Journal of Air Transport Management 34 (2014) 1–5

Contents lists available at SciVerse ScienceDirect

Journal of Air Transport Management

journal homepage: www.elsevier.com/locate/jairtraman

Note

Runway surface friction characteristics assessment for Lamezia Terme airfield pavement management system

Mario De Luca*, Gianluca Dell'Acqua

University of Napoli Federico II, Via Claudio 21, 80125 Napoli, Italy

Keywords:
Aircraft
Runway-friction measuring
Maintenance testing
Grip Tester

A B S T R A C T

The main objective of this paper was to explore the relationship between runway friction and traffic data useful for the APMS of Lamezia Terme Airport (IATA: SUF, ICAO: LICA), located near Lamezia Terme in the Calabria region in southern Italy. Its IATA airport code SUF originates from Sant'Eufemia, the part of Lamezia Terme which the airport is closest to. The infrastructure is the most important Calabrian airport and is under continuous development. In the last few years, the number of passengers using the airport has risen enormously (more than 1.9 ml passengers in 2010), as have traffic and handling activities.

The performance models proposed here are useful in predicting the decay of a runway's pavement surface characteristics. The results were obtained from a large number of experimental evaluations over the last nine years. The main model obtained in the study makes it possible to predict the decay curve as a function of aircraft structure, load and passages.

1. Introduction and literature reviews

It is well known that pavement structures are an airport's greatest asset and that in response to increasing needs, efficiency is the most important factor in airfield facility maintenance. The APMS includes a set of methods that can help decision makers find cost-effective strategies for providing, evaluating, and maintaining pavements in a serviceable condition (Yi-hsien and Chia-pei Chou, 2004). The APMS has been used by many airport agencies around the world for many years. This can yield significant cost savings, increased operational efficiency and safety, and reduced environmental impact (Pittenger, 2011).

In a recent study (Chun-Hsing and Romero, 2011), an integrated GIS system combined with Geographic Positioning Systems and personal digital assistants was proposed. The system provides a powerful tool that helps airport operators and engineers improve regular airfield inspection, management, and reporting processes, resulting in a more efficient airport operation system. In this context it is well known that regular monitoring of runway friction is essential to enable the planning of maintenance. The authors described the application of the system at Salt Lake City International Airport (SLC) in Utah, where the system was used to show GIS applications in facilitating the evaluation of skid resistance on runway surfaces.

In general there is a need to develop a system to quantify the quality of survey data and to study pavement performance characteristics with levels of confidence. To address this need, a system has recently been proposed to quantify historical asphalt pavement condition survey data quality. The proposed confidence evaluation system used indicators based on asphalt pavement life-cycle characteristics. The authors used the resulting confidence levels of the indicators to determine the confidence level of the analyzed pavement's life curves and performance characteristics (Tsai et al., 2012). Khraibani et al. (2012) proposed a mixed-effects logistic model to describe the evolution law of pavement deterioration and identify the effects of many factors on pavement behavior. This approach made optimum use of the data by taking into account unit-to-unit variability; the approach was found to be more powerful than traditional regression approaches in establishing the evolution curves (Dell'Acqua et al., 2011) of each pavement section and identifying the most important factors involved in the cracking process.

2. Data collection

2.1. The airport of Lamezia Terme

The investigation was carried out on the runway of the international airport of Lamezia Terme (SUF) whose layout is shown in Figs. 1 and 2. In the last few years the airport has highly incremented in terms of passengers traffic and handling activities.

* Corresponding author. Tel.: +39 (0)817683936.
E-mail address: mario.deluca@unina.it (M. De Luca).

0969-6997/$ – see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.jairtraman.2013.06.015

Fig. 1. Runway of Lamezia Terme.

Airports belonging to a local air transportation system where competition is strong exploit their inputs less intensively than do airports with local monopoly power (Scotti et al., 2012). In 2011, the airport of Lamezia Terme recorded traffic amounting to more than 2 million passengers.

The airport has a runway of 2416 m, an apron, secondary access ways and cargo passenger terminals as well as parking facilities and minor airport operation facilities. The runway has a semi-rigid pavement with a dense asphalt wearing surface.

The different layers and materials making up the pavement of the runway are as follows:

- first layer (surface): 4 cm in dense asphalt
- second layer (binder): 4 cm in dense asphalt
- third layer (base): 18 cm in dense asphalt
- fourth layer (subbase): 20 cm in concrete
- fifth layer (subgrade): 40 cm in "mixed crushed rock"

The following data were obtained for the runway during the observation period from 1 January 2001 to October 14, 2009:

- *GN*, the Grip Number using Grip Tester
- Loads moving on the runway during the study period (i.e., number, type and weight of the aircraft using the runway during the study)

2.2. Measurement of surface friction characteristics

The friction characteristics of the paved runway were determined using Grip Tester (see Figs. 2 and 3), according to the Publication ICAO-Doc.9137-AN/898, guidelines where Speed equals 65 km/h. Twenty-five readings were taken (see Table 1). For each of the readings shown in Table 1, eight different Grip Tester tests were carried out as shown in Fig. 2.

In the last column of Table 1, the total period *T* is represented by the relation (1) below:

$$T = \sum_{i=1}^{25} \Delta i \tag{1}$$

Where Δi is the difference between the successive dates when the Grip Tester tests were carried out, as shown in Table 1.

Throughout the period of the study (i.e., from 1st January, 2001 to 14th October, 2009), no work or alterations were made to the layers of pavement, least of all to the first layer (surface). The only work done was to remove rubber deposits from the touchdown area. These consisted of 4 interventions (every two years) near the touchdown area. In the area affected by rubber deposits, measuring about 100 m in length by 10 m, there was a difference in *GN* (before and after rubber removal) of no more than 10%.

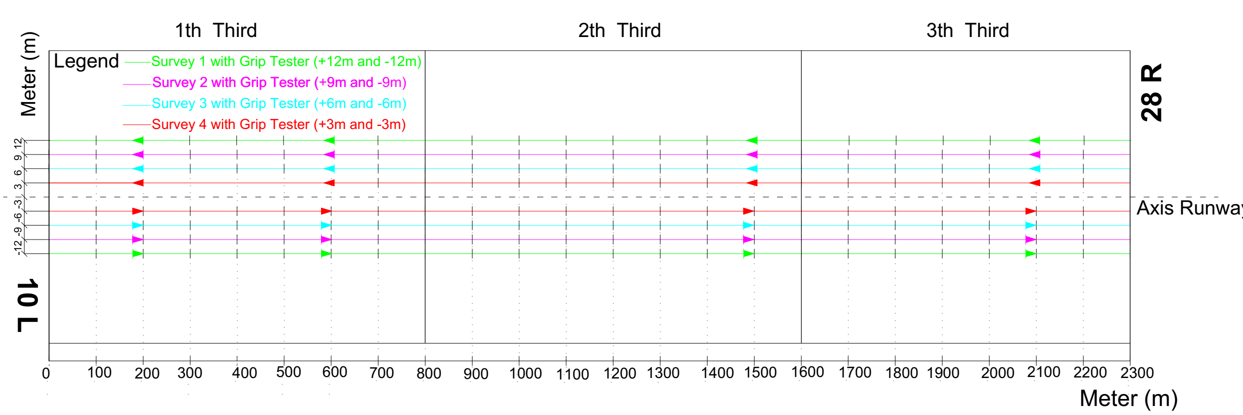

Fig. 2. Layout of "Grip Tester" Surveys.