



Flight Calibration Services

**Colibrex**

Smart Drone Solutions



**Drone Measurements**

**5** YEARS  
in Operational  
Use at DFS

## Drone-based NavAids Measurements

Colibrex/FCS NavAidDrone

An advanced system for NavAids inspection and calibration –  
setting new standards in CNS maintenance.

# NavAidDrone

## A cutting-edge solution for airborne and ground-based NavAids measurements

The Colibrex/FCS NavAidDrone is a compact, high-precision drone measurement system developed specifically for the commissioning and maintenance of terrestrial navigation aids, such as Instrument Landing Systems (ILS).

Unlike traditional ground-based systems, and thanks to its ability to fly precise routes and hover in defined positions, the NavAidDrone performs highly accurate airborne measurements—even in areas where the signal-in-space is fully established. For glide path antennas, clearance and width measurements can be performed without restriction. Localizer parameters are captured through automated arc flights, removing the need for service roads.

The NavAidDrone also supports precise data correlation with manned flight inspections. This includes the ability to fly partial approach profiles – enhancing consistency across all measurement methods. Additionally, the drone offers a unique capability for VOR validation: with just one circular flight in the vicinity of the installation, a complete check of CVOR/DVOR system performance can be performed – including the detection of bearing errors.

The NavAidDrone is the result of a strategic collaboration between Colibrex GmbH, specialists in drone-based RF

measurement systems, and FCS Flight Calibration Services GmbH, experts in global flight inspection services. The system meets the highest standards of traceability and reproducibility, in line with ICAO recommendations.



NavAidDrone and pilot in operation

The NavAidDrone isn't just a concept—it's a proven solution. Validated and operated for over five years by DFS Deutsche Flugsicherung in Germany, and deployed across Europe, Americas, Asia and Africa, it has become an integral part of regular ILS validation and maintenance procedures.

As pioneers in drone-based navigation aid inspection, we not only deliver a mature, field-tested system – but also provide expert guidance to help our customers successfully adopt and integrate this innovative technology into their own operations.

### From commissioning to routine checks: Real-world applications

The NavAidDrone delivers tangible advantages across multiple applications – increasing runway availability, lowering operational costs and emissions, and fully aligning with ICAO Doc 8071 standards.

It replaces and enhances ground inspections and complements or partially substitutes flight inspection (FI) in the following areas:

#### Pre-commissioning / Pre-calibration

- Enables precise alignment using NavAidDrone, with only a final validation flight check required

#### Fault finding

- Allows fast and targeted troubleshooting of navigation aids (e.g. phasing)

#### Routine checks

- Delivers FI-correlable measurement data
- Supports extended FI intervals or reduced FI programs (e.g. excluding alarm checks)

# NavAidDrone Highlights

## Measurement accuracy & reproducibility

The extremely lightweight receiver has been designed to cope especially with the measurement of “signal-in-space” from a moving platform. To guarantee that the DDM value can be measured at highest precision, an adaptive signal processing is implemented that adjusts filtering efforts in real-time. Unlike other standard ILS receivers, the measurement system of the NavAidDrone features high bandwidth internal processing and recording of the entire transmission channel, permitting in-channel separation of useful ILS signals and interference sources. Potential propeller modulation from the drone can thus be analyzed and eliminated.



Measurement of VOR signals

### The measurement system allows:

- All localizer (LOC) and glide path (GP) measurements, i.e. DDM, SDM, course/clearance ratio linearity
- Separate measurement of SBO components of an ILS signal, which can be very useful for commissioning work
- Separate analysis of course and clearance signal in a single measurement
- Optional VOR measurements, for Doppler-VOR, the system can also evaluate a single SBO antenna radiation in both LSB and USB
- Optional DME Measurement (available soon)

## A new standard in integration – Far beyond a basic setup

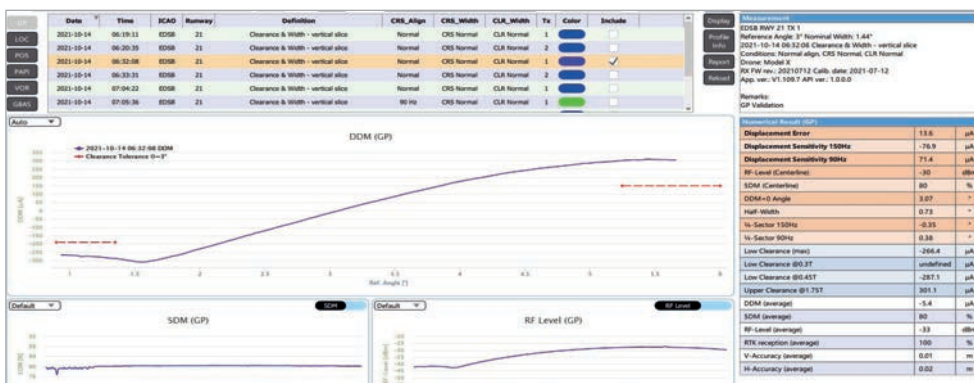
Unlike other concepts currently available or announced on the market, the NavAidDrone is not merely a drone equipped with a measurement receiver. It is a fully integrated system with purpose-built hardware and software.

To ensure optimal system performance, a full numerical simulation of the complete setup was conducted, including the custom-designed VHF/UHF antenna.

The most challenging aspect – achieving precise synchronization between time, drone position, and measurement data – has been successfully mastered and validated through an intensive test campaign. A GNSS receiver module incl. anti-jamming and anti-spoofing technology provides best-in-class RTK performance with 100 Hz output.

Special attention was given to electromagnetic compatibility (EMC) and minimizing interference in the measurement process.

Finally – and importantly – dedicated radio links provide robust system control, real-time telemetry, access to key measurement parameters, and efficient download of captured data.



Example of GP measurement results

# All-in-one software and workflow management

A seamlessly integrated software environment manages the entire workflow—from uploading airport data and handling coordinate transformations to selecting or creating measurement profiles, generating corresponding flight plans, controlling the drone, downloading and processing measurement data, and finally generating detailed measurement reports.

This unprecedented level of integration significantly streamlines on-site operations and accelerates the execution of measurement programs. Flight inspection experts will appreciate the familiar structure and detail of the generated reports.



Overview software (live measurement, waypoints & telemetry)

# Versatile and scalable drone platform

The NavAidDrone's flying platform is purpose-designed by Colibrex, with full control over the supply chain to ensure top-tier performance, ease of use, and operational safety.

### Key features include:

- Robust X8 frame with 4x2 motors for enhanced redundancy
- Open-source autopilot for mission flexibility, full control, and data confidentiality
- Swappable batteries approved for transport on commercial aircraft
- Removable arms, legs, and antennas for compact and convenient transport
- Camera payload for PAPI inspection



View of the NavAidDrone during night operation

# Safe operation and seamless airport integration

Operating drones in airport environments demands the highest safety standards. Beyond its highly redundant architecture, the NavAidDrone is equipped with multiple hardware and software safety features — including battery monitoring, safety lighting, mandatory geo-fencing, and an optional emergency parachute.

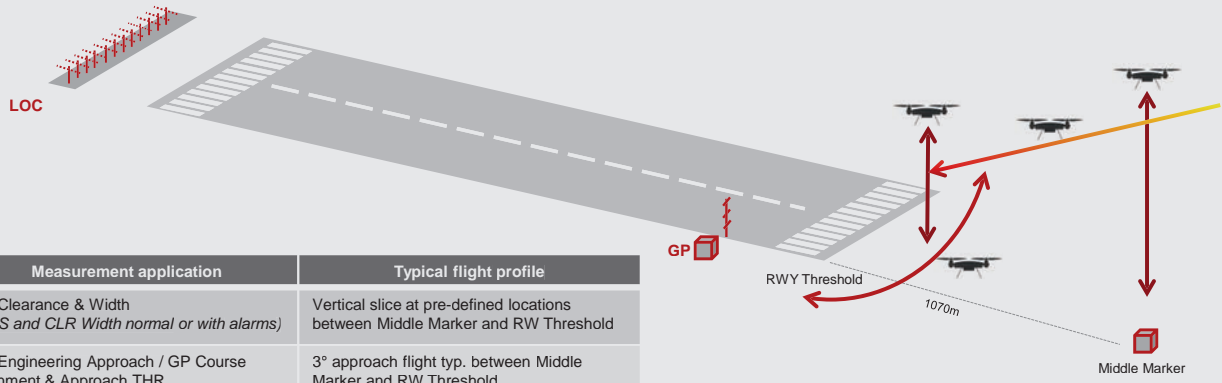
With open interfaces, the system is ready for integration into any UTM (Unmanned Traffic Management) platform. Parallel tracking of the NavAidDrone alongside manned aircraft is a key factor in gaining ATC acceptance and is embedded in a well-defined Concept of Operations (ConOps). Colibrex has been a certified drone operator since 2011 and has deployed the NavAidDrone at airports since 2018 — proving both safety and operational reliability in controlled airspace.



NavAidDrone operation without runway closure

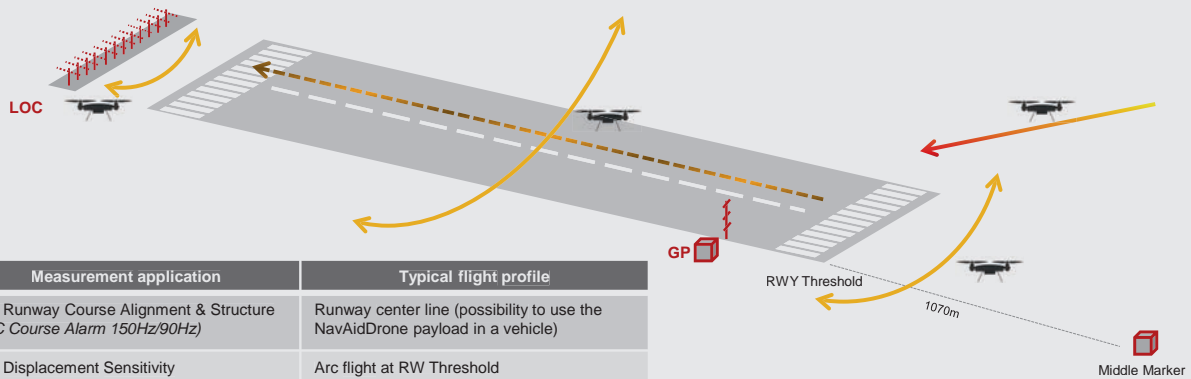
# NavAidDrone typical measurement flights

## For ILS Glide Path Inspection



Measurement application	Typical flight profile
GP Clearance & Width (CRS and CLR Width normal or with alarms)	Vertical slice at pre-defined locations between Middle Marker and RWY Threshold
GP Engineering Approach / GP Course Alignment & Approach THR	3° approach flight typ. between Middle Marker and RWY Threshold
GP Engineering / Sector ARC	Arc flight near to RWY Threshold

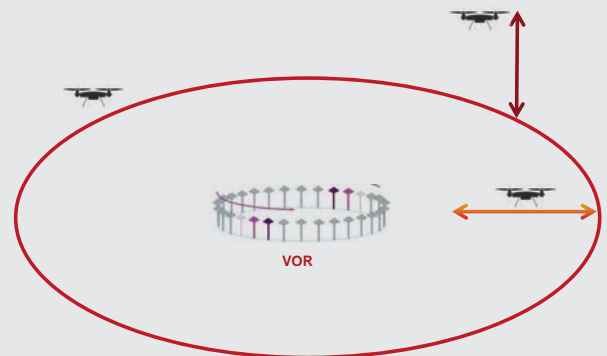
## For ILS Localizer Inspection



Measurement application	Typical flight profile
LOC Runway Course Alignment & Structure (LOC Course Alarm 150Hz/90Hz)	Runway center line (possibility to use the NavAidDrone payload in a vehicle)
LOC Displacement Sensitivity (CRS Width normal or with alarms)	Arc flight at RWY Threshold
LOC Clearance & Width Sector (CRS and CLR Width normal or with alarms)	Arc flight from a predefined point on the RWY
LOC Nearfield Sector	Arc flight near to LOC antenna
LOC Course Alignment	3° approach flight

## For VOR Inspection

Measurement application	Typical flight profile
VOR orbital inspection	CW/CCW Orbital flight at certain distance
VOR radial inspection	Radial flight in/outbound
VOR elevation view	Vertical flight at a predefined point



# It's all about **accuracy, efficiency and safety** – 10 reasons to choose the NavAidDrone:

Key Points	Benefits
SISMOS measurement technology	<b>1</b> Measures the true signal-in-space – unmatched for fault-finding and pre-commissioning work
Lightweight, dual-antenna design	<b>2</b> Purpose-built for the drone platform, minimizing external influences and maximizing measurement accuracy
Advanced RTK GNSS with anti-spoofing/jamming	<b>3</b> High-precision and reproducible measurements with robust operational integrity
Purpose-designed, deployable drone platform	<b>4</b> Custom-built and independent solution. Removable components and air-transportable batteries enable fast logistics and easy deployment
Built-in safety & failsafe feature, proven safety and reliability	<b>5</b> Engineered for safe operation in demanding airport environments, with readiness for UTM integration, real-time tracking and BVLOS operation
Flight inspection-grade validation	<b>6</b> Fully compliant with ICAO Doc. 8071 for ground inspections and industry-leading accuracy for correlation with flight checks
All-in-one mission software	<b>7</b> Seamless planning, control, live data monitoring, and reporting – all in a single, integrated interface
Automated workflows and data reuse	<b>8</b> Streamlines routine inspections and builds reliable correlation datasets to extend or optimize flight inspection programs
Scalable purchase and service models	<b>9</b> Includes calibration and maintenance support, tailored to operational needs – ready for PAPI and DME measurements
Designed by CNS experts for CNS users	<b>10</b> Backed by Colibrex's unmatched operational experience – expert support for a smooth transition to drone-based inspection

FDA

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