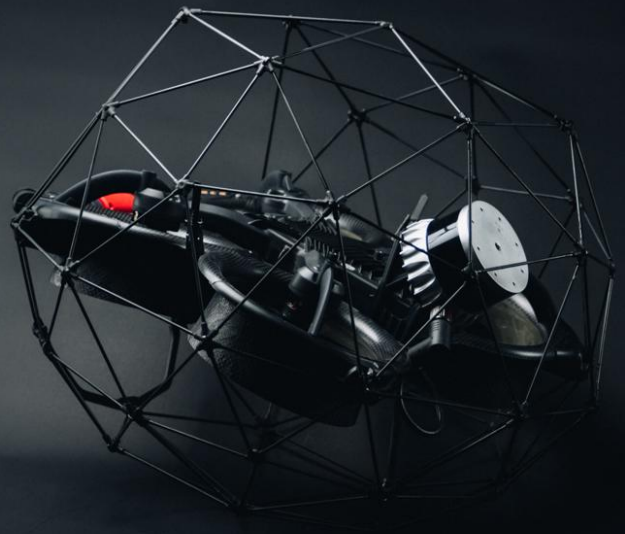
FLYABILITY

SAFE DRONES FOR INACCESSIBLE PLACES



How Inspectors Are Using Elios 3's 3D Models in the Field

Wednesday, February 1 2022

4 PM - 5 PM CEST / 10:00 AM - 11:00 AM EST

MODERATOR

Zacc Dukowitz
Senior Communications Manager
—Flyability—

PANELISTS

Adrien Briod
Co-founder and CTO
—Flyability—

Charles Rey
Global Field Operations Manager
—Flyability—

WEBINAR ENGAGEMENT

Ask questions during the webinar.

REPLAY

The recording of this webinar will be sent to you afterward.

AGENDA

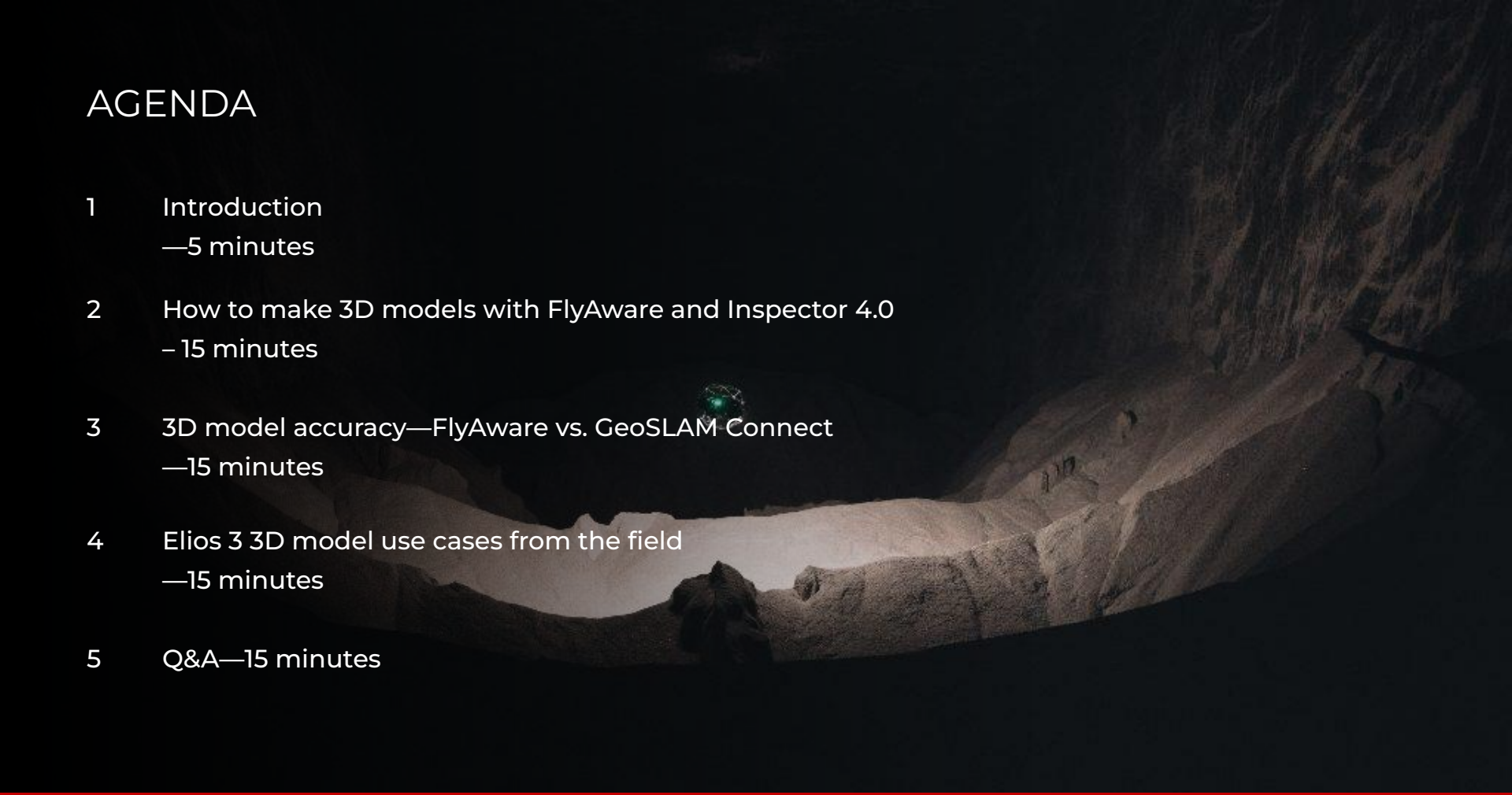
1 Introduction
—5 minutes

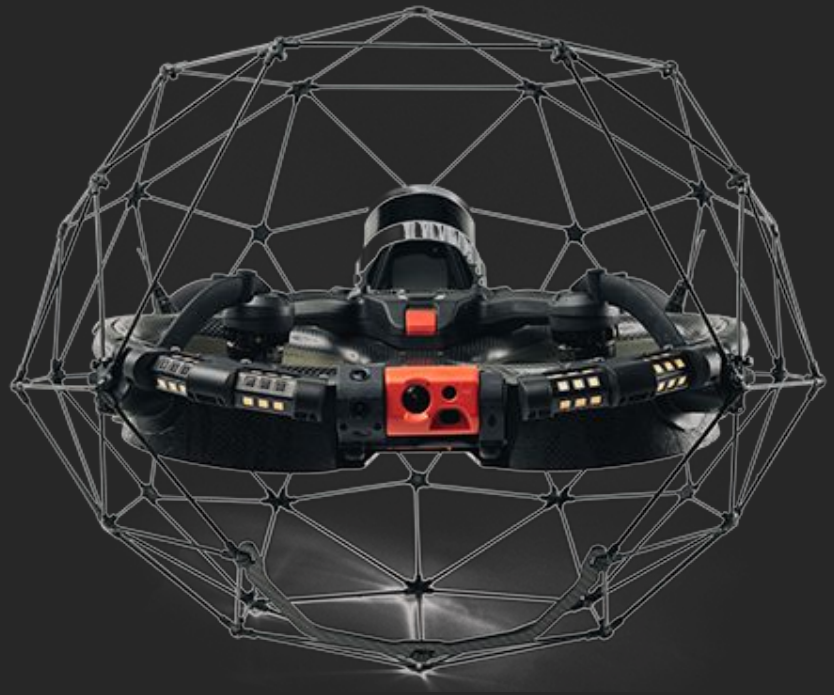
2 How to make 3D models with FlyAware and Inspector 4.0
– 15 minutes

3 3D model accuracy—FlyAware vs. GeoSLAM Connect
—15 minutes

4 Elios 3 3D model use cases from the field
—15 minutes

5 Q&A—15 minutes





How to make 3D models with FlyAware and Inspector 4.0

Important steps for an inspection

Step one:

Preparation of the inspection

- Clear objective
- Assessment of the risks
- Decompose your inspection (what will you inspect in each flight)
- Preparation of the material

Step two:

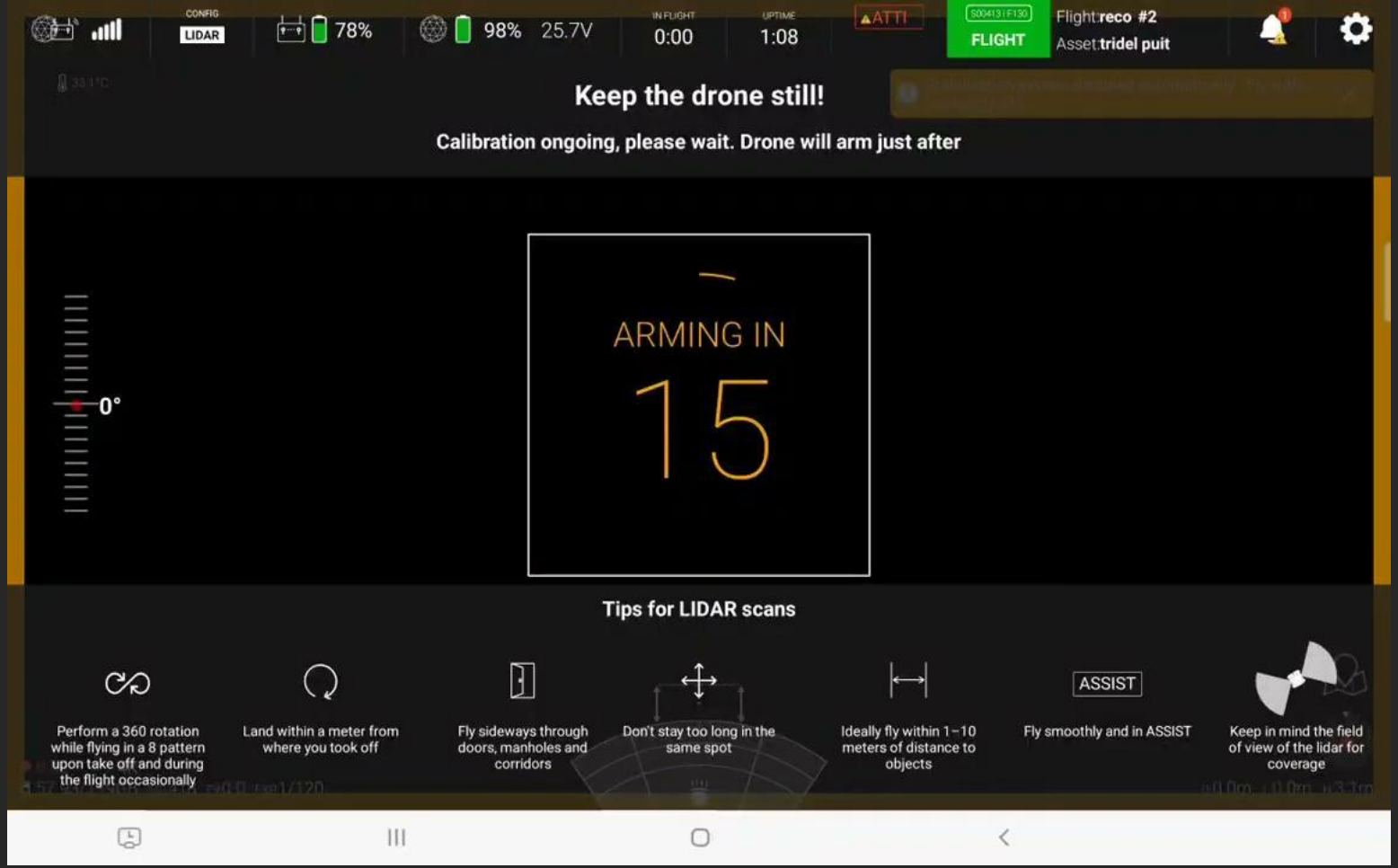
Performing the inspection

- Perform your flights
- Check the quality of the data

Step three:

Post processing of the data

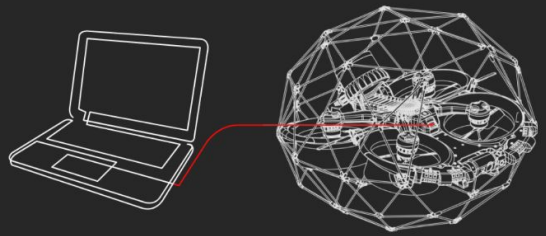
- Review your flights
- Create your inspection reports in Inspector
- Create the model in Geoslam


CONFIG
LIDAR
78%
98%
25.7V
IN FLIGHT
0:00
UPTIME
1:08
ATTI
FLIGHT
Flight:reco #2
Asset:tridel puit
Keep the drone still!
Calibration ongoing, please wait. Drone will arm just after
0°
ARMING IN
15
Tips for LIDAR scans
Perform a 360 rotation while flying in a 8 pattern upon take off and during the flight occasionally
Land within a meter from where you took off
Fly sideways through doors, manholes and corridors
Don't stay too long in the same spot
Ideally fly within 1–10 meters of distance to objects
ASSIST
Fly smoothly and in ASSIST
Keep in mind the field of view of the lidar for coverage

IMPORT FLIGHTS

ELIOS 3

Not connected



Connect **Elios 3** to your computer
After you plug the drone you will automatically be redirected to the import page to get the data of your drone
Drone booting may take about 1 minute

TIPS TO CONNECT

Check that the drone is powered on
Drone booting may take about 1 minute

Drone LED is steady purple

Use recommended cable provided with the drone
⚠ USB 3 cable required

Check that the Avionics and Camera SD cards are mounted in Windows file explorer

Import Flights

ELIOS 2

Connect **Elios 2** to your computer

OR

Select files from your PC manually

Log files location

Browse

Video files location

Browse

Import Flights

239-ROOM 280 RE...

IMPORT FLIGHTS

List idle files | Import debug files | Refresh

All

Boiler 1

294-Andrea [0]	04:43	23/09/2022 15:40	5.85 GB	Elios 3	Flight	New		
293-andrea [1]	03:03	23/09/2022 15:32	3.91 GB	Elios 3	Flight	New		
292-andrea [0]	03:05	23/09/2022 15:28	3.98 GB	Elios 3	Flight	New		
291-lara [2]	03:31	23/09/2022 15:20	4.61 GB	Elios 3	Flight	New		
290-lara [1]	03:33	23/09/2022 15:16	4.61 GB	Elios 3	Flight	New		
289-lara [0]	05:17	23/09/2022 15:00	6.74 GB	Elios 3	Flight	New		
288-reco [1]	05:56	23/09/2022 14:48	7.52 GB	Elios 3	Flight	New		
287-reco [0]	06:56	23/09/2022 14:32	8.88 GB	Elios 3	Flight	New		

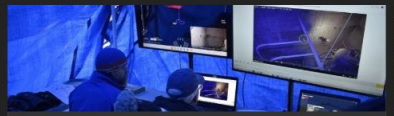
Destination

C:/Users/charles.rey_flyabili/Documents/inspector

Browse

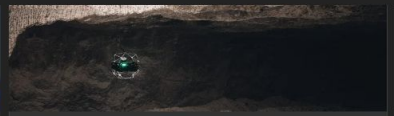
4.3.0.253

NEWS



In Historic Mission, DOE Site Uses Elios 3 to 3D Map Radioactive Waste Storage Vault

Monday, 23 January 2023



Flyability adds CHF 15 million in new funding led by SBI Investment, with participation from Cargill, Verve Ventures, and existing investors...

Wednesday, 7 September 2022

Sigma Enterprises partners with Flyability to bring world class indoor drones to United Arab Emirates

Wednesday, 6 July 2022

ABDULLA FOUAD partners with Flyability to bring world class indoor drones to Saudi Arabia

Tuesday, 7 June 2022

Flya dro

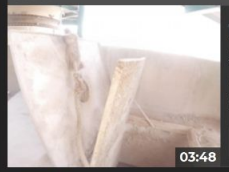
Thur

RECENT FLIGHTS

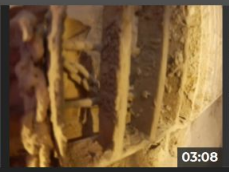
Open flight...

search

Order by: Flight Name

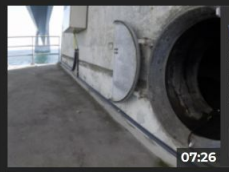


170-inspection C1 [67]
Apr. 27, 2022 13:03 | **642 MB**
Inspection: C1
Open in file explorer
Elios 2 Map



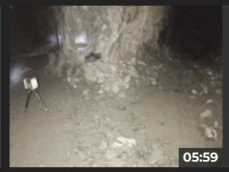
173-inspection C1 [70]
Apr. 27, 2022 13:37 | **517 MB**
Inspection: C1
Open in file explorer
Elios 2 Map

191-1recon-last scan 3rd ... [0]
Jan. 17, 2023 08:19 | **8.75 GB**
Inspection: lvl150-beam1
Open in file explorer
Elios 3



193-SOUTH EAST PILLAR... [1]
Sep. 01, 2022 12:06 | **8.82 GB**
Inspection: STOREBAELT
Open in file explorer
Elios 3

204-tunnel 2 [1]
Jun. 02, 2022 09:37 | **10.3 GB**
Inspection: arvel
Open in file explorer
Elios 3

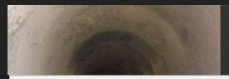


238-Stope - 280 Reco fl... [0]
Oct. 03, 2022 07:29 | **7.18 GB**
Inspection: Mine Semei
Open in file explorer
Elios 3

239-room 280 2 openings [1]
Oct. 03, 2022 07:42 | **7.68 GB**
Inspection: Mine Semei
Open in file explorer
Elios 3

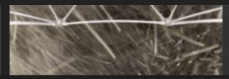
240-Stope - 280 2 entry [2]
Oct. 03, 2022 08:13 | **8.46 GB**
Inspection: Gold Mine Semei
Open in file explorer
Elios 3

241-Mine at - 350m [3]
Oct. 03, 2022 08:24 | **6.76 GB**
Inspection: Gold Mine Semei
Open in file explorer
Elios 3



246-big pipe [6]
Nov. 12, 2021 19:29 | **1.29 GB**

249-stack [0]
Oct. 05, 2022 10:50 | **7.08 GB**

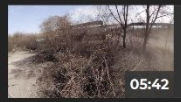


256-orepass 2 [2]
Oct. 10, 2022 11:10 | **9.95 GB**

4.6.0.253

239-ROOM 280 2 O...

AM Kazakhstan



Elios 3

249-stack [0]

Oct. 05, 2022 10:50 | **7.08 GB**

Inspection: **AM Kazakhstan** Elios 3

Path: C:/Users/charles.rey_flyabili/Documents/Inspector/249- AM Kazakhstan-stack-00 delete

Gold Mine Semei

Elios 3

241-Mine at - 350m [3]

Oct. 03, 2022 08:24 | **6.76 GB**

Inspection: **Gold Mine Semei** Elios 3

Path: C:/Users/charles.rey_flyabili/Documents/Inspector/241-Mine Semei-mine 350 . 2-03 delete

Elios 3

240-Stope - 280 2 entry [2]

Oct. 03, 2022 08:13 | **8.46 GB**

Inspection: **Gold Mine Semei** Elios 3

Path: C:/Users/charles.rey_flyabili/Documents/Inspector/240-Mine Semei-room 280 2 openin delete

Mine Semei

Elios 3

239-room 280 2 openings [1]

Oct. 03, 2022 07:42 | **7.68 GB**

Inspection: **Mine Semei** Elios 3

Path: C:/Users/charles.rey_flyabili/Documents/Inspector/239-Mine Semei-room 280 2 openings-01 delete

Elios 3

238-Stope - 280 Reco flight [0]

Oct. 03, 2022 07:29 | **7.18 GB**

Inspection: **Mine Semei** Elios 3

Path: C:/Users/charles.rey_flyabili/Documents/Inspector/238-Mine Semei-room 280-00 delete

STOREBAELT

Elios 3

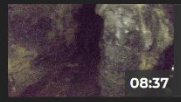
193-SOUTH EAST PILLAR INSIDE TRY 2 [1]

Sep. 01, 2022 12:06 | **8.82 GB**

Inspection: **STOREBAELT** Elios 3

Path: C:/Users/charles.rey_flyabili/Documents/Inspector/193-STOREBAELT -SOUTH EAST PILL delete

valorbe



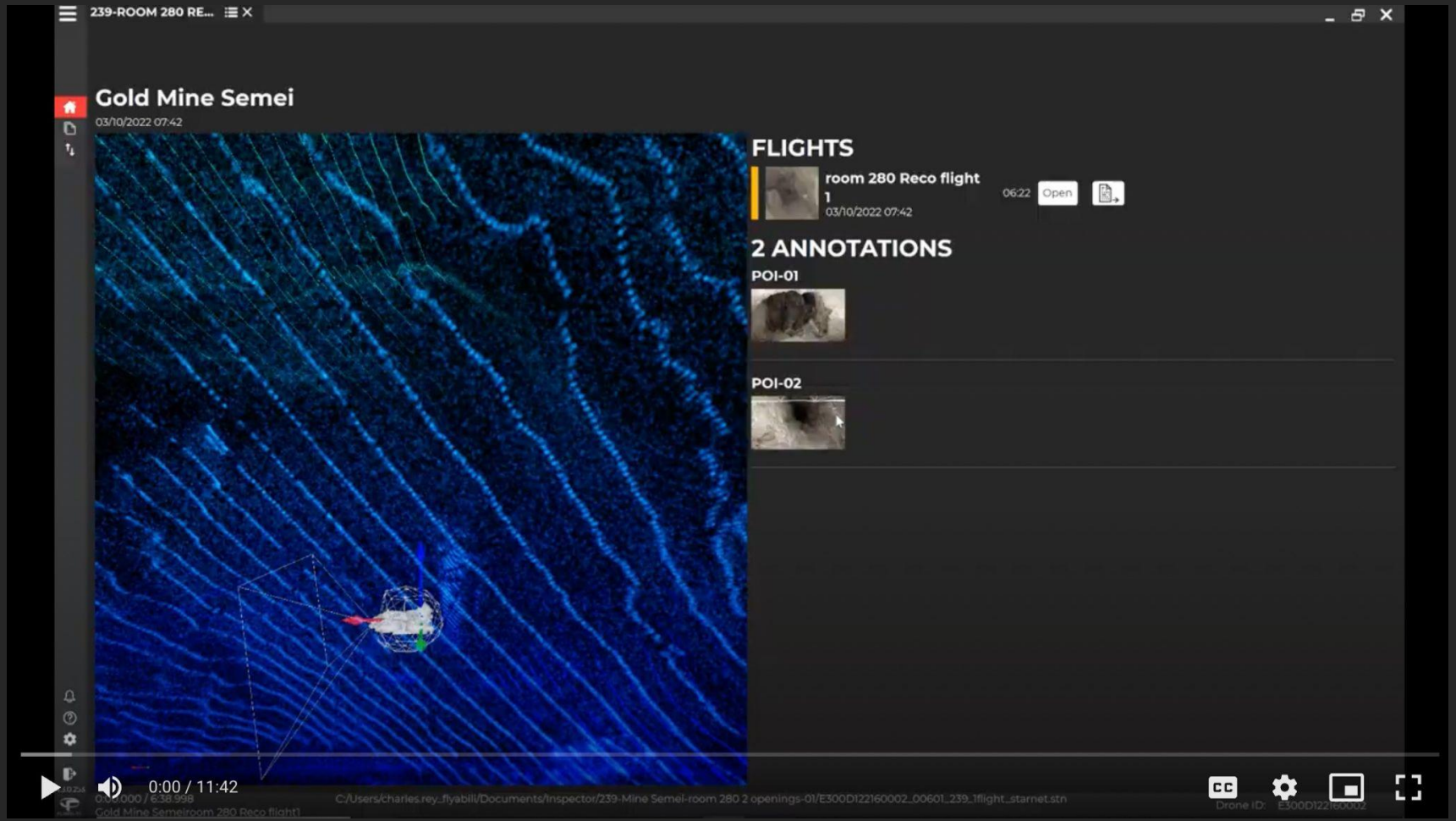
Elios 3

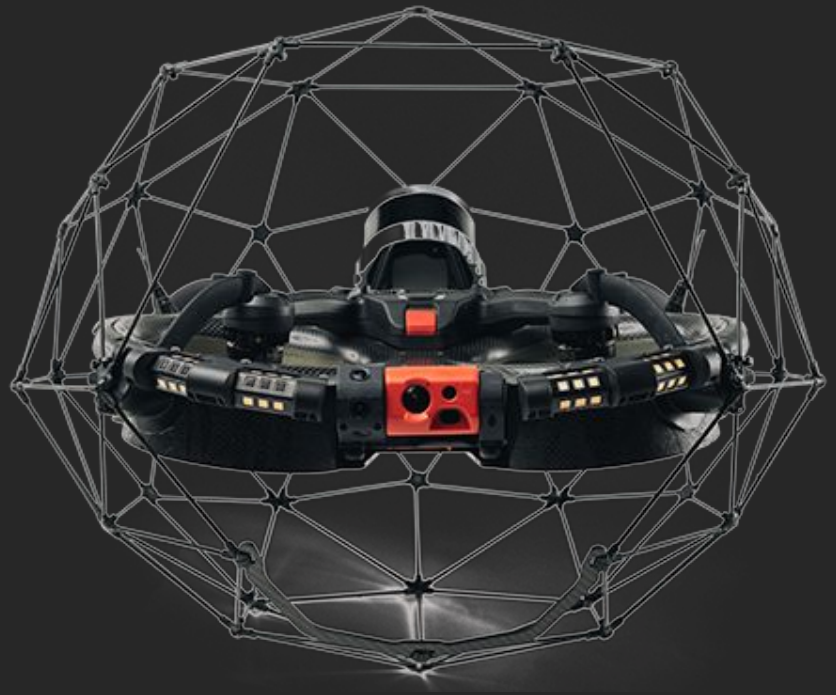
97-reco long tunnel [2]

Jun. 14, 2022 14:08 | **5.67 GB**

Inspection: **valorbe** Elios 3

Path: C:/Users/charles.rey_flyabili/Documents/Inspector/097-valorbe-reco long tunnel-02 delete

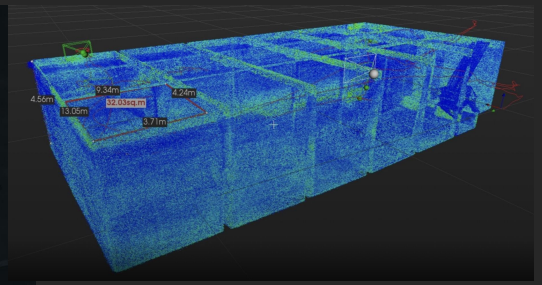

239-ROOM 280 RE...
Gold Mine Semei
03/10/2022 07:42
FLIGHTS
room 280 Reco flight 1
03/10/2022 07:42
06:22
Open
2 ANNOTATIONS
POI-01
POI-02
0:00 / 11:42
C:/Users/charles.rey_flyabil/Documents/Inspector/239-Mine Semei-room 280 2 openings-01/E300D122160002_00601_239_1flight_starnet.stn
Gold Mine Semeiroom 280 Reco flight1
Drone ID:

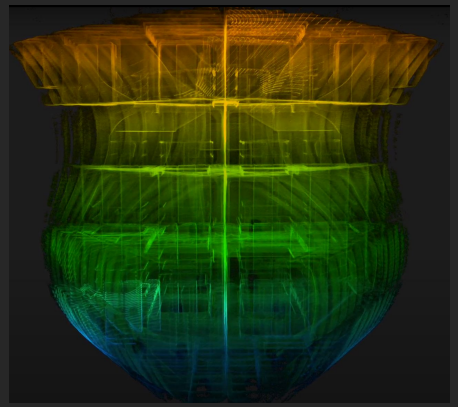


Elios 3 3D model accuracy—FlyAware vs. GeoSLAM Connect

FlyAware vs. GeoSLAM Connect

Product	**FlyAware** Flyability's SLAM engine, used on Elios 3's piloting app (Cockpit) and Inspector 4.0		**GeoSLAM Connect** GeoSLAM's 3D mapping SW	





FlyAware vs. GeoSLAM Connect

Product	**FlyAware** Flyability's SLAM engine, used on Elios 3's piloting app (Cockpit) and Inspector 4.0	**GeoSLAM Connect** GeoSLAM's 3D mapping SW
Description	Processed live on Elios 3. SLAM Algorithm focused on robustness in most conditions. No capture guideline, meant to work in any inspection flight. SW features targeting inspection and reporting	Post processing only. SLAM Algorithm focused on high accuracy. Following capture guidelines is recommended SW features targeting surveying.
Use-case	*"When localizing the drone or inspection data matters"* Situational awareness during piloting from the live map displayed on Cockpit. Data localization of defects and creating reports with localized data.	*"When the 3D model matters"* Survey grade 3D point clouds and further processing of point clouds (e.g. georeferencing, merging, floor plans, volume monitoring, etc)

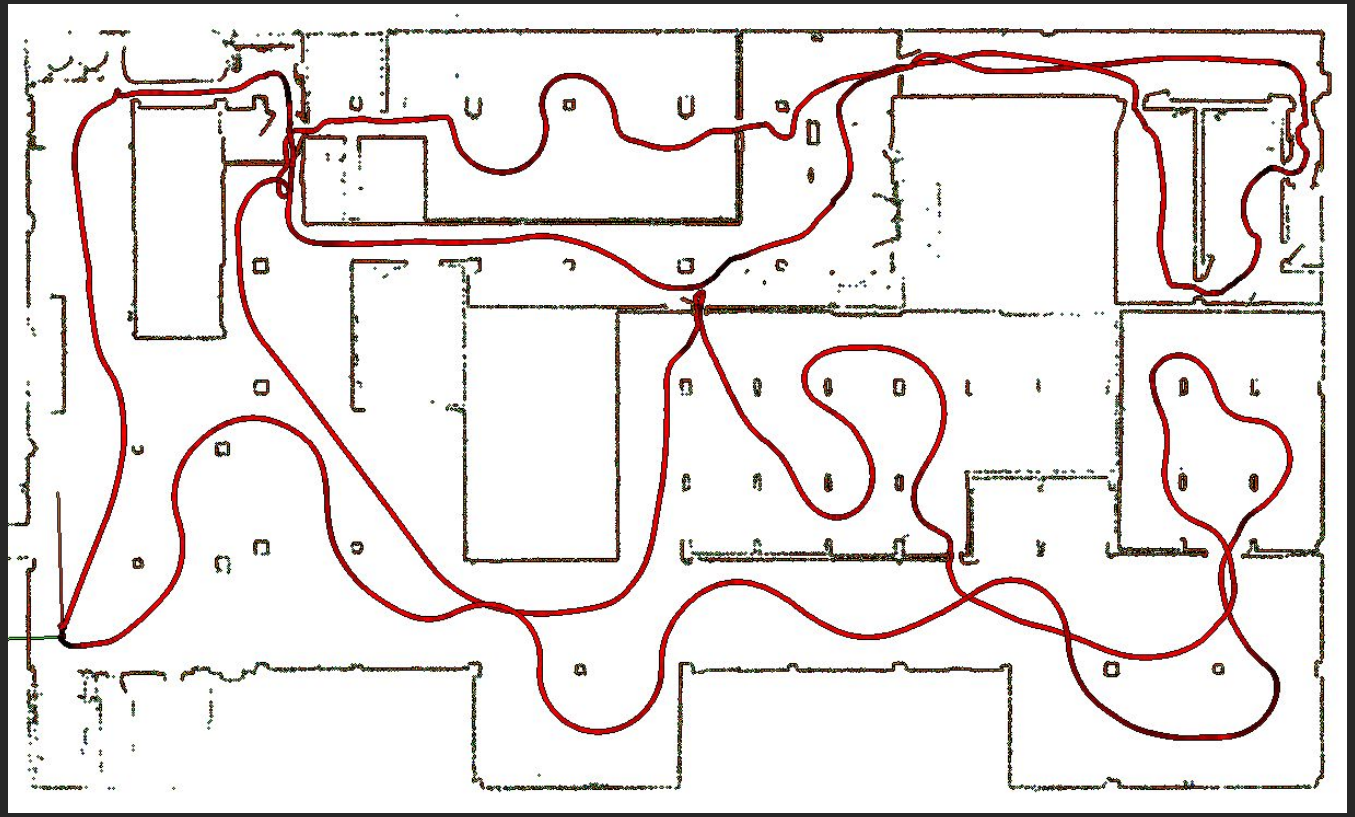
How accurate is FlyAware compared to GeoSLAM Connect?

GeoSLAM and FlyAware comparison—methodology

Same datasets as the thorough evaluation of GeoSLAM Connect's accuracy ("TESTING GLOBAL ACCURACY AND GEOREFERENCED ACCURACY IN 3D MAPPING WITH THE ELIOS 3 AND GEOSLAM CONNECT")

Ground truth of 70x40m factory floor was captured with a Riegl TLS (6 hours of work), with 15 targets placed all over the asset.

GeoSLAM and FlyAware comparison—methodology

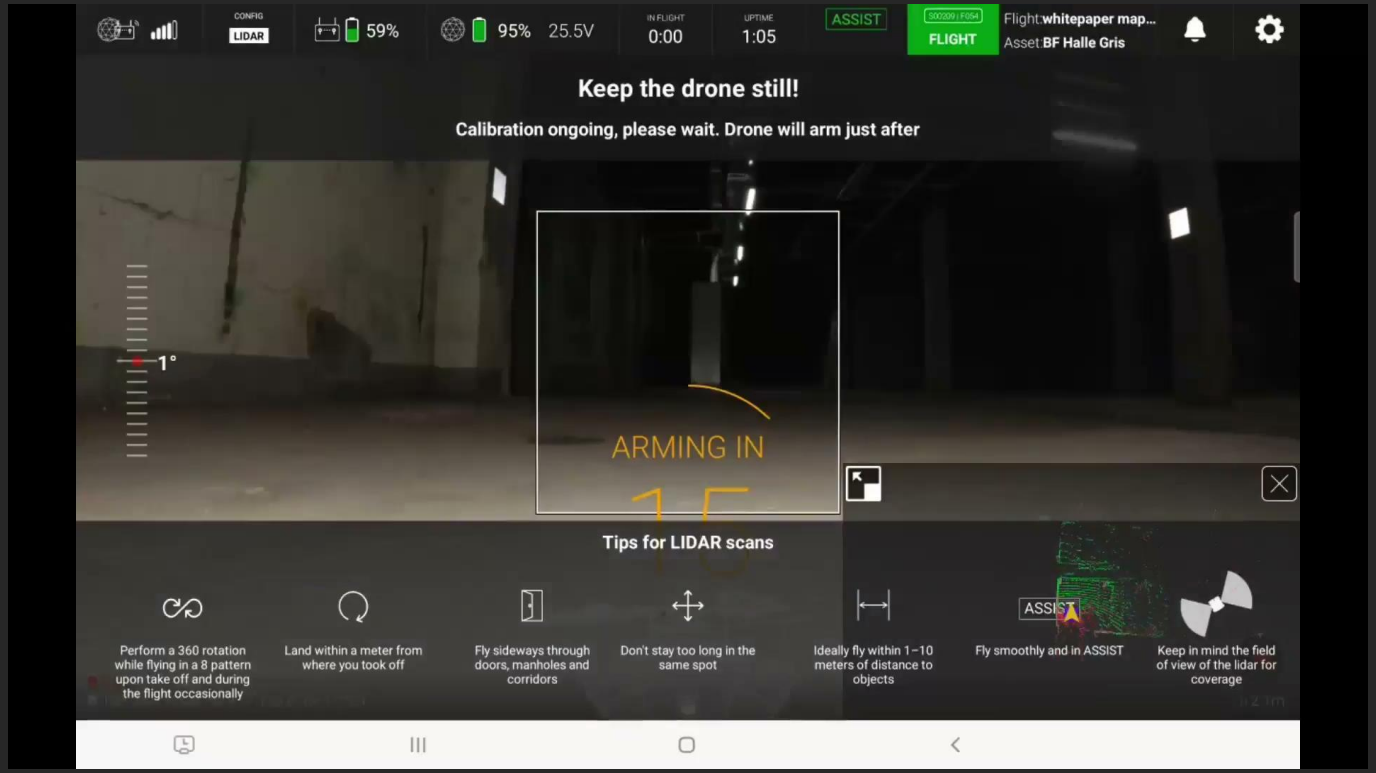


3 scans were captured with E3 (each scan capturing the full asset, in 8.5 minutes of flight)

Each scan was processed with GeoSLAM Connect and FlyAware

The 6 scans were compared to the Riegl ground truth

GeoSLAM and FlyAware comparison—methodology



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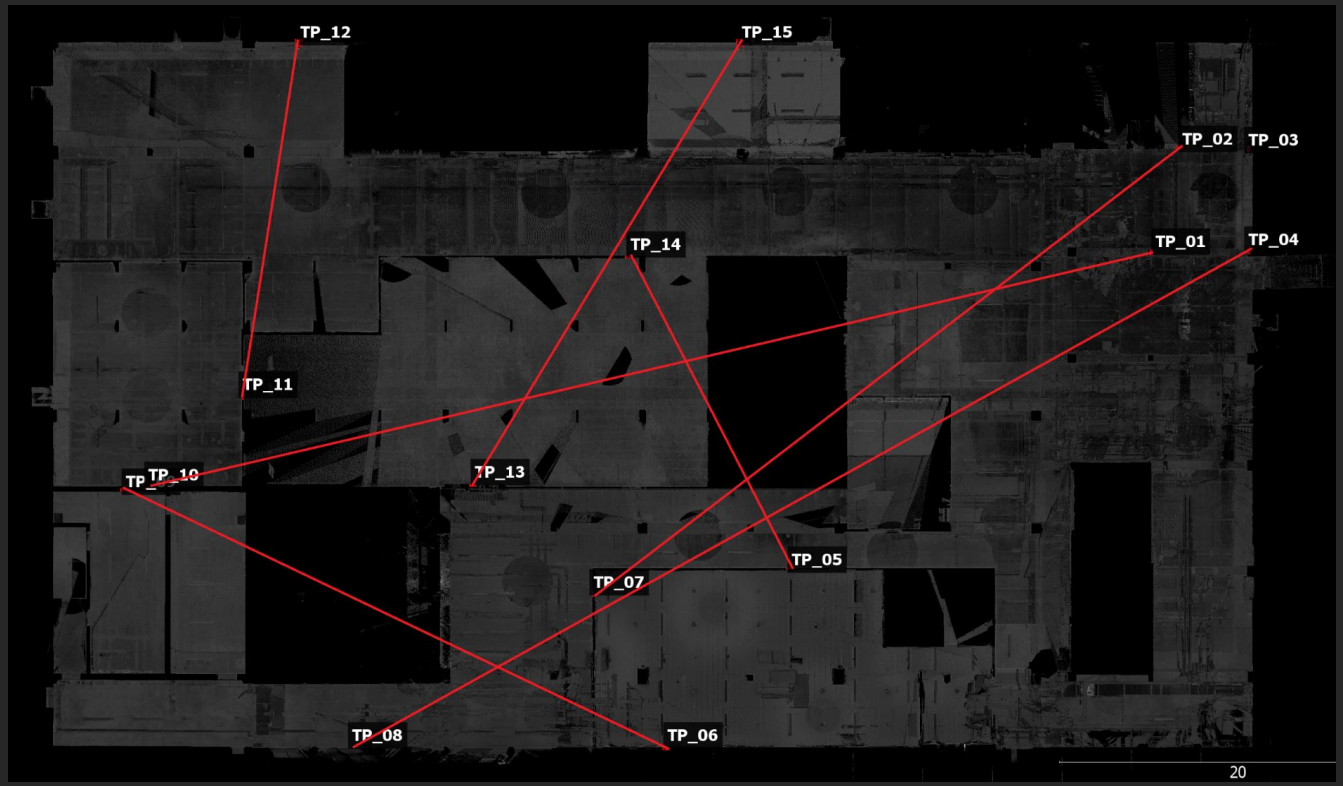
GeoSLAM and FlyAware comparison



Distance (20-60m) measurements compared to the ground truth:

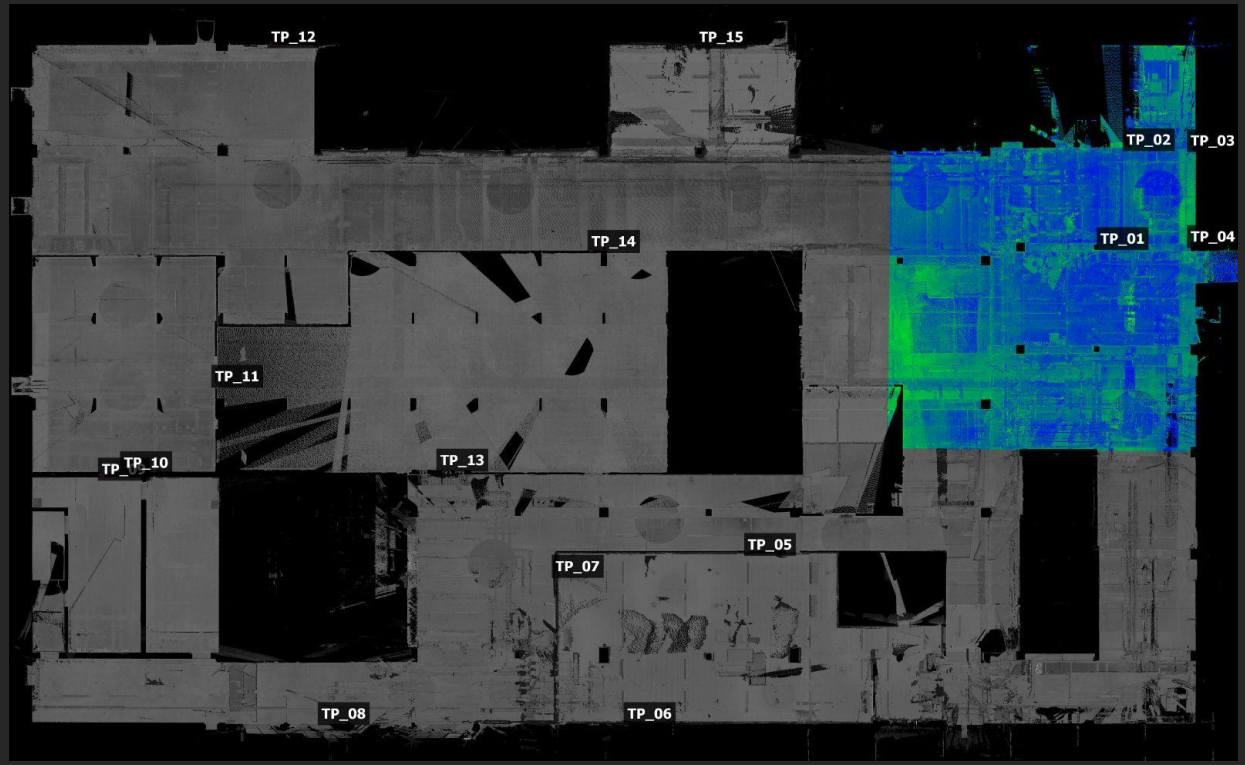
Average FlyAware error*: **18.3cm**

Average GeoSLAM error*: **3.5cm**

→ **~5x improvement**

*RMS error of the 3 scans, then averaged among the 7 distances

GeoSLAM and FlyAware comparison



Alignment of E3 scan with Riegl ground truth around take-off location, and evaluation of XYZ error of each target

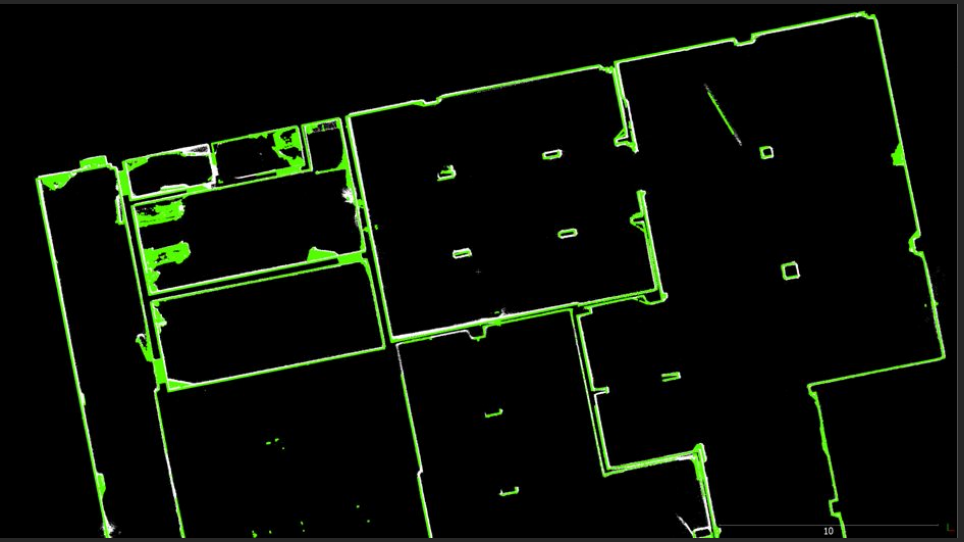
Avg FlyAware error: ~**1.4%**
(e.g: 1.4m on a 100m distance)

Avg GeoSLAM error: ~**0.2%**
(e.g: 20cm on a 100m distance)

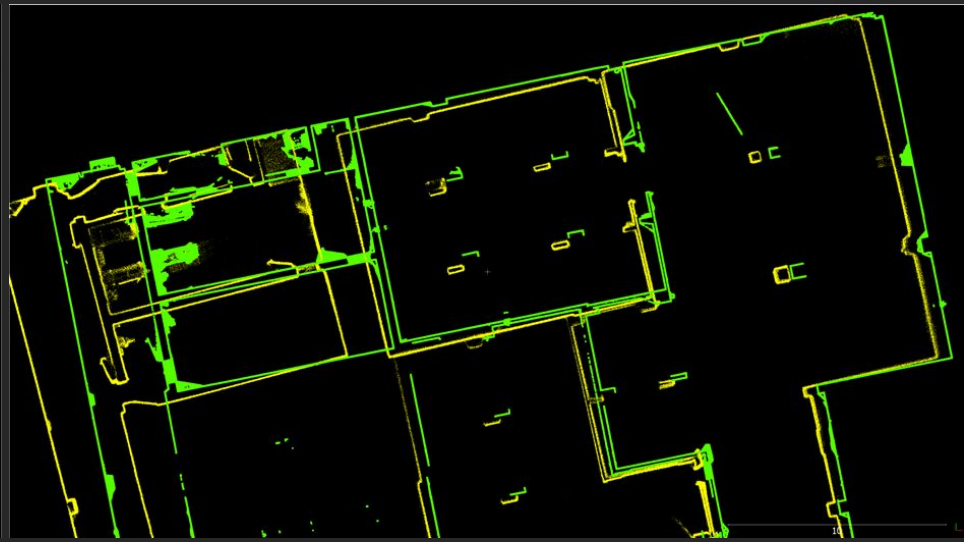
→ ~7x improvement

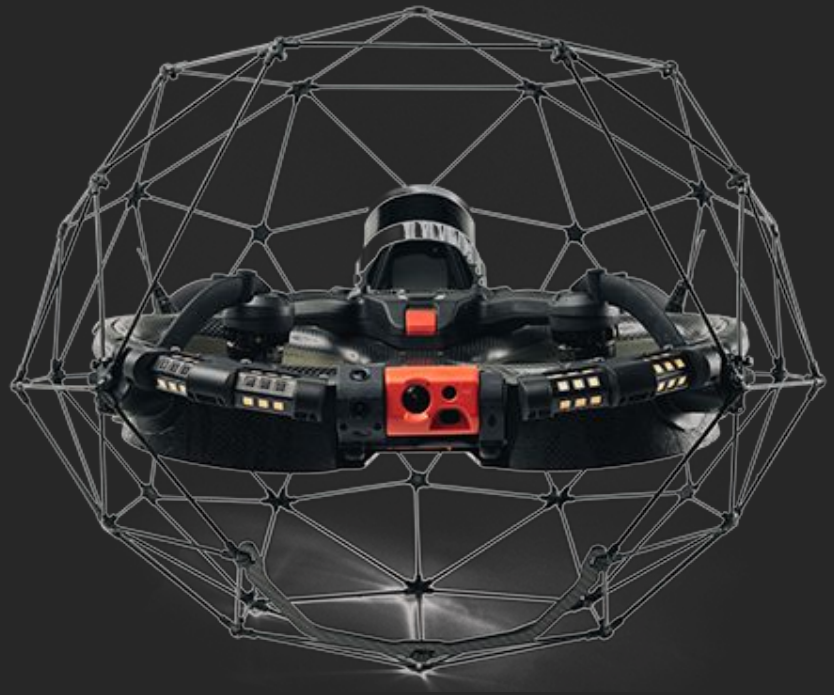
GeoSLAM vs. FlyAware—visuals comparison

GeoSLAM (white) vs Riegl ground truth (green):



FlyAware (yellow) vs Riegl ground truth (green):



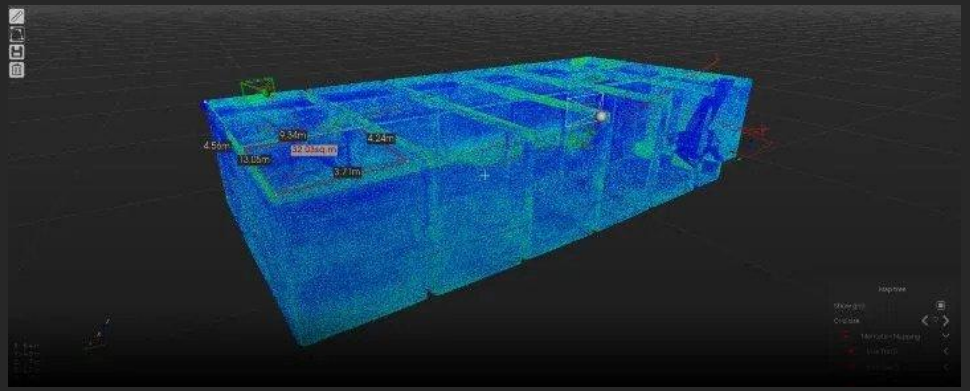


Elios 3 3D model use cases from the field

Primary Use Cases for FlyAware and Inspector 4.0

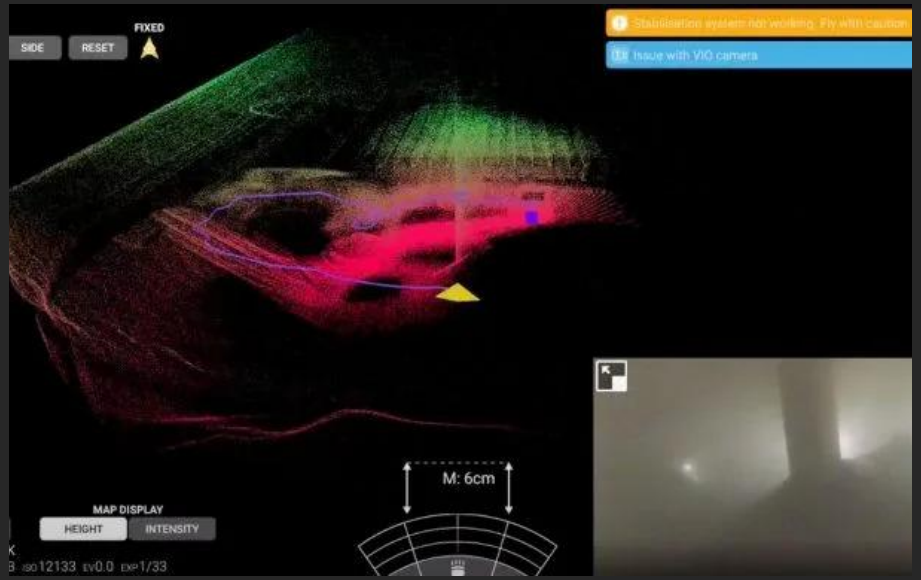
Here are the primary ways inspectors are using the 3D models you can make with the Elios 3's FlyAware in their work:

- Flying in dusty environments
- Ensuring full coverage
- Localizing inspection data
- Enhanced situational awareness during inspections
- Improving knowledge of unknown places



Case study: Flying in a dusty cement silo

A cement plant in France wanted to 3D map the interior of a clinker silo to measure its volume—but the silo was almost too dusty to see for flying.



Industry

Cement

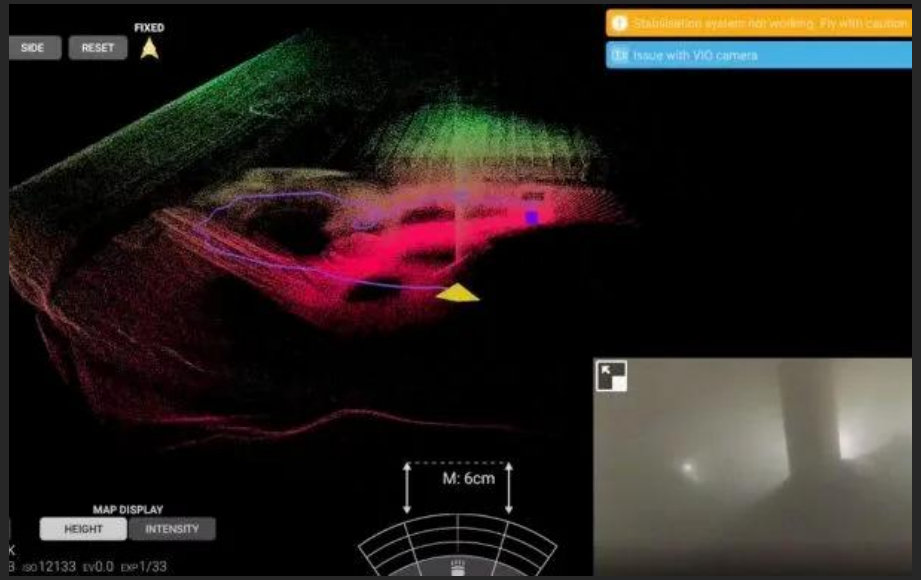
Asset/environment

Silo

Traditional approach

Standing on a platform at 25 meters (80 feet) in the air inside a clinker silo and poke into the clinker stored below with a long pole.

Case study: Flying in a dusty cement silo



Benefits

Dusty flying. FlyAware made it possible to fly despite the high volume of dust.

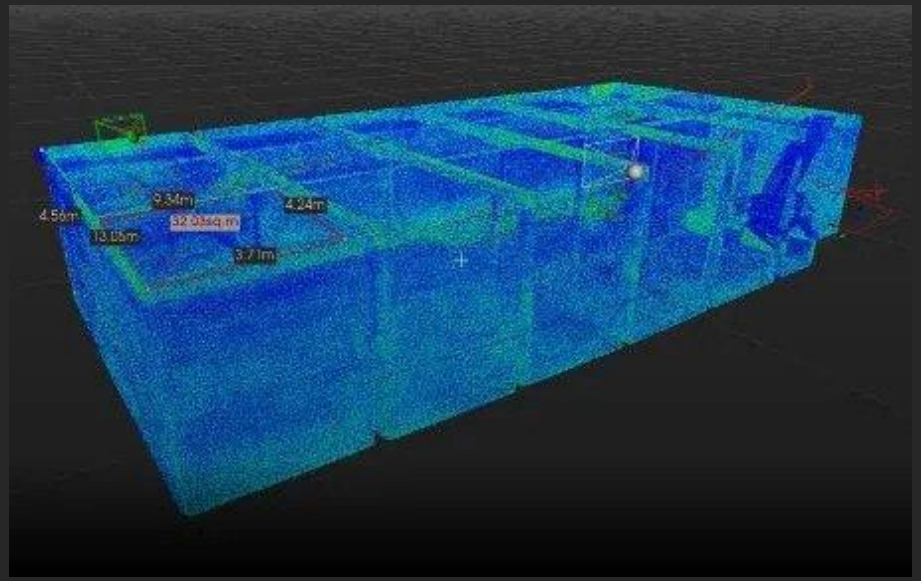
Safety. No one had to climb onto an unstable platform 25 meters (80 feet) in the air to collect data.

Speed. Ten minutes for data collection.

Read the full case study.

Case study: Ensuring full coverage in a cargo tank inspection

Inspectors used the Elios 3's 3D maps from FlyAware during a cargo tank inspection on an oil tanker to ensure full coverage and avoid the need for confined space entry.



Industry

Oil and gas

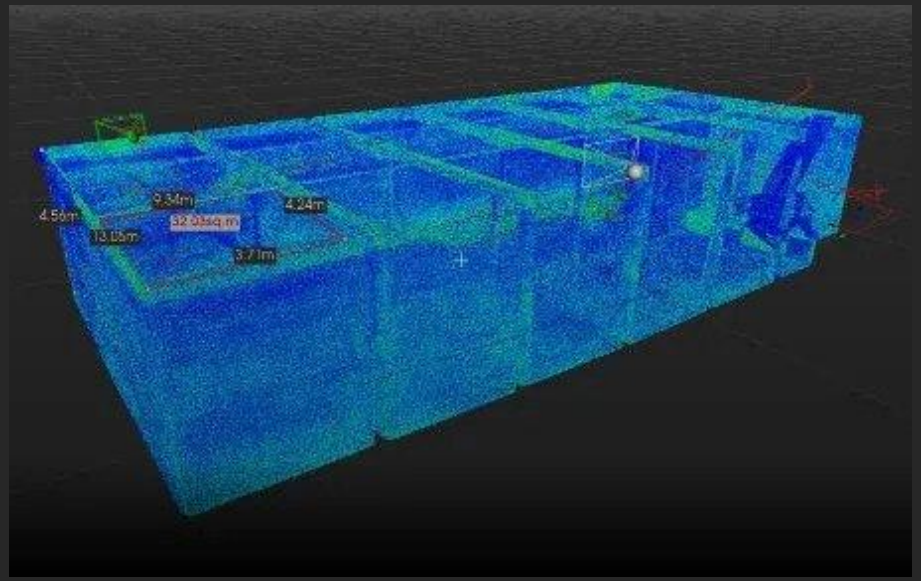
Asset/environment

Cargo tank on an oil tanker

Traditional approach

Erecting scaffolding within the tank and standing on it to collect visual data, risking work at height, confined space entry, and the chance of leaving materials behind after the inspection.

Case study: Ensuring full coverage in a cargo tank inspection



Benefits

Full coverage. The 3D Live Map guaranteed full coverage, meeting inspection requirements.

Safety. No one had to enter the tank to ensure full coverage.

Speed & labor. Half a day of work with no dry dock required vs. 15 people working for a full day in dry dock.

*This case study hasn't been published yet.

Case study: 3D mapping old slate mines

Luxembourg's division of Mines, Mining, and Quarries used the Elios 3 to 3D map an old slate quarry that was being turned into a museum.

Industry

Mining

Asset/environment

Old slate mine

Traditional approach

Handheld LiDAR could collect some of the information needed to 3D map the old mine but it would have had gaps and the process would be much more dangerous, given the unknown conditions inside the mine.

Case study: 3D mapping old slate mines

Benefits

Speed. Aerial LiDAR data collection was much faster than manual data collection.

Safety. No one had to enter unknown areas within the old mine.

3D maps. The Elios 3's LiDAR sensor allowed Luxembourg authorities to make 3D maps of all the mine's chambers quickly and efficiently.

Read the full case study.

Case study: Finding the cause of an ore pass hangup

A large mining operation used the Elios 3 to find the cause of a clog in an ore pass in just 10 minutes, pinpointing its exact location and visualizing the clog in a 3D map.

Industry

Mining

Asset/environment

Ore pass

Traditional approach

Drilling exploratory holes and sliding snake cameras through them to find the cause of the hangup and pushing explosives through them to try and blast the clog open.

Case study: Finding the cause of an ore pass hangup

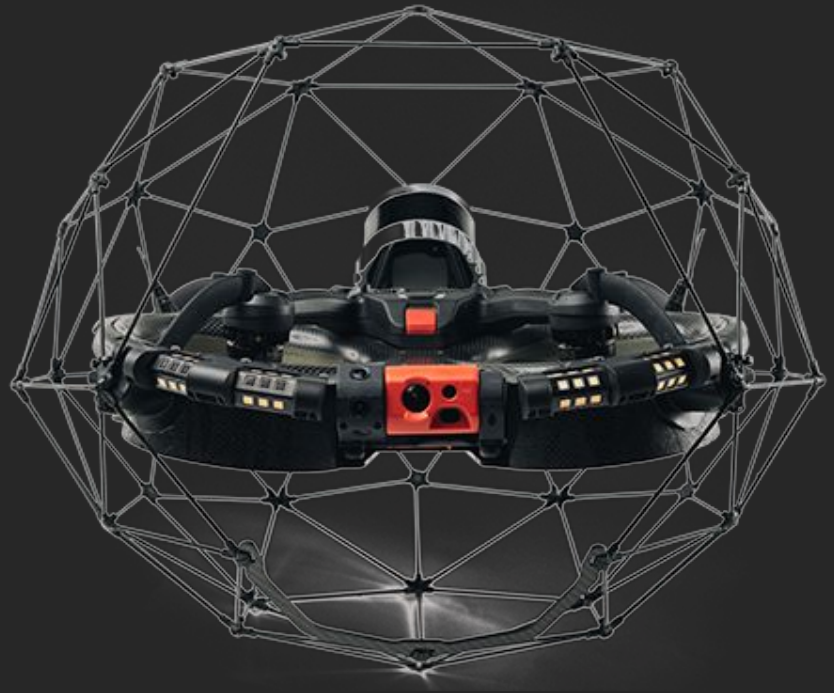
Benefits

Savings. From avoiding prolonged downtimes and resulting loss of production.

Safety. No one had to manually look for the cause of the hangup.

Speed. Ten minutes vs. two months.

Read the full case study.



Q&A

Send your follow up questions to:

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