

Lifetime prediction of bearings in on-board starter generator

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Abstract. Ensuring flight safety for passengers as well as crew is the most important aspect of modern aviation, and in order to achieve this, it is necessary to be able to forecast the durability of individual components. The present contribution illustrates the results of a computational analysis to determine the possibility of analysing the prediction of bearing durability in on-board rotating equipment from the point of view of thermal fatigue. In this study, a method developed at the Air Force Institute of Technology was used for analysis, which allowed to determine the bearing durability from the flight altitude profile. Two aircraft have been chosen for analysis - a military M-28 and a civilian Embraer. As a result of the analysis were obtained: the bearing durability in on-board rotating devices, average operation time between failures, as well as failure rate. In conclusion, the practical applicability of this approach is demonstrated by the fact that even with a limited number of flight parameters, it is possible to estimate bearing durability and increase flight safety by regular inspections.

Keywords: aircraft; durability of bearing; failure mode; mathematical model; temperature profile

1. Introduction

In order to improve safety, a number of day-to-day and cyclical inspections are carried out on the aircraft. With the aim of achieving the highest required standard, the most important issues is to predict and avoid the possible faults. To reach this goal, the data from operating process are used to build mathematical models, allowing to calculate the lifetime of a given element. As was stated by Carrera (2002), stress fields related to the temperature variations often represent a contributing factor and, in some cases, are the main causes of the failure structures. The component whose durability can be calculated from the ambient temperature are bearings in on-board rotating devices. One of the parts of the aircraft, which lifetime depends on thermal conditions, is bearing in rotating devices. Due to the difficulty of abrasion measurement, the relation between durability of the bearings and the altitude of flight can be used. Bearing is an element of these machines, which are strongly influenced by thermal conditions (Cinefra *et al.* 2015). Based on the change of ambient temperature, it is possible to determine the durability of bearings in on-board rotating devices without any interference.

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