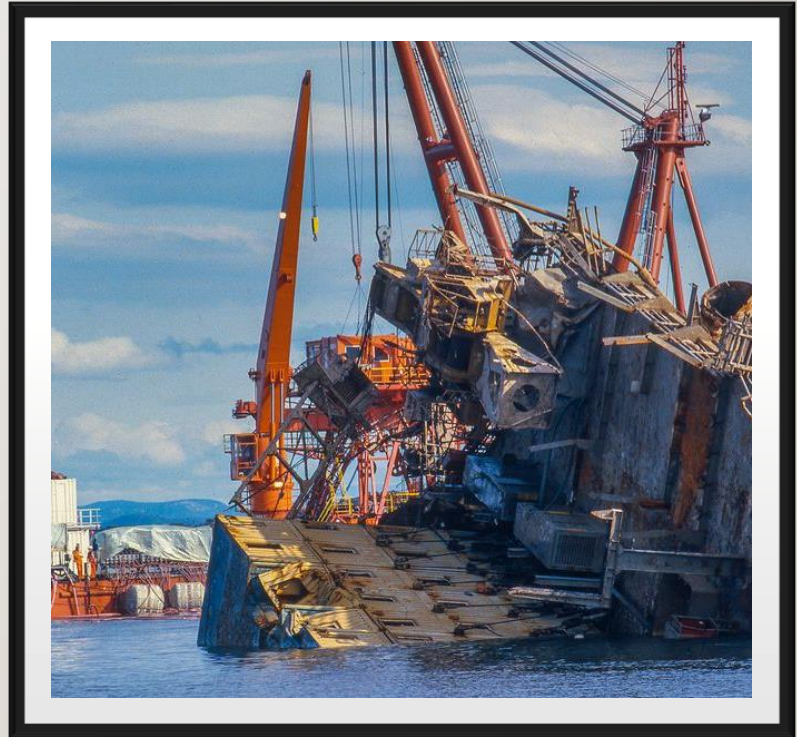

Kielland:

What happened?
- theories on causes

Kian Reme, Kielland Network





Kielland seminar october 2023

COMPOUND CAUSES

“A breakdown in a complicated structure has not one cause, but a series”

Lars A Myhre, LO

“We have learned that major accidents are compound and complex. I don't think anyone today would agree that there was only one decisive reason.”

Anne Myrvold, former director of the Petroleum Safety Authority

Kielland seminar oktober 2023

SEVEN DEADLY SINS

- Fatigue fracture in the D6 brace
- Stability
- Explosion in the D4 brace
- Operation failures over time
- Chaos on bord
- Anchoring and shifting
- Negligence and incompetence in management

*First causal
explanation
april 1981*

Fatigue fracture in D6 brace

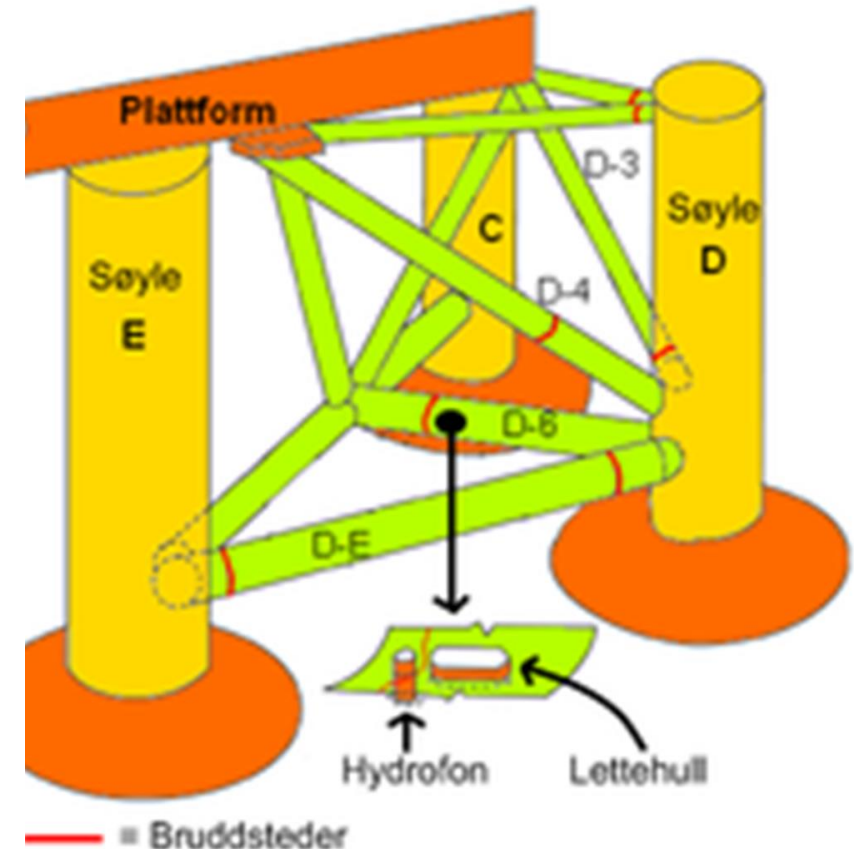
The Norwegian Inquiry Commission

The Commission april 1981

One triggering cause:

Fatigue fracture by the hydrophone in D6 brace.

“The report and its assessments are limited to the type of accident that has been encountered here. The report thus does not deal with other accident situations, e.g. explosion accidents.” (NOU 11:1981)



*Second causal
explanation
1980*



Stability

Stability

Prof Dr Engineer Emil Aall Dahle:

- Doors should have been shut.
- Open doors and water penetration:
 - «*This led to the final capsizing of the rig.*»
- The platform «*lay stable*» at 35°. The open doors broke the stability of the platform.

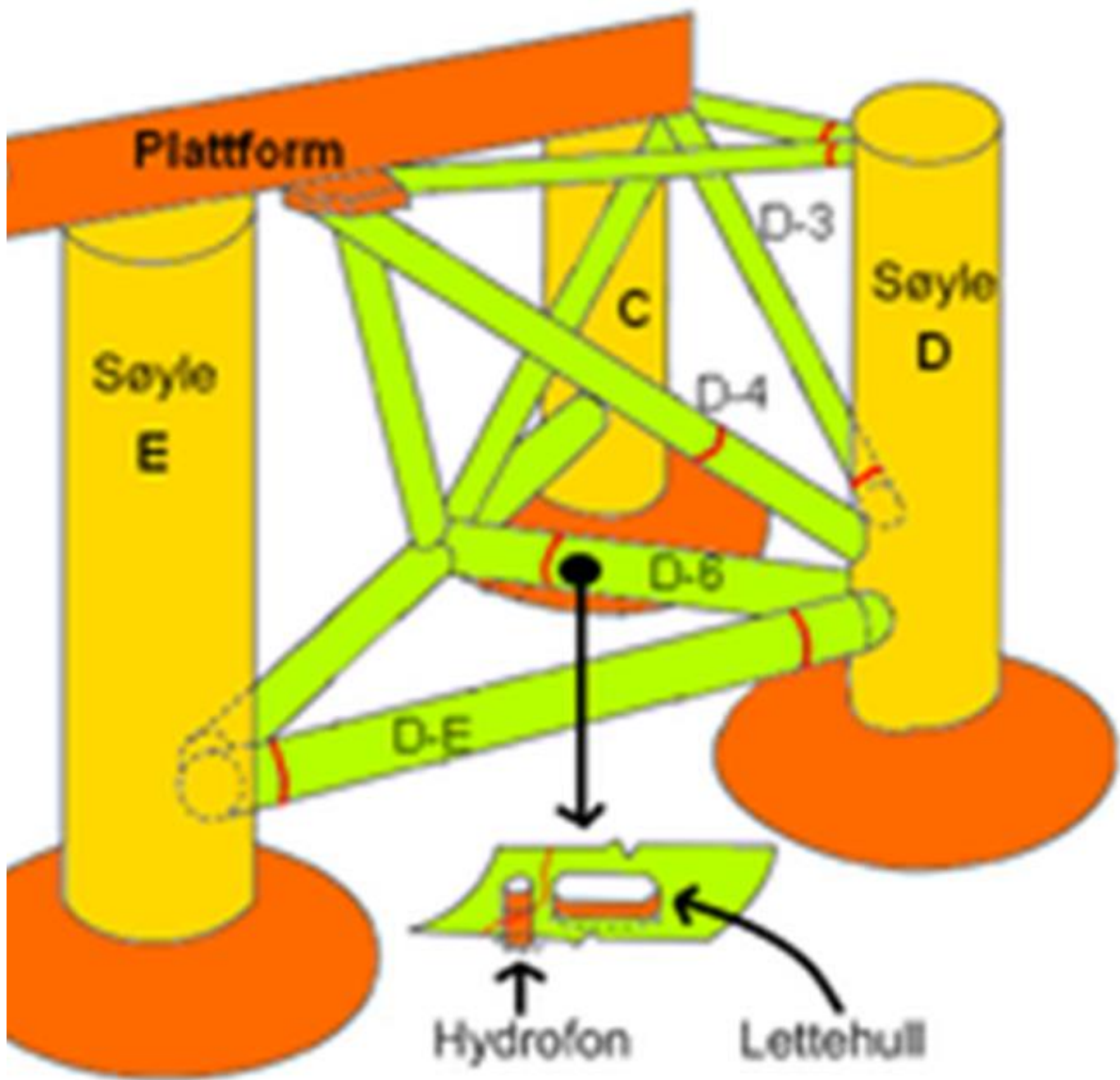
This analysis from 1981 was classified.

*Third causal
explanation
1983*



Explosion in D4 brace

The Kielland Foundation



— ■ Bruddsteder

Indications

- Hole in D4 brace
- Photos of the braces
- Missing material in D6
- Explosion experts
- Metallurgy tests
 - Bainite and twins



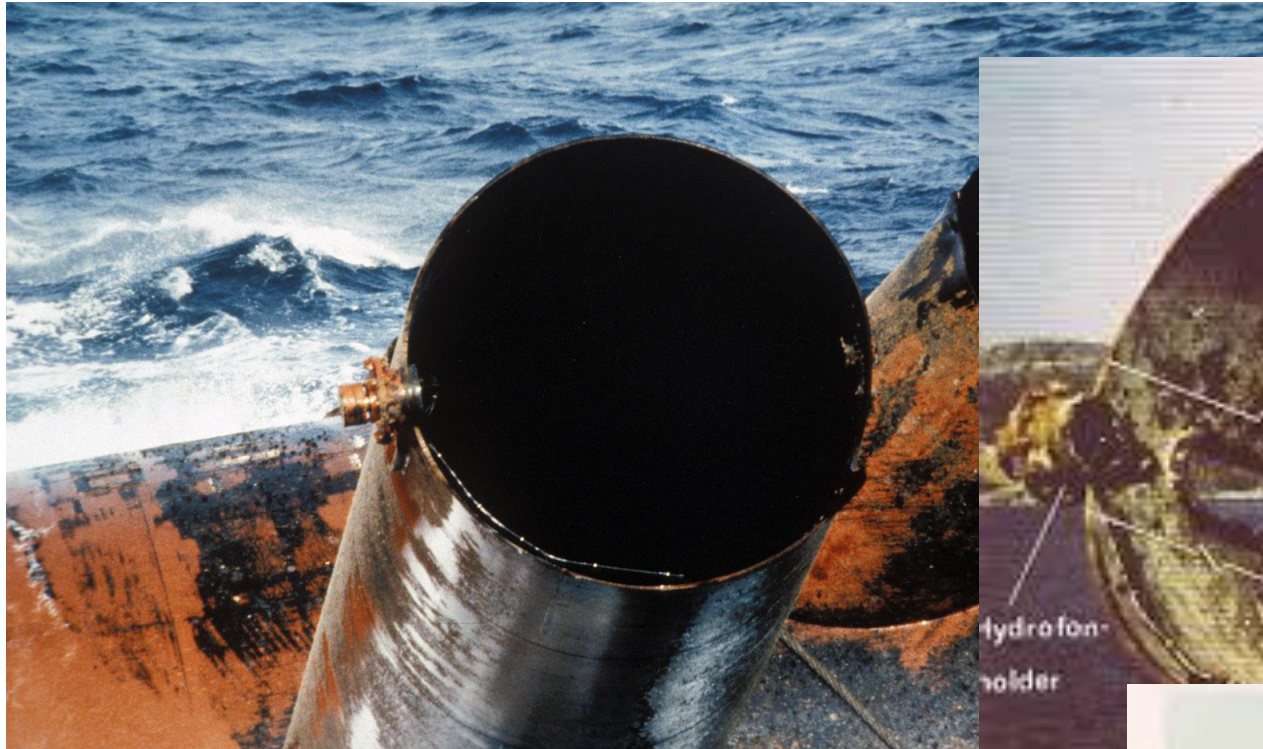


Fig. 8.2.1. Del 3 fra step D-5.



Kielland seminar october 2023

*Fourth causal
explanation
1985*

Incorrect operation over time

The French Expert Commission



- Confirming the bad welding in D6 –
but this did **not** cause the fatigue fracture
- Theory of collision
- Incorrect operation – from the start
- Strongly critical to the owner
- Insisted on seeing the weekly reports – they never appeared

Fifth causal explanation 2017

Chaos on board

Converting the rig back to a drilling rig – at sea.

Open doors, cables

No securing of drilling equipment

UiS, survivors and others

*Sixth causal
explanation
1981*

Anchoring and shifting

8 in stead of 10 anchors

Nils Gunnar Gundersen and others

*Seventh causal
explanation
1983 / 2017*

Negligence and incompetence

The D6 crack was reported to and known by operator and management

Responsibility for chaos, open doors, safety breaches

Weekly reports removed

Unsecured drilling equipment

UiS, Kielland Network ao.

DE brace?
