R&D UK Centre

Showcase of use of Multicopters for Inspection – Offshore and Onshore Wind

Hugo Herrmann – Jan Pagan

Workshop on Multicopters for Inspection – BINDT 2018





Outline

1. Blade inspection: towards an unmanned experience

2. Transition Piece internal inspection at Teesside Offshore Wind Farm

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1. Blade inspection: towards an unmanned experience



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WHY ARE BLADES FAILING DURING OPERATION?







The most common answer is, they are not being inspected regularly.

WHAT ARE WE DOING NOW?

As R&D we set out to answer these main questions:

1. What is the current blade inspection practice?

2. How much time is required to inspect all the blades of a single wind turbine?

3. Can we reduce health & safety risks and at the same time be more efficient?



COMMON PRACTICE FOR BLADE INSPECTIONS









USING DRONES TO IMPROVE BLADE INSPECTIONS

CRITERIA DEFINITION:

1. Must be **safe and reliable** to operate in the field
2. Must be able to **deploy onshore and offshore**
3. Asset **downtime** must be kept as short as possible without affecting inspection quality
4. Image **resolution** should be high
5. **Logistical requirements** must be reasonable
6. Drone should be capable to operate in **variable weather conditions**



USING DRONES TO IMPROVE BLADE INSPECTIONS

















Cyberhawk – SKYSPECS - Inspectools

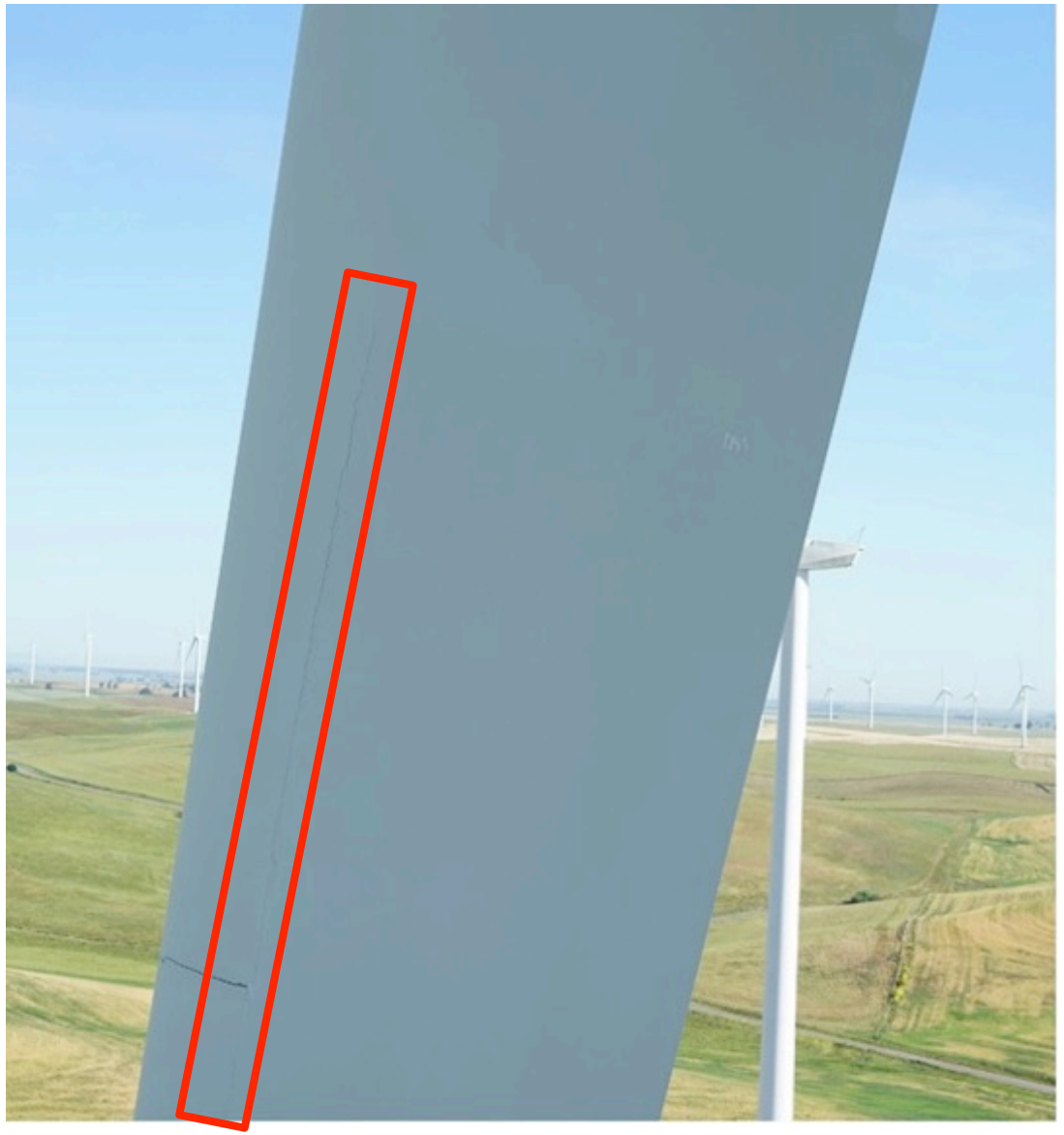






SHILO WIND FARM – USA





CONCLUSIONS

- **Fast, efficient and safe way to inspect** wind turbines
- Asset **downtime is reduced** significantly
- Post processing capabilities are **still developing**
- **Potential limit? Image resolution varies** due to what seem to be focusing issues.



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2. Internal inspection at Teesside Offshore Windfarm



Context

Owner Operator:	EDF Renewables
Wind Farm:	Teesside
Capacity:	62.1MW
Number of Turbines:	27
Wind Turbine Capacity:	2.3MW
Full Commission Date:	October 2013
OEM Warranty Handover:	October 2013



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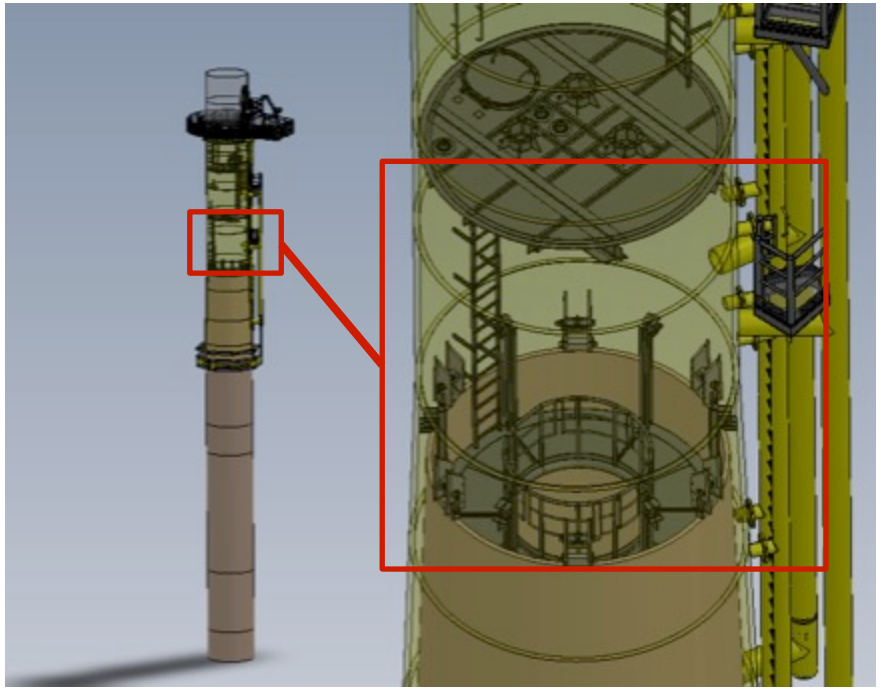

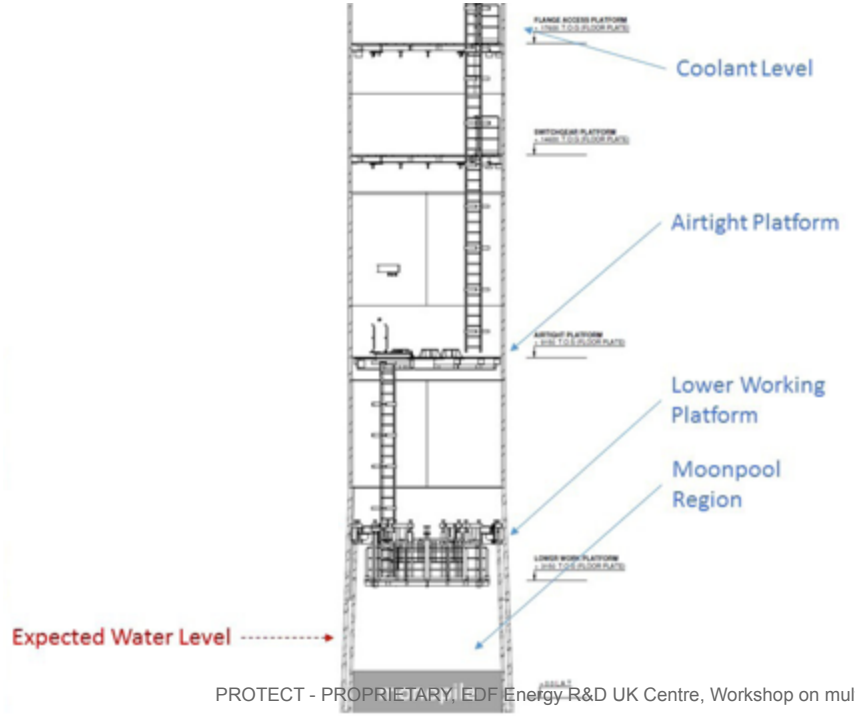

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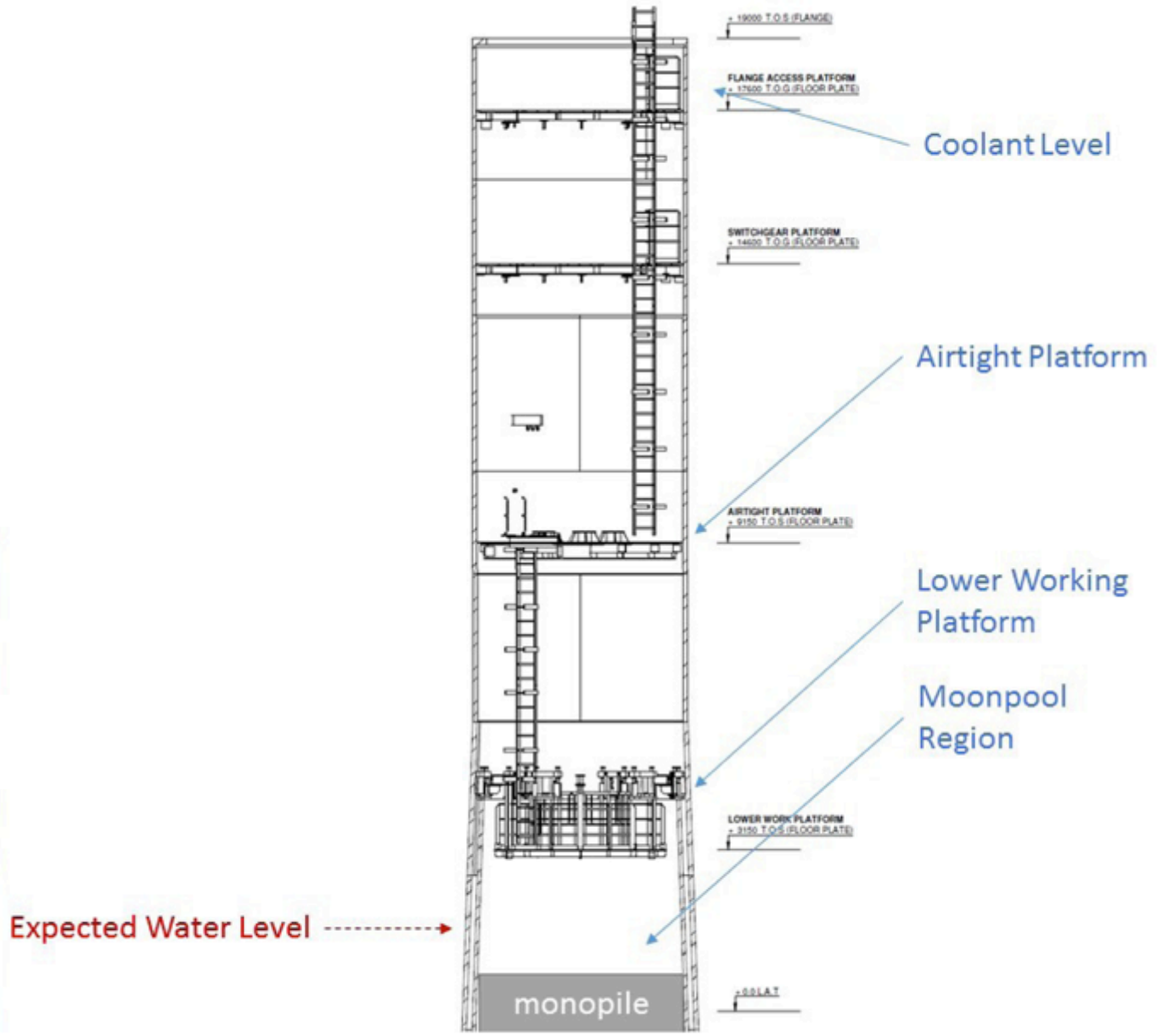
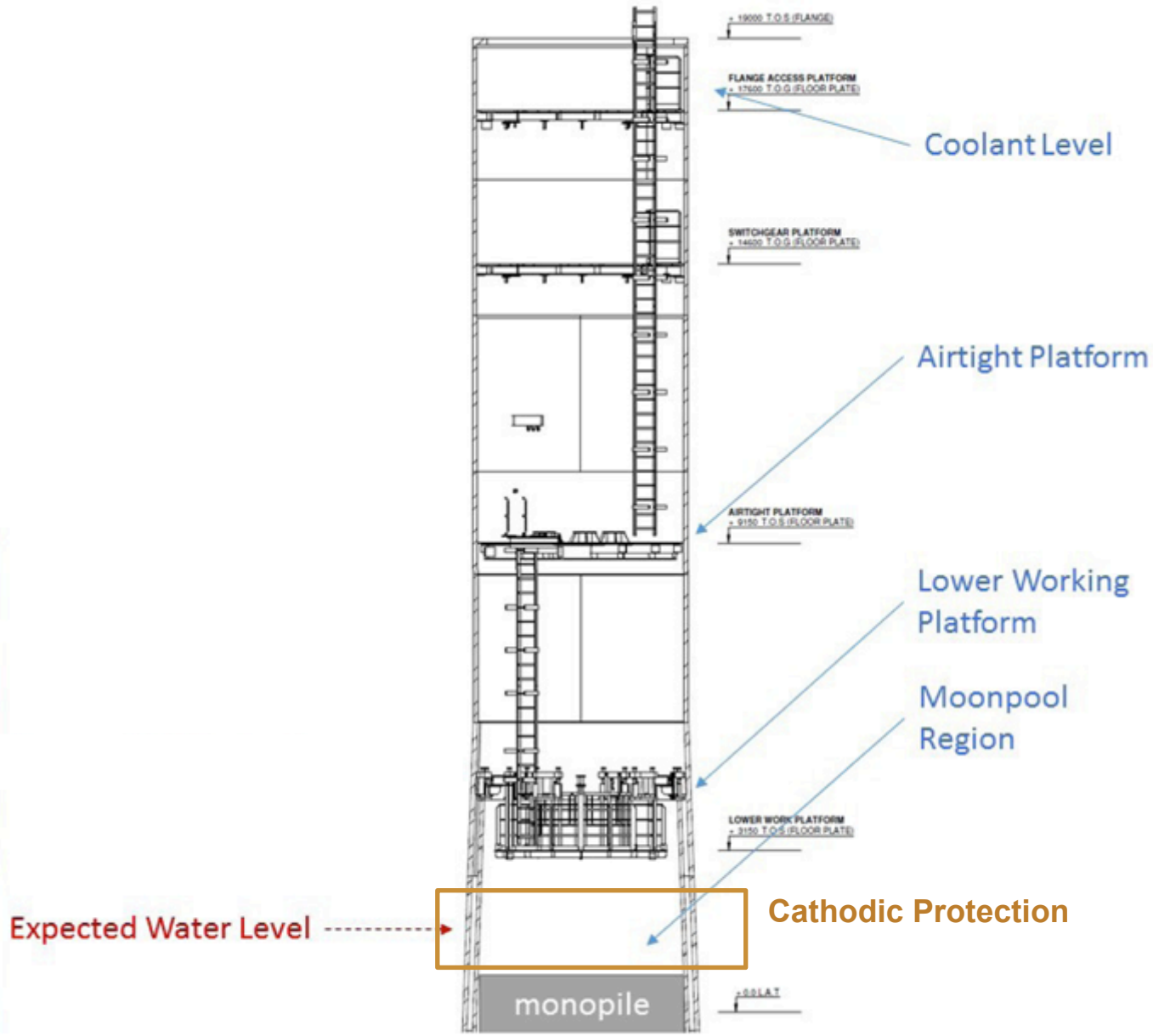
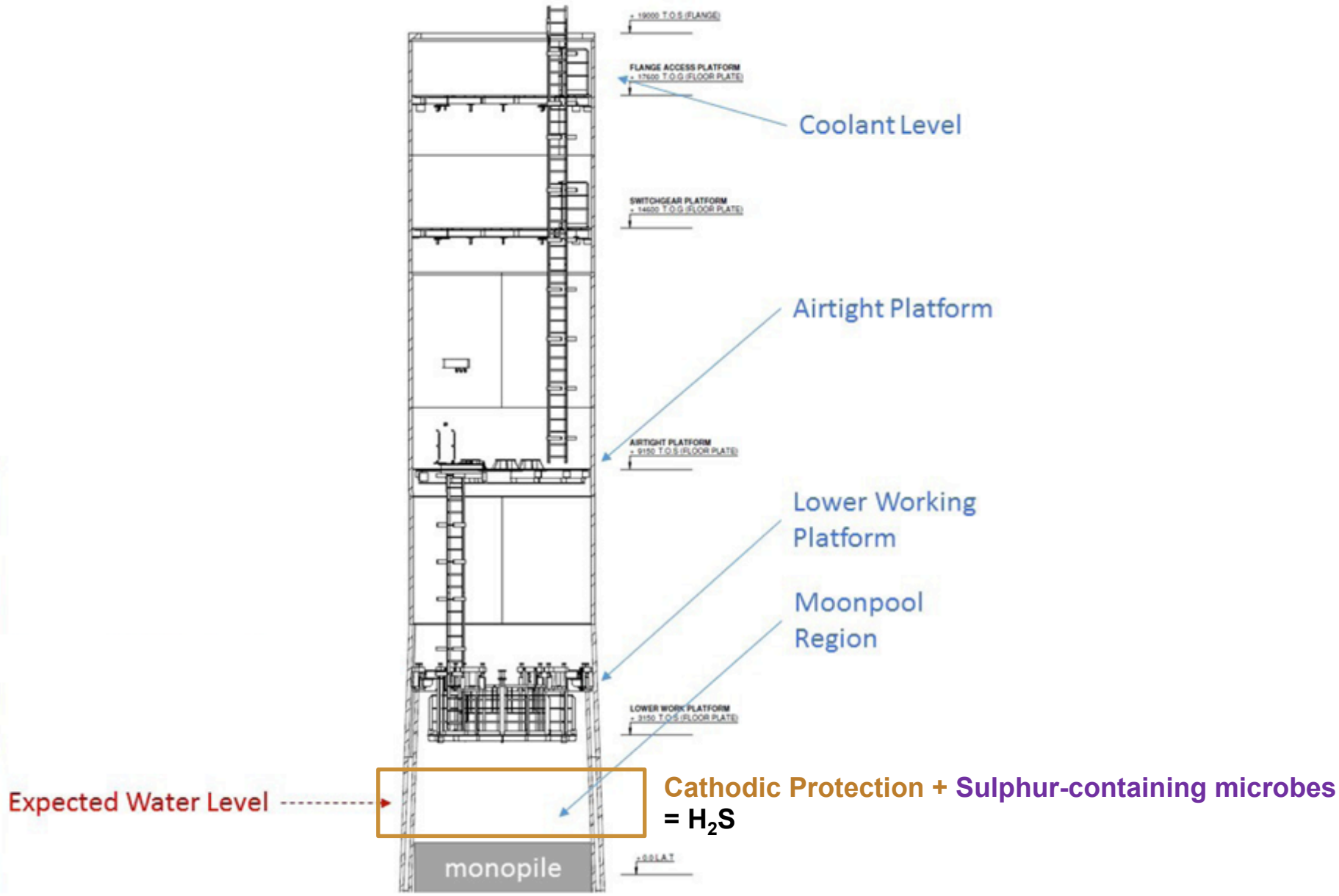

+ 19000 T.O.S (FLANGE)
FLANGE ACCESS PLATFORM
+ 17600 T.O.S (FLOOR PLATE)
Coolant Level
SWITCHGEAR PLATFORM
+ 14600 T.O.S (FLOOR PLATE)
Airtight Platform
AIRTIGHT PLATFORM
+ 9150 T.O.S (FLOOR PLATE)
Lower Working Platform
Moonpool Region
LOWER WORK PLATFORM
+ 3150 T.O.S (FLOOR PLATE)
Expected Water Level
monopile
+ 0.0 LAT

Context


FLANGE ACCESS PLATFORM
SWITCHGEAR PLATFORM
AIRTIGHT PLATFORM
LOWER WORK PLATFORM
monopile
Coolant Level
Airtight Platform
Lower Working Platform
Moonpool Region
Cathodic Protection
Expected Water Level

Context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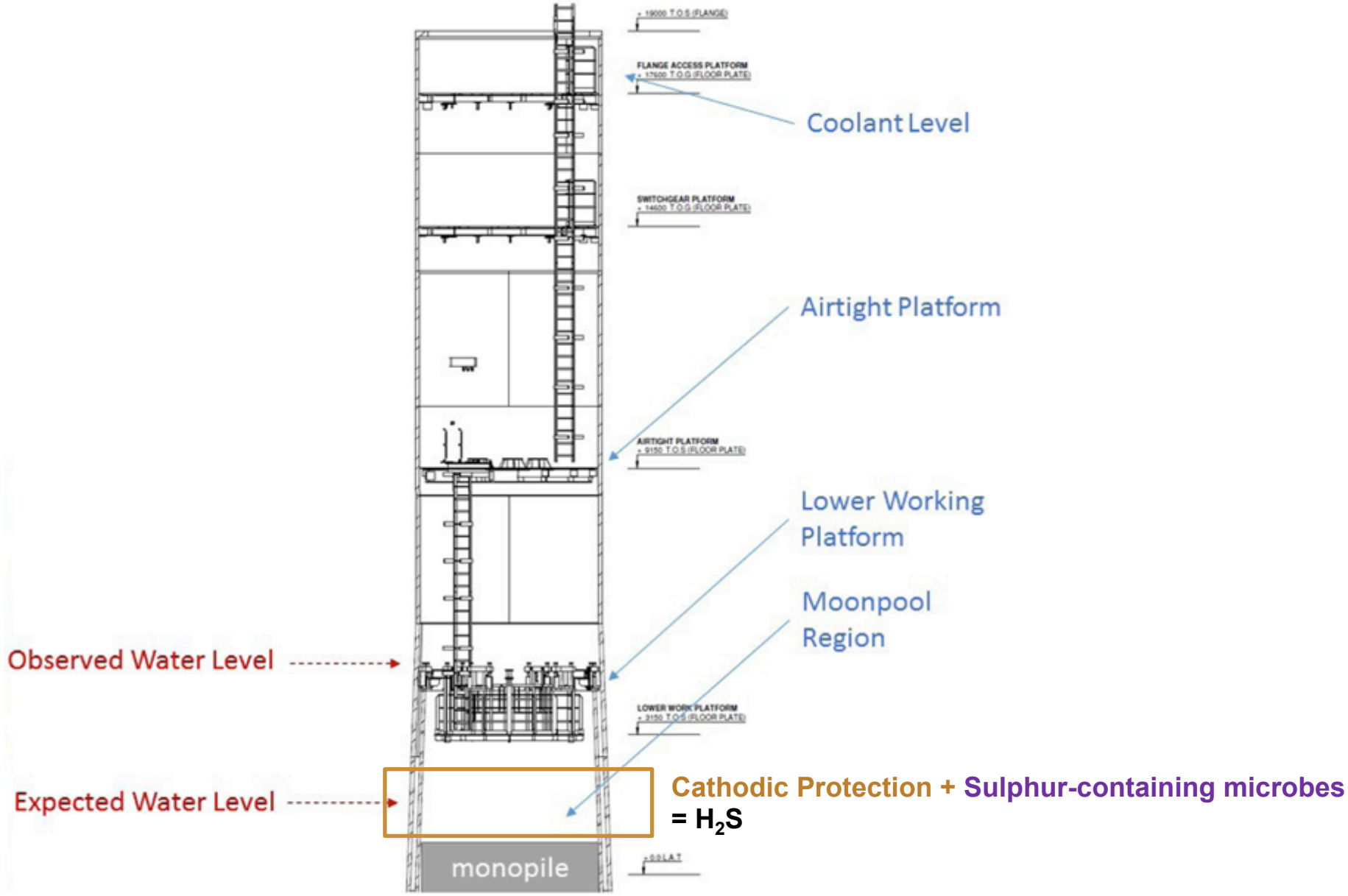
Expected Water Level
Cathodic Protection + Sulphur-containing microbes
= H_2S
monopile

Context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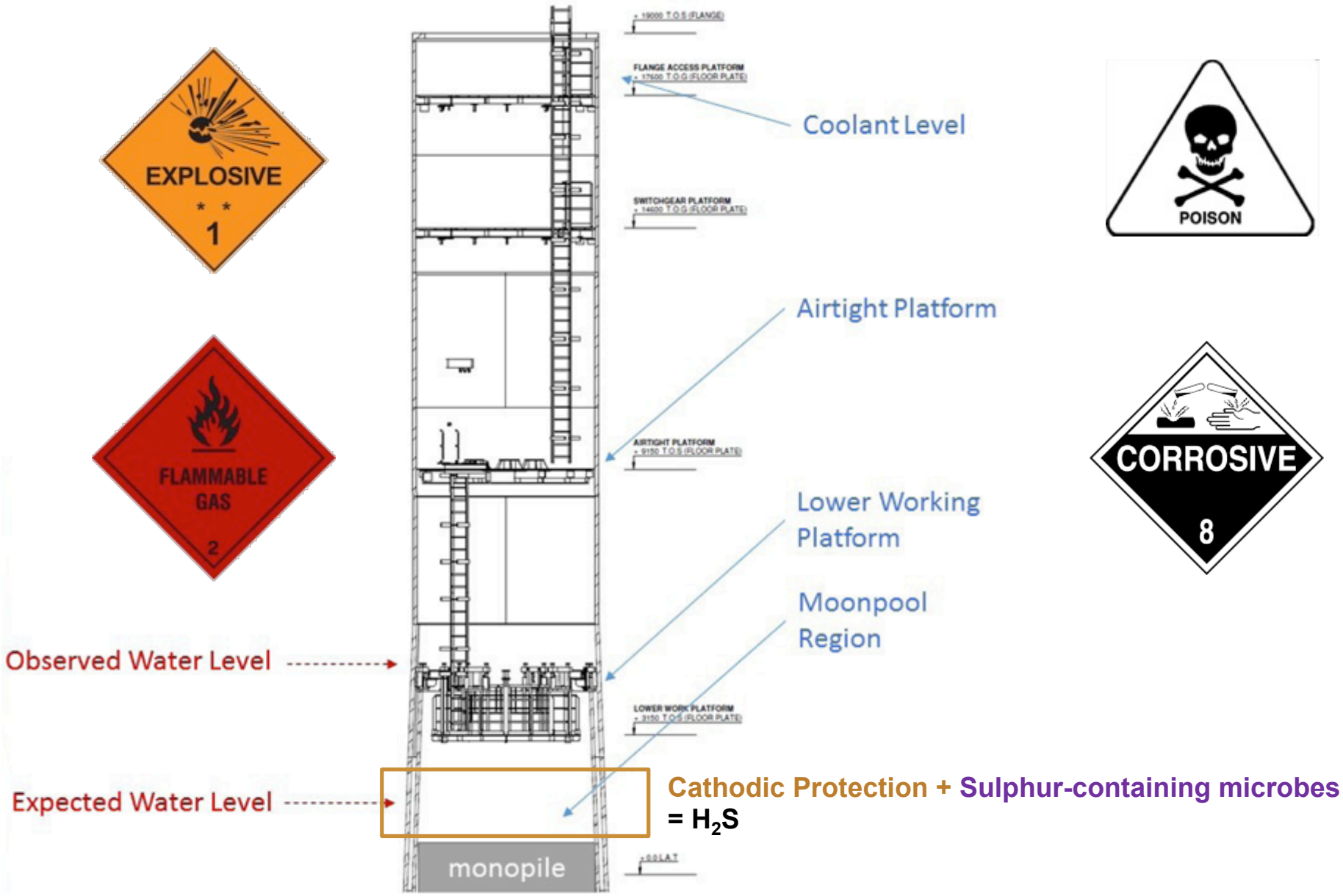
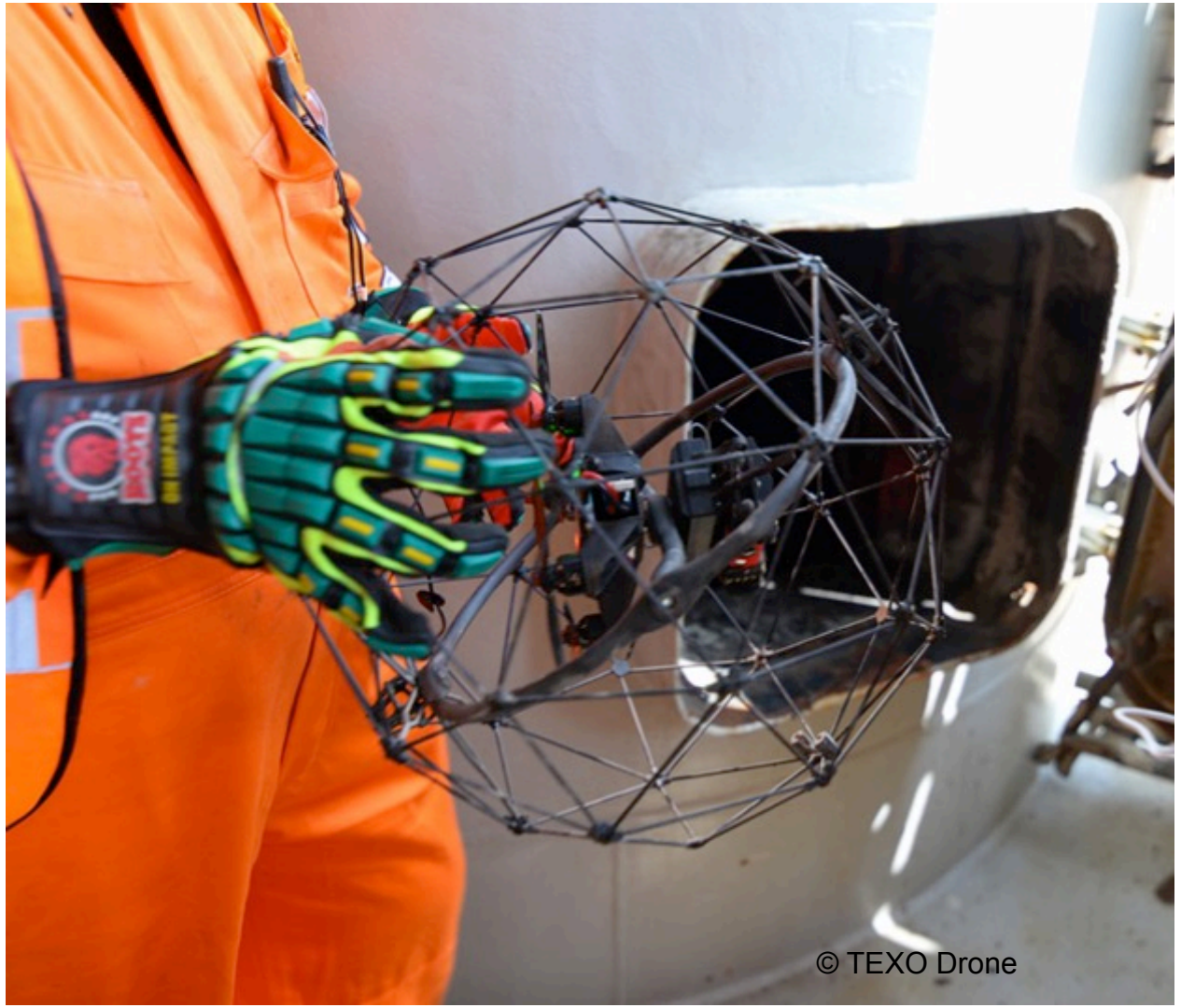

EXPLOSIVE
1
FLAMMABLE GAS
2
POISON
CORROSIVE
8
Coolant Level
Airtight Platform
Lower Working Platform
Moonpool Region
Observed Water Level
Expected Water Level
monopile
Cathodic Protection + Sulphur-containing microbes
= H_2S

Scope of the proof of concept

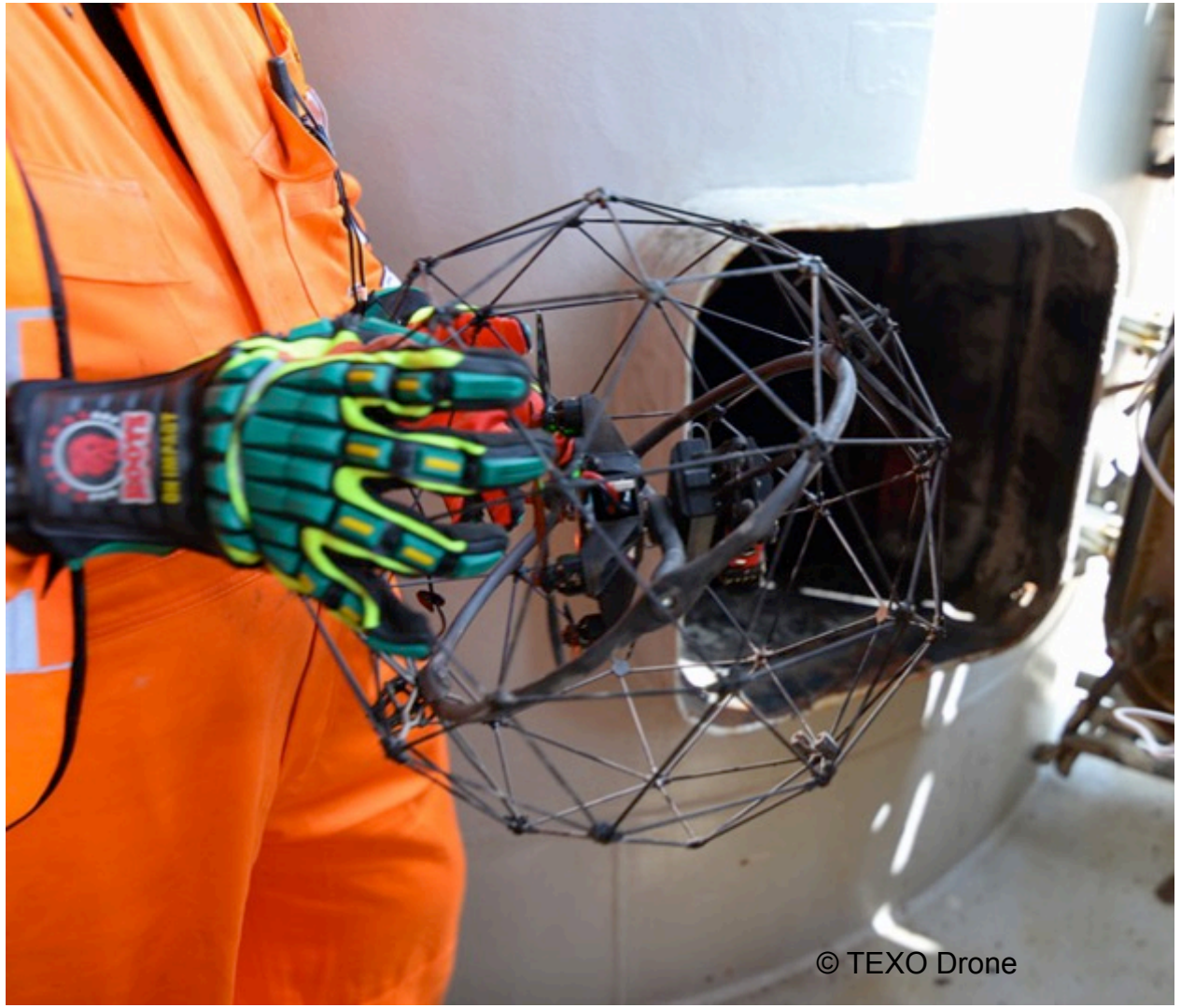
Conduct an offshore turbine foundation internal inspection using TEXO flying drone



Scope of the proof of concept

Conduct an offshore turbine foundation internal inspection using TEXO flying drone

<u>Aim:</u> Evaluate the feasibility of flying a drone within a confined space environment



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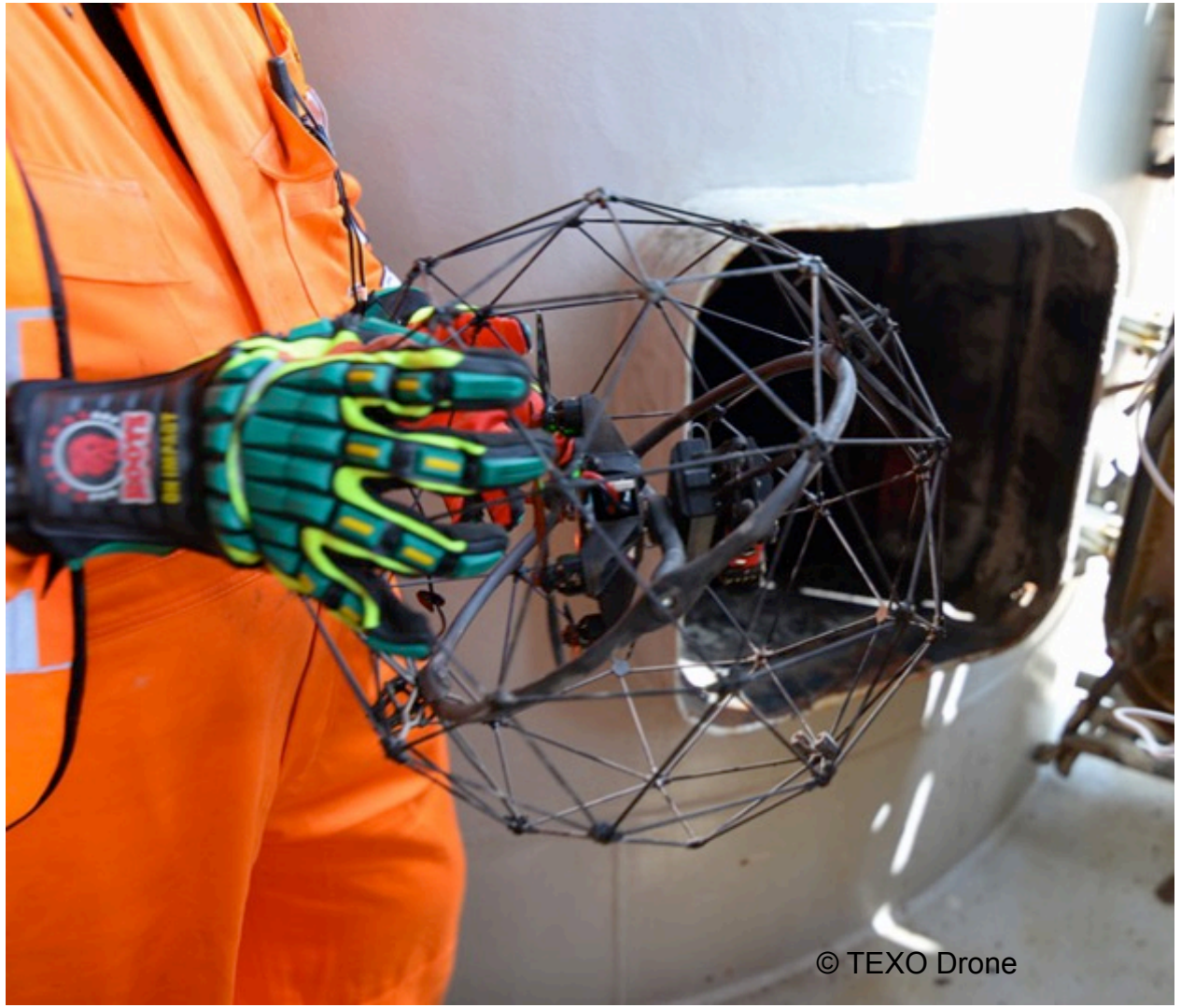
Feasibility study: A drone operator will be located above the air-tight platform and control the inspection. A technician will be located inside the air-tight platform to make sure the inspection is going fine.



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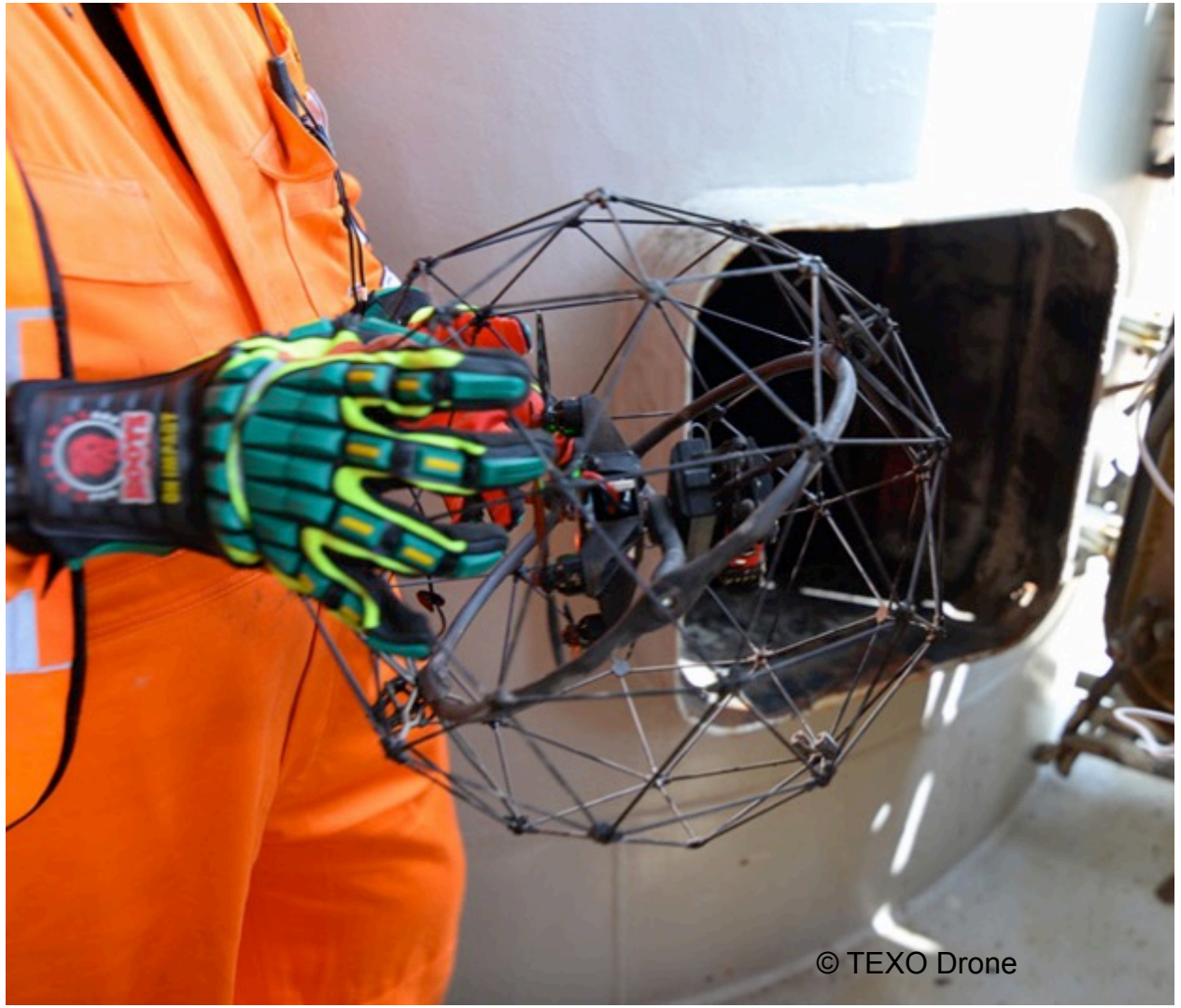
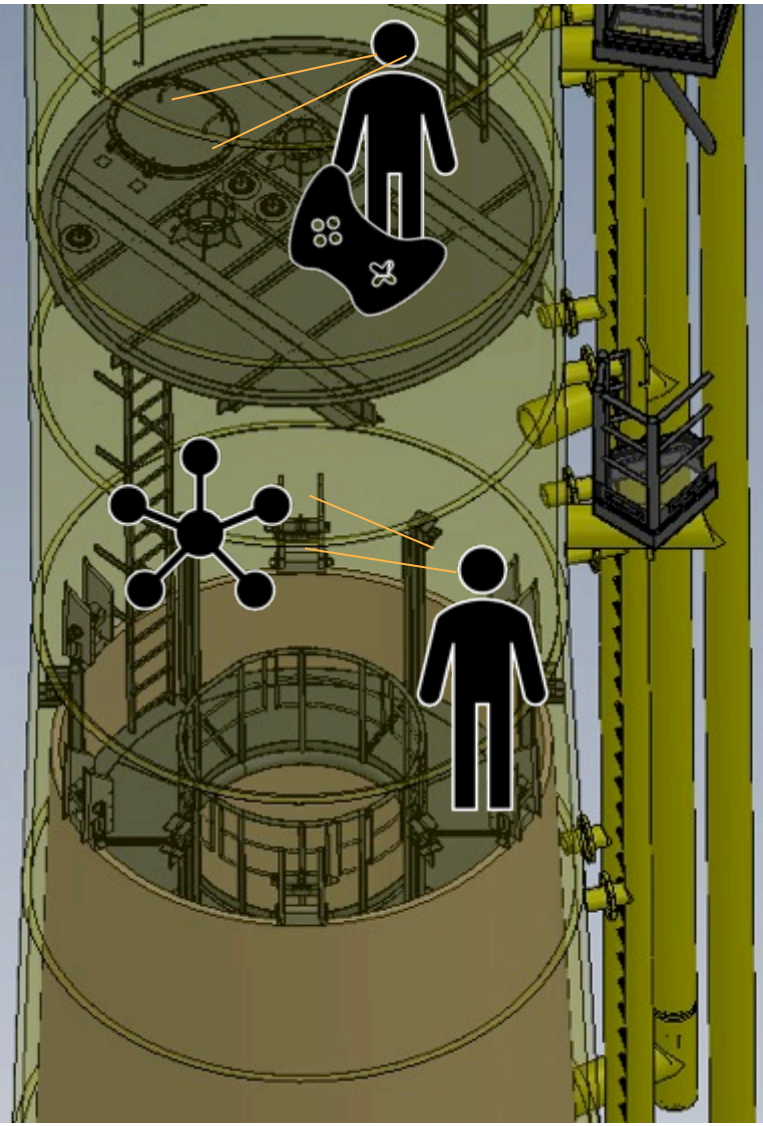
Value: Safer & more efficient



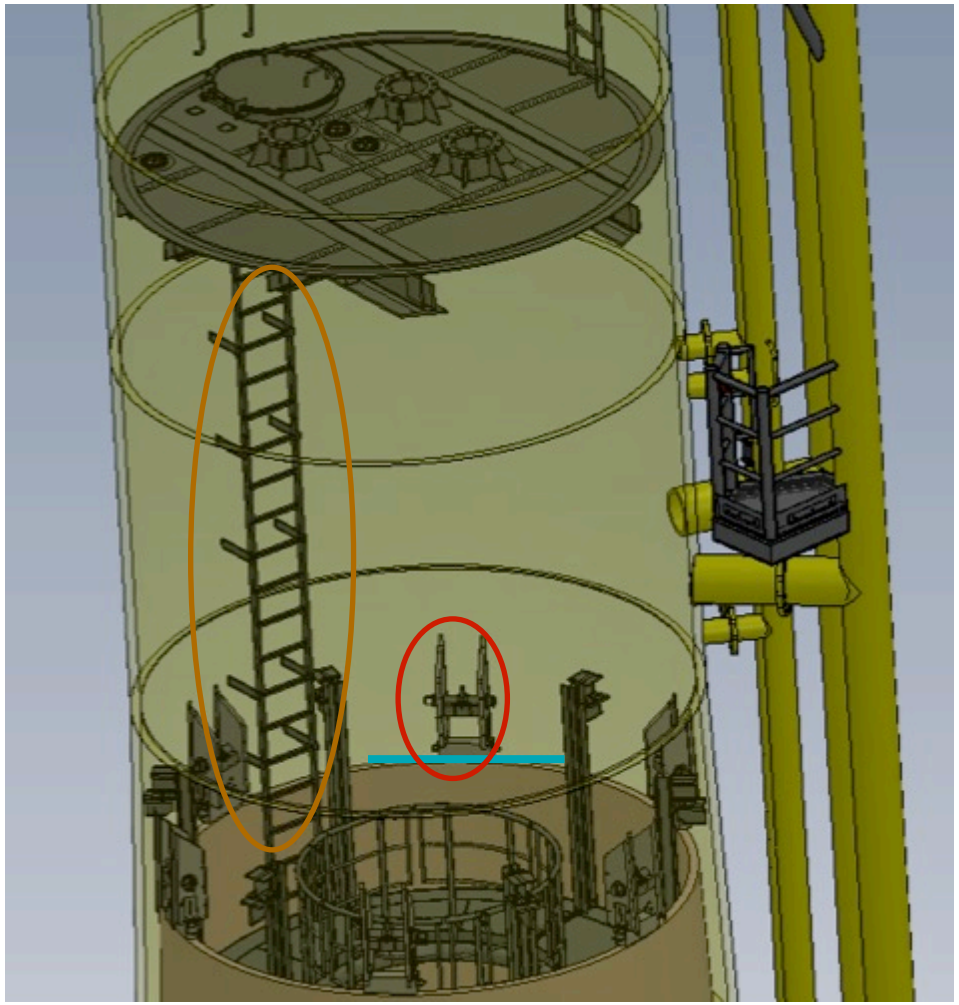
Setup

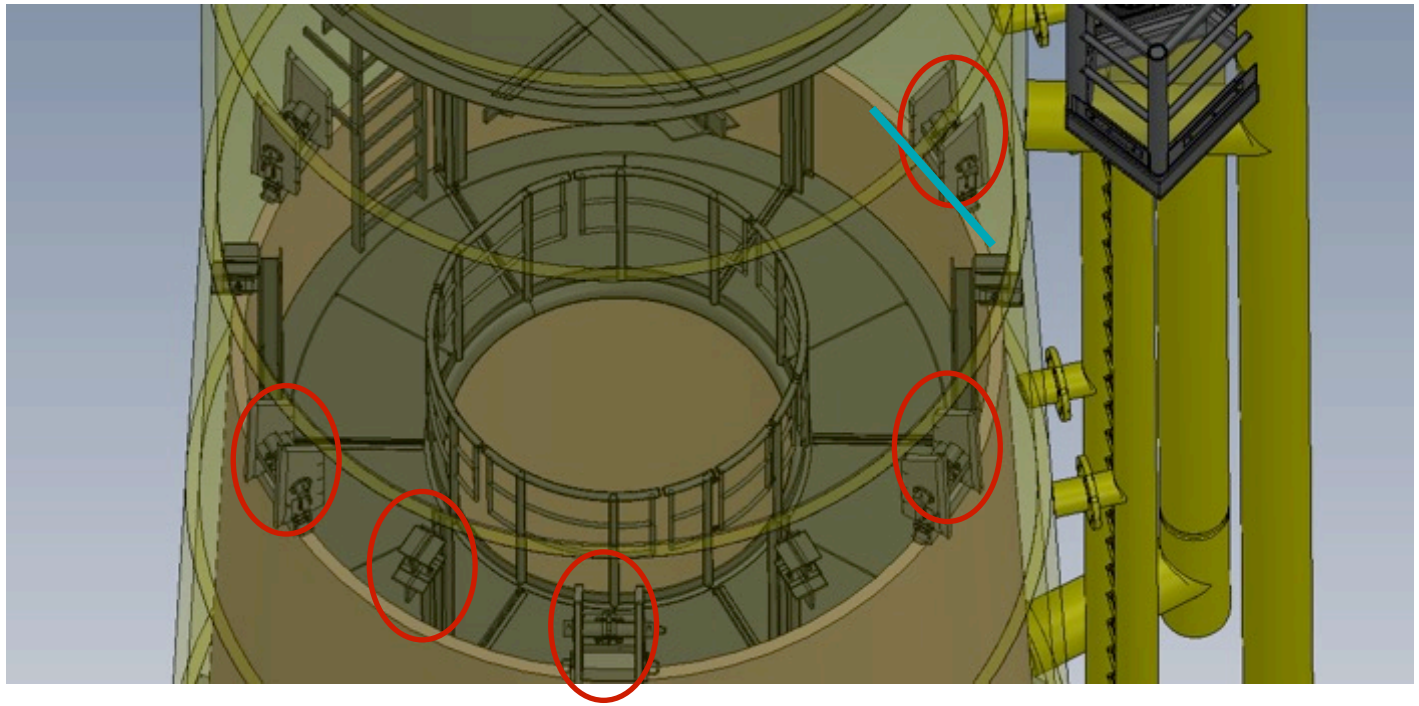
- TEXO pilot standing on top of the air-tight platform
- Restricted view of the drone



- Technician below the air-tight platform
- Making sure the drone isn't damaging components and in audio contact with TEXO pilot

Components to be inspected: loadshoes and ladder





Results



Conclusions and next steps

- Success of the air-tight platform inspection!

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Conclusions and next steps

- Success of the air-tight platform inspection!
- In addition, it was shown that the radio transmission link is strong enough to inspect the whole Transition Piece
- Next Steps: Develop a generic inspection procedure and potential use of additional sensors

General conclusion

- Only 2 of many drones case studies we are undergoing…
- The innovations differ but overall aims remain the same:

Make O&M:

- **Safer**
- **More efficient**
- **Cheaper**

- A challenge is the transfer from R&D to operations

R&D UK Centre

Thank you

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