

Design of a high accurate aircraft ground - based landing systems

Abstract

The rapid increase in aviation industry requires parallel effective plans, programs and designs of systems and facilities nationwide to fulfill the increasing needs for safe air transportation. Aircraft landing remains a problem for a long time all over the world. Systems that aircraft rely on in landing are unreliable to perform a precise guidance due to many limitations such as inaccuracy , unreliability and dependency. In low visibility conditions, when pilots are unable to see the runway, the aircrafts are diverted to another airport. However, low visibility can also affect all airports in the vicinity, forcing aircrafts to land in low visibility conditions depending on Instrument Flight Rules (IFR). Aircraft approach and landing are the most hazardous portions of flight; accidents records indicate that approximately 50 percent of the accidents occur during aircraft landing. Aircraft landing Category III C is not yet in operation anywhere in the world. It requires landing with no visibility or runway visual range. Currently, Global Positioning System (GPS) is the main navigation system used all over the world for aircraft navigation, approach and landing. However, in aircraft approach and landing phase, the accuracy of GPS is not sufficient to perform a perfect landing due to the possibility of aircraft to be drifted out of the runway. The accuracy of GPS could be improved to 3 meter by sending correction. Improved accuracy has not been able to meet ICAO standards for aircraft automatic landing. In this paper, aircraft landing systems characteristics, performance and accuracies have been studied and compared for the purpose of assessing limitations and drawbacks. An aircraft landing system with improved performance is proposed to meet ICAO standards for all - weather aircraft landing required and recommended practices with high accuracy to perform full automatic landing for aircrafts.

Keyword: Landing system; Trilateration; Triangulation; Ground-based system; Accurate positioning; ILS; MLS; Positioning; GPS; DGPS