

Modeling and simulation of a high accurate aircraft ground-based positioning and landing system

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, 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 indicated that approximately 50 percent of the accidents occur during these portions. Aircraft landing Category IIIC 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, GPS accuracy 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 receiving correction messages. Improved accuracy has not been able to meet International Civil Aviation Organization (ICAO) standards for aircraft precision landing. In this study, aircraft landing systems characteristics, performances 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 and to provide accurate guidance for approaching and landing aircrafts.

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