A Flight Scenario based Workload Prediction Method

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Abstract

Introduction: In the process of aircraft design, the flight task workload under flight phases need to be predicted in order to improve the quality of the interface design of aircraft. The aim of flight task workload prediction is to predict the maximum and minimum values of flight task of each flight phase. Among them, the minimum value comes from the nominal flight scenario, and the maximum value comes from a specific flight scenario which could influence by many factors, such as the weather, the flight status, the personal pilot status, etc. The objective of this paper are: 1. Find out a nominal flight scenarios used for evaluating flight workload and the factors that will influence the flight workload in specific scenarios. 2. Describe specific flight scenarios with the combination of the influence factors and the nominal flight scenario, obtain the flight workload value in each flight phase. 3. Study the influence of influence factors on flight task workload.4. Establish a prediction method of flight workload with the base of mission scenarios and the influence factors.

Method: Firstly, based on a method of interviews with pilots, the flight scenario was built, and task workload of each phase of flight was evaluated as the base of the flight workload predicting method. Then, by means of literatures review and interview with pilots, a category list of scenario shaping factors (SSFs) on flight workload t is established. SSFs are divided into three classes of environment, human and aircraft. Then by using the interviews method again, differences between nominal flight scenarios and specific scenarios was identified, and SSFs were chosen from the category list to characterize the differences. As a result, the specific scenario were divided into a nominal flight scenario and several SSFs. Then by using the subjective evaluation method again, flight task workload of the specific flight scenario was evaluated. Finally, the influence coefficient of each SSFs was determined. According to the degree of influence of each SSFs, their weights were determined, and a workload prediction model was established.

Results: The nominal flight scenario was defined and scenario shaping factors (SSFs) were identified in this paper. These SSFs were further classified into environment factors, pilot factors and human interface factors. Then the pilot workload under nominal flight scenario and the influence coefficient of each SSF on nominal flight scenario was determined through pilot
subjective judgment. Thus a flight task workload database was established, which can be used to predict workload of any flight scenario.

Discussion: From the practical flight experience of pilots, based on three kinds of factors of flight workload, a method that can predict the flight task load of specific flight scenarios is established. This method provides guidance of describing specific flight scenarios and tool to predict flight task load for researchers. It also benefits the design personnel to conduct survey work in design research among pilots.

Keywords: Flight scenario; task load; Subjective evaluation; Workload; Scenario shaping factors

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