Managing the risks associated with the extreme environmental loading hazard through de-staffing

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Inspiring Engagement and Impactful Initiatives

Gain insight into how to communicate corporate policies to the frontline. Discover how leadership can impact the safety performance of your organisation and discover key initiatives that are keeping people safe.

- Low likelihood event, but with very high potential severity of outcome
- Important that plans are in place and adequately communicated to the workforce to ensure buy-in
- Give an insight to how structural analysis and weather forecasting come together to predict risk
- Understanding Risk in a Storm and the context to decisions that feed into SWAPs
- Provide answers to common misunderstandings

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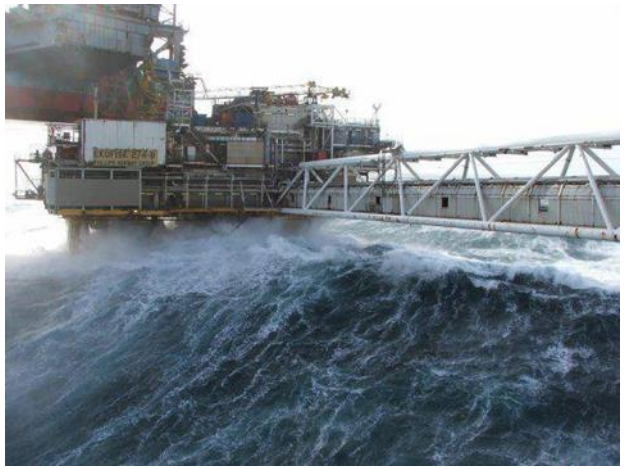
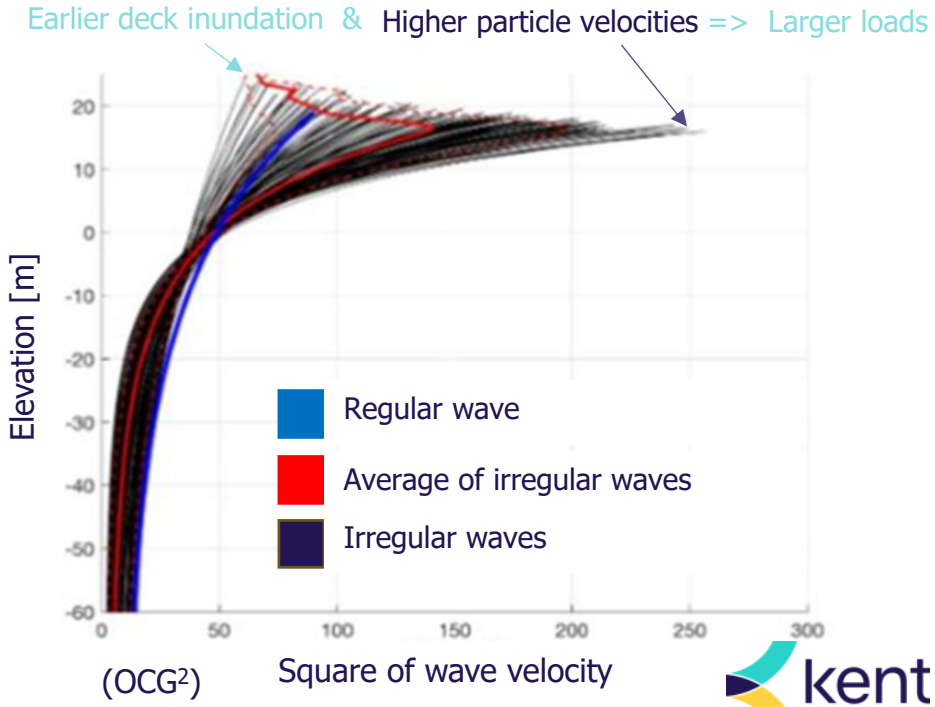
Extreme Environmental Loading



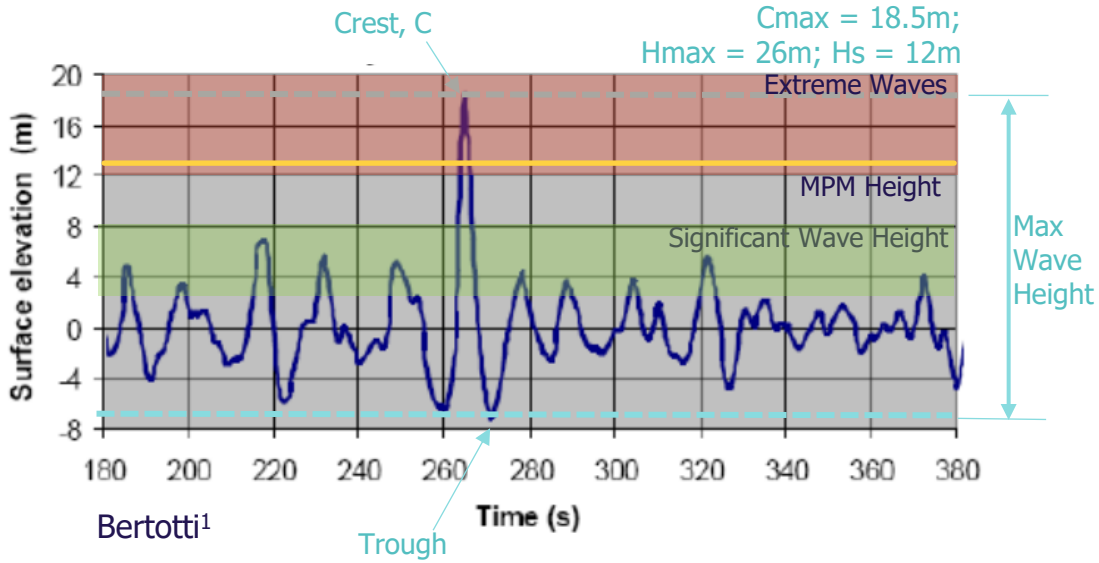
- 2018 - study initiated on guidance for assessment of fixed jackets to extreme environmental loading (**LOADS JIP**[1]).
- **Irregular waves** that are **plunging breaking waves** provide more realistic estimate of jacket and deck loading.
- Wave loading as **regular waves** can in certain cases be **non-conservative.**
- **Larger wave loads** with high consequence – platform collapse.
- **Severe weather action plans (SWAPs)** for **controlled pre-cautionary shut-down and de-staffing** ahead of forecast extreme storm events.



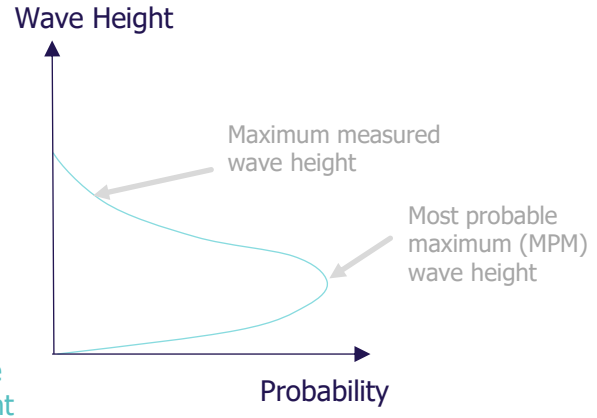
1. HSE Offshore: Extreme Environmental Loading of Fixed Offshore Structures
2. OCG, "Structural Assessment - LOADS and the Hazard-Fragility Curve Method", Richard Gibson, Chris Swan, Marios Christou OSRC, 26 October 2022.

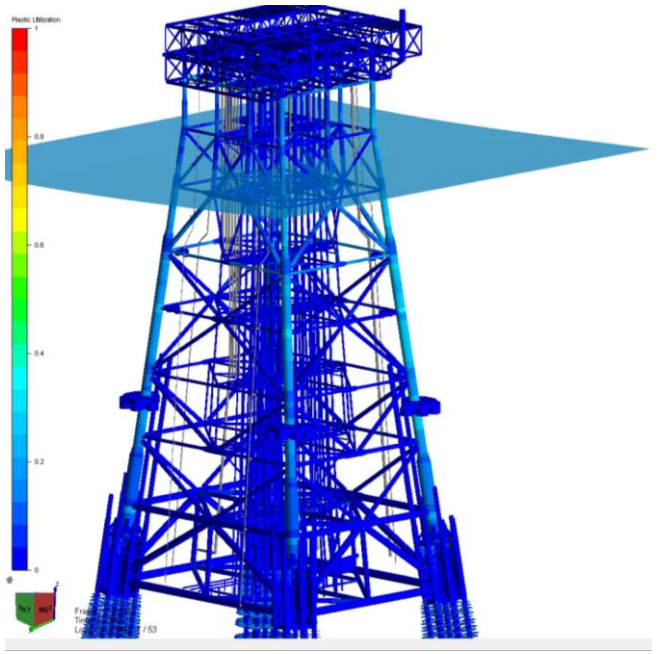
Storms, seastates and extreme waves

- Storm characterised by **seastates** of fixed duration (1hr, 3hrs, 10hrs, etc.) with **intensities of Hs**.
- **Significant wave height, Hs,** defined as **average of upper third of highest waves** in seastate.
- **Extreme waves** can have **wave heights (and crests) much higher** than most-probable maximum and Hs.
- Structural re-assessment for these extreme waves.



Bertotti[1]

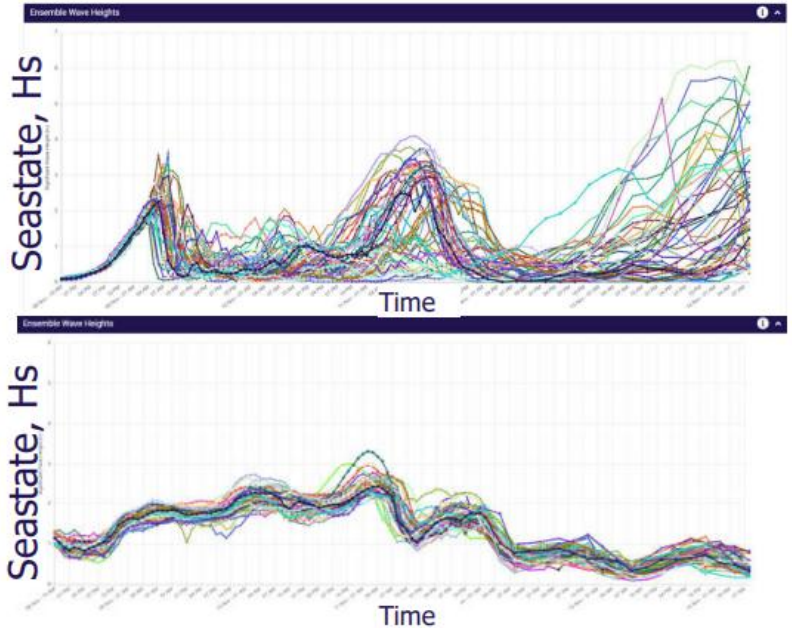


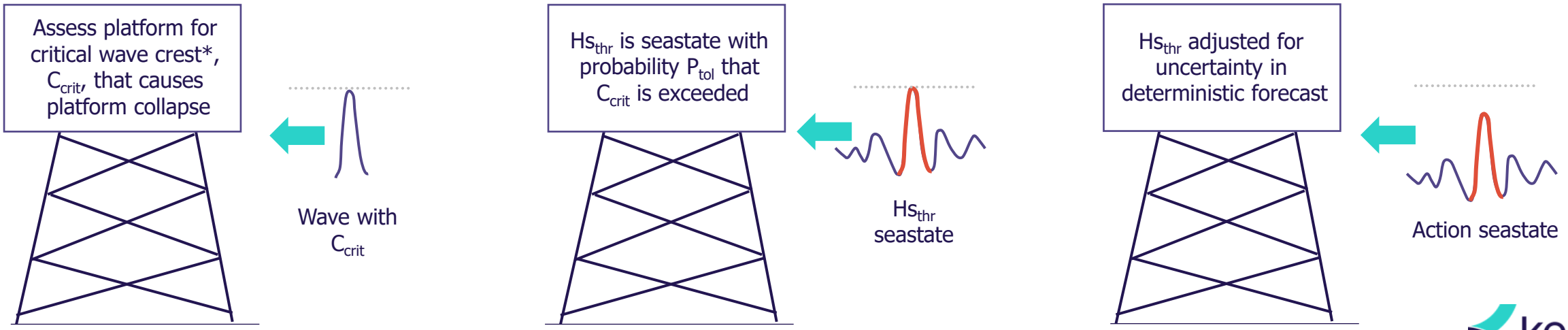


1. Bertotti, L. and Cavaleri, L., "The predictability of the 'Voyager' accident", Natural Hazards and Earth System Sciences, 8, 533-537, 2008.

Platform capacity and SWAP trigger

- **SWAP triggers** often in terms of **threshold forecast Hs (Hs_{thr}).**
- Risk-in-storm tolerance, $P_{tol} = P(C > C_{crit} \mid Hs_{storm}) < 1e\text{-}3$ (for example).
- **Forecast uncertainty** needs to be accounted for.
- Often, the greater the forecast horizon, the greater the uncertainty.





* For purposes of this presentation considering single critical wave crest. Multiple critical waves can also be considered (ref failure surface method or structural reliability analysis).

Risk in a Storm

Low likelihood event, high severity outcome

Important to understand the difference between annualised and forecast risk.

For the same platform, we may find, e.g.:

Annualised risk of collapse due to severe weather between 1E-05 or once in 100,000 years – every year.

Risk in a storm – the storm that is **currently approaching** has a 1 in 1,000 chance of causing platform collapse. That once in 100,000 years, is **now.**

Once the risk has been forecast, annualised risk becomes irrelevant – mitigation measures need to be taken.

What's the Trigger?

Sea State	Likelihood of collapse	Return period	Outcome	
10m	1E-04	25 years	Lower risk in each storm, but more likely to have to enact SWAP	More Risk Averse
12m	1E-03	150 years	May never have to enact SWAP, but exposing personnel to higher risk.	Less Risk Averse

Balancing act between minimising risk to personnel and not incurring excessive costs and the associated disruption of overly-frequent demobilisation.

A full demobilisation and shutdown of a platform is expensive = several £million – don't set trigger too low
Losing a fully occupied platform = much, much more >£1 billion – don't set the trigger too high

It's an ALARP argument – how much should be spent on avoiding risk?

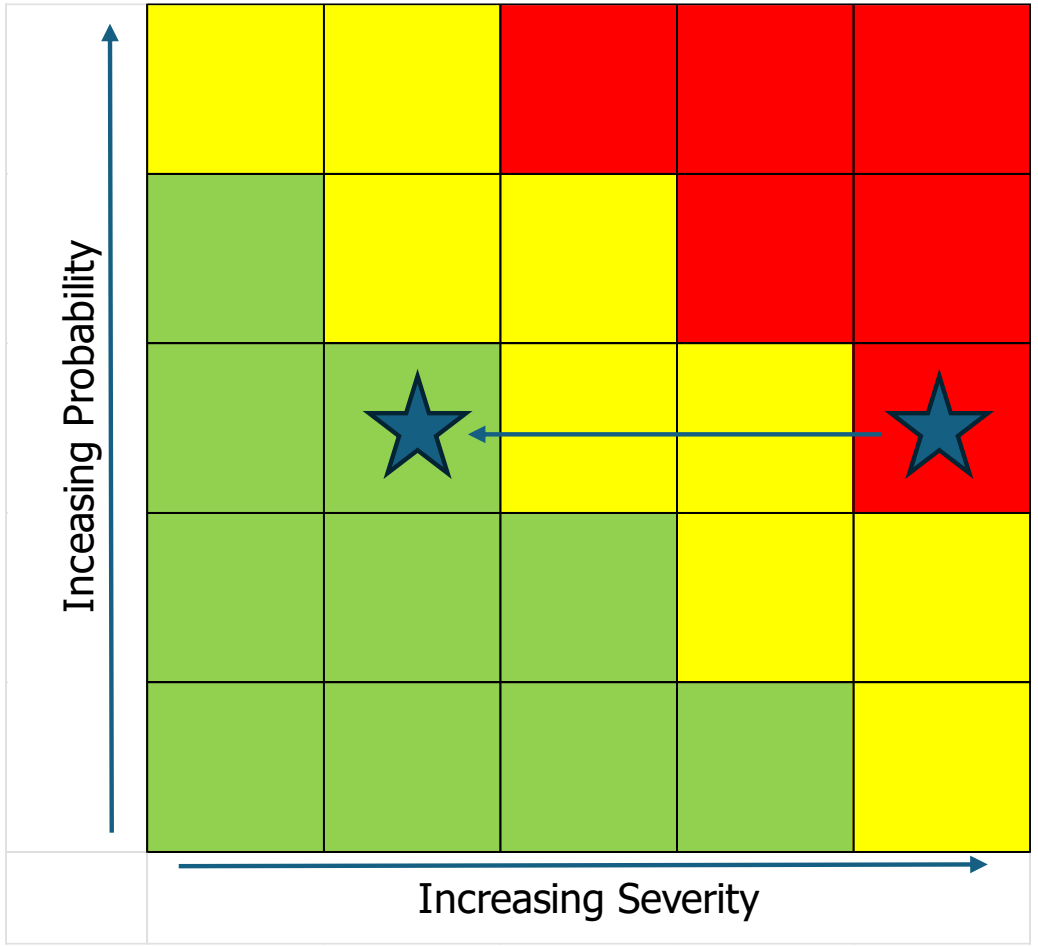
Consider the SWAP like an insurance policy

Judging Tolerable Risk

There is no universally agreed trigger probability, but we are typically seeing operators set it between 1E-04 and 1E-03. How to decide the trigger point?

Consider

- Cost Benefit Analysis
- Risk Matrix
- Risk Level from other Hazards
- Corporate Tolerable Limit on Risk



Helicopters & other Misconceptions

"What about the helicopter risk?"

- Helicopter risk statistics are well documented – an individual's risk of fatality per 1 hour flight is 1.2E-06
- Risk of staying on board would be several orders of magnitude higher
- May not even be an extra flight – just bringing it forward
- SWAP should be designed so that demobilisation occurs within normal flying limits of helicopter, so should not be any higher risk than normal.

"Chances are, we demobilise and shutdown and it turns out the platform was fine – what a waste"

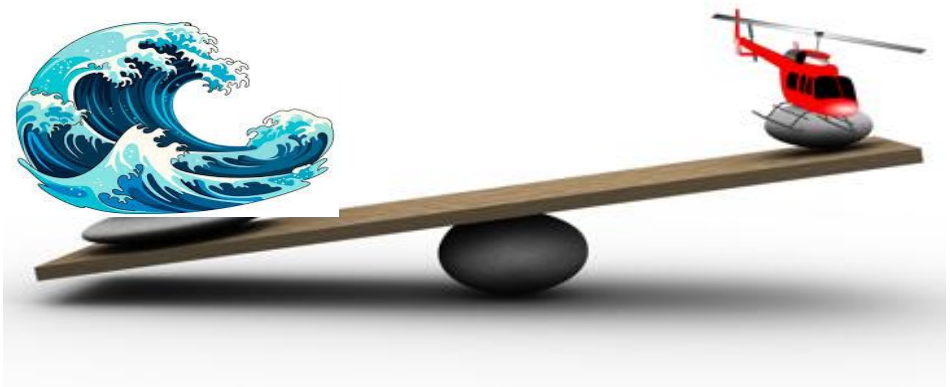
– by definition, 999 out of 1000 times it will be fine
– doesn't mean the SWAP was unnecessary or that the forecast was wrong
– just reflects the level of risk accepted

It's not an **evacuation.**

- plans should allow controlled demobilisation
- should use normal helicopter allocation

"We've survived until now – why has the risk increased?"

- risk hasn't changed – but our understanding of it has



Final Thoughts

- Ultimately, there's no correct answer to exactly where the trigger point should be set.
- A logical and well thought out rationale for setting the trigger point is important to get buy-in from the key stakeholders.
- It should be set with consideration to the specific details of the asset, costs, logistics.
- With people at the heart of the decision, so that assets can continue operating efficiently, but without exposing personnel to unnecessary risk.

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