COMMERCIAL AVIATION NAVIGATION SYSTEMS ANALYSIS TOOLSET

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BIOGRAPHIES

Ian Longstaff
Ian Longstaff has recently joined NAVSYS Corporation as the Integrated Product Team Leader for GPS/Inertial products and services. He has more than 25 years experience in developing Inertial systems and Inertial measurement units. He was most recently Lead System Engineer at Litton Space Systems, Goleta, CA, on their Precision Hemispherical Resonant Gyro program, for space-based applications. Previous to this he was Systems Engineer for the Litton ZLG™-based LN100 systems from 1986-1994 at Litton Guidance and Control Systems in Woodland Hills, CA. Prior to this Mr. Longstaff was a Systems Engineer at Litton Italia in Rome, on the LISA 2000 and Tornado Nav HARS. Mr. Longstaff started his professional career as an Assessment Engineer at British Aerospace's Precision Products Group working on testing and designing gyroscopes for tactical applications.

Gengsheng Zhang
Gengsheng Zhang is an engineer at NAVSYS Corporation. He has more than ten years experience in GPS and INS applications. Mr. Zhang received his first MS degree from Northwestern Polytechnical University, China, and a second MS degree from the University of Calgary, Canada, both with specializations in navigation.

Alexander J. Brown, PE
Al Brown has more than 25 years experience, primarily in the areas of research and development of aerospace communications systems. He has worked with GTE Sylvania, Martin Marietta, GE Aerospace and Loral Command & Control Systems. He supports NAVSYS Corporation in the areas of systems engineering and program management. He has a BSEE degree from the University of New Mexico and an MBA degree from the University of Utah. Mr. Brown is the owner of Colorado Corporate Library, a market research and consulting firm.

ABSTRACT

NAVSYS Corporation has developed a set of Commercial Aviation Navigation Systems (CANS) tools that allow post-flight analysis of various reference aids and systems used in aircraft en-route navigation and landing approaches. These tools were developed to provide qualification capability for civil aviation navigation and landing systems, and they can be used to compare any new navigation or landing aid to existing systems. This toolset provides a cost-effective method of integration, validation and verification of new systems. They were developed using the flexible open architecture of the MATLAB programming environment.

These tools allow the on-board GPS, Differential GPS, VOR/DME, and Inertial Navigation systems performance to be compared and analyzed for an aircraft enroute scenario, against each other, against a GPS base station, airborne rover station, post-processed "Truth" solution, and against the performance of other on-board systems, such as the Flight Management System (FMS) and the Automatic Dependent Surveillance (ADS). The approach segment of a flight can also be analyzed with the CANS software suite. In this flight segment, the on-board GPS and Differential GPS performance can be analyzed and compared to Radar and Instrument Landing System (ILS) approach data and compared to a base station Differential GPS rover station "Truth" solution. The suite can also compare the differential corrections from different base stations and determine the accuracy levels of the differential corrections for a particular time slice.

This toolbox allows evaluation of Differential GPS against conventional accepted civil aviation navigation and landing aids and analysis of its performance against these aids, and thus qualify Differential GPS systems for civil aviation use.

This software suite has been used by an avionics manufacturer to evaluate a differential GPS navigation and landing approach system developed by them for civil aviation. This paper discusses the analysis capability of the NAVSYS CANS software and relative performance characteristics of the different commercial navigation and landing approach systems analyzed by NAVSYS.

INTRODUCTION

There is an ongoing multifaceted drive within the aviation community to apply Global Positioning System (GPS) technology in a safe and cost beneficial manner to enroute