FLYABILITY

SAFE DRONES FOR INACCESSIBLE PLACES

How to Conduct Drone Inspections in High Risk Environments—Part 2 of 2

Thursday, December 3 2020

04:00 PM - 05:00 PM CEST

10:00 AM - 11:00 AM EST

MODERATOR

Zacc Dukowitz
Content Marketing Manager
—Flyability—

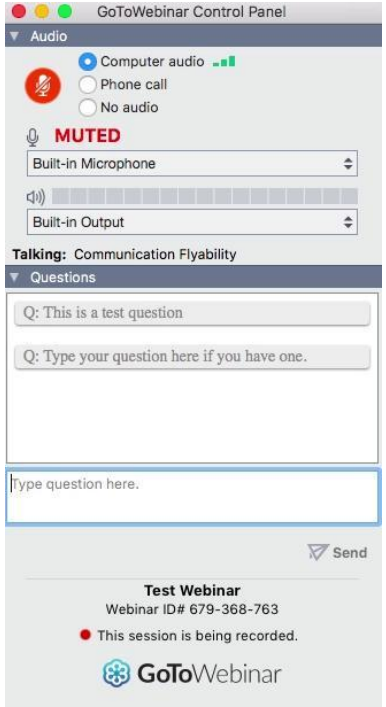
PANELISTS

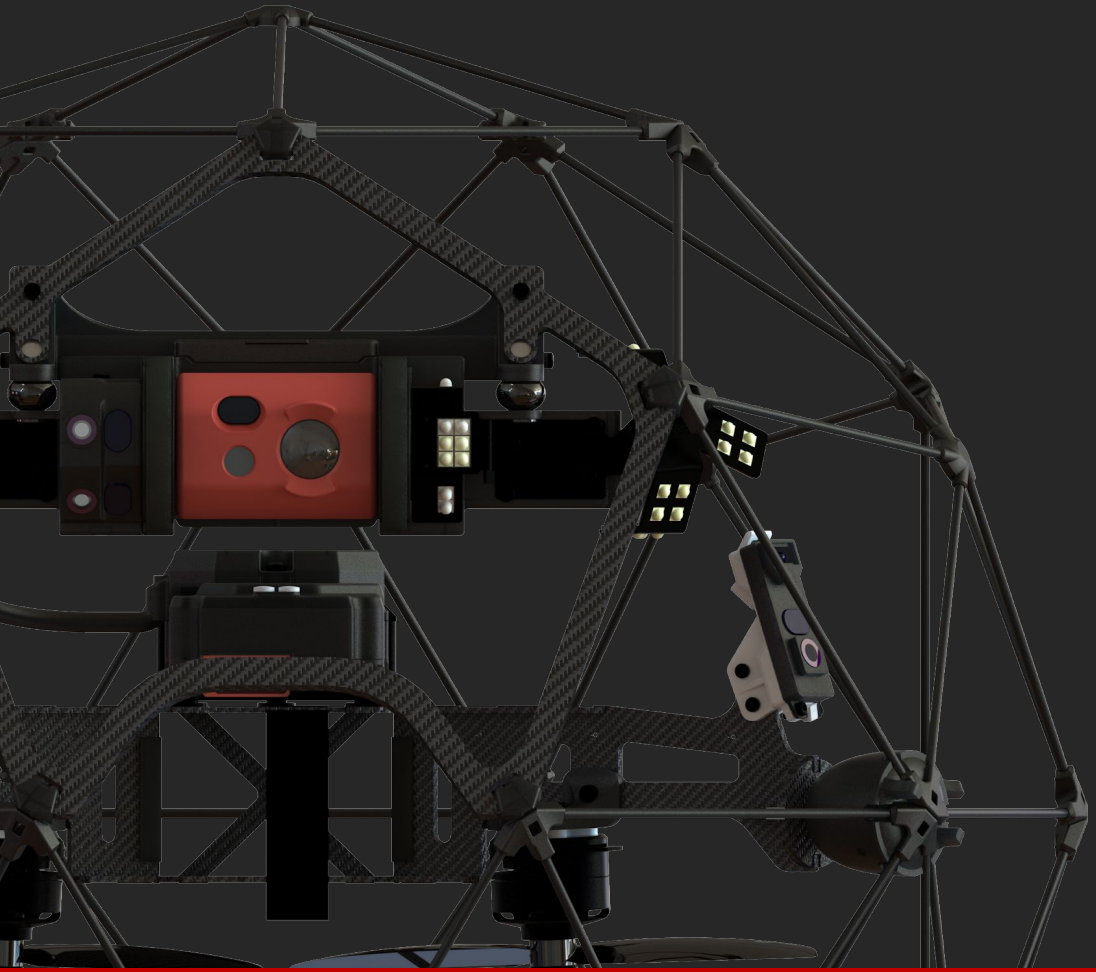
Eli Moselle Landry
CEO
—Halo Robotics—

Charles Rey
Training Manager
—Flyability—

WEBINAR ENGAGEMENT

Ask questions during the webinar.





REPLAY

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

AGENDA

1 5’ Introduction

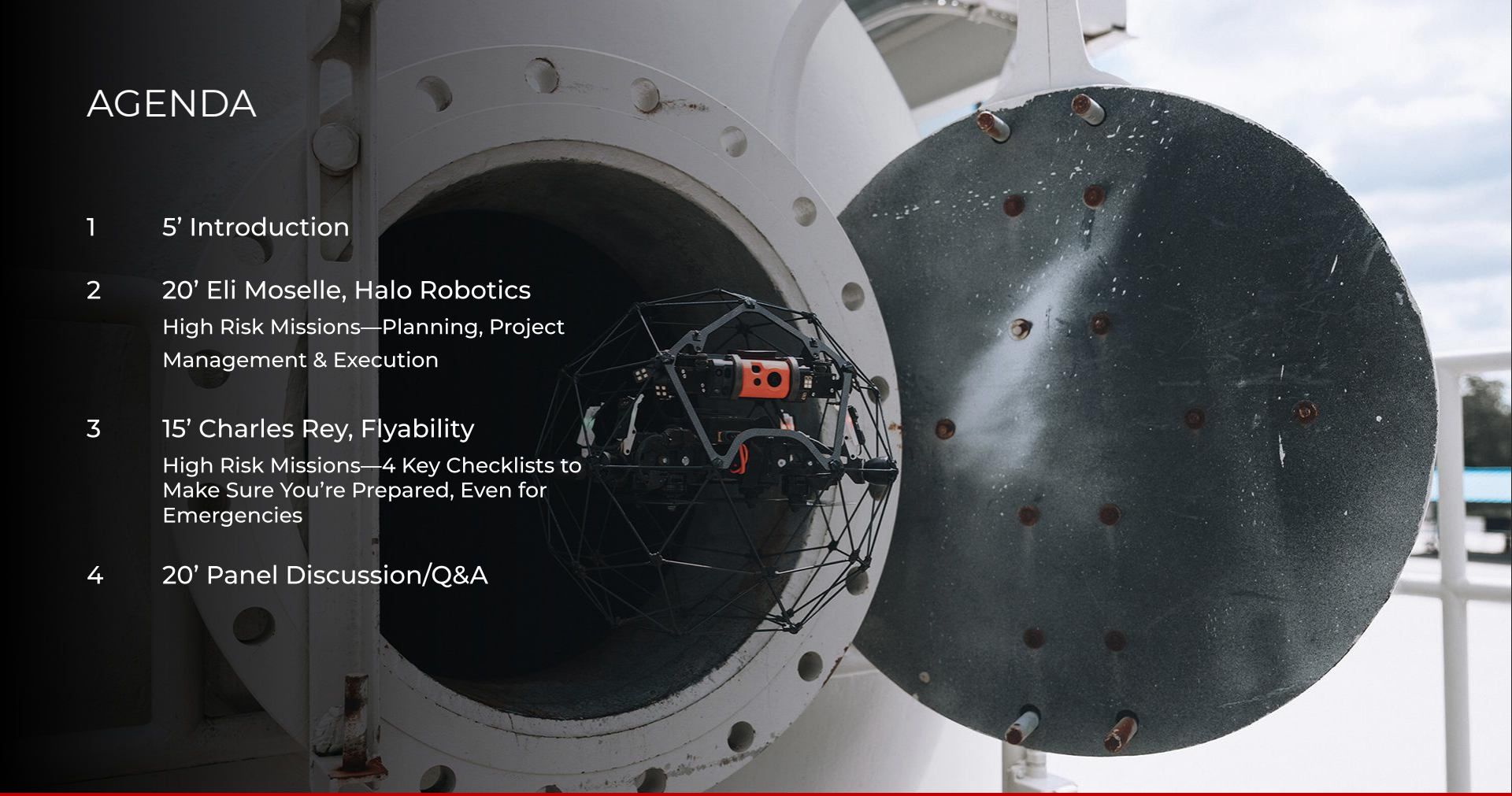
2 20’ Eli Moselle, Halo Robotics

High Risk Missions—Planning, Project Management & Execution

3 15’ Charles Rey, Flyability

High Risk Missions—4 Key Checklists to Make Sure You’re Prepared, Even for Emergencies

4 20’ Panel Discussion/Q&A



High Risk Missions—Planning, Project Management & Execution

Eli Moselle
CEO

HALO ROBOTICS

HALO ROBOTICS

OPERATING IN HIGH RISK ENVIRONMENTS

nqa.
ISO 9001
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INTEGRATED MANAGEMENT

UKAS
MANAGEMENT SYSTEMS
015

SPEAKER: ELI MOSELLE

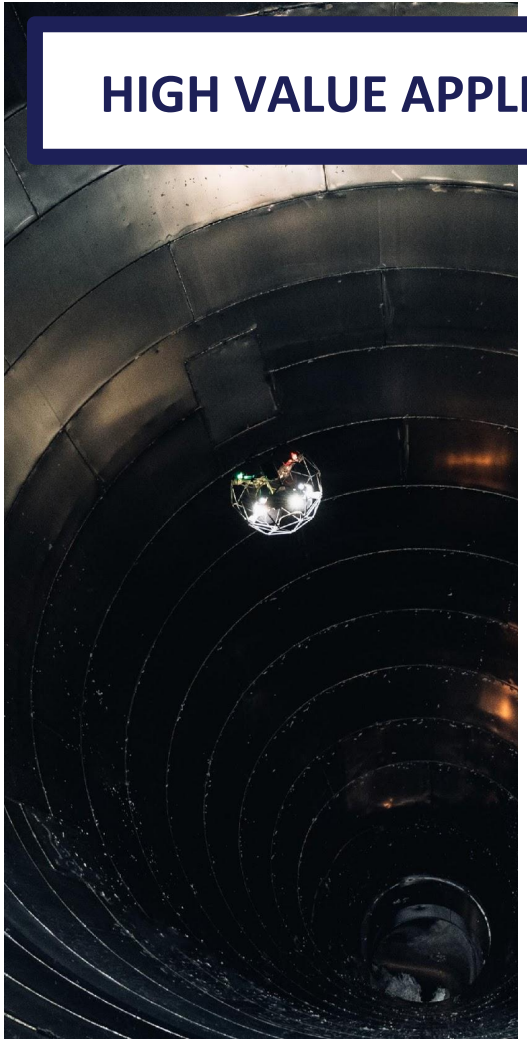
- CEO of Halo Robotics
- MSc, Strategic Studies, Nanyang Technological University
- Certified PMP, Project Management Institute
- CASA Certified Drone Pilot: Remotely Piloted Aircraft Systems
- 10 Years Indonesia Business Experience
- Specialized Areas & Drone Program Focus:
  - Inspection & Asset Integrity Management
  - Survey, Mapping, LIDAR & GIS
  - Intelligence, Surveillance, Reconnaissance
  - Risk Analysis & Non-Traditional Security Studies

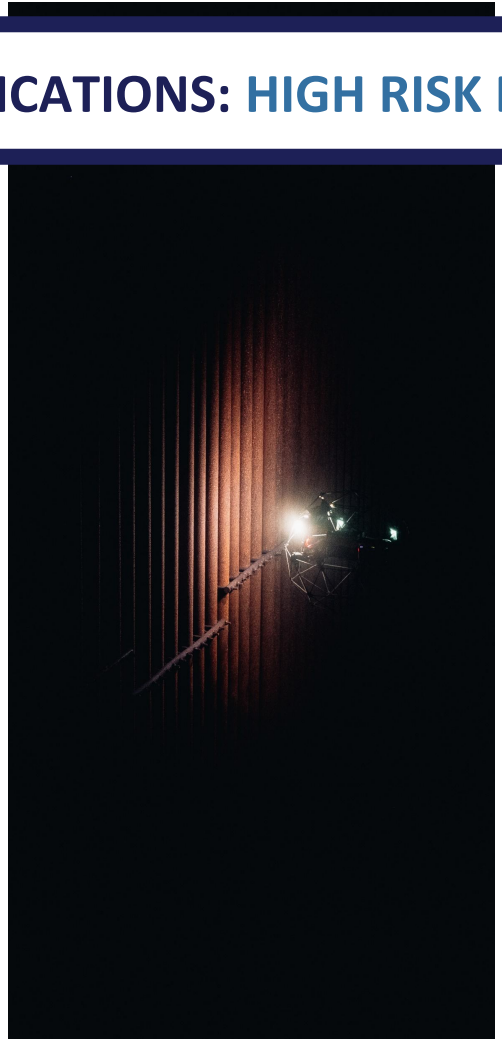
ELI MOSELLE
CEO

NATIONAL OPERATIONS. SERVICE EXCELLENCE.

PAMA
BUMA
HALO ROBOTICS
PP
JAWA POWER
PERTAMINA
ConocoPhillips
THIESS
GAMA PLANTATION
NAWAKARA SECURITY SOLUTIONS
BINTANG DELAPAN MINERAL
KORPS BRIMOB
FEDERASI AERO SPORT INDONESIA EKA DAYA DIRGANTARA KARMA
PLN
G4S
BAYER
green company Great Giant Pineapple
ASTRA AGRO LESTARI
APRIL
sinarmas
JASAMARGA Indonesia Highway Corp.
IndoAgri
syngenta
PTPN XIV
WASKITA
WIKA
SAMSON TIARA Safety & Survival Training
SIMS PT. SIMS JAYA KALTIM
HK
bp
BKI 1964 Biro Klasifikasi Indonesia
P.T. ARUTMIN INDONESIA
star energy
PT Indospec Asia Inspection & Certification
AIRFAST Indonesia
FMC

HIGH VALUE APPLICATIONS: HIGH RISK ENVIRONMENTS





AGENDA: OPERATING IN HIGH RISK ENVIRONMENTS

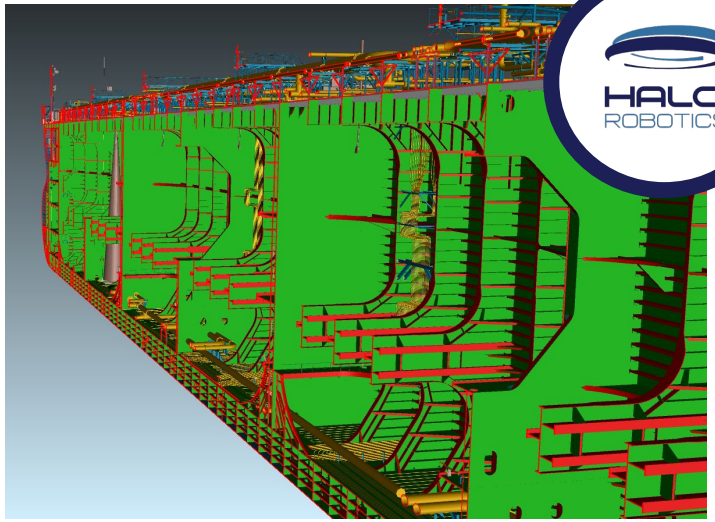
- **Initial Concerns & Hazards**
- **Key Risks in Halo's Experience**
- **Project Management Approach**
  - Project PICs
  - Method Statements
  - Deliverables & Data Management
- **Preparation with Method Statements**
  - Scope of Work
  - Flight Planning
  - Risk Analysis & Mitigation Plan
- **Execution**
  - Site Access & Permits
  - Managing Changes Systematically
  - Emergency Scenarios
- **Data Management Procedures & Repeatability**

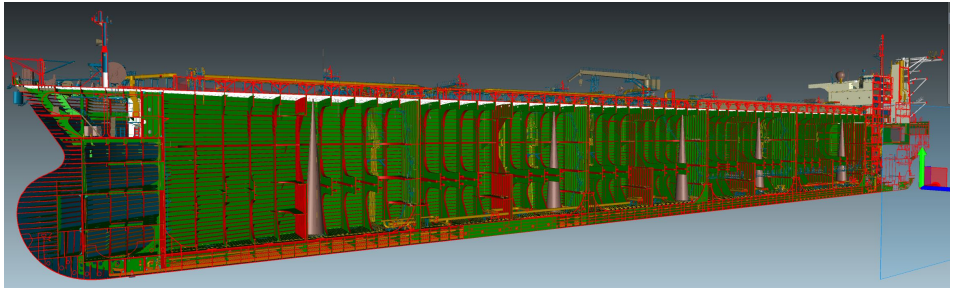
BASIC QUESTIONS & INITIAL CONCERNS

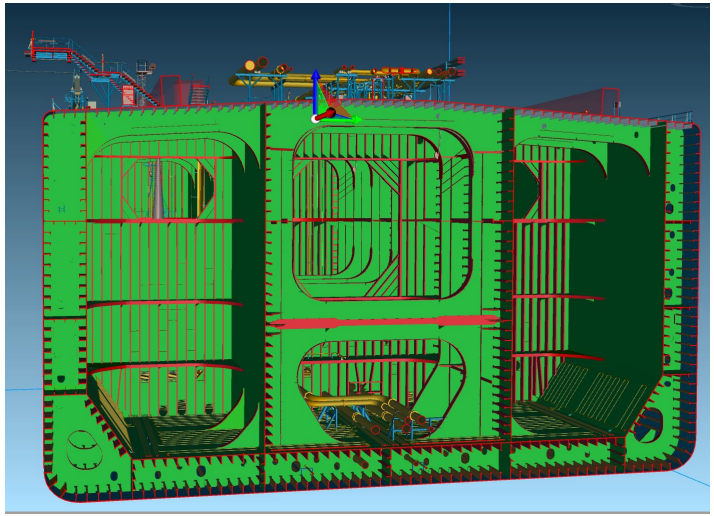
- Explosion Proof & ATEX Zone Ratings
  - **Gas Free – required** (or below threshold levels)
  - **ATEX Zone 2 & Hot Works Permits – OK**
- Drone Access & Obstacles, Recovery Plan
- Temperature
- Water & Moisture
- Dust and Debris
- Hazardous & Toxic Materials
- Altitude

BASIC QUESTIONS & INITIAL CONCERNS

- Explosion Proof & ATEX Zone Ratings
  - **Gas Free – required** (or below threshold levels)
  - **ATEX Zone 2 & Hot Works Permits – good to go**
- Drone Access & Obstacles, Recovery Plan **(OK)**
- Temperature **(50°C Max)**
- Water & Moisture **(Depends/No)**
- Dust and Debris **(OK)**
- Hazardous & Toxic Materials **(OK)**
- Altitude **(OK/will impact flight plans, battery life)**

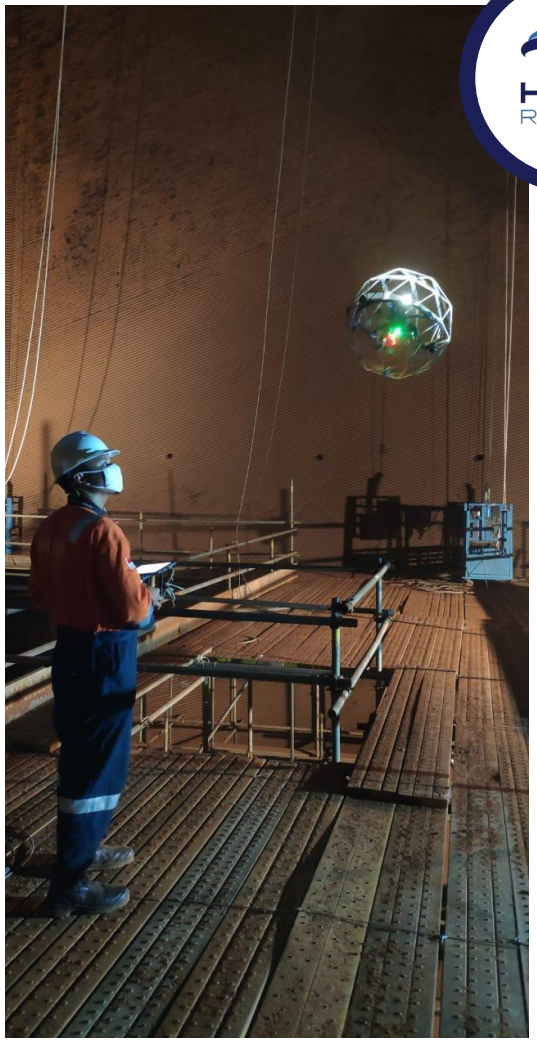






KEY RISKS [HALO EXPERIENCE]

- **Failure to Prepare**
- **Scope Creep** – Extra Onsite Scope Requests
- Non-Technical Slowdowns Onsite & Time Pressure
- Data Requirements – Not Getting the Data Needed
- Localizing the Data – Not Able to Locate the Defects/Issues in the Visual Data that was Obtained
- Repeatability – Not Being Able to do the Same Thing Twice



PROJECT MANAGEMENT APPROACH

Identify Key Project Personnel [Including Data Users/Stakeholders]

- Project Sponsors
- Project Manager
- Pilots
- Administrative & Commercial (HSE, Permits, Budgetary, etc.)
- Data User PIC and/or Data Procedures PIC

Scope Organization

- **Scope of Work – Assets & Inspection Plan** (and *not* XYZ++)
- **Assumptions:** e.g.,
  - Project assumes Assets will be Gas Free at [X] time
  - Project assumes Assets are non-operational at [X] time

Timeline, Deliverables, and Data Procedures

Project Risks & Mitigation Plan

Method Statement

Document Owner: PT Halo Indah Permai
Confidentiality status: STRICTLY CONFIDENTIAL
Document Manager:
Last review date:
Document status: Draft

Table of Contents

1 Task Description 2
2 Appendix: Schematics, Blueprints, Maps, Diagrams, ... 4
3 Appendix: Scope of Work – Flight Plan Description 5
4 Appendix: Risk Assessment 6

Company Name:		Start Date:	
Project Reference	YYMMCCC	Finish Date:	
Project Description		Site location / Address:	

Halo Robotics:		Company:	
Position:		Position:	
Signature:		Signature:	

PREPARATION: THE METHOD STATEMENT

Task Description (i.e., Project Charter)

- ☐ **be sure to list Assumptions here!**

Schematics, Blueprints, Maps, Diagrams, Document References

Scope of Work: Flight Plan Description & Timeline

Risk Assessment & Mitigation plan

Project Assumptions & Other Comment
Assets are assumed to be gas free or flushed of gas before the operations begin. Assets are assumed to be non-operational during the time of the inspection operations. Assets are assumed to be pumped of water, and major debris/ancillary equipment is removed before operations. However, project assumes that surrounding assets are operational and Hot Works Permits will be required. Operations shall comply with ATEX Zone 2 management parameters and Company standards, whichever is higher. Flights will not be conducted over people or property at any time. Safe perimeter flight, and Close Visual Inspection operations in/around the designated assets, are permitted only by designated XXXX personnel for approved assets within this Method Statement. Be aware that having a drone onsite can generate interest, and curious people may engage with the drone operators. If possible, it is best to arrange a demonstration prior to operation so that this hazard is minimized, and operations can be fully focused.

1 Task Description

Personnel Involved		On si
Name	Role	Name
		Contact

Description of the Task	On site sequence of Operati
	Subject to change / amendment 1. On site safety induction 2. Item 3. Item 4. Etc.
Specific staff training	

Is Halo Robotics allowed to use the gathered footage for public communication material?	No
Is Halo Robotics allowed to disclose the company name for public communication material?	No

Elements that may damage the RPAS					
Moisture or presence of water	Explosive environment	Wind higher than 10m/s	Confined space	Elements that may entered the cage (Twigs, rods, pipes, any elements that may fall)	Other:
Yes	No	No	Yes	No	

RPAS Recovery after Incident	
In case of incident, can the RPAS be recovered?	
If left in place, can it damage the asset?	

Hazardous Substance – Attach MSDS if necessary							
Toxic	Harmful or irritant	Corrosive	Biohazard	Oxidizing	Highly Flammable	Explosive	Other:
No	No	No	No	No	No	No	

Required Personal Protection Equipment							
Safety boots	Safety gloves	High visibility	Hard hat	Eye protection	Ear protection	Overall	Other:
Yes	Yes	No	Yes	Yes	No	No	

Identified Residual Hazards	First Aid Facilities	
All inspection area will be designated as no go zone for all personnel not involved in the operation	Name: Onsite First Aid Person	
	First Aid Box Location	
	Nearest Hospital Location	

Key Tools & Equipment	Other Essential Equipment (i.e. generator, power outlet, car ,etc.)
#/Type Drone #/Type Batteries #/Type Battery charger #/Type Ground Control System #/Type Accessories, Range Extenders, Additionals	110V / 240V Power Supply (onsite) Etc. Etc.

PREPARATION: THE METHOD STATEMENT

Task Description (i.e., Detailed Project Charter)

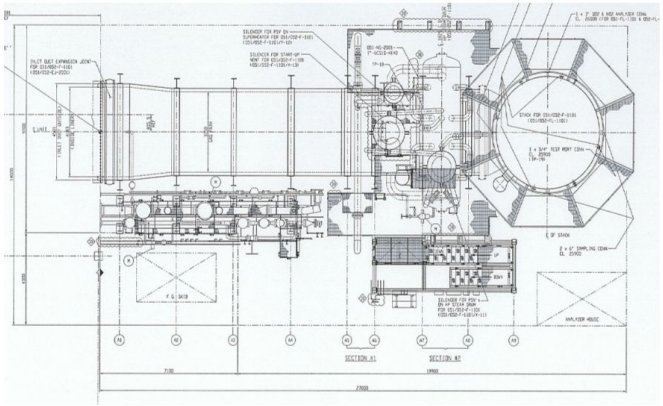
Schematics, Blueprints, Maps, Diagrams, Document References

Scope of Work: Flight Plan Description & Timeline

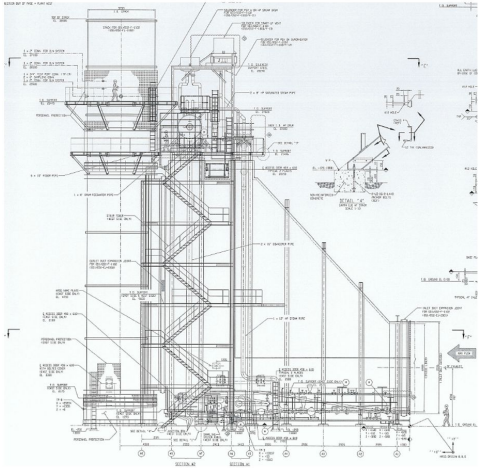
Risk Assessment & Mitigation plan

(2) General Photos: Overview

UPPER: HRSG XXXXXX DIAGRAM



SIDE 2: HRSG XXXXX DIAGRAM



PREPARATION: THE METHOD STATEMENT

Task Description (i.e., Detailed Project Charter)

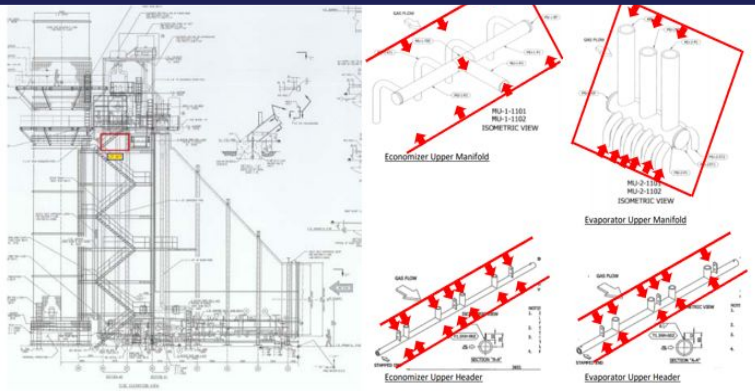
Schematics, Blueprints, Maps, Diagrams, Document References

Scope of Work: Flight Plan Description & Timeline

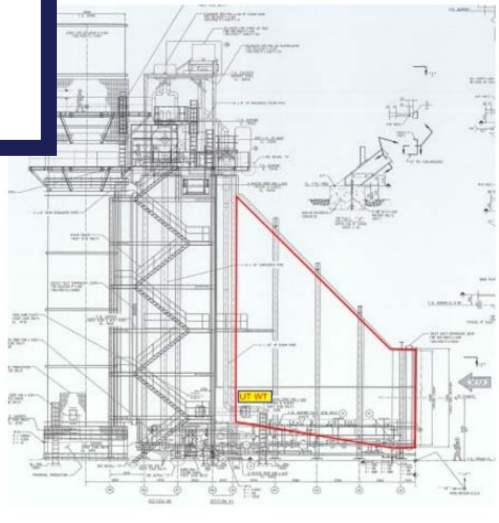
Risk Assessment & Mitigation plan

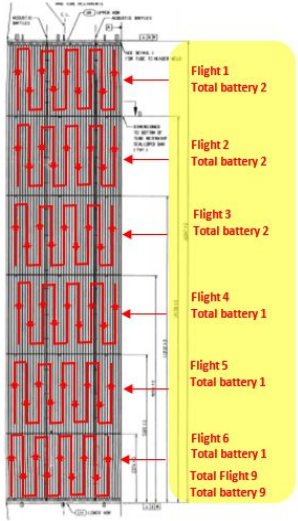
2 Days (ACTIVE):
HRSG XXXXXXX
CVI Inspections (Confined Space Operations – Thermal & RGB)
- **Elios 2 Drone Operations**
  - 1x **Recon Flight**
  - **24-48 Systematic Inspection Flights** (Internal + Confined Spa Structures)
  - **Following [INSPECTION PLAN] CVI inspection plan and equipment**
- **Inspection Reporting & Onsite Review of the Data with [XXXXX TEAM]**

2 Days (STANDBY):
Redundancy & Further Inspection requirements as/if needed:
- Permits, Checks, Asset Accessibility
- CVI inspection flights and repeats if/as needed
- Further flights on any assets as needed/if requested to achieve maximal detail
- Preliminary job reporting (Quick Reports) to be prepared if time permits



Flight Plan – Manhole 7 – Evaporator & Economizer Upper Box





Final Superheater

Flight Plan – Manhole 1 – Inlet Duct, Final Superheater

PREPARATION: THE METHOD STATEMENT

Task Description (i.e., Detailed Project Charter)

Schematics, Blueprints, Maps, Diagrams, Document References

Scope of Work: Flight Plan Description & Timeline

Risk Assessment & Mitigation plan

4 Risk Assessment

RISK MATRIX

		Likelihood of Occurrence				
		Unlikely < 1 : 1,000,000 – [1]	Seldom < 1 : 100,000 – [2]	Occasionnal < 1 : 10,000 – [3]	Likely < 1 : 1,000 – [4]	Definite > 1 : 1,000 – [5]
Severity	Slight Damage – [1]	1	2	3	4	5
	Minor Damage – [2]	2	4	6	8	10
	Moderate Damage – [3]	3	6	9	12	15
	Major Damage – [4]	4	8	12	16	20
	Massive Damage – [5]	5	10	15	20	25

Steps	Hazard		Initial risk score			Mitigation (Human & Equipment)	Residual risk score		
	Description	Effect	Likelihood	Severity	Score		Likelihood	Severity	Score
1 - Displacement Around Site & Work Area Checks									
	1. Loss of Footing while walking 2. Tripping over unseen items on the ground 3. Dust, foreign materials in the air 4. Loud and/or unpredictable noise 5. Falling debris or dropped objects	1. Slips, trips and falls	5	3	15	1. Wear footwear with ankle support 2. Identify a path before setting off 3. Don't carry too much equipment 4. Make two trips if required 5. Use backpacks where possible 6. Walk slowly. Don't rush! 7. Bring knee brace or any other support needed.	2	3	6

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EXECUTION : THE METHOD STATEMENT

Using the Method Statement as a "Live Document"

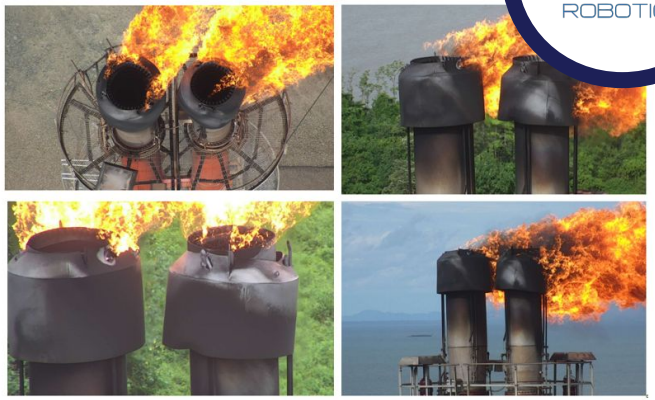
- Alignment for shared understanding of the operation
- Drafting the Method Statement as the channel for confirmation
- Management of changes in scope, or additional scopes

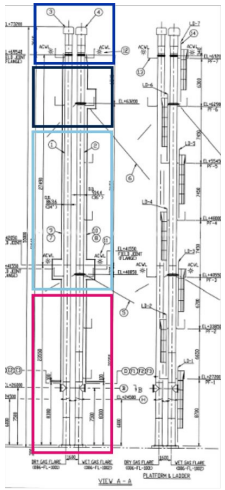
Using the Method Statement as a Reference

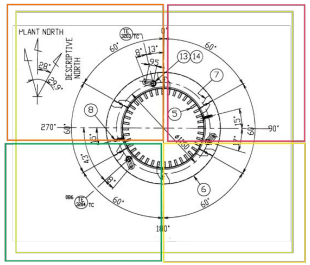
- **Version Documentation**
  - V1, V2, V3, V4, etc. – references for future discussions if needed
- **File Organization:** anything ever related to a Method Statement
  - Asset Data
  - Method Statement(s)
  - Inspection Plans (if any)
  - Project Administration

FLARES

GENERAL OVERVIEW PHOTOS







Take 1
Take 2
Take 3
Take 4
1 Flight

Take 1
Take 2
Take 3
Take 4
Take 5
1 Flight

EXECUTION: SAFE OPERATIONS & CHANGE MANAGEMENT

Preparation & Execution: **Method Statements, Checklists**

Non-Technical Factors: Site Access, Permits, Equipment Checks

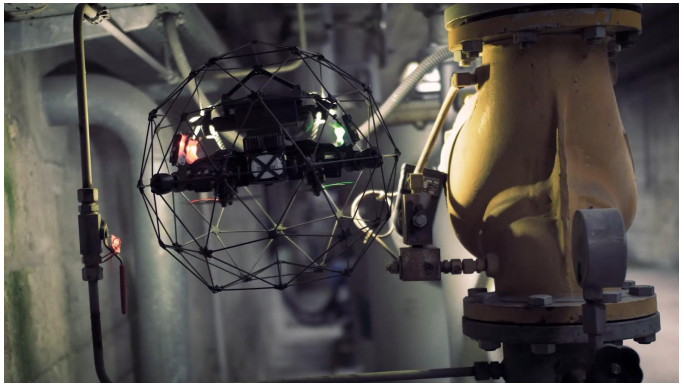
- This takes real time! **Include Standby Time into plans**

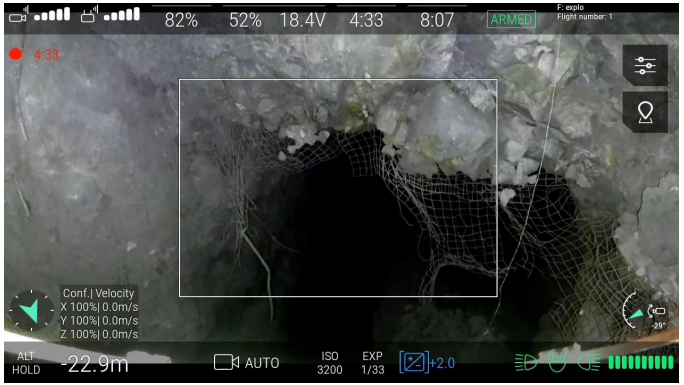
Managing Changes □ Stick to the Method Statement

- Scope creep is a **major** risk.
- **Mitigation:**
  - New scopes = new Method Statement for that scope
  - New scopes = new permits if needed
  - New scopes = full coordination with all Project PICs

Data & Time Pressure: when is the data needed?

- If the inspection results are time-sensitive requirements, make sure to allow project time to check the data, generate inspection reports, and provide the reports to Users/PICs





DATA: INSPECTIONS → ASSET INTEGRITY MANAGEMENT

Good: drones produce a huge amount of high value data
Risk (!!): drones produce a huge amount of high value data

Anticipate the large volume of asset data and reporting.
Anticipate the review of previous data for ongoing asset analysis.

Set up data management procedures and systems

- **Organized file folders**
  - Raw Data (Photo, Video, Thermal)
  - Inspection Reports
  - Method Statements
  - Asset Data
- **Data management PICs**

…Third party software tools for AIM? […++]

CLOSE VISUAL INSPECTION (CVI)

ER NO: Revision: 0.0

Flight Number	6	Mission	Tank 3 Roof
Flight	Q1 R3-1 (R3.1-23)	POI Name	*[CONFIDENTIAL]*

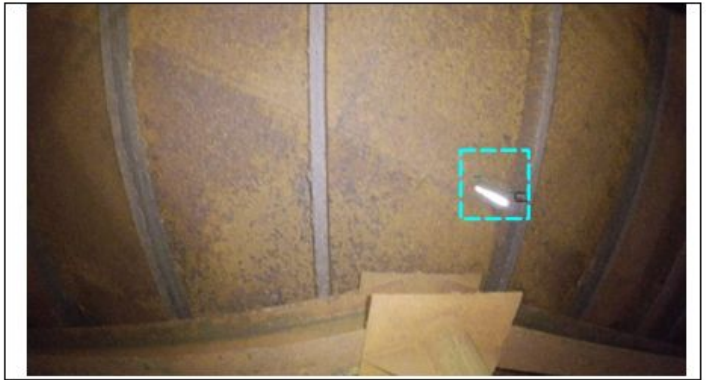
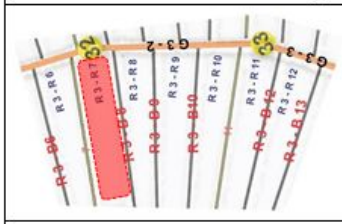


Image: Anomaly 1



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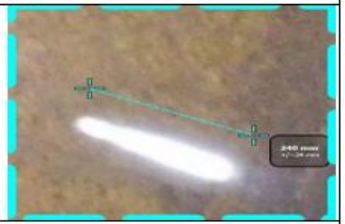
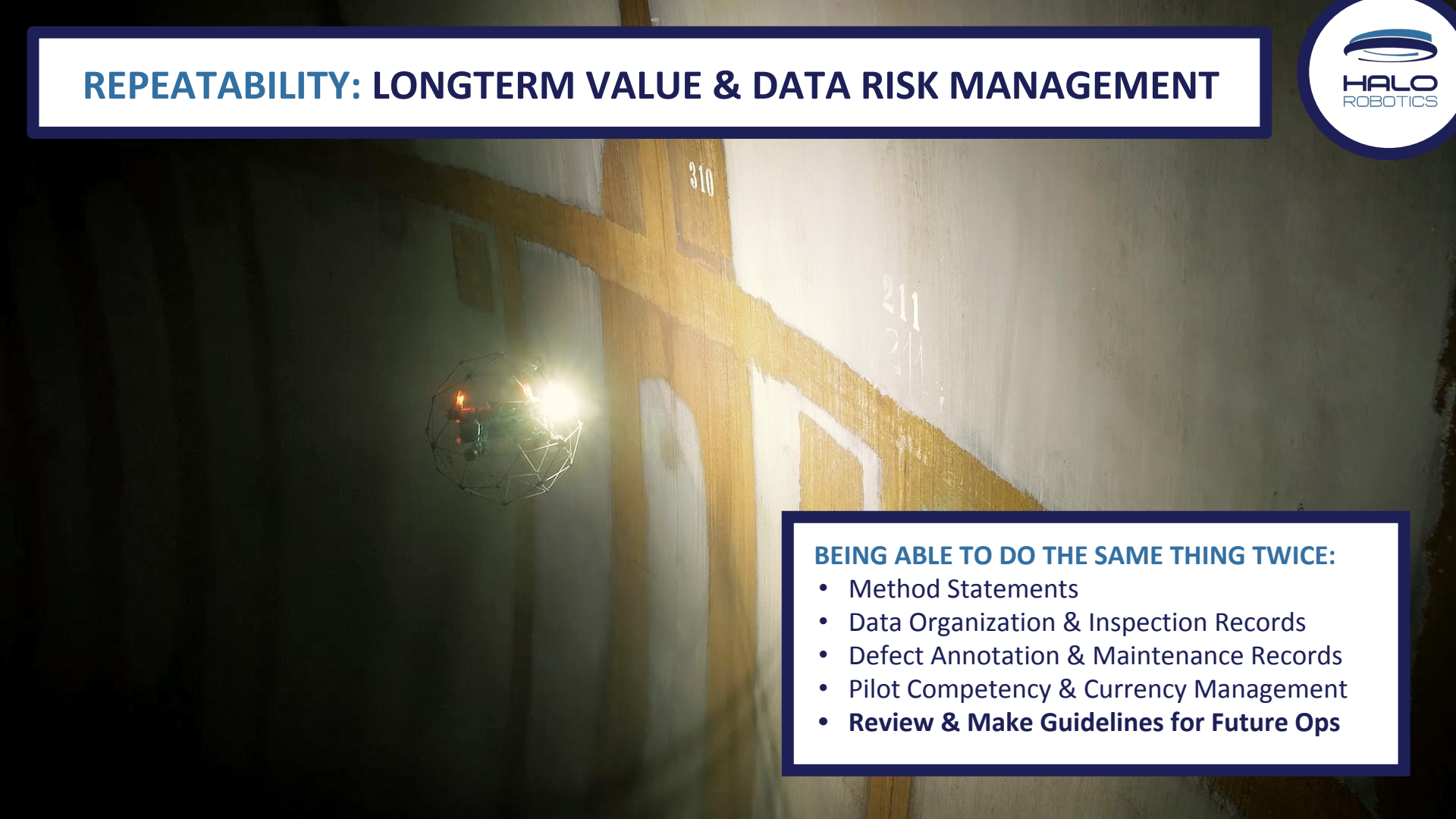


Distance Measurement: 240 mm

COMMENT :
- *[CONFIDENTIAL]*

700 annotations later…

REPEATABILITY: LONGTERM VALUE & DATA RISK MANAGEMENT



BEING ABLE TO DO THE SAME THING TWICE:

- Method Statements
- Data Organization & Inspection Records
- Defect Annotation & Maintenance Records
- Pilot Competency & Currency Management
- **Review & Make Guidelines for Future Ops**

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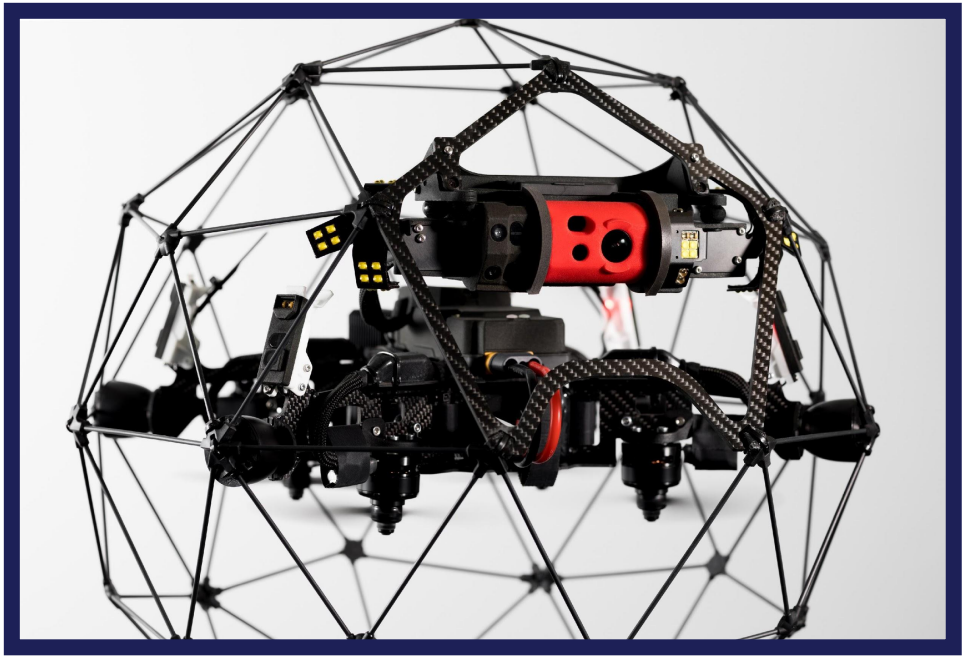

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UKAS MANAGEMENT SYSTEMS
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THANK YOU

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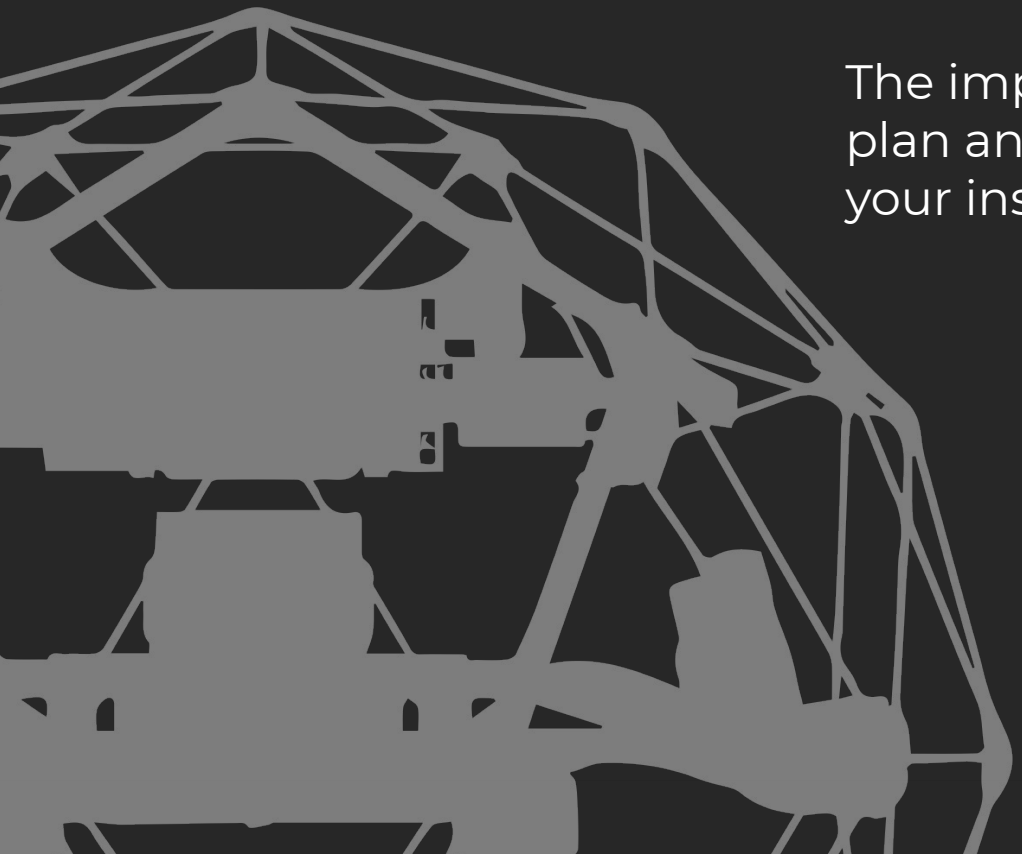
COMMITTED TO EXCELLENCE

High Risk Missions—4 Key Checklists to Make Sure You're Prepared, Even for Emergencies

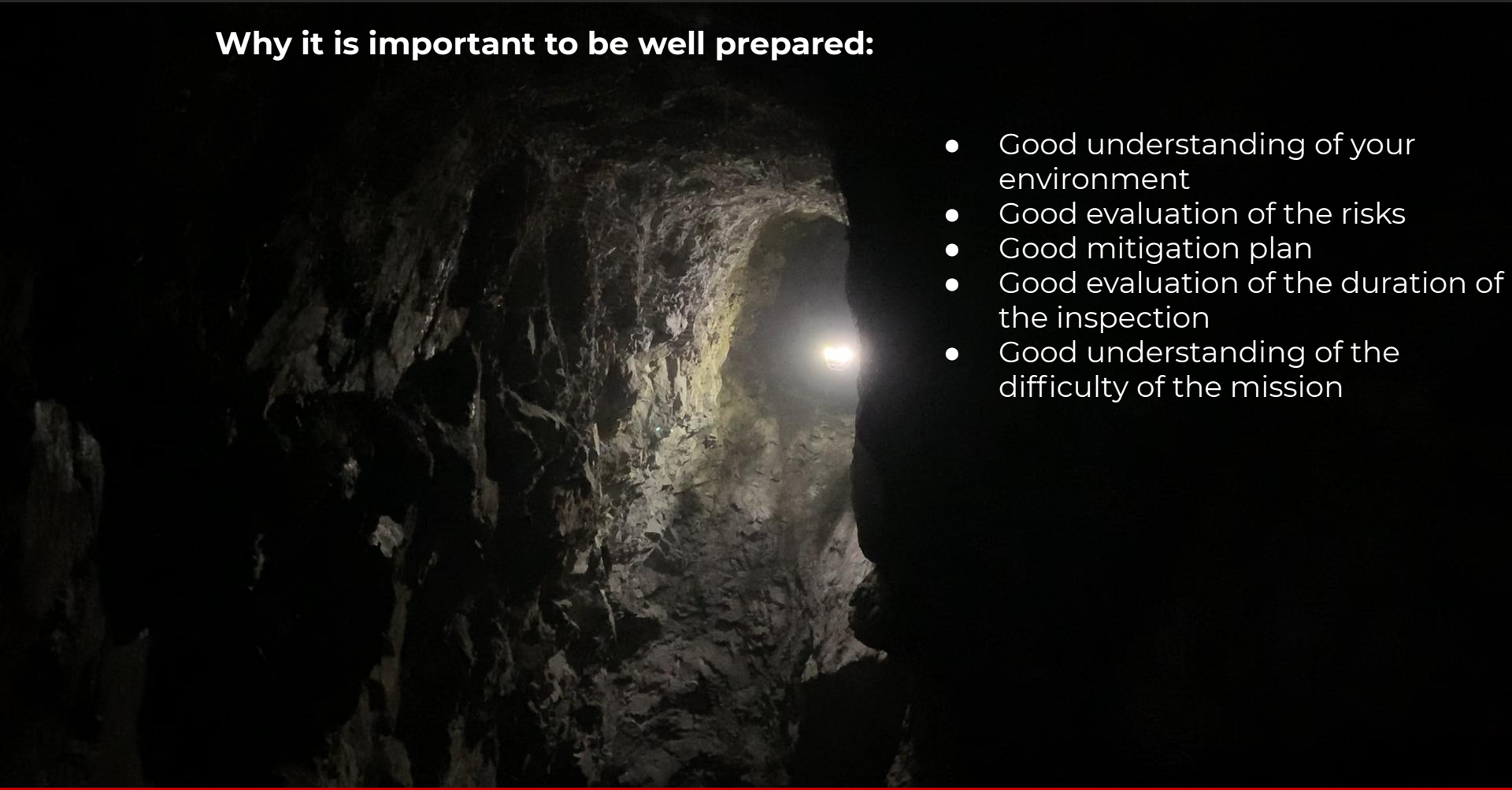
Charles Rey
Training Manager

FLYABILITY



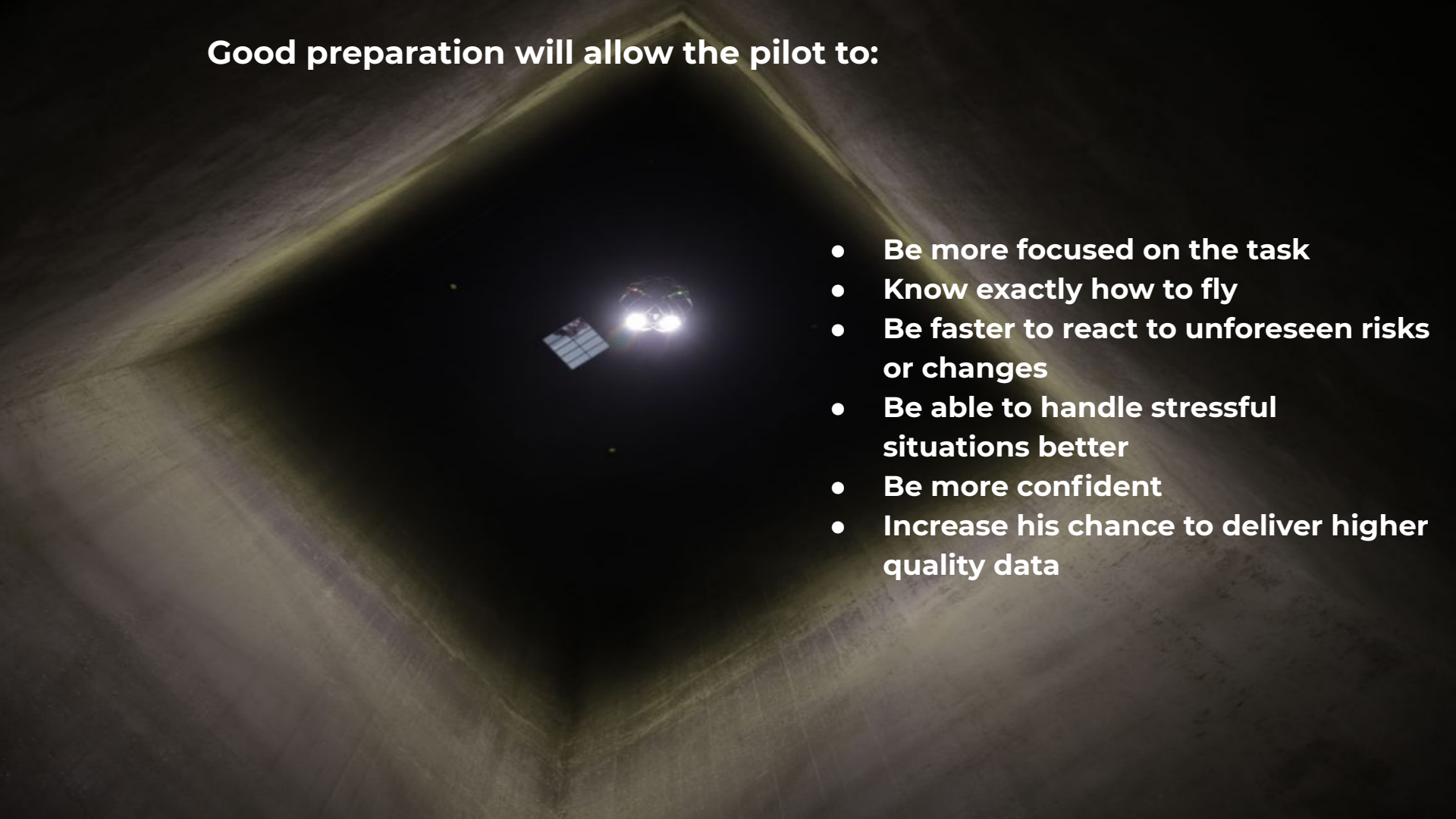
The importance of having a good plan and being well prepared before your inspection—

Why it is important to be well prepared:



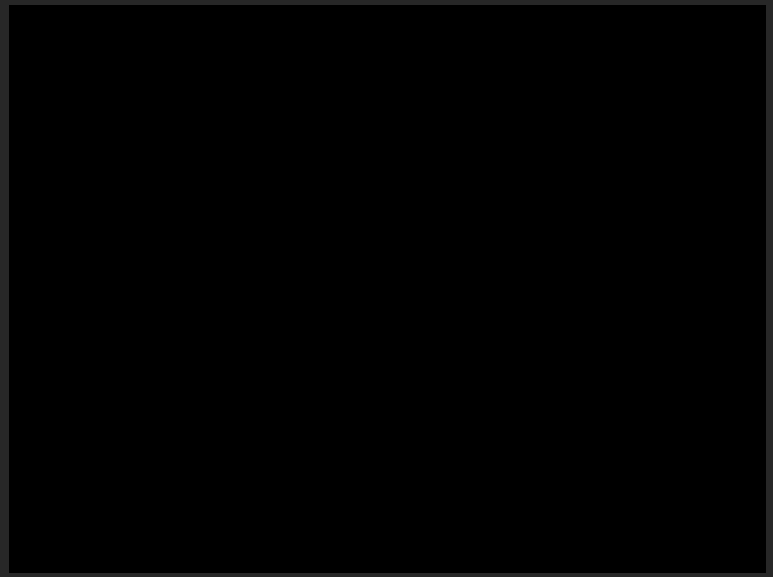
- Good understanding of your environment
- Good evaluation of the risks
- Good mitigation plan
- Good evaluation of the duration of the inspection
- Good understanding of the difficulty of the mission

Good preparation will allow the pilot to:



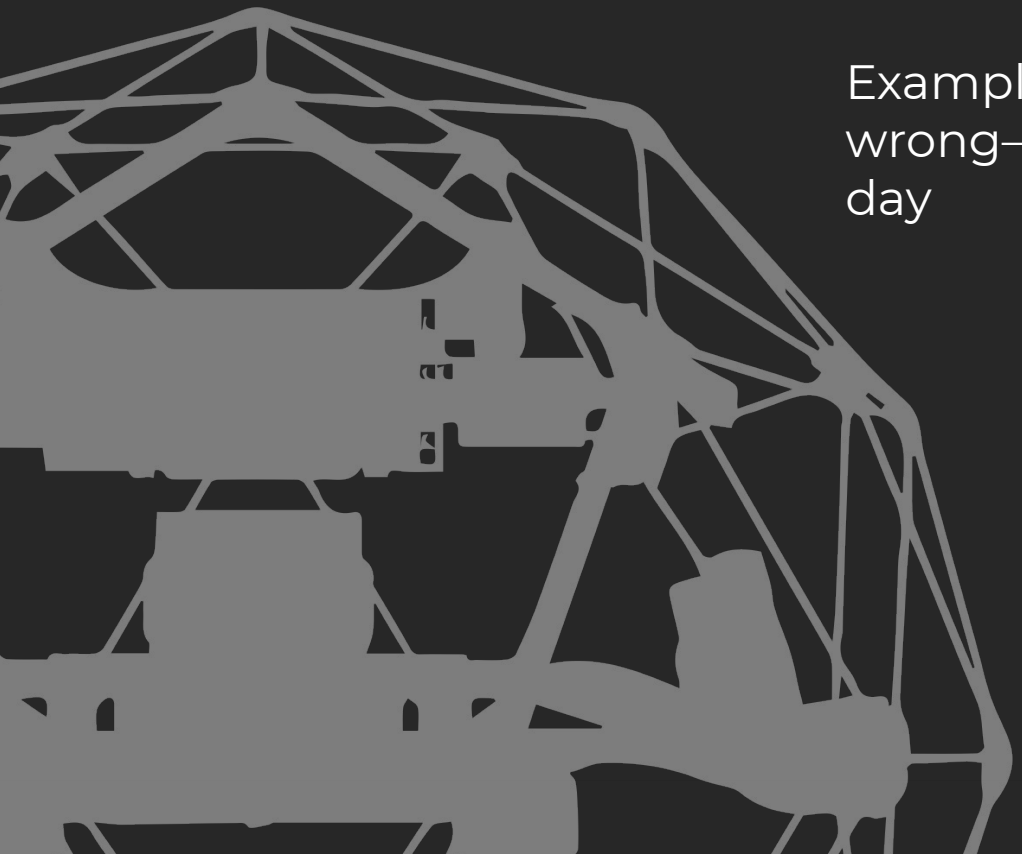
- Be more focused on the task
- Know exactly how to fly
- Be faster to react to unforeseen risks or changes
- Be able to handle stressful situations better
- Be more confident
- Increase his chance to deliver higher quality data

How to Prepare for High Risk Inspections



For each inspections, we use 4 Checklists:

- **Weeks before the inspection**
  - Collect and analyse intel
  - Decide on flight plan
  - Organisation on site...
- **Day before the inspection**
  - Material check
- **Day of the inspection**
  - Follow the plan established weeks ago
- **Day after the inspection**
  - Process the data
  - Material check



Examples where things go wrong—and preparation saves the day

Sewer inspection

View example video 1—Sewer inspection

See webinar recording page for a link to this video:
https://info.flyability.com/how-to-inspect-high-risk-environments-part-2

Stope inspection

View example video 2—Stope inspection

See webinar recording page for a link to this video:
https://info.flyability.com/how-to-inspect-high-risk-environments-part-2

Ship inspection

View example video 3—Ship inspection

See webinar recording page for a link to this video:
https://info.flyability.com/how-to-inspect-high-risk-environments-part-2

PAST WEBINARS

Thursday, April 9
10:30 AM EST / 04:30 PM CEST

Learn How API and ASME Experts Are Working to Expand Drone Inspection Applications

- Suzanne Lemieux, Manager, Operations Security & Emergency Response Policy at API
- Luis Pulgarin, Project Engineering Advisor at ASME

Tuesday April 14
11:30 AM EST / 05:30 PM CEST

How Country-of-Origin Drone Bans Impact U.S. Companies & Agencies Including Public Safety Agencies Fighting COVID-19

- Jordan Gross, Senior Government Relations Lead at DJI
- Romeo Durscher, Senior Director of Public Safety Integration at DJI

Tuesday, April 21
10:30 A.M. EST / 04:30 PM CEST

3D Modeling with Indoor Drones: Applications and Implications

- Andrew McIntyre, Technical Trainer and mapping expert at Pix4D
- Marc Gandillon, Head of Marketing at Flyability

Wednesday April 22
10:30 AM EST / 04:30 PM CEST

How to Build and Scale a Drone Program at Your Company

- Calvin Rieb, Head of Global Unmanned Systems at Cargill
- James Manni, UAS Program Manager at TVA

Tuesday April 28
10:30 AM EST / 04:30 PM CEST

Drones in Oil & Gas: How Chevron Uses Drones to Improve Safety, Reduce Downtimes, and Save Money

- Mauricio Calva, Non-Destructive Examination Expert at Chevron
- Larry Barnard, Downstream & Chemicals, Manufacturing ~ UAS Governance at Chevron

PAST WEBINARS

Thursday, April 30
11:30 AM EST / 5:30 PM CEST

Indoor 3D Modeling Use Cases: Photogrammetry in Action
- Laurie McBean, Geospatial Data Specialist at UAS, Inc.
- Gregory Spirlet, Professional Services Engineer at Flyability

Thursday, May 14
10:30 AM EST / 4:30 PM CEST

Drones in Power Generation: How Exelon Clearsight Uses Drones to Improve Safety, Reduce Downtimes, and Save Money
- Chris Place, Business Development Manager at Exelon Clearsight
- Marc Gandillon, Head of Marketing at Flyability

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

How to Mitigate Intrinsic Safety
- Danny Landry, Unmanned Operations Manager, Premium Inspection & Testing

Thursday, July 2
10:30 AM EST / 4:30 PM CEST

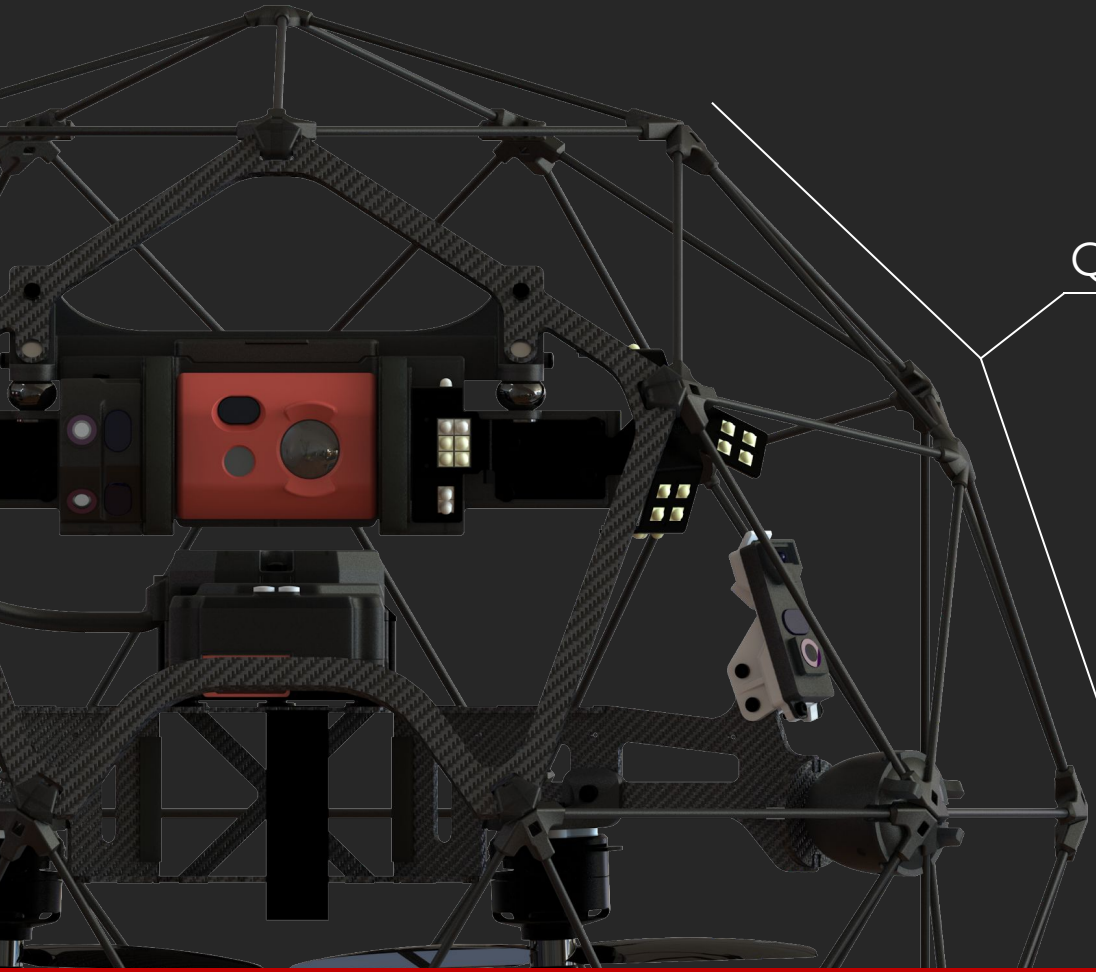
Drones in Marine & Offshore: Improving Safety and Reducing the Costs of Inspections
- Vincent Joly, Digital Solution Manager at Bureau Veritas
- Damien Thiery, Offshore Network Support and New Technologies Manager at Bureau Veritas

Thursday, September 10
10:30 AM EST / 4:30 PM CEST

How to Get the Most Out of Your Drone's Battery Life
- Geroge Burne, COPTRZ
- Ana Gamara, Raptor UAS

Thursday, November 5
10:00 AM EST / 4:00 PM CEST

How to Conduct Drone Missions in High Risk Environments—Part 1 of 2
- Danny Landry, Premium Inspection & Testing
- Charles Rey, Flyability



Q&A

Send your follow-up questions to:

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