlaid for strengthening or resurfacing purposes. Composite pavement structures

are evaluated as flexible or rigid pavements in accordance with the procedures below.

(a) Asphalt overlay on flexible pavement

A flexible pavement overlaid with additional asphalt pavement layers is evaluated as a flexible pavement having an equivalent granular thickness determined as outlined in ICAO Aerodrome Design Manual part III.

(b) Asphalt overlay on rigid pavement

A rigid pavement receiving an asphalt overlay less than 25 cm in thickness is evaluated as a rigid pavement, with the concrete slab and asphalt overlay thickness converted to an equivalent single slab thickness as given Aerodrome Design Manual part III. A rigid pavement receiving an asphalt overlay greater than 25 cm in thickness is evaluated as a flexible pavement with an equivalent granular thickness determined as outlined in Aerodrome Design Manual.

(c) Concrete overlay on flexible pavement

A flexible pavement overlaid with a concrete slab is evaluated as a rigid pavement with the flexible pavement structure forming the base for the concrete slab.

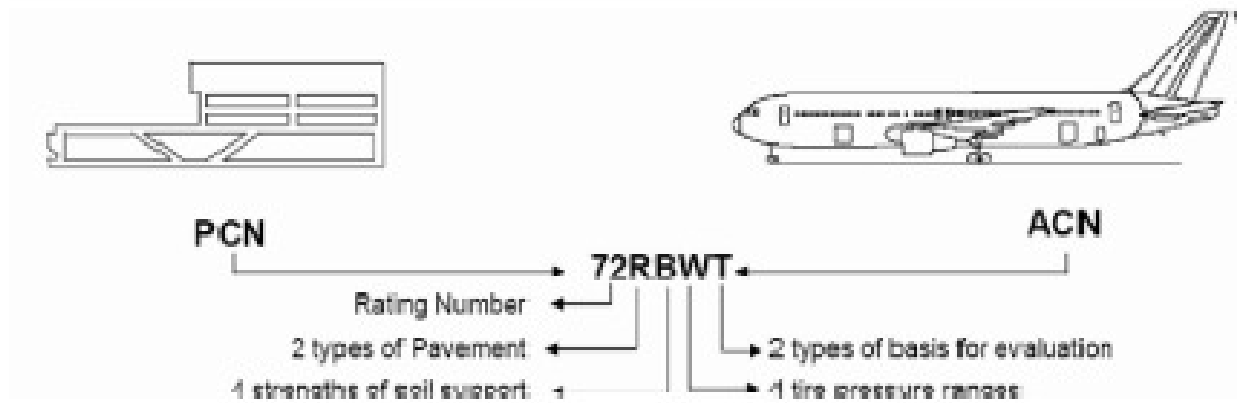
(d) Concrete overlay on rigid pavement

A rigid pavement overlaid by a concrete slab is evaluated as a rigid pavement with the two slabs converted to an equivalent slab thickness as given in Aerodrome Design Manual, except when a separation course greater than 15 cm is placed between the two slabs. When a separation course greater than 15 cm in thickness is used, the upper slab is considered to act independently as a single slab with the lower slab forming part of the base.

5. INTRODUCTION

5.1 Unrestricted Operations

The overload control is not applicable in case where ACN is less than the PCN provided for the pavement.



5.2 Method for Overload Operation Controls (restricted operations)

In essence, overloading of pavements can result either from loads too large, or from a substantially increased application rate, or both. Loads larger than the defined (design or evaluation) load shorten the design life, whilst smaller loads extend it. With the exception of massive overloading, pavements in their structural behavior are not subject to a particular limiting load above which they suddenly or catastrophically fail. Behavior is such that a pavement can sustain a definable load for an expected number of repetitions during its design life. As a result, occasional minor overloading is acceptable, when expedient, with only limited loss in pavement life expectancy and relatively small acceleration of pavement deterioration. For those operations in which magnitude of overload and/or the frequency of use do not justify a detailed analysis, the following criteria are suggested:

- (a) for flexible pavements, occasional movements by aircraft with ACN not exceeding 10 per cent above the reported PCN should not adversely affect the pavement;
- (b) for rigid or composite pavements, in which a rigid pavement layer provides a primary element of the structure, occasional movements by aircraft with ACN not exceeding 5 per cent above the reported PCN should not adversely affect the pavement;
- (c) if the pavement structure is unknown, the 5 per cent limitation should apply; and
- (d) the annual number of overload movements should not exceed approximately 5 per cent of the total annual aircraft movements.

Such overload movements should not normally be permitted on pavements exhibiting signs of distress or failure.

Such overload movements should not normally be permitted on pavements exhibiting signs of distress or failure. Furthermore, overloading should be avoided during periods when the strength of the pavement or its sub-grade could be weakened by water. Where overload operations are conducted, the Aerodrome Operator should review the relevant pavement condition regularly, and should also review the criteria for overload operations periodically since excessive repetition of overloads can cause severe shortening of pavement life or require major rehabilitation of pavement.

5.3 Other alternative means of compliance

This advisory circular draws the attention to some information that can be used by aerodrome operators to aid in establishing such criteria using the ICAO standards and recommended practice. However different pavement overload criteria have been used by various Civil Aviation Organizations (please refer Doc 9157 Part3). Aerodrome operator should adopt criteria which is compatible with the pavement management system in place at the aerodrome.

6. OVERLOAD OPERATIONS

6.1 The ICAO Doc 9157 Airport design manual, Part 3 Pavements, contains far more information on the subject, including background explanation as well as an insight in how several states have approached the subject. These are regarded as acceptable means of compliance to controlling overloading the pavements and are generally best practices in the industry which can be applied to ensure pavement preservation.

6.2 While the occasional marginal overload operation should not result in catastrophic damage, overload operations can affect the usable lifetime of a pavement. Significant overload operations may severely affect the lifetime of the pavement, and damage can occur, particularly with very new or already much worn pavements.

7. SUMMARY

The information contained in these documents should be used as basis for aerodrome operators to establish a system for control of overload operations and the necessary correlation with the aerodrome pavement maintenance programme.