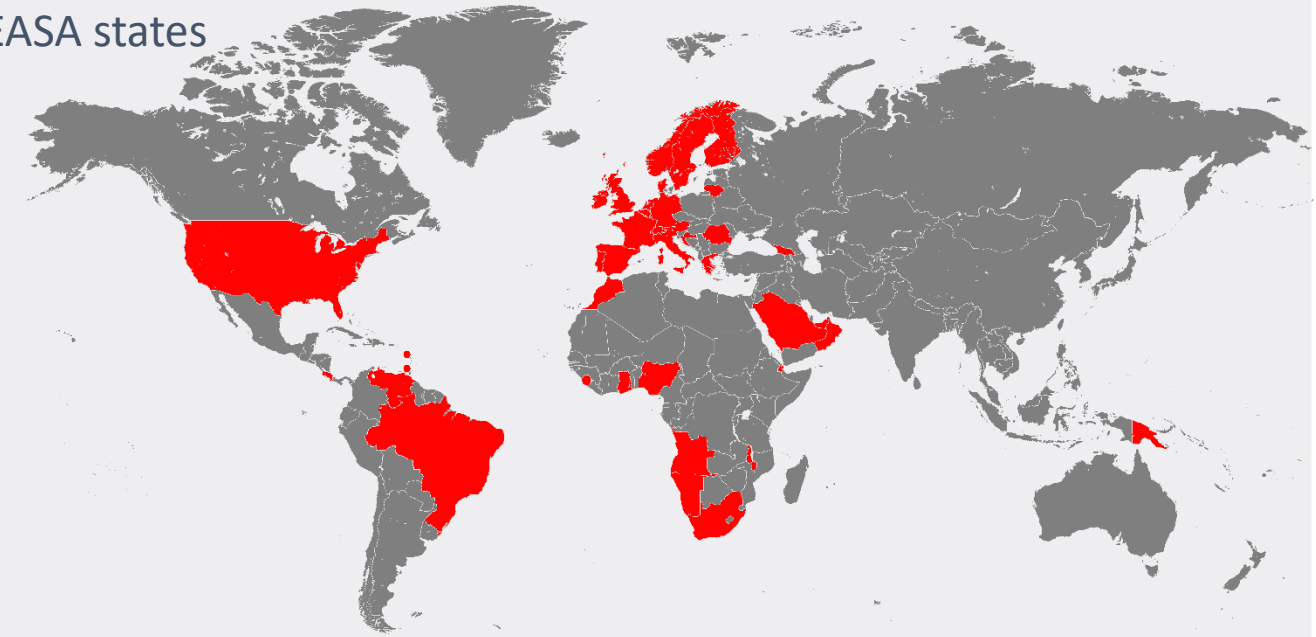
Skeye

Aerial Solutions

ROUNDS BY EXCEPTION AT SHELL REFINERY ROTTERDAM

About Skeye

- Founded in 2013 with offices in UK, Romania & NL
- LUC allowing self-risk assessment & approval in all EASA states
- Over 30,000 flights
- Onshore & Offshore operations
- Approved supplier for major global clients



UK Civil Aviation Authority

EASA European Aviation Safety Agency

ISO 9001:2015

ISO 45001:2018

CYBER ESSENTIALS CERTIFIED

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Services Portfolio

1

Topographic Surveys RGB & Lidar

Multispectral & Hyperspectral

Baselines & Comparisons

3D Modelling

2

Visual Indoor & Outdoor

UT Indoor & Outdoor

Thermal

Gas Detection

Online 3D Reporting

Remote Operations Monitoring

3

Emissions Measurement

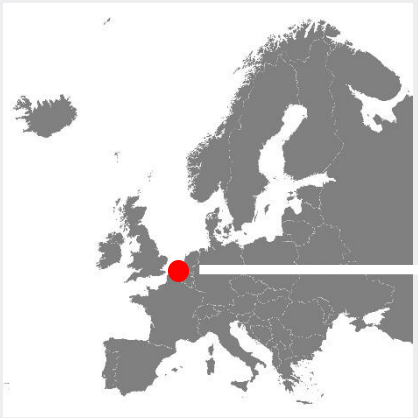
Heavy Lifting

Oil Spill Response

Line Handling

Skeye

Shell Netherlands Project



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SECPR Pernis Overview

1,000 Seagoing vessels/yr
10,000 Barges/yr
120,000 Trucks/yr
10,000 km of pipelines in all directions

405,000 Barrels of crude oil per day (750 litres per second, 20 million tonnes per year)

450,000 neighbours in the immediate vicinity

160,000 km pipelines on site
7 Production Units
60 plants Pipeline stacks of over 200 metres
24/7 operation
Oil /chemicals integration

Safety:
focus on personal and process safety, environment and neighbours

1,750 Shell employees;
2,000 – 4,000 contractors per day

High pressure,
high temperatures,
highly flammable, toxicity

Shell Netherlands Project

“The vision for drones at Shell Energy and Chemical Park Rotterdam, is to create an efficiency to integrate drones into our everyday work practices.

Increasing the usage of drones will give an added layer of consistency when it comes to measurements, inspections, and surveillance.

This is the opportunity to move us into a more predictive mind frame. Which will also ensure that we have additional overview of the site assets, increasing the safety of our personnel, by leaning on the Rounds by Exception philosophy”

Use Cases:

- Tank roof inspections
- Top deck equipment rounds
- Fan Heat Monitoring
- Emission detection
- Construction progress
- Security
- Emergency response

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Data Capture Robots

- Robotic ground fleet

- Robotic arial fleet

- Fixed equipment

- Wireless IIoT sensors

Rounds by Exception (High level)

01-A

EXR-2 Robot sets route around the asset.

01-B

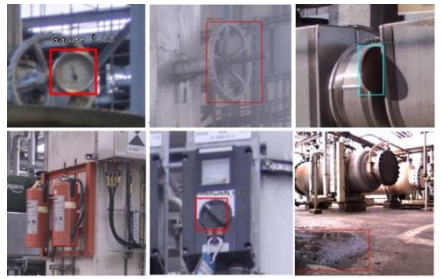
DiaB drone flies route around the asset.

02

Autonomous Data capture

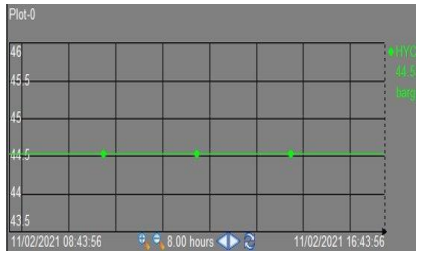
03

Machine Vision Insights



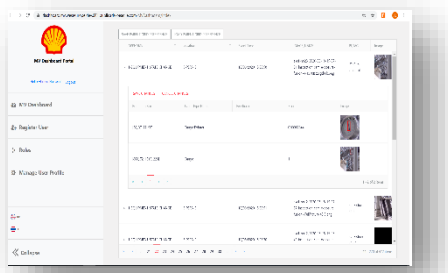
04

Readings are sent for further analysis.



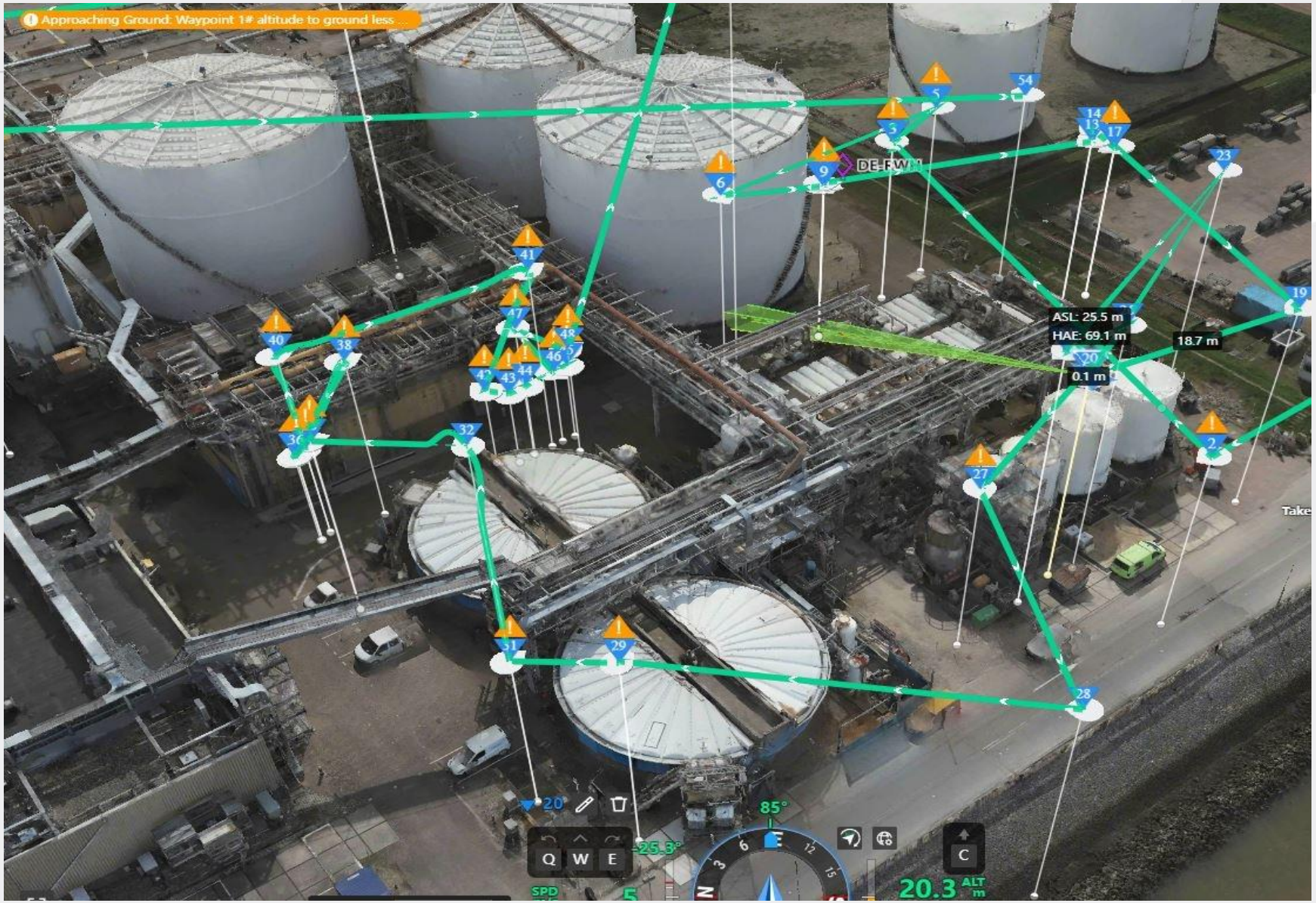
05

Validation and insights



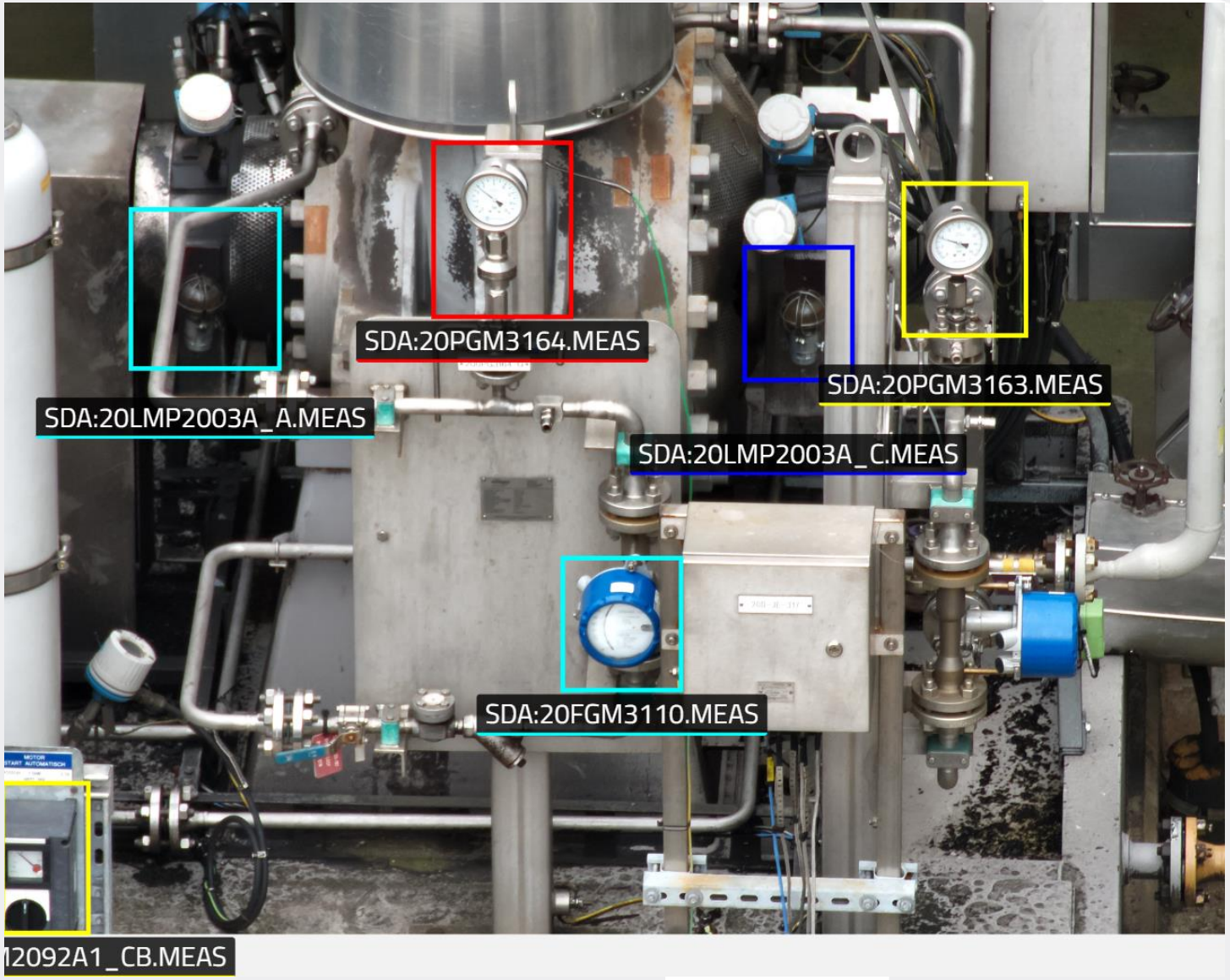
Data Capture

1. Points of Interest (POIs) based on operator round added to the map
2. Mission based on operator round created
3. Mission executed at set time interval



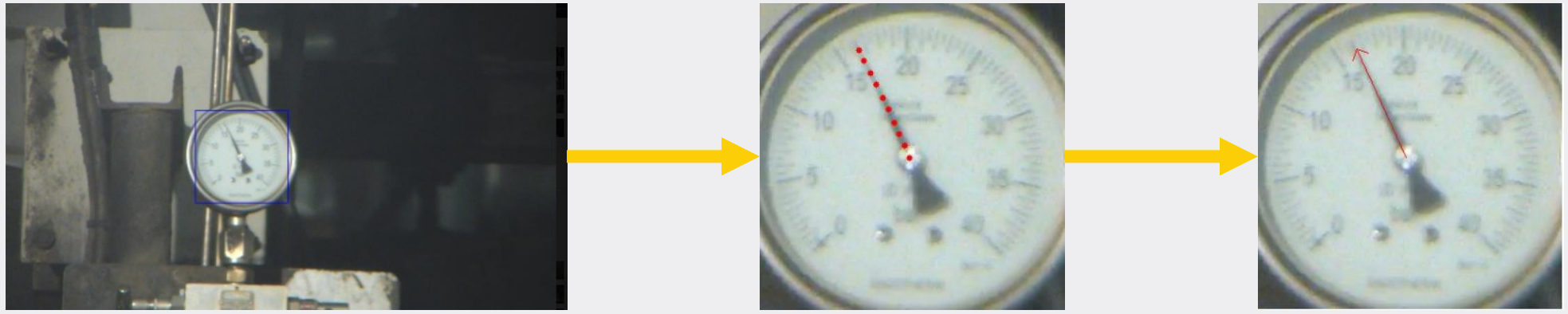
Data capture: robotic platforms

- Robotics/Drones
  - Local flow
  - Gauges
  - Handwheels
  - Liquid spills
  - Anomalies
  - Leaks
  - Oil cups
- LoRa
  - Temperature
  - Vibration
- Fixed camera
  - Leak detection



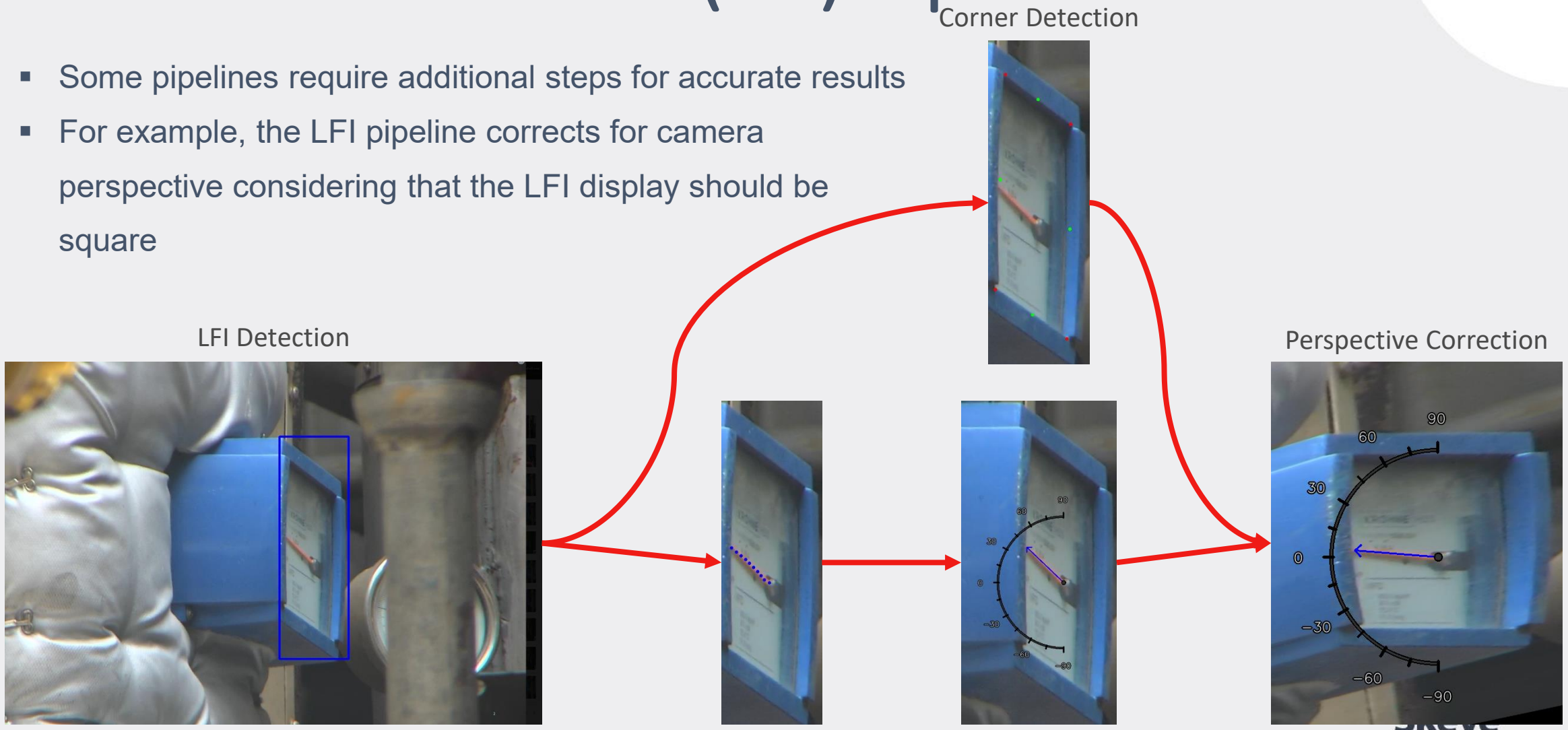
Gauge Reading Pipeline

- The Gauge Reading pipeline consists of three modules:
  1. Gauge Detection: Detect the gauge in the image
  2. Needle Detection: Predict several points on the needle
  3. Needle Angle: Determine the angle of the needle by fitting a line through the points
- Since we use deep learning to detect both the gauge and the needle, the pipeline becomes robust to variations in lighting and image quality

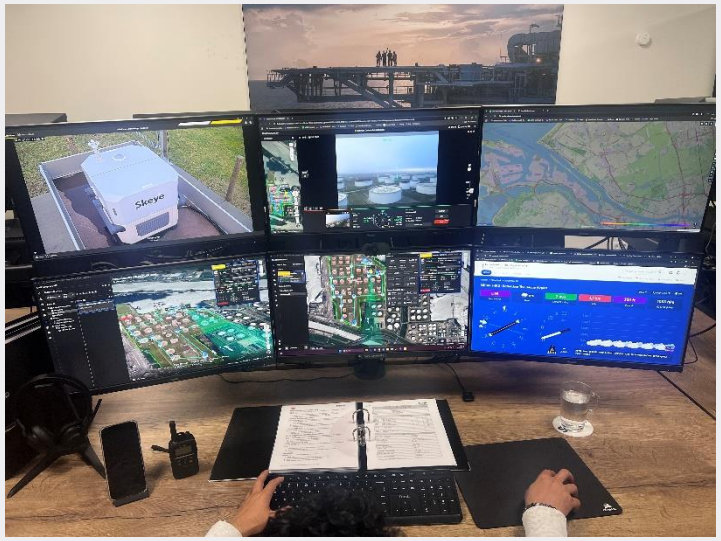


Local Flow Indicator (LFI) Pipeline

- Some pipelines require additional steps for accurate results
- For example, the LFI pipeline corrects for camera perspective considering that the LFI display should be square



SKEYE REMOTE FLIGHT CENTRE

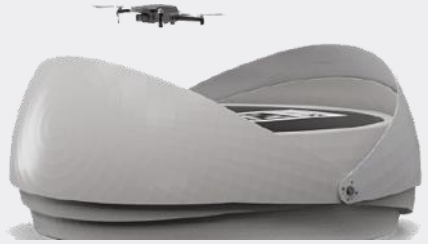


- Double Redundant Internet Connection
- Back-up Power
- Radio communication with Rotterdam ATC
- 7 FTE on 24/7 3 shift rotation

DIAB Systems Tested and operated

Percepto Airmax

IDIPloyer Nexus



Counterdrone - Omnidock

flytbase

DJI FlightHub 2

Heisha F135

DJI Dock 1

DJI Dock 2

Hextronics

DJI Dock 3

UNMANNED LIFE
Autonomy-as-a-Service

ENERGY ROBOTICS

Skeye

CHALLENGES

- Creation of new 3D models for the deployment locations
- Cyber Security infrastructure (DJI – on premise)
- Balance between flight and Cyber safety (ALARP)
- CAA-NL regulations for BVLOS flights
- Air Traffic Control Restrictions
- Shell regulations
- In house staff training program

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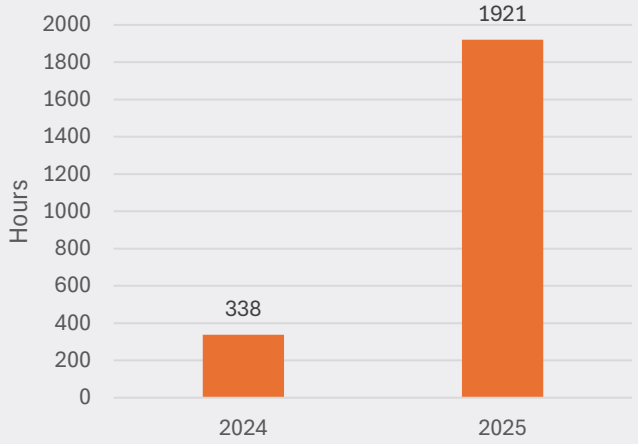
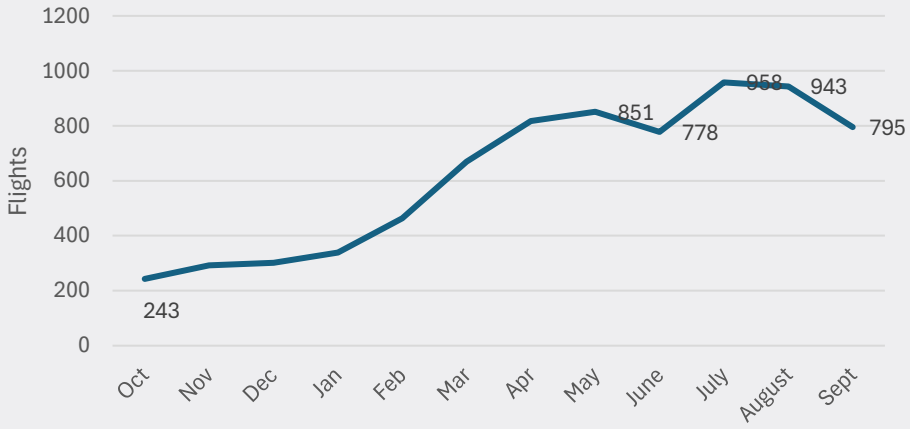
Flight Hours (BVLOS)

YTD total: 2259hrs

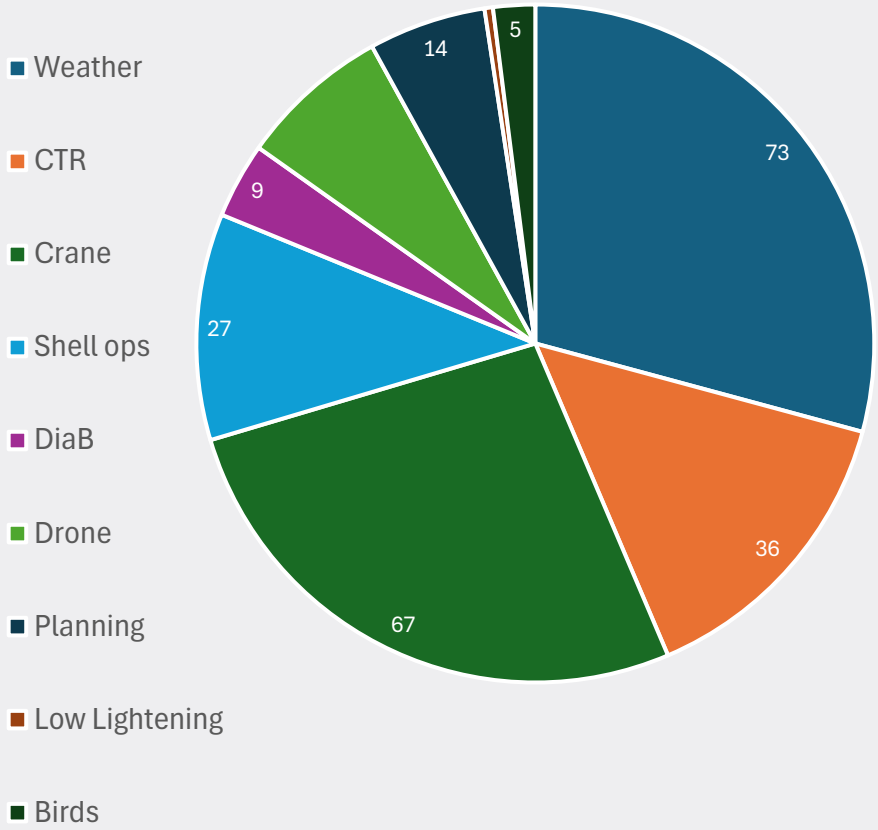


BVLOS Flights

Since Oct 24 - total: 7451



YTD Unplanned Downtime



THANK YOU!

info@skeye.com

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