Precision Flight and Autonomy for Industrial Inspection of Aircraft and Other Complex Objects

Klaus Sonnenleiter
Co-Founder, CEO
(p): 201 925 5391
(e): klaus@luftronix.com
(skype): klaussxon2
Video
Safety. For industrial inspections, drones need to navigate through complex objects and keep a safe distance from the objects they inspect.

Automation. To decrease the amount of operator interference required during the inspection process, precise and reliable flight paths are a necessary condition.

Repetition. Getting a second look, possibly from a close-up, may be necessary for artifacts that show inconclusive results - precise flight paths permit to come back to the exact location.

Comparison. With guaranteed precision, flight paths can be repeated for verification purposes: Find a problem, fix it, verify that it’s fixed. During future inspections, the location can be added to a watch list.
Generating a High-Precision Reference System Using Patented Fused Flow™ Method

- Displacement is measured optically while the camera moves in a horizontal direction using a technique known as “optical flow”
- Results are calibrated and corrected using distance sensors or a 3D camera and Luftronix Fused Flow™ algorithm
- No requirement for GPS
- Uses markers on the floor and known points on the airframe for reference
- Generates precise location meta data that is added to the sensor data collected during flight
- Flight path simulation using Luftronix Orchestrator™
Collecting Data

- Drones change how sensors are mounted, but preserve known and working mechanisms
  - Data collection methods do not change, but flexibility and speed increases
  - Minimal approval requirements
  - Implicit ability to share data remotely
- Data collected during flight can be “stitched” to match geometry of the airframe
- Coverage guarantees by matching flight paths with airframe geometry
- Data viewers for different review methods including remote analysis
Benefits of Using Drones for Inspection

- **Reduce time** spent on identifying potential problems
- Make data collection instantly reproducible - repeat, zoom, verify
- Enable change management using comparison data from different snapshots over time
- Enable remote analysis of data
- Reduce the need for experts to travel to where the problem occurred
- Most importantly: *Increase efficiency*
Questions

Klaus Sonnenleiter
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(p): 201 925 5391
(e): klaus@luftronix.com
(skype): klausson2
Luftronix Roadmap

3D Motion Control for Entertainment

Autonomous navigation in GPS-denied space

Precision navigation for commercial applications

Fully automated industrial inspections

before 2010
2014
2015
2016
2017

Precision Navigation with Patented Fused Flow™

Industrial Scale Mapping Using 3D Model

Launch of Luftronix drones

Autonomous Sense&Avoid

Multi-Drone Operations

Full Autonomy in Complex Airspace

Real-time Motion Control Managing Thousands of Objects

Eleks, Inc Research Lab

Luftronix
Precision Flight Architecture

Flight Control Unit (FCU)  Data Acquisition Unit (DAU)

Position Estimator

Fused Flow™

INS/IMU

Relative HRS  Absolute HRS

Mapper

3D Optical Flow

Optical Flow  LPS  Model

Map

Gyro Comp.