Chapter 16

Methods for Assessing the Glissade Entrance Quality by the Crew

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ABSTRACT

This chapter proposes methods for assessing the quality of entry into the glide path using autocorrelation functions and regarding the psycho-physiological state of the human operator. This is due to the possible increase in the psycho-physiological tension of a human operator in special flight situations. The analysis of the pilot’s ability to control the trajectory of the aircraft is presented. A method for alerting the crew about the failure in the system for obtaining data on the angle of attack and airspeed to prevent non-coordinated turn is given. The majority of the calculations are based on the method of determining the correlation fields during the flight.

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INTRODUCTION

Safety issues occupy one of the main places in the air transport system. The quality of maintaining the flight trajectory depends both on the navigation aids and flight navigation equipment, as well as on the quality of the crew training. Most often, there is a deterioration in the quality of piloting in the event of special cases in flight.

The final stage of the landing (landing) depends on the timely entry into the glide path and further maintaining its trajectory.

The literature analysis shows that most authors already considered the influence of the human factor on the glide path approach (Kazak & Budzynska (2009); Gibb & Schvaneveldt (2008); Kashmatov (2008). One of the authors of those books has also adequately investigated the topic. The purpose of the chapter is to research the problem in more detail and propose methods for assessing flight quality with further automation of this process.

This paper examines the accuracy of the aircraft’s entry to the glide point by correlation functions and piloting estimation for pre-landing maneuvering, regarding the angle of attack and the flight speed.

Currently, there are deterministic methods for assessing the quality of entry into the glide path under director control mode. However, the pilot’s integrated differentiated control movements are stationary. Therefore, we consider it expedient to evaluate the accuracy of entry into the glide path by the correlation functions. But the only accuracy of the glide path entrance is not enough for successful flight. The flight speed must also be observed. We suggest determining the dependence of the velocity on the angle of attack on the contours of the correlation fields. This will allow to identify dangerous configurations of aircraft movement. Thus, according to the above components, we can determine the quality of the glide path entrance.

BACKGROUND

Autocorrelation Functions and Their Use in Assessing Quality of The Approach

The correlation functions between information about the flight trajectory and distortions during the operator tracking operations considered below. This happens due to its psycho-physiological features in a state of high tension.

A comprehensive analysis of the trajectory of the aircraft allows to determine the degree of operator training, his psycho-physiological state, the quality of work of all elements of the aircraft, as well as the reliability of communication in the reception and transmission of commands.

The ideal trajectory control system is the one that provides for the full ergatic compatibility of the operator – aircraft subsystem and continuously processes information about the flight trajectory of the aircraft (AC) without errors and fully performs the specified flight program according to function \( I(t) \). In this case, the specified trajectory and information about the real flight trajectory will be the same.

Any deviation from a given flight mode is immediately recorded by the onboard equipment, which also notifies the operator. If necessary, the operator can work this difference to zero (Figure 1).

If there is a following situation: the operator uses information \( I(t) \), which becomes a subject of distortion due to a combination of certain reasons. In this case, the information management facility will change and become different – \( I'(t) \) (Figure 2)
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