Drone Measurements

Drone-based ILS Measurements

Colibrex / FCS NavAidDrone
New era in NAVAIDS inspections
The new Colibrex/FCS NavAidDrone is a unique and revolutionary tool to carry out specialized field measurements required for commissioning or regular maintenance of Instrument Landing Systems (ILS) of all categories. It is especially designed for use by ANSP CNS (Communication, Navigation, Surveillance) maintenance staff, NAVAIDS system manufacturers and CNS installation and maintenance service engineers. Due to the high flexibility of the airborne platform, ILS transmitter and antenna adjustments are now much easier. Areas which cannot be accessed by the traditional telescopic mast can be easily accessed by the NavAidDrone. For example for localizer coverage measurements in a sector of ± 35° around the antenna which may be difficult with a measurement vehicle, the NavAidDrone offers a substantial improvement, thanks to its ability of flying fully programmable orbit paths without necessity of service roads.

The same applies for measurements of the glide path antenna system with its critical adjustments from a distance. All in all, the NavAidDrone offers an alternative to time- and manpower consuming ground based measurements and opens the way to potential extension of flight inspection periods with the corresponding savings.

The NavAidDrone is a system resulting from a multi-year R&D project. It merges the flight inspection and receiving/processing expertise of FCS Flight Calibration Services GmbH and the expertise in design and international commercial operation of RF measurement drone (UAS) of Colibrex GmbH.

A documented calibration process for measurement receiver, processing and antennas ensures that all measurement results of the NavAidDrone are fully reproducible. The NavAidDrone and antenna design were fully simulated in a 3D complex electromagnetic model using a leading electromagnetic solver software. The RF front-end and processing subsystem are lightweight purpose-designed components. The low weight of the payload improves the UAS autonomy, as larger batteries can be carried.

*Flight path segments of the NavAidDrone for a localizer coverage measurement*
The NavAidDrone, by means of an additional software module, is also suitable for VOR and GBAS measurements – without any hardware changes

Basic system features

- All localizer (LOC) and glide path (GP) measurements, i.e. DDM, SDM, course/clearance ratio (averaged CRS/CLR ratio along the runway), linearity and true field strength/RF level and coverage

- Software filtering of DDM and course structure data according to ICAO Annex 10 and DOC 8071 specifications

- Separate analysis of course and clearance data in a single measurement

- Fully integrated and light-weight dual-channel receiver for simultaneous processing of GP and LOC signals

- High bandwidth internal processing and recording, permitting in-channel separation of ILS signals and potential interferences

- DGPS-based, precise navigation position accuracy of less than 10 cm

- Purpose-designed, horizontally polarized VHF and UHF antennas

- Real-time data downlink for measurement control, WLAN interface for transfer of recorded mission raw data to a PC on the ground

- Comprehensive mission management software

- Prepared for Beyond-Line-of-Sight operation (BVLOS) with implementation of dedicated tracking solutions

- Fully-featured measurement evaluation software with graphical display, exhaustive data analysis, GPS data window, CSV export capabilities

Separate CRS and CLR CSB patterns

ILS glide path spectrum during measurement flight
Measurement applications

- Localizer inspection (course structure, alignment, SDM, coverage, linearity)
- Spectrum detection of spurious signals
- Glide path inspection (structure, angle alignment, SDM, coverage)
- VOR coverage, north adjustment, interference measurements
- GBAS signal analysis incl. measurement of VDB

Use cases and key advantages

- ILS periodical measurements as specified by ICAO, to reduce ground-based inspection costs
- Special measurements to detect degradation of ILS/VOR signals coming from change of the surrounding infrastructure or moving structures (cranes, temporary buildings, ...)
- Support of ILS commissioning during/after installation of new systems or replacement/repair of antennas, potentially enabling a reduction of flight inspection efforts
- Special measurements to facilitate maintenance and problem detection; possibility of extensive offline data analysis
- Correlation with flight inspection data for overall optimization of ILS/VOR installations and preparation of an extension of flight inspection periods with the corresponding savings

Localizer DDM measurement results

Glide path ascent near threshold: DDM and level

For further information, please visit www.Colibrex.com or contact us:

Colibrex GmbH
Victoria Boulevard B109
77836 Rheinmünster
Germany
📞 +49 7227 9535 600
📞 +49 7227 9535 605
✉️ info@Colibrex.com
🌐 www.Colibrex.com

LS telcom worldwide entities:

LS telcom AG, Im Gewerbegebiet 31-33, 77839 Lichtenau, Germany | LS telcom UK Limited, Riverside House – Mezzanine Floor, 2a Southwark Bridge Road, London SE1 0HA, United Kingdom | LS telcom Inc., 5021 Howerton Way, Suite E Bowie, Maryland 20715, USA | LS of South Africa Radio Communications (Pty) Ltd., 131 Gelding Ave, Roodepoort, 1724 Johannesburg, South Africa | LS telcom SAS, 47, boulevard de Sébastopol 75001 Paris, France | LS telcom Limited, 1145 Hunt Club Road, Suite 100 Ottawa, ON, K1V 0Y3, Canada | RadioSoft Inc., 194 Professional Park Clarksville, Georgia 30523, USA | LST Middle East FZ-LLC, Office 2118, (21st Floor), Dubai Media City, Dubai, United Arab Emirates

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