Referenced to Nigeria Regulations

Advisory Circular

NCAA-AC-ARD014

NIGERIAN CIVIL AVIATION AUTHORITY (NCAA)

ISSUE NO 1 SEPTEMBER 2012

ASSESSMENT OF RUNWAY FRICTION

1.0 GENERAL

Nigerian Civil Aviation Authority Advisory Circulars from Aerodrome Standards Department contain information about standards, practices and procedures that the Authority has found to be an Acceptable Means of Compliance (AMC) with the associated Regulations.

An AMC is not intended to be the only means of compliance with a regulation, and consideration will be given to other methods of compliance that may be presented to the Authority.

2.0 PURPOSE

This Advisory Circular provides methods, acceptable to the Authority, for showing compliance with Assessment of Runway Friction requirements of Part 12 of Nig. CARs as well as explanatory and interpretative material to assist in showing compliance.

3.0 APPLICATION

The material contained in this Advisory Circular applies in the performance of friction measurement for runway pavements at aerodromes.

4.0 REFERENCE

The Advisory Circular relates specifically to Part 12.6.4(d) of Nig. CARs.

TABLE OF CONTENT

SECTION 1: INTRODUCTION

I. General

A. This document describes the minimum level of assessment that should be employed for the Continuous Friction Measuring Equipment (CFME) listed in the Aerodrome Standards Manual. Other types of CFME may be used if their performance can be demonstrated, to the satisfaction of the NCAA, to provide comparable results with currently accepted CFME.

B. The criteria, which are given in this AC, reflect the NCAA's interpretation of the Standards and Recommended Practices of Annex 14 to the Convention on International Civil Aviation in so far as these have been adopted by the NCAA in respect of runway surface friction testing.

2. Purpose

A. The purpose of this document is to outline the procedures for undertaking runway surface friction assessments and to define the criteria by which friction values should be assessed on runways under specified conditions.

B. This document also provides guidance to aerodrome operators on how they may assess the friction of runway surfaces in order to adjust maintenance schedules to ensure that the runway condition is adequate for aircraft to operate safely.

3. Definitions

For the purpose of a runway surface friction assessment the following definitions apply:

A. **Continuous Friction Measuring Equipment (CFME)** - A device designed to produce continuous measurement of runway friction values.

B. **Design Objective Level (DOL)** - The target friction level to be achieved on a new or resurfaced runway within one year.

C. **Friction Level** - The overall average friction value calculated from a minimum of 10 average friction values obtained over a rolling distance of 100 metres within a portion of the pavement.

D. **Maintenance Planning Level (MPL**) - The friction level below which a runway maintenance programme should be undertaken.

E. **Minimum Friction Level (MFL)** - The friction level below which a runway shall be notified as 'may be slippery when wet'.

F. **Portions of the Pavement** - One third of the declared runway width, referred to as the 'central' trafficked portion and two 'outer' portions.

G. **Runway Surface Friction Assessment** - The assessment of friction carried out under conditions of self-wetting using a CFME.

H. **Wet Runway Surface** - A runway that is soaked but no significant patches of standing water are visible.

Note: standing water is considered to exist when water on the runway surface is deeper than 3mm.

4. Scope

A. The criteria in this document apply to all paved runways exceeding 1200 metres in length and all paved runways used for public transport operations. It is not applicable to grass runways or helicopter landing sites.

B. On paved runways of 1200 metres or less, where public transport operations are not carried out, the application of the procedures is at the discretion of the aerodrome operator.

C. The procedures in this document are only to be used for the acquisition of friction levels of a runway surface for maintenance purposes.

D. An aerodrome operator should carry out additional friction testing as an integral part of their Safety Management System to establish friction readings during adverse weather conditions and to identify those areas of the runway where contamination may build up over a short period of time. These tests should be conducted under natural conditions with the CFME self-wetting system switched off.

SECTION 2. Runway Surface Friction Assessments

A. A runway surface friction assessment is conducted under controlled conditions using self-wetting CFME, to establish the friction characteristics of a runway and to identify those areas of a runway surface that may require attention.

B. Friction readings for the survey run are collected by the CFME along the line of the entire pavement length. An average friction value is determined every 10 metres along a run, enabling a 100-metre rolling average to be calculated. This is best visualised by the use of a sliding 100 metre cursor passing over the surface. The runway width should be divided into equal thirds; these portions of the pavement are referred to as 'central' and 'outer' traffic portions. The friction level for each portion is determined by the lowest of the rolling averages. The procedure for calculating the rolling average for each run is repeated in a similar fashion for each of the three portions across the runway. In each case, the applicable runs across the width of each portion are first averaged before undertaking the rolling average calculation as described above.

C. The aerodrome operator should determine the frequency of the assessments that will enable any significant change in runway surface friction characteristics to be identified and, if appropriate, for remedial maintenance to be conducted before the friction level falls below the MFL.

D. The recommended periodicity of runway surface friction assessments is outlined in Table 1.

Table 1 Recommended Interval between Runway Surface Friction Assessments

Average number of A/C movement on the runway per day	**Frequency of assessment of frictional coefficient**
Less than 15	12 months (annually)
16 – 30	6 months
31 - 90	3 months
91 and above	Monthly

NOTE: The average number of movements on a runway is determined by the total number of movements, on both runway directions.

E. The friction characteristics of a runway vary over time as the runway is subject to wear and tear, rubber deposits and to the effects of weather and other environmental conditions. Aerodrome operators should monitor the results of assessments and should vary the interval between assessments depending on the results. If historical

data indicates that the surface is deteriorating relatively quickly, more frequent monitoring may be required in order to ensure that maintenance is arranged before the friction characteristics deteriorate to an unacceptable level. The aerodrome operator should record the justification for any variation from the recommended periodicity for assessments, for example on Assessment Report No. 2 – see Table 5.

F. The friction characteristics of a runway can also alter significantly following maintenance activities, even if the activity was not intended to affect the friction characteristics. Therefore, a runway surface friction assessment should be conducted following any significant maintenance activity conducted on the runway and before the runway is returned to service. Runway surface friction assessments should also be conducted following pilot reports of perceived poor braking action, if there are visible signs of runway surface wear, or for any other relevant reason.

SECTION 3. Runway Surface Friction Assessment Procedures

1. Equipment Checks

The CFME operator should ensure that the equipment is in full working order and calibrated in accordance with the manufacturers' operating instructions.

2. Operator and Training Competency

A. The success of friction measurement in delivering reliable friction data depends greatly on the personnel who are responsible for operating the CFME. All operators should be trained in its operation and maintenance and be aware of the critical factors affecting the accuracy of friction measurements. General guidance on assessment speed, calculated water depth and tyre type and pressure should be sought from the CFME manufacturer.

B. Where a contractor carries out an assessment, it is the responsibility of the aerodrome operator to satisfy himself as to the competency and experience of the CFME operator.

3. Assessment Conditions

A. The runway surface should be free from precipitation during the assessment, with no wet patches.

B. The assessment should be conducted at an ambient air temperature above 2° C.

C. Dampness, fog and mist conditions might also affect the outcome of the assessment and aerodrome operators should be aware that cross-winds may affect self-wetting assessments. Aerodrome operators should seek advice on these issues from the CFME manufacturer.

4. Assessment Procedure

A. A runway surface friction assessment consists of two check runs supplementing a series of standard runs.

B. **Check Runs**

1. A check run is designed to confirm that the operation of the CFME is consistent throughout the full runway surface friction assessment and should be conducted before and after completion of the standard runs, under the same conditions.

2. A check run should be performed over the entire pavement length on a portion of the runway that does not traverse any other runs, and at a constant speed.

C. **Standard Runs**

1. Starting with the run closest to the runway edge, a standard run should be carried out along the entire pavement length at a constant run speed, allowing for acceleration and safe deceleration. Table 2 defines the recommended location of each run for nominal width runways.

2. The track(s) of the measuring wheel(s) should not run along the line of the pavement joints or longitudinal cracks.

Table2. Recommended Format for Runway Surface Friction Assessment Standard Runs Based on Nominal Runway Width

Runway Width	**Recommended lateral displacement of standard runs each side of the centreline (metres)**					
18m	1,5	3,5	6			
23m	1,5	3	6	9		
30m	1,5	4	7	12		
45m	1,5	4	7	11	17	
60m	1,5	4	7	11	17	23

3. Where a runway is not a standard width, the aerodrome operator should ensure that the spacing between the standard runs is of similar dimensions to the patterns illustrated in Table 2 above; that they run parallel to the runway centreline; and are laterally separated by a distance no greater than 6 metres.

4. The run pattern for a runway with Touchdown Zone (TDZ) markings should be planned so as to include one run either side of the centreline to pass through the centre of the painted TDZ markings.

5. If there is any reason to doubt the accuracy of the runway surface friction assessment, it should be repeated.

5. Records

A. Aerodrome Operators should keep records of all runway surface friction assessments. The following items should be recorded for each assessment, and made available upon request to the NCAA:

• Date and time of assessment.

• Runway assessed.

• Run number and runway direction.

• Distance from the centreline and on which side of centreline the run was performed.

• Constant run speed (Km/h) for each run.

• Run length.

• Self-wetting system on/off (refers to check runs only).

• Surface condition.

• Average friction level per run.

• Friction levels for each portion of the pavement.

• Overall friction level.

B. Tables 4 and 5 depict typical assessment report sheets that can be used and retained as a record for each runway surface friction assessment.

SECTION 4. Evaluation of Runway Surface Friction Assessment Results

1. Introduction

A. The friction level values obtained should be compared with the following criteria:

• The Design Objective Level (DOL)

• The Maintenance Planning Level (MPL)

• The Minimum Friction Level (MFL)

B. The friction level values produced by different CFME vary slightly for any given runway surface friction characteristics; therefore, Table 3 indicates the correlation between the assessment criteria of CFME devices.

Table 3. CFME and Friction Level Values for 65km/h and 95km/h test speeds

Test Equipment	Test tire		Test speed (km/h)	Test water depth (mm)	Design objective for new surface	Maintenance planning level	Minimum friction level
	Type	Pressure (kPa)					
(1)	(2)		(3)	(4)	(5)	(6)	(7)
Mu-meter Trailer	A	70	65	1.0	0.72	0.52	0.42
	A	70	95	1.0	0.66	0.38	0.26
Skiddometer Trailer	B	210	65	1.0	0.82	0.60	0.50
	B	210	95	1.0	0.74	0.47	0.34
Surface Friction Tester Vehicle	B	210	65	1.0	0.82	0.60	0.50
	B	210	95	1.0	0.74	0.47	0.34
Runway Friction Tester Vehicle	B	210	65	1.0	0.82	0.60	0.50
	B	210	95	1.0	0.74	0.54	0.41
TATRA Friction Tester Vehicle	B	210	65	1.0	0.76	0.57	0.48
	B	210	95	1.0	0.67	0.52	0.42
GRIPTESTER Trailer	C	140	65	1.0	0.74	0.53	0.43
	C	140	95	1.0	0.64	0.36	0.24

2. Action to be taken as a result of a runway friction assessment

A. The aerodrome operator should review the results of each runway friction assessment and where appropriate take the following action:

- If the friction level is below the MPL, maintenance should be arranged to restore the friction level, ideally to a value equal to or greater than the DOL.

- If the friction level indicates a falling trend, the Aerodrome Operator should increase the frequency of runway friction assessments in order to identify any further or rapid deterioration and, if appropriate, the action to be taken.

- If the friction level is below the MFL, maintenance should be arranged urgently in order to restore the friction level and, in accordance with ASM Section 14.2.7, Table 14-1, a NOTAM shall be issued advising that the runway may be slippery when wet.

- If the friction level is significantly below the MFL, the aerodrome operator should consider withdrawing the runway from use for take-off and/or landing when wet.

3. Assessments made following maintenance activities

A. The friction characteristics of some runway surface materials can improve over time, commonly as a result of the dispersal of oils in the surface layers. However, if the runway surface friction assessment indicates that the friction characteristics of an area of the runway that has been subject to maintenance work are poorer than anticipated or fall below the MPL, additional assessments should be performed over a period of time to ascertain whether the friction characteristics remain stable, improve, or if additional work should be carried out.

Table 4. Assessment Report No.1

RUNWAY SURFACE FRICTION ASSESSMENT
Summary of Runs

Airport	
Runway	
Date	

Run No.	Rwy Direction	Time UTC	Dist from C/L	Side of C/L	Speed (Km/h)	Run Length	Self-Wet On/Off	Surface Condition	Average Friction Value
Check 1									
Check 2									

Remarks

Table 5. Assessment Report No.2

RUNWAY SURFACE FRICTION ASSESSMENT RESULTS

Airport	
Runway	
Date	

Description	**Applicable Runs**	**Friction Level**
Friction Level for Central Portion	Run Numbers:	
Friction Level for Outer Portion (Right)	Run Numbers:	
Friction Level for Outer Portion (Left)	Run Numbers	
Overall Friction Level	Average Value taken from all Standard Runs	

Is any portion of the runway below the MFL?	YES/NO
Remarks	
Action to be taken	
Recommended date of next assessment	

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