FLYABILITY

SAFE DRONES FOR INACCESSIBLE PLACES

Outdoor Drone Inspections: Case Studies and Best Practices from the Field

Thursday, April 1 2020

04:00 PM - 05:00 PM CEST

10:00 AM - 11:00 AM EST

DRONE INSPECTION WEBINAR SERIES

—WEBINAR 4 OF 6—

PRESENTED IN PARTNERSHIP WITH MFE

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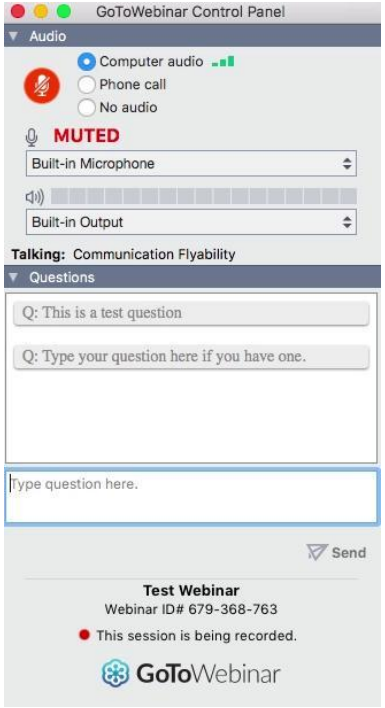
Courtland Penk

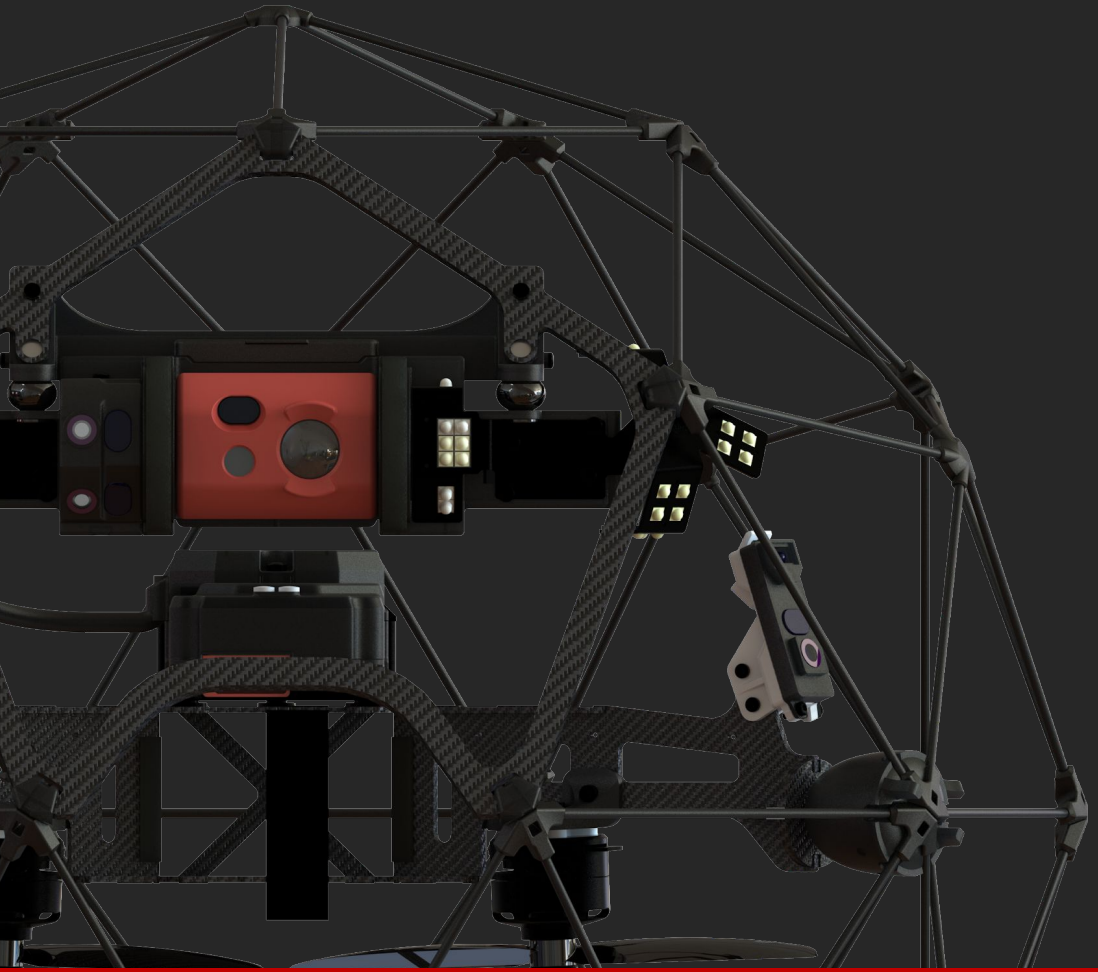
Chief Executive & Operations Manager

—Osprey Integrity Ltd.—

WEBINAR ENGAGEMENT

Ask questions during the webinar.





REPLAY

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

AGENDA

1 5’ Introduction

2. 55’ Courtland Penk, Osprey Integrity Ltd.
   Outdoor Drone Inspections: Case Studies and Best Practices from the Field

3 15’ Q&A
   Audience questions answered live

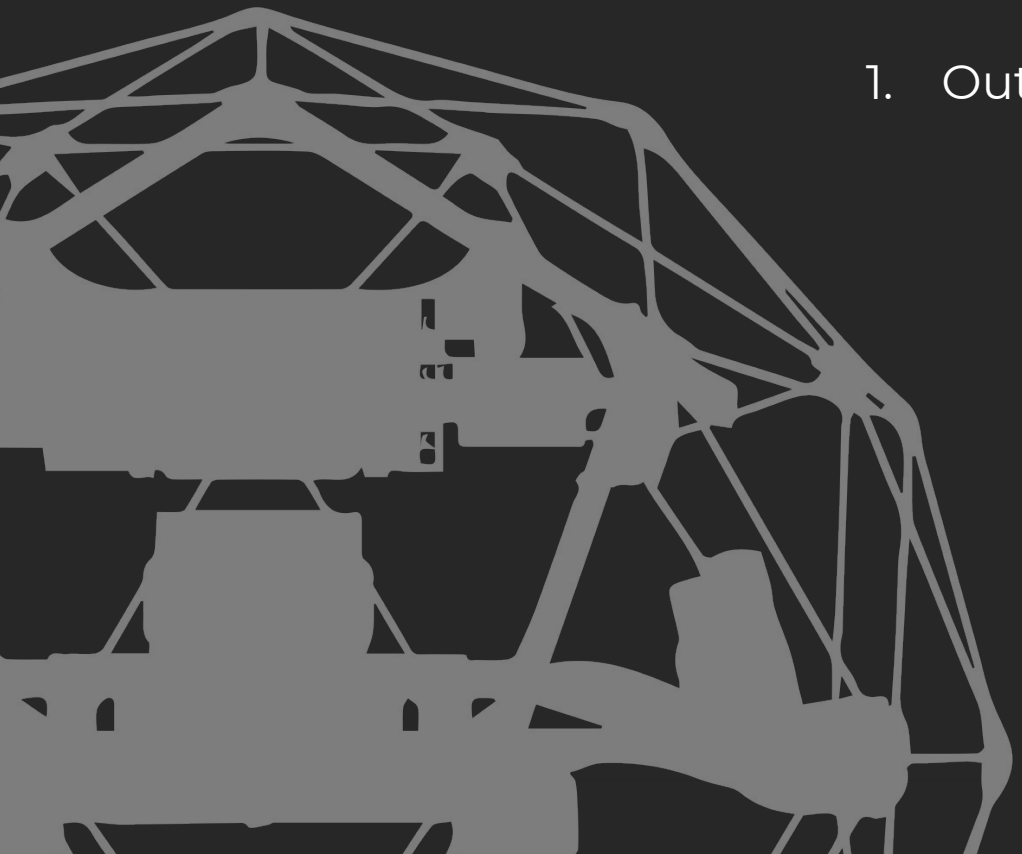
Outdoor Drone Inspections:
Case Studies and Best Practices from the Field

Courtland Penk
Chief Executive & Operations Manager

OSPREY INTEGRITY LTD.

POINTS TO COVER

1. Outdoor inspections overview
2. Assets & industries
3. Case studies
4. Best practices



1. Outdoor inspections overview

What is an outdoor inspection?

And what is an outdoor drone?

Outdoor inspections overview—RVI tools

RVI* tools can replace the need for manned data collection.

- Start with client requirements—what kind of data do they need?
- But remember—a drone is just one type of RVI tool

*RVI = Remote Visual Inspection

Outdoor inspections overview—Outdoor drone considerations

In general, what you need is a drone that can take high quality images of an asset from a distance.

Things to look for:

- Optical zoom capabilities
- High quality images
- Other sensors (corona discharge, general infrared, gas detection, etc. as needed)

Outdoor inspections overview—traditional methods

How are external inspections traditionally conducted?

Methods for manned/direct data collection:

- Scaffolding
- Rope access
- Aerial work platforms
- Man-basket crane combos
- Helicopters

Outdoor inspections overview—Primary benefits

SAVINGS. From reduced downtimes and work hours.

SAFETY. From reduced need for climbing, use of scaffolding, and use of rope access.

REDUCED DOWNTIMES. From increased speed of inspection process.

Outdoor inspections overview—U.S. regulatory considerations

What are the regulatory requirements for commercial drone operations in your country?

In the U.S. All **external** commercial drone operations in the U.S. require a Part 107 certificate.

In other countries. Almost every country in the world has some kind of certification requirement for **external** commercial drone operations. Familiarize yourself with the requirements where you plan to operate.

DRONE PILOT Ground School

Outdoor inspections overview—Canadian regulatory considerations

CAR (Canadian Aviation Regulations) – 101.01

Small remotely piloted aircraft means a remotely piloted aircraft that has a maximum take-off weight of at least 250 grams (0.55 pounds) but not more than 25 kilograms (55 pounds).

Important sections of CAR – 101.01

- *Aeronautics Act of Canada*
- *Privacy Act of Canada*
- *Bylaws*

Outdoor inspections overview—Canadian regulatory considerations

CARs Section IX – Remotely Piloted Aircraft Systems

- *901.02 – Registration*
- *901.11 – Visual Line of Sight*
- *901.20 – Visual Observers*
- *901.23 – Procedures*
- *901.27 – Site Survey*
- *901.47 – Operations at or in Vicinity of Aerodrome, Airport or Heliport*
- *901.54 / 901.63 – Basic & Advanced Operations*
- *901.71 – Operations in Controlled Airspace*

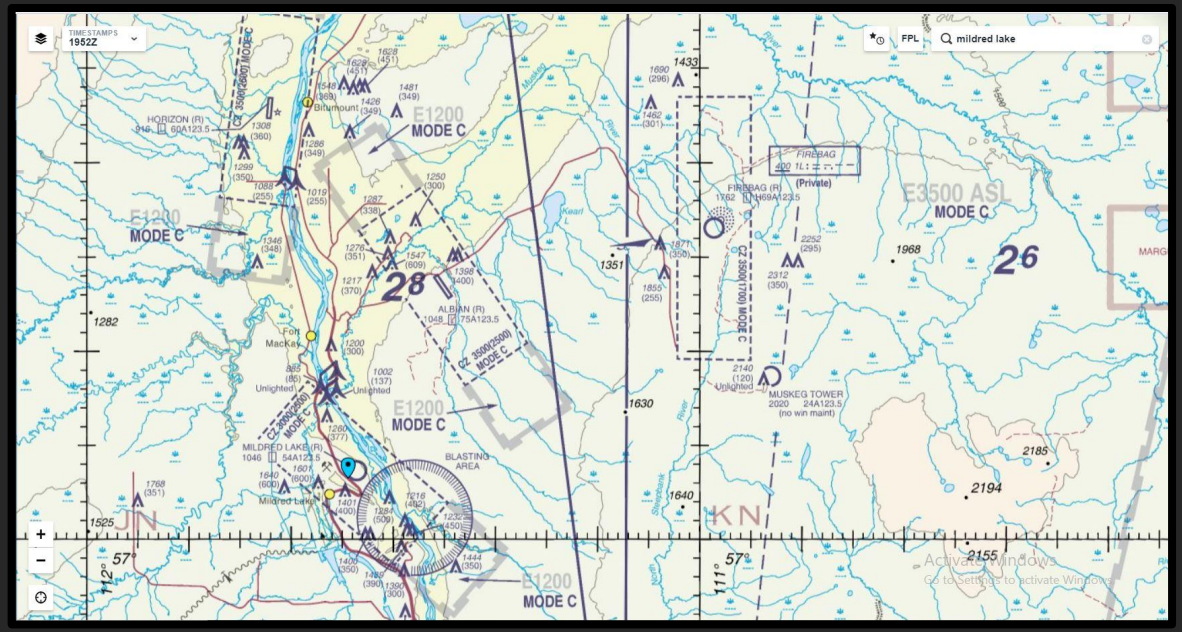
Outdoor inspections overview—Canadian regulatory considerations

What happens if you're caught skirting the regs?

Source:
https://tc.canada.ca/en/aviation/drone-safety/flying-your-drone-safely-legally#penalties

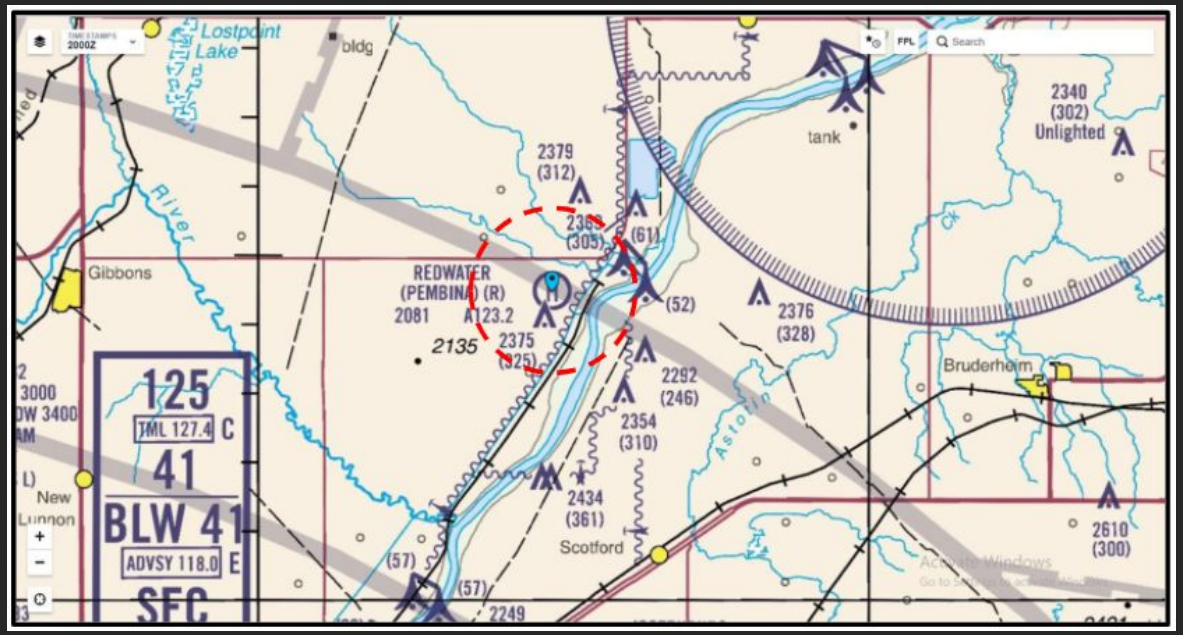
Outdoor inspections overview—airspace considerations

Always do airspace research. *A site could be owned by a major company but still require special airspace authorization.*



Outdoor inspections overview—airspace considerations continued

Heliports have special requirements. Again—do your research.



Outdoor inspections overview—training considerations

Will you do the work yourself or outsource it? How will you ensure that your pilots are properly trained to fly?

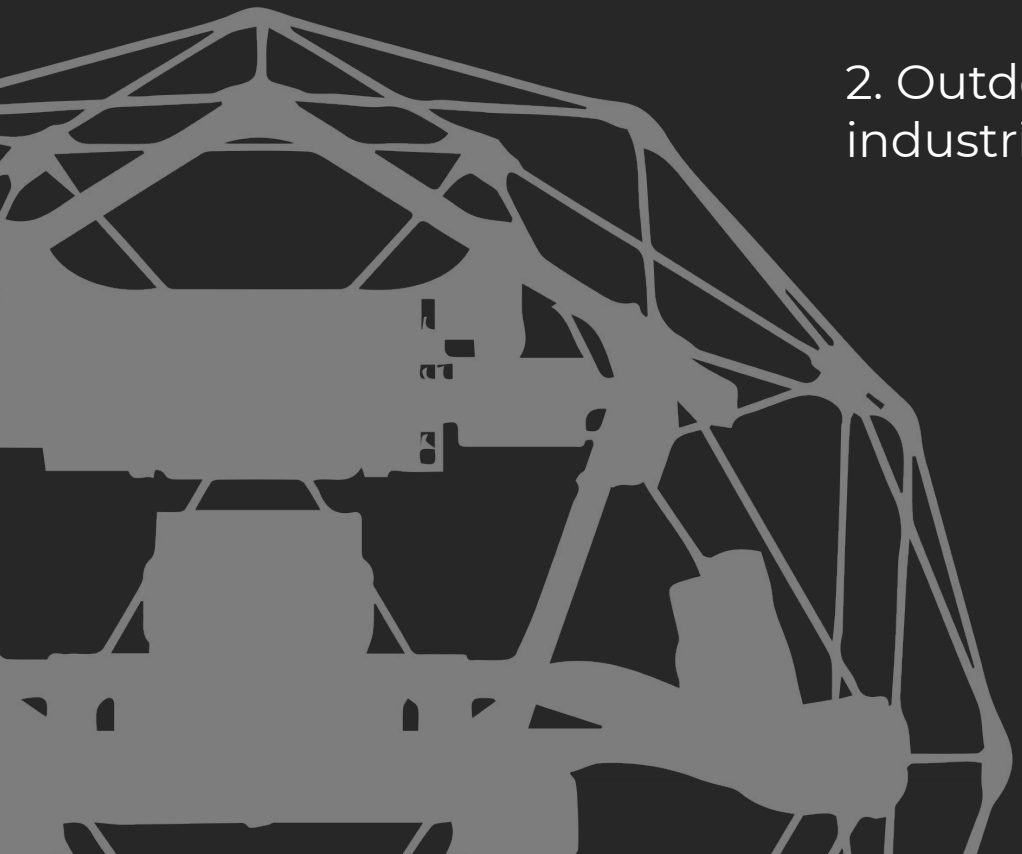
In-person training

Self-training

Outdoor inspections overview—what kind of pilot do you need?

Do you need:

- ***Just drone data***.
  A drone service provider might be a good fit.
- ***Inspection expertise + drone data***.
  An inspection service provider who works with drones might be a good fit.

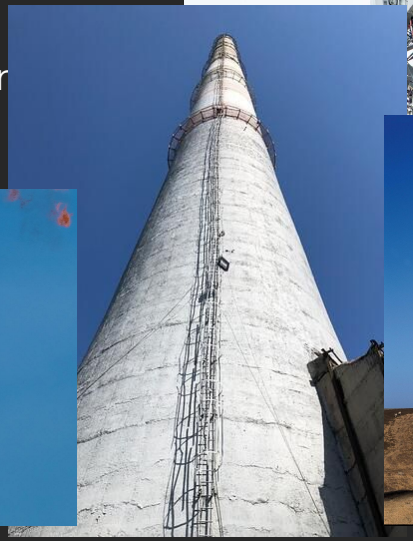


2. Outdoor inspections—assets & industries

Outdoor inspections—assets

Common assets include:

- Flare stacks
- Chimneys
- Columns / distillation towers
- Cell towers
- Wind turbines
- Bridge structures / infrastr



Outdoor inspections—assets

Other common assets include:

- Tanks
- Spheres
- Furnaces / boilers
- Heat Recovery Steam Generators (HRSGs)

Outdoor inspections—assets

Less common assets / use cases:

- Kilns
- Ducting
- Pipe racks
- PRDs / PSVs (Pressure Release Devices / Valves)
- Forestry installations (locks, culverts)

Outdoor inspections—hazard identification

External drones aren't just being used to do inspections—they're also being done used for hazard identification.

Hazard identification includes looking for:

- Loose flashing
- Drop hazards left in piperacks
- Open holes
- Other safety considerations

+ Tie points for rope access

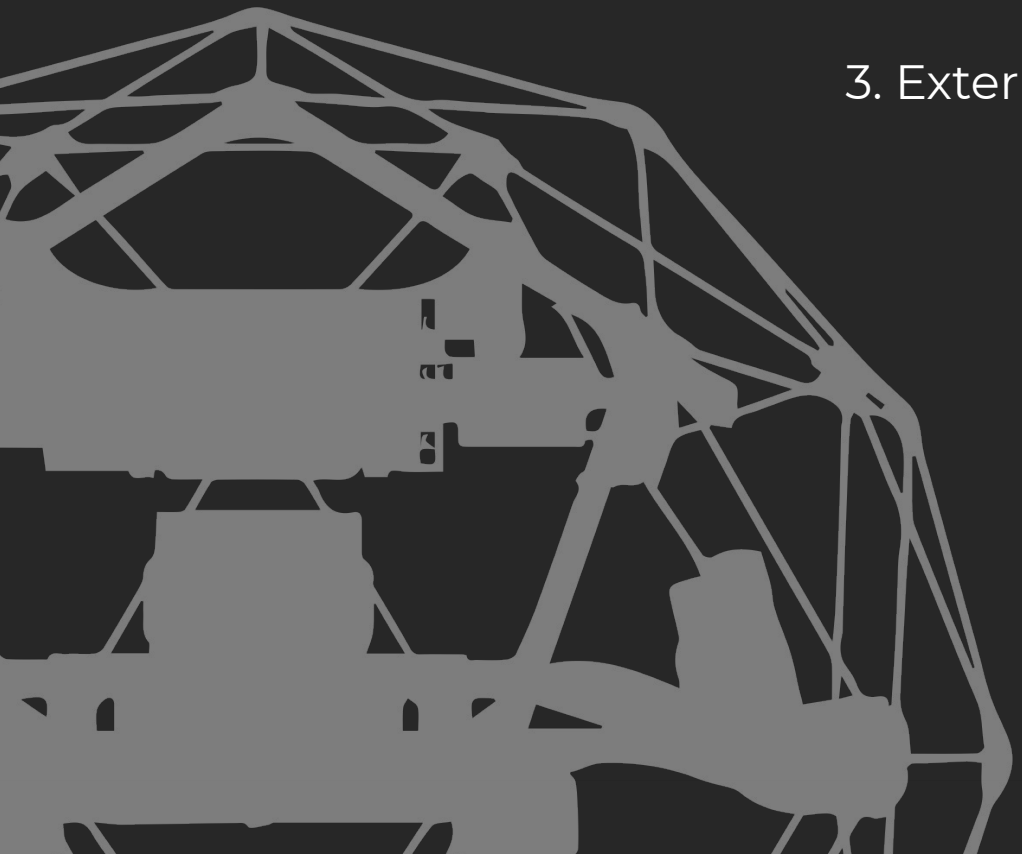
Outdoor inspections—industries

Most common industries include:

- Oil & gas
- Power generation
- Chemicals
- Infrastructure (bridges, other infrastructure)

With growing adoption in:

- Forestry
- Cement
- Food, beverage & agriculture



3. External inspections—case studies

Use Case #1—Cement plant chimney

Objective

To remotely inspect upper ladder and platform installations to ensure safe use prior to major repairs of Flu Gas Chimney.

Primary benefits to drone use

Savings. Cost reduction of 80%.

Reduced downtime. Reduced downtime by 50%.

Use Case #1—Cement plant chimney

Outcomes

- Small on-site footprint for safe operations.
- Remove personnel from the line of fire.
- Limit or remove the requirement for rope access, scaffold or aerial lift technologies.
- Thread counting resolution
- Infrared application to identify areas susceptible to imminent spalling.

Use Case #2—Column inspection

Objective

Perform API 510 visual external of a distillation tower at a petrochemical facility to supplement turnaround planning.

Primary benefits to drone use

Savings. Cost reduction of 20%.

Reduced downtime. Reduced downtime by 25%.

Use Case #2—Column inspection

Outcomes

- Equipment remained on-stream.
- Thorough inspection of areas not accessible by platforms in timely, cost effective manner.
- Identification or several key findings critical to additional follow up during turnaround.
- Maintain safe distance from operating equipment to ensure ignition risk it mitigated.
- Infrared application after sunset to identify areas susceptible to corrosion under insulation.

Use Case #3—Wind turbine blades

Objective

Expediently inspect wind turbine blades to identify areas of compromised integrity for engineering assessment and repair requirements.

Primary benefits to drone use:

Savings. Cost reduction of 25%.

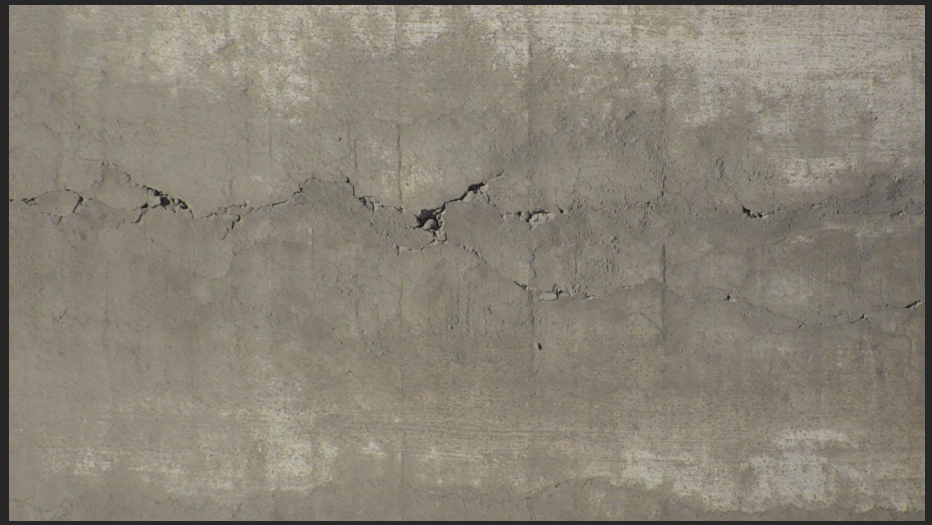
Reduced downtime. Reduced downtime by 70%.

Use Case #3—Wind turbine blades

Outcomes

- Minimal downtime – As little as 20 minutes.
- Strategically acquired for ease of repeatability and trending over time.
- Can be automated or flown manually.
- Human or AI review of data
- Infrared application to identify spar deficiencies and areas suspected of delamination.

Use Case #4—Spillway crack mapping



Objective

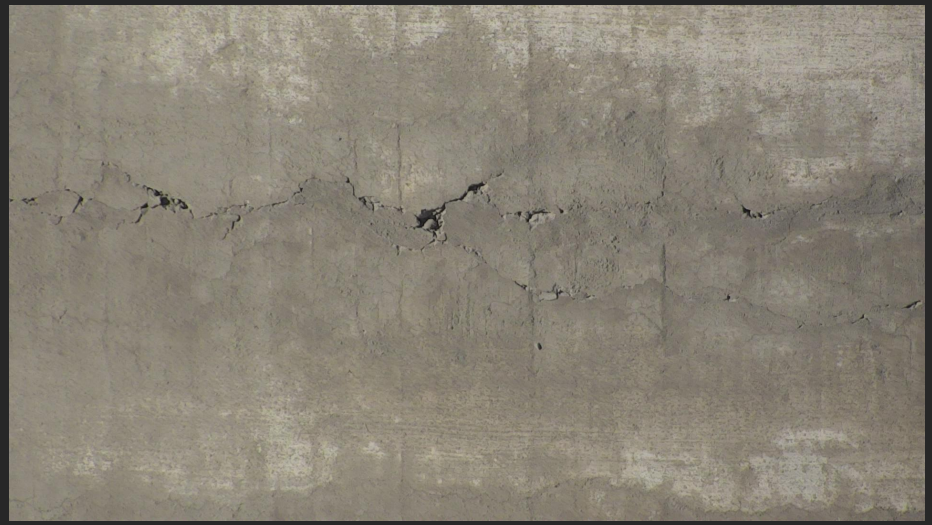
Utilize very high resolution (less than 1mm) imagery to generate a comprehensive, up to date, concrete crack map of a major facility spillway.

Primary benefits to drone use

Savings. Cost reduction of 70%.

Reduced downtime. Reduced downtime by 85%.

Use Case #4—Spillway crack mapping



Outcomes

- Workers removed from line of fire.
- Abundance of imagery available for detailed review and on demand follow up.
- Geo-referenced projection for precise identification of concerns.
- Infrared application to help identify extent of visible concrete spalling.

Use Case #5—Heat medium heater (both internal and external)

Objective

Leverage external inspection equipment to conduct root cause exploration after internal inspection deficiency noted.

Primary benefits to drone use

Savings. Cost reduction of 85%.

Reduced downtime. Reduced downtime by 50%.

Use Case #5—Heat medium heater (both internal and external)

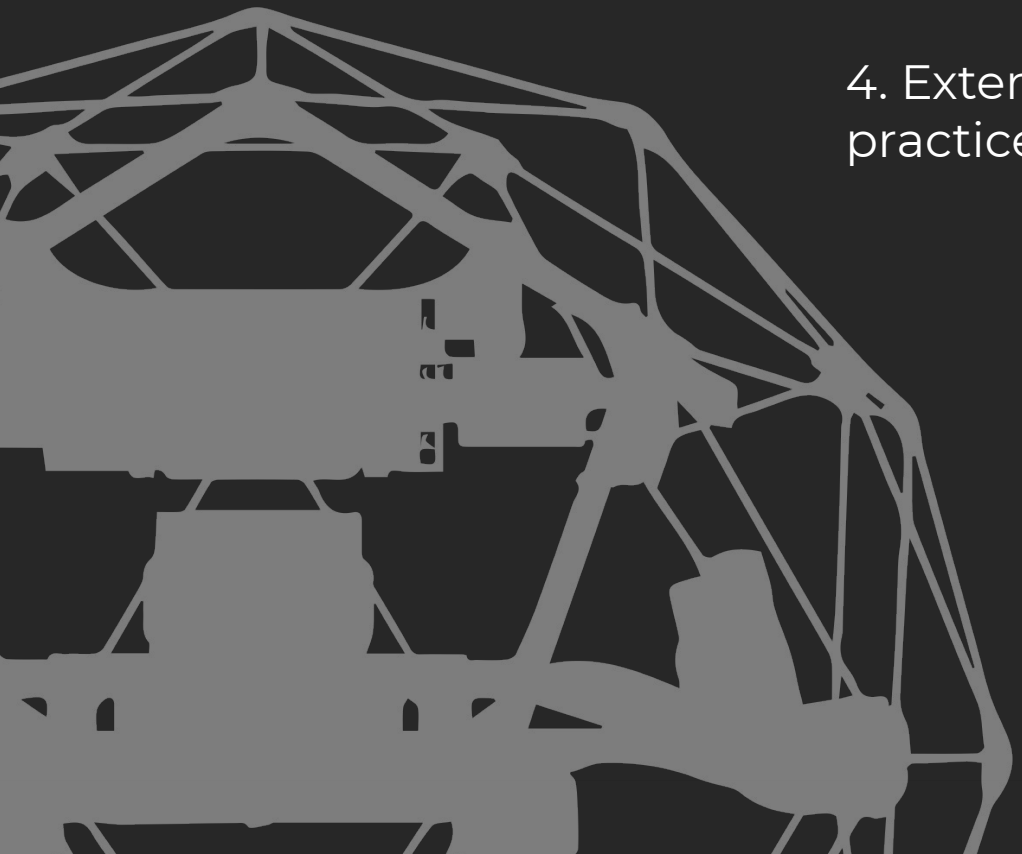
Outcomes

- Signs of moisture ingress noted during internal inspection.
- Opportunistic on-site follow-up.
- Detailed results with no additional access requirements.
- Immediate identification of moisture ingress location that was leading to compromised insulation.

A note on internal vs. external drone inspections

Make sure to pick the right tool for the job

- Start with your data needs, then back into the right RVI tool / drone(s) for collecting that data.
- Internal / external drones are complementary.
- Multiple UAV platforms support greater operational efficiency (i.e., having the right tool for the job).



4. External inspections—best practices

Outdoor inspections—best practices

List of best practices:

1. Desktop planning
2. Historical review
3. Risk analysis & mitigation
4. Environmental & safety checks
5. Data validation

Outdoor inspections—best practices

1. Desktop planning

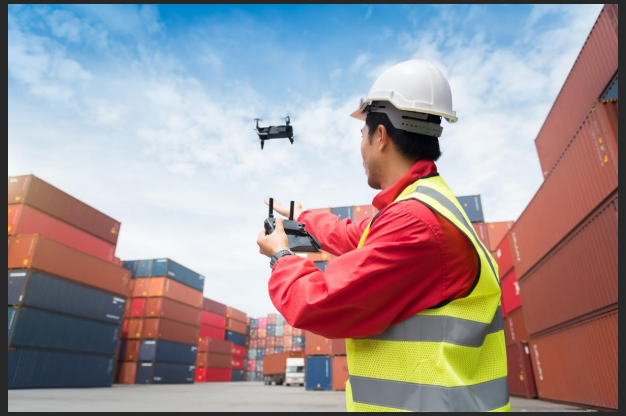
- **Define datums to be collected**. Cardinal directions, or a specific asset feature, including an elevation. Also, is it a close visual or general visual? Regulatory inspection that required a certified inspector?
- **Airspace designation research**. Proximity to heliports, airports, aerodromes, relevant communication frequencies, obstacles + line of sight concerns.
- **Secure required authorizations** (based on above research). Applies to controlled airspace, military airspace, or otherwise restricted airspace.*

*Sometimes this process can take up to 6 weeks, if an SFOC is required (Special Flight Operations Certificate).

Outdoor inspections—best practices

1. Desktop planning

- **Scouting**. Safe out your take off and landing location (can usually be done on desktop planning and confirmed in field).
- **Brief impacted trades**. Brief other trades in the area who will be affected by the operations. Not allowed to fly over people who aren't briefed with most quadrotor equipment.



Outdoor inspections—best practices

2. Historical review

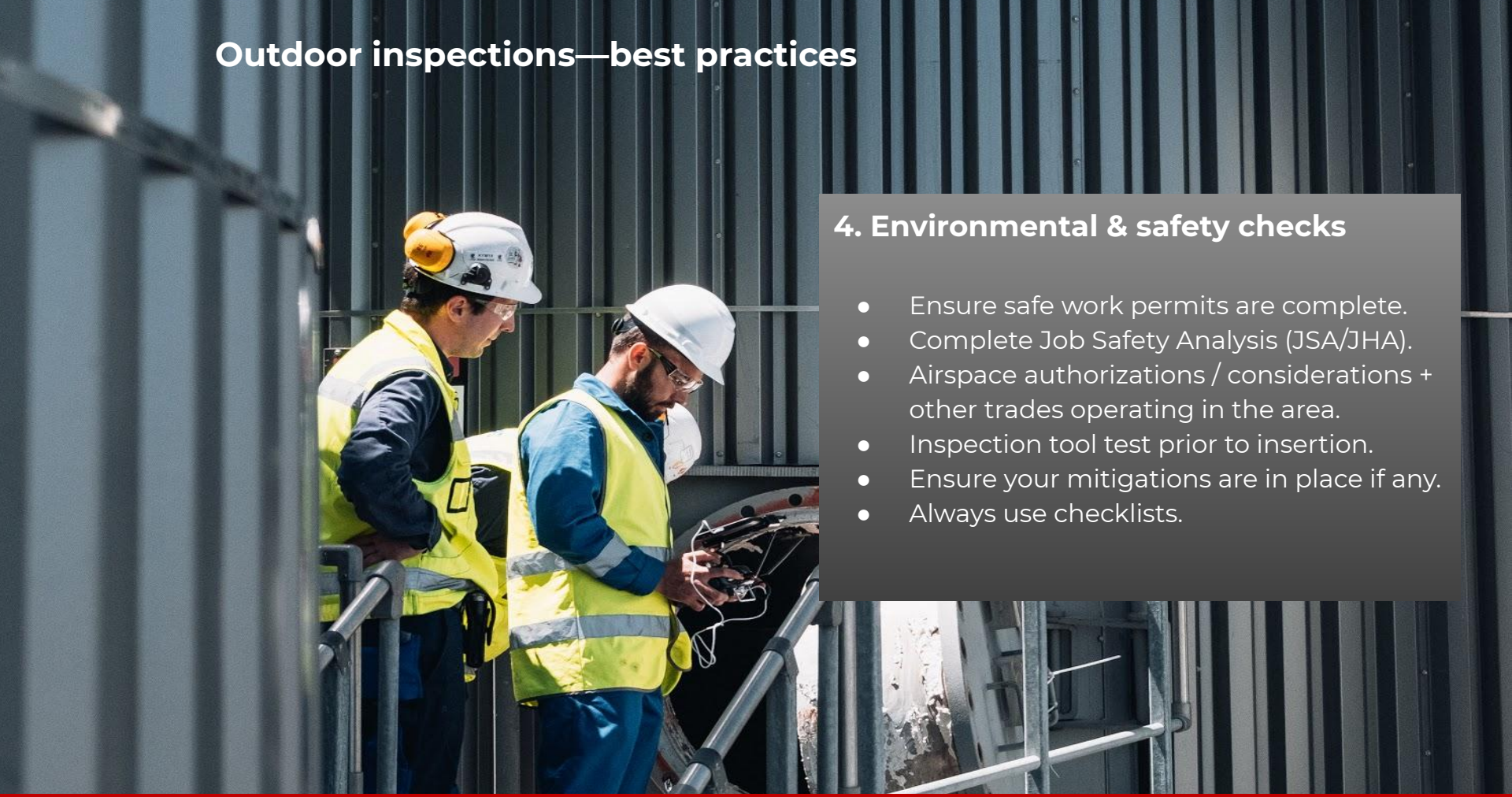
- **Walkdown and drawing review**.
- **Historical report reviews for the equipment**.
- **Review photos from previous inspections** (if possible). These can help you understand previous issue areas + layout / asset features.

Outdoor inspections—best practices

3. Risk analysis & mitigation planning

- What could go wrong and can be done if it does?
- Obstacles.
- Equipment failure (battery, signal, etc).
- Recovery points and plan.
- Can inspection tool or client equipment be damaged?

Outdoor inspections—best practices



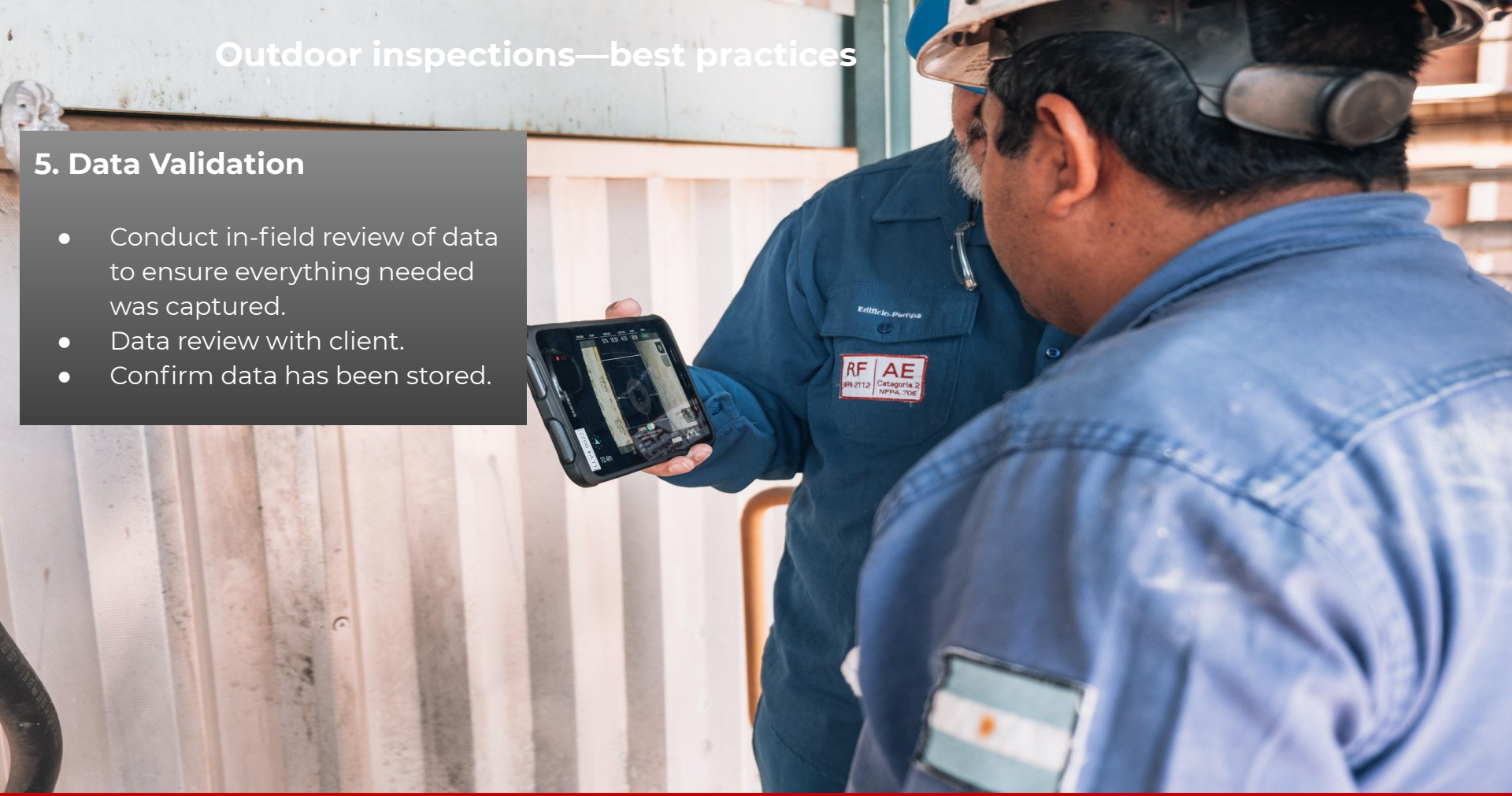
4. Environmental & safety checks

- Ensure safe work permits are complete.
- Complete Job Safety Analysis (JSA/JHA).
- Airspace authorizations / considerations + other trades operating in the area.
- Inspection tool test prior to insertion.
- Ensure your mitigations are in place if any.
- Always use checklists.

Outdoor inspections—best practices

5. Data Validation

- Conduct in-field review of data to ensure everything needed was captured.
- Data review with client.
- Confirm data has been stored.



DRONE INSPECTIONS WEBINAR SERIES

—PRESENTED BY FLYABILITY AND MFE—

Thursday, February 11
10:00 AM EST / 4:00 PM CEST

Webinar 1 of 6—The Benefits of Drone Inspections: How Inspectors Are Using Drones to Improve Safety and Save Millions

- Joe Grelewicz, Middough, Inc.
- Mike Vanovermeir, MFE Rentals

Thursday, February 25
10:00 AM EST / 4:00 PM CEST

Webinar 2 of 6—Drone Inspections: Insourcing vs. Outsourcing Your Drone Inspection Program

- Nick Hardwood, MISTRAS Group, Inc.
- Zacc Dukowitz, Flyability

Thursday, March 18
10:00 AM EST / 4:00 PM CEST

Webinar 3 of 6—Indoor Drone Inspections: Case Studies & Best Practices from the Field

- Nick Hardwood, MISTRAS Group, Inc.
- Zacc Dukowitz, Flyability

UPCOMING WEBINARS

Thursday, April 15
10:00 AM EST / 4:00 PM CEST

Webinar 5 of 6—Drone Inspections: How to Manage Data for All Stakeholders Involved

Thursday, April 29
10:00 AM EST / 4:00 PM CEST

Webinar 6 of 6—Drone Inspections: The Importance of Data Localization

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⇨ Send an email to sbalzer@mferentals.com

- Training for flying in both indoor and outdoor scenarios
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- Other RVI tools + accessories for drones and beyond

Scott Balzer

General Manager, MFE Canada

MFE Rentals Canada

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Need drone inspection services in Canada?

Get in touch with Courtland from Osprey Integrity.

⇨ Send an email to courtland@ospreyintegrity.com

- Include scope of work (as possible)
- General consultations for inspection work also available
- Feel free to email with questions about the presentation!

Courtland Penk

Chief Executive & Operations Manager,
Osprey Integrity Ltd.

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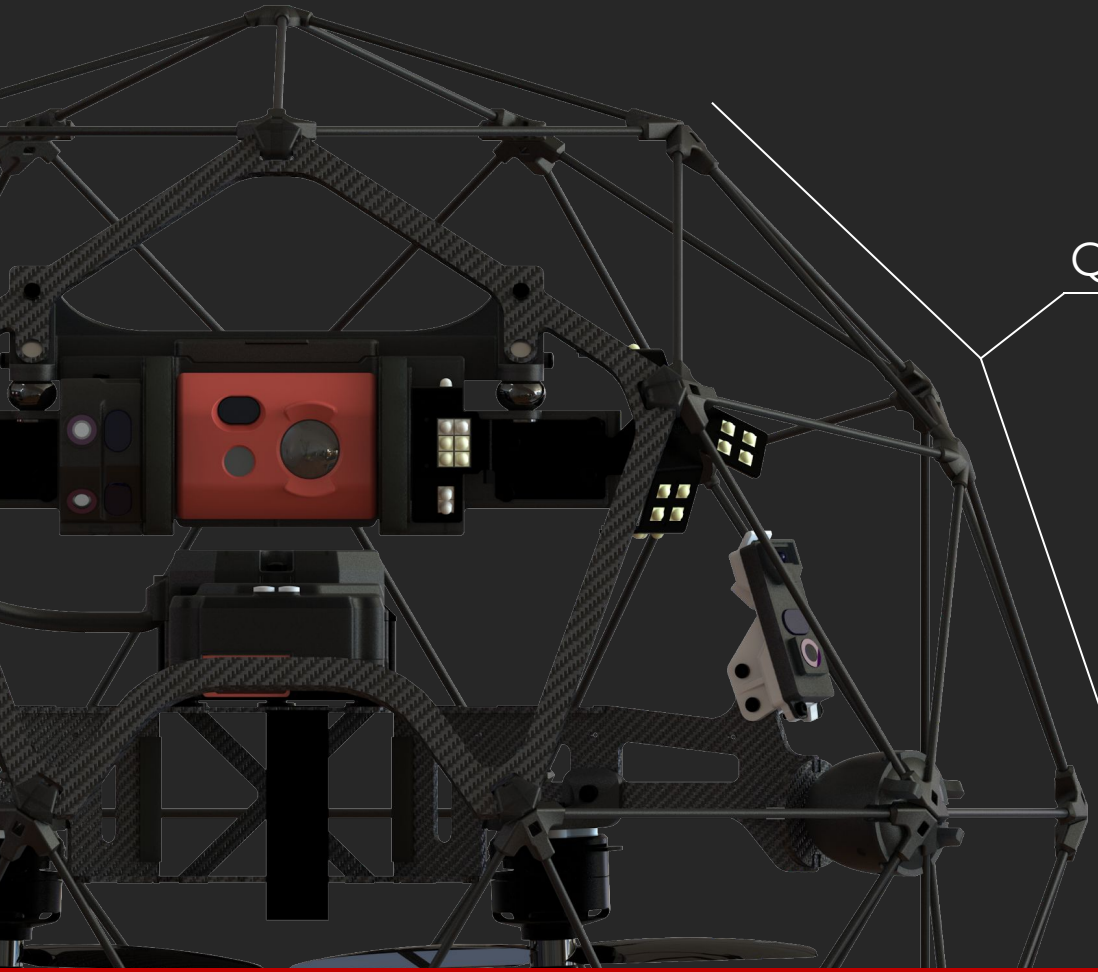

Q&A

Send your follow-up questions to:

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