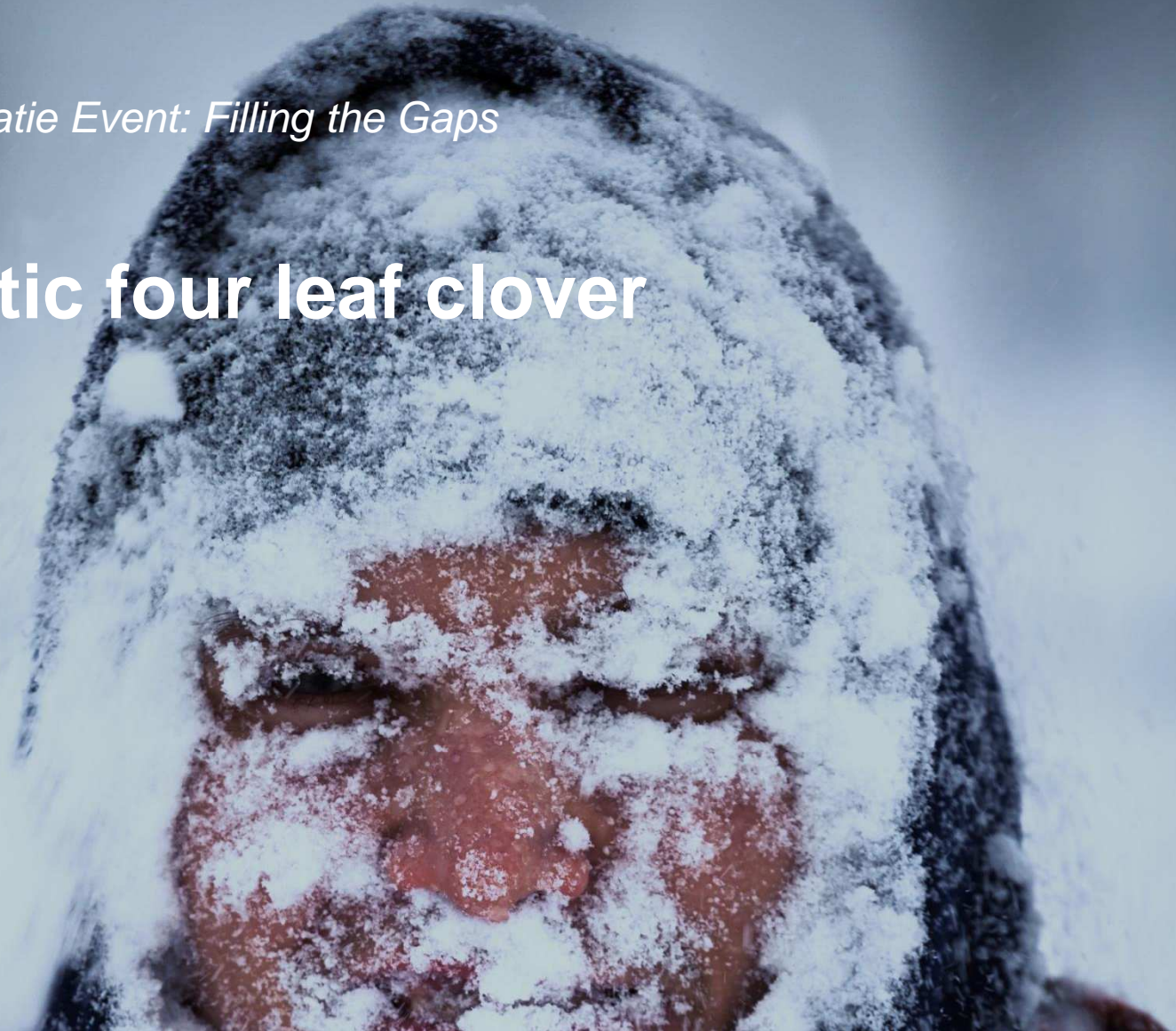




## TKI initiatives

*Maritiem Innovatie Event: Filling the Gaps*

## The Arctic four leaf clover



# The Arctic four leaf clover

**LNG TP**

LNG Tank Placement

**ARES**

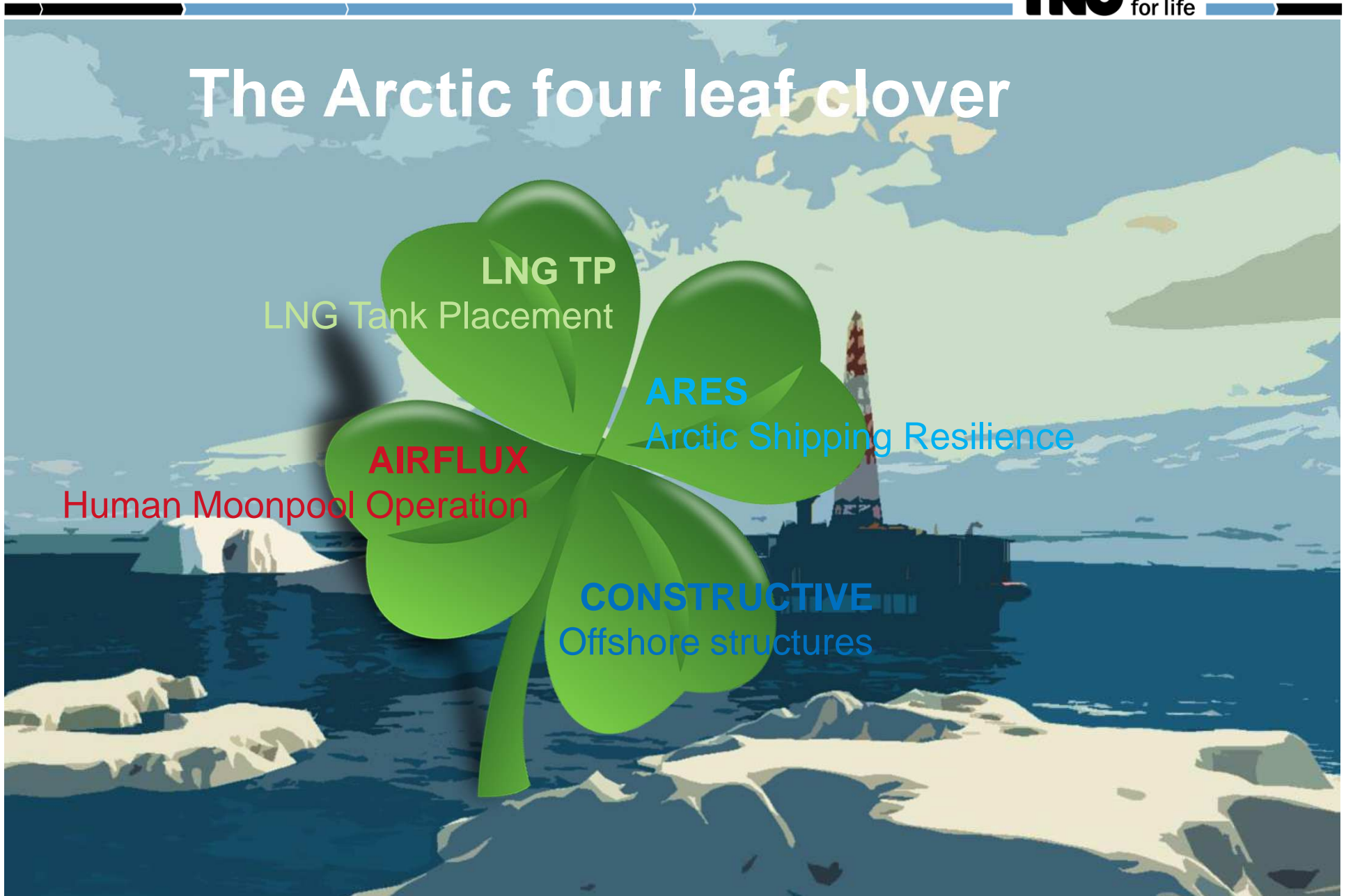
Arctic Shipping Resilience

**AIRFLUX**

Human Moonpool Operation

**CONSTRUCTIVE**

Offshore structures



## TKI JIP LTP LNG Tank Placement



**Problem:** Bunker tank placing = show stopper for LNG implementation

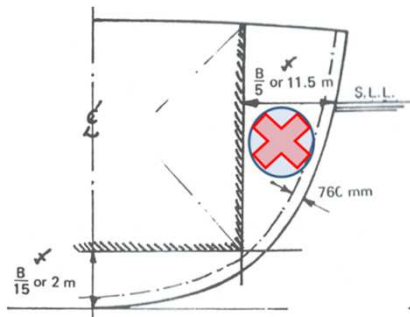
- Regulations => needed space is not (commercial) applicable

**Opportunity:** Constructive measurements + inherent bunker tank crash worthiness

- => Prescriptive regulations overruled by first principles !

**Results:** Bunker tank placement scenario due to goal based design

*An opportunity as a safe fuel for cleaner shipping ie Arctic regions (zero oil spill!)*



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Lex Vredevelde [lex.vredevelde@tno.nl](mailto:lex.vredevelde@tno.nl)

**Join Us!**

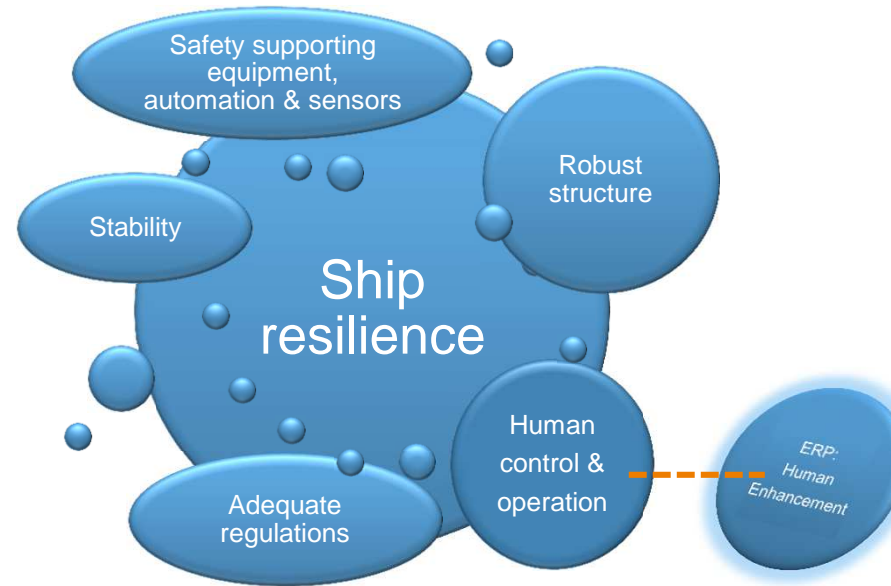
Short Sea, Dredgers, Fishing, Yachts, Offshore Vessels. Ship owners, Ship Engineering, Builders, Class, Government



# JIP ARES: Arctic REsilience of Ships



Bring the robustness of asset and operation to the next level



Join Us!

**Proposed Scope:**

- Risk assessment on the operation (scenarios, tools and criteria)
- Human Control (incl. training & education)
- Stability tools (flooding etc.)
- Robust & resilient structures (before & after an incident)
- Decision support (sensor systems)

More info:

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Pieter Boersma [pieter.boersma@tno.nl](mailto:pieter.boersma@tno.nl)

Draft plan available

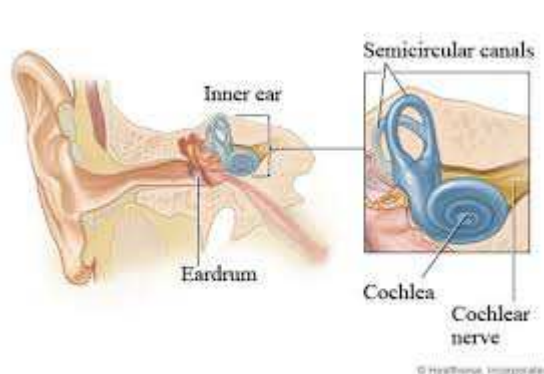
# JIP AIRFLUX

## Air pressure Fluctuations in Enclosed Moonpools



Problem: Closed moonpool (harsh environments) result in operational limitations for humans (dizziness / nausea)

Goal: Avoid health and safety risks and reduction of work efficiency => stay fit for purpose



### Proposed scope:

- Examination of nausea related to complaints
- Determine acceptable limits (literature)
- Simulate Moonpool environments & validate the limitations
- Define parameters for attractive & healthy job environment
- Mitigation measures on habituation (retention)

### JIP with Partners

Offshore Operators, Oil majors, Special Equipment Engineering, Class, Government

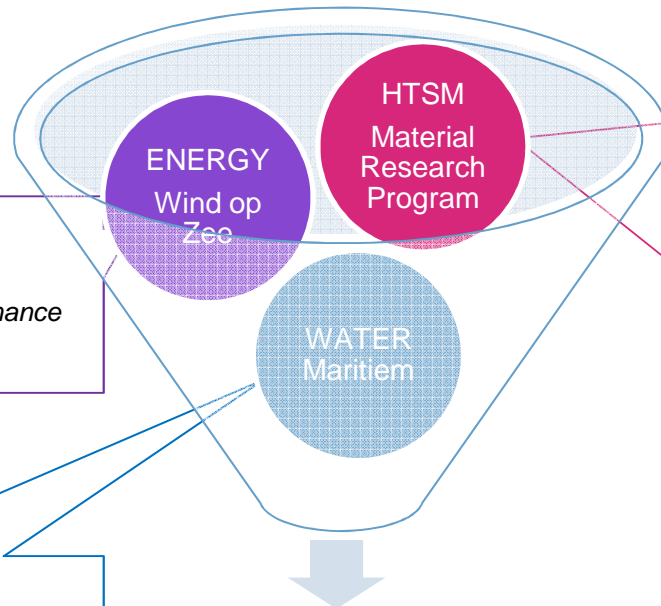
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Initiative partner: Alexei Bereznitski , Huisman

**Join Us!**

# CONSTRUCTIVE Offshore structures & materials



*Open for participation:*

MONITOR (JIP)  
FELOSFI (JIP) *cost reduction / maintenance*  
EUROS (STW)

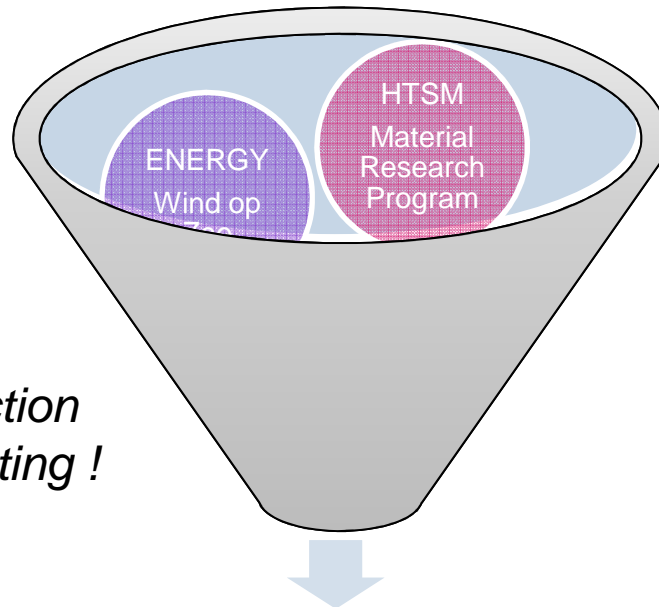
- Mooring Chain Corrosion (residual strength & fatigue lifetime)
- Fatigue of steel under Arctic conditions
- Crack Arrest for Arctic conditions
- Dynamic Ice-loads

- Materials Research program TTI Materials:
- Fracture of steel:(AFSUM -2/-3) (S355/S690)**
- Small scale weld material toughness testing
  - Small scale cast material toughness testing
  - CoFrac: fracture toughness in constraint condition CTOD vs Wide plate
- Fatigue of Steel**
- Fatigue of steel under Arctic conditions
  - Corrfat I: Corrosion fatigue Initiation
  - Corrfat II: Corrosion fatigue propagation
- Composites**
- Reliability of (damaged) composite structures
  - Reliability of generic GFRP panels in offshore and infrastructural applications
  - Reliability of joints for GFRP panels in offshore and infrastructural applications

**CONSTRUCTIVE**  
**Power of Collaboration, in**  
**People and Facilities**



# CONSTRUCTIVE Offshore structures & materials



*Good ideas  
Need your reflection  
Schedule a meeting !*

**CONSTRUCTIVE**  
Power of Collaboration, in People  
and Facilities

## Research topics:

- Fracture of steel (S355/S690)
- Fatigue of steel (corrosion fatigue)
- Composites (reliability / joints and GFRP panels)

## Applied research related to:

### WATER

(Offshore, Arctic & deep sea )

### ENERGY: Offshore Wind & tidal

(cost reduction and predictable behaviour)

### HTSM

(materials under extreme conditions)

Predictable behaviour  
(new applications &  
extreme conditions) !

- Brittle Fracture of steel
- Damage mechanics
  - Fatigue of steel
  - Composites

**INDUSTRY**



Delft University of Technology



Joint initiative **program** on Offshore Structures (TKI JIP's & STW)  
by Industry, TNO & TUD, supported by MKC

**Join Us!**

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THANK YOU FOR YOUR ATTENTION !

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PLEASE LEAVE YOUR BUSINESSCARD FOR MORE INFORMATION !