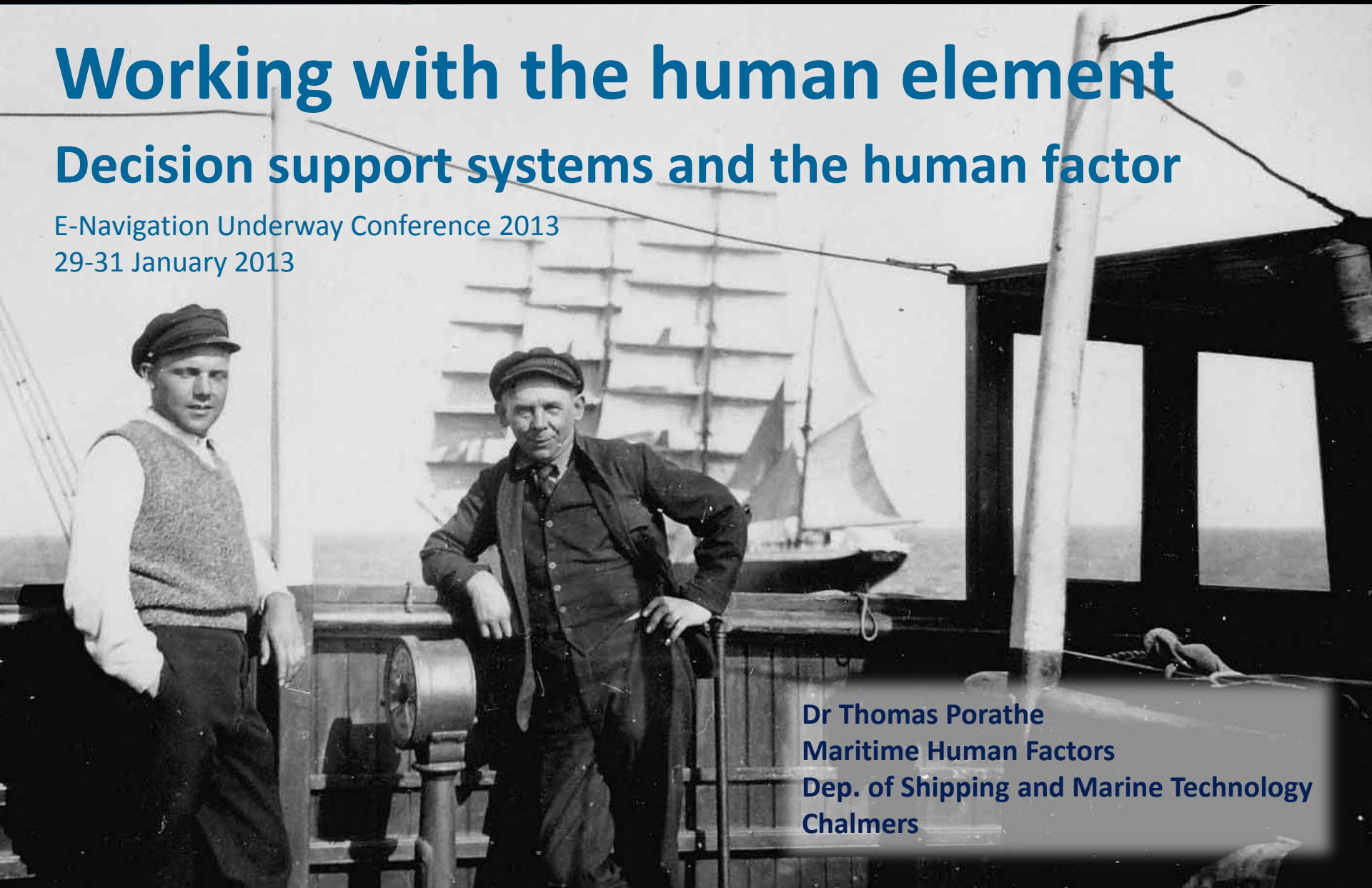


Working with the human element

Decision support systems and the human factor

E-Navigation Underway Conference 2013

29-31 January 2013



Dr Thomas Porathe
Maritime Human Factors
Dep. of Shipping and Marine Technology
Chalmers



Godafoss grounded at Kvernskjærgrunnen, 18 February 2011

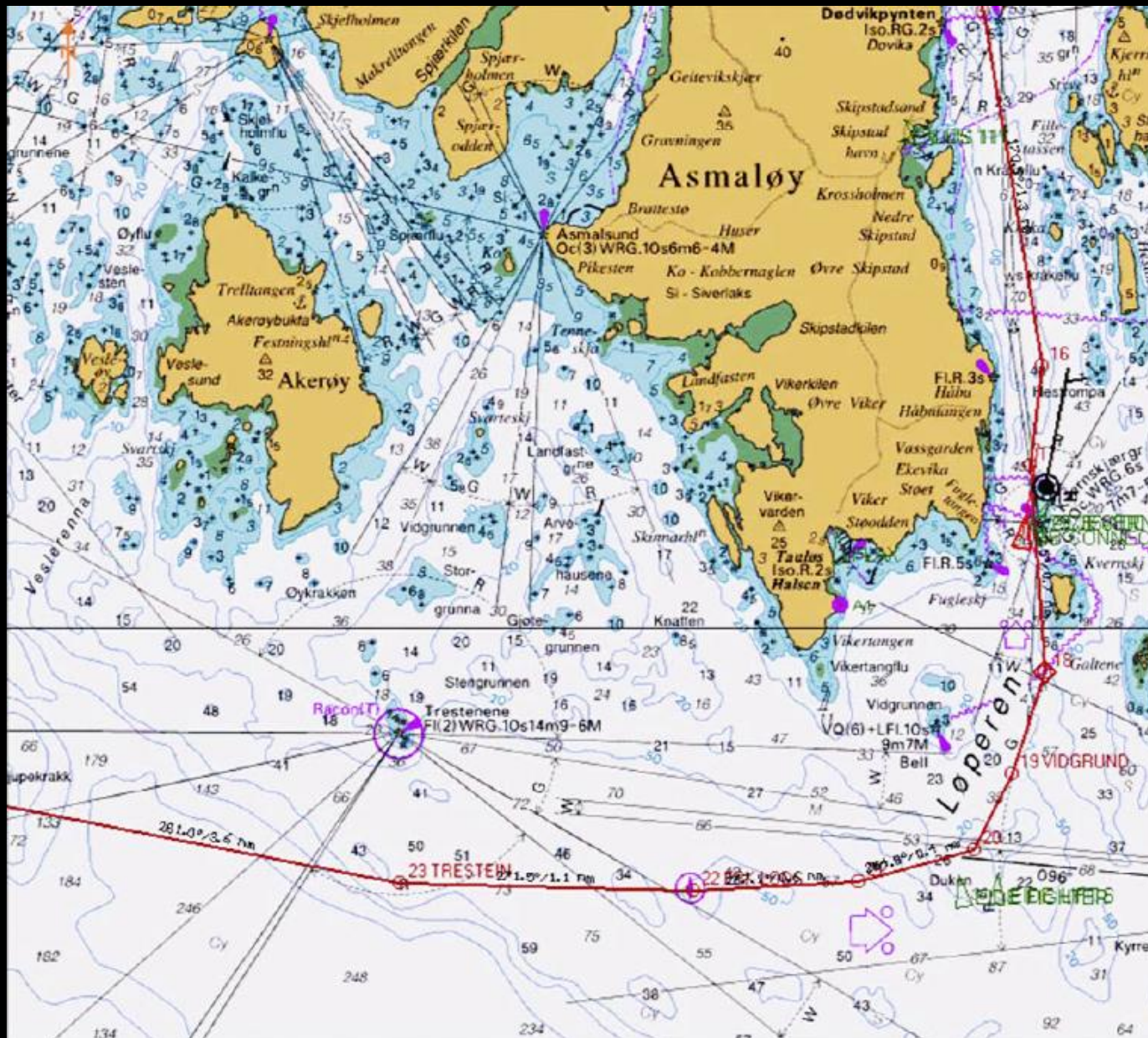


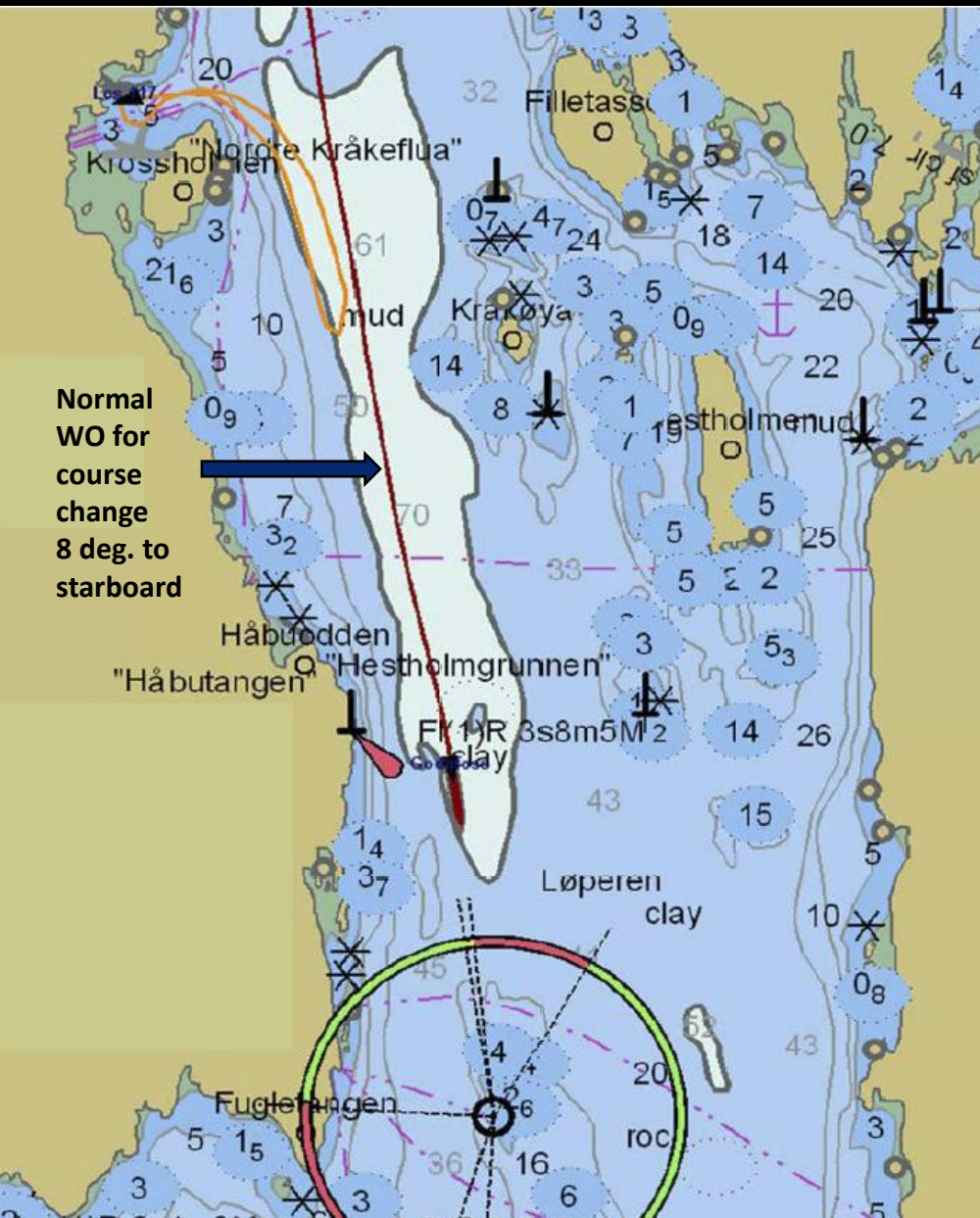
Pearl Seaway's route

18 February 2011

Norway

Sweden





“The master incorrectly understood how the voyage was to continue through and out of Løperen. The master’s decisions and interpretation of the surroundings remained uncorrected and led to the grounding of Godafoss at Kvernskjær beacon at 19:52 at a speed of 14 knots, resulting in acute oil pollution.”

(Accident report, AIBN, 2012)

“The master incorrectly understood how the voyage was to continue through and out of Løperen. The master’s decisions and interpretation of the surroundings remained uncorrected and led to the grounding of Godafoss at Kvernshjær beacon at 19:52 at a speed of 14 knots, resulting in acute oil pollution.”

(Accident report, AIBN, 2012)

“Human error”

“Human error” contribution to accidents

84-88% of tanker accidents

79% of towing vessel groundings

89-96% of collisions

75% of allisions – ship/structure accidents

75% of fires and explosions

Various studies by TSB Canada, Cormier, UK P&I Club and Bryant. <http://www.wmu.se/fortet.funcform.se/o.o.i.s/71>

- Human error is not a cause of failure. It is the effect, or symptom, of deeper trouble.
- Human error is not the conclusion of an investigation. It is the starting point.
- Human error is not random. It is systematically connected to features of people's tools, tasks and operational environment.

(Dekker, 2002)

Dekker, S. (2002). The field guide of human error investigations. Aldershot, U.K.: Ashgate.

Human error? It sounds to me as serious design error!

(Donald Norman, 2002)

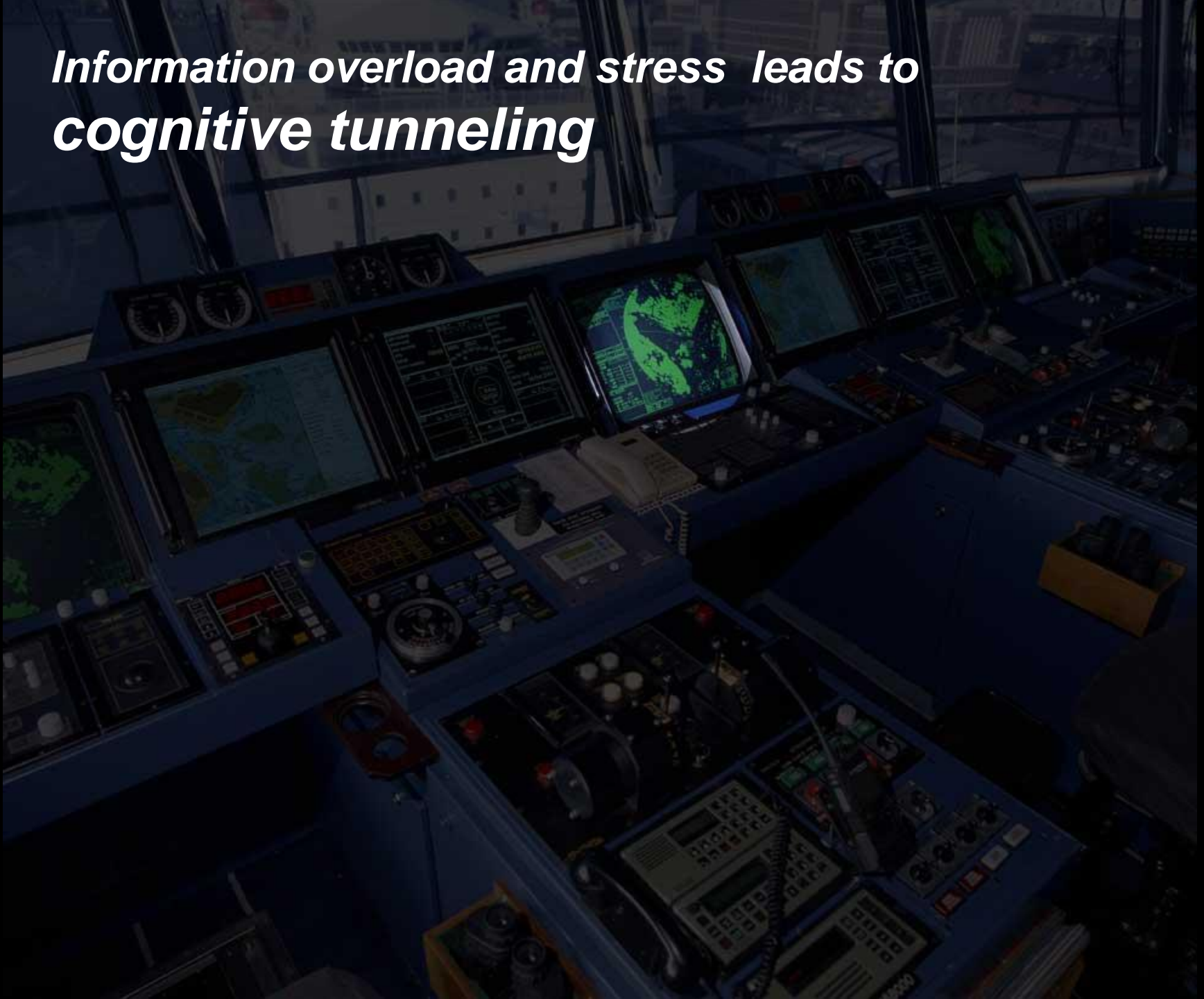
Norman, D. (2002). *The Design of Everyday Things*. Basic Books

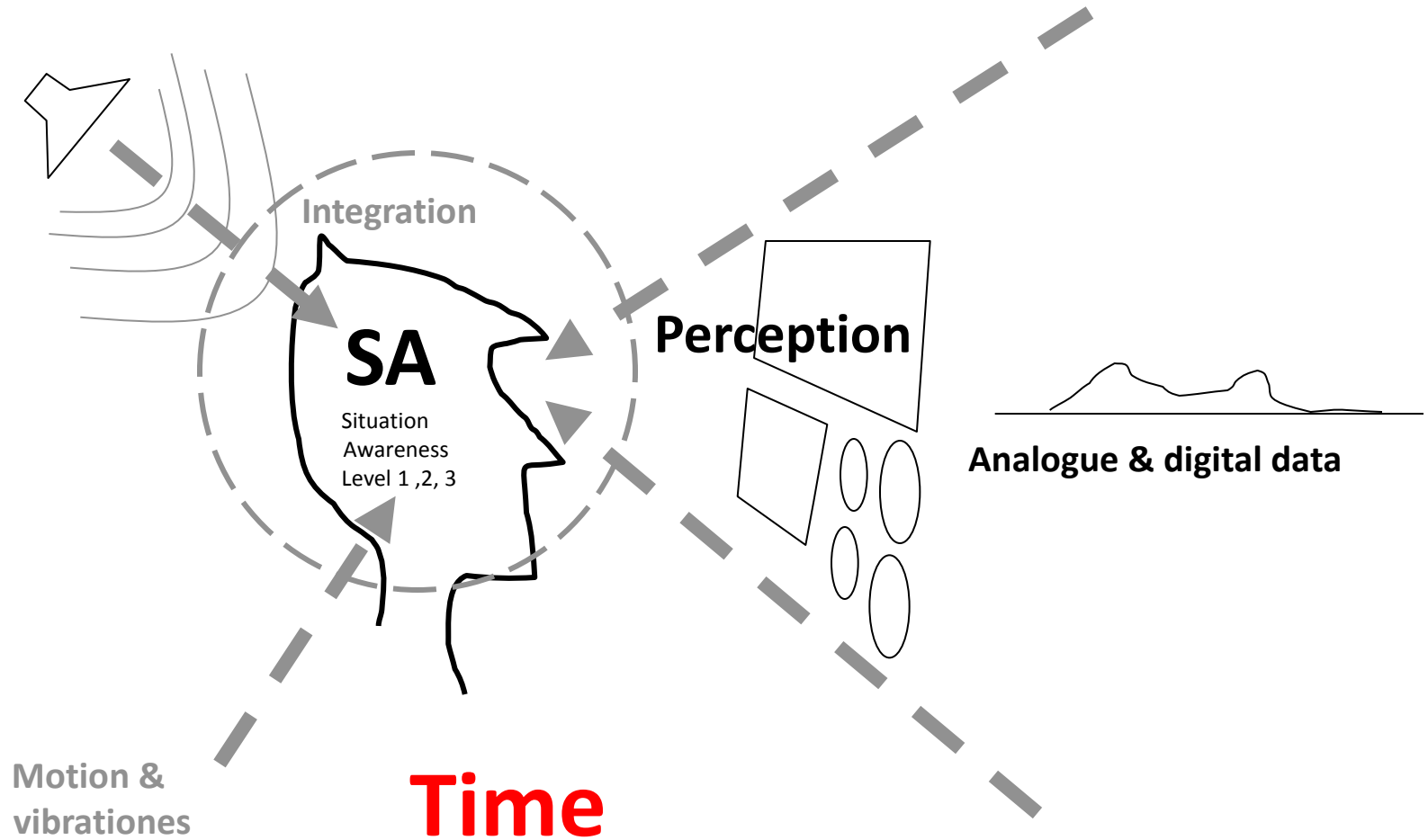
Humans do make errors,
it is part of the human condition!





***Information overload and stress leads to
cognitive tunneling***





Margareta Lützhöft yesterday:

Factors contributing to failure

- **Situations** requiring rapid response
- Challenge of managing concurrent **tasks**
- Equipment failure and design flaws
- Misleading or missing **cues** normally present
- **Plan** continuation bias
- Stress
- Shortcomings in training and/or guidance
- **Social/organizational** issues

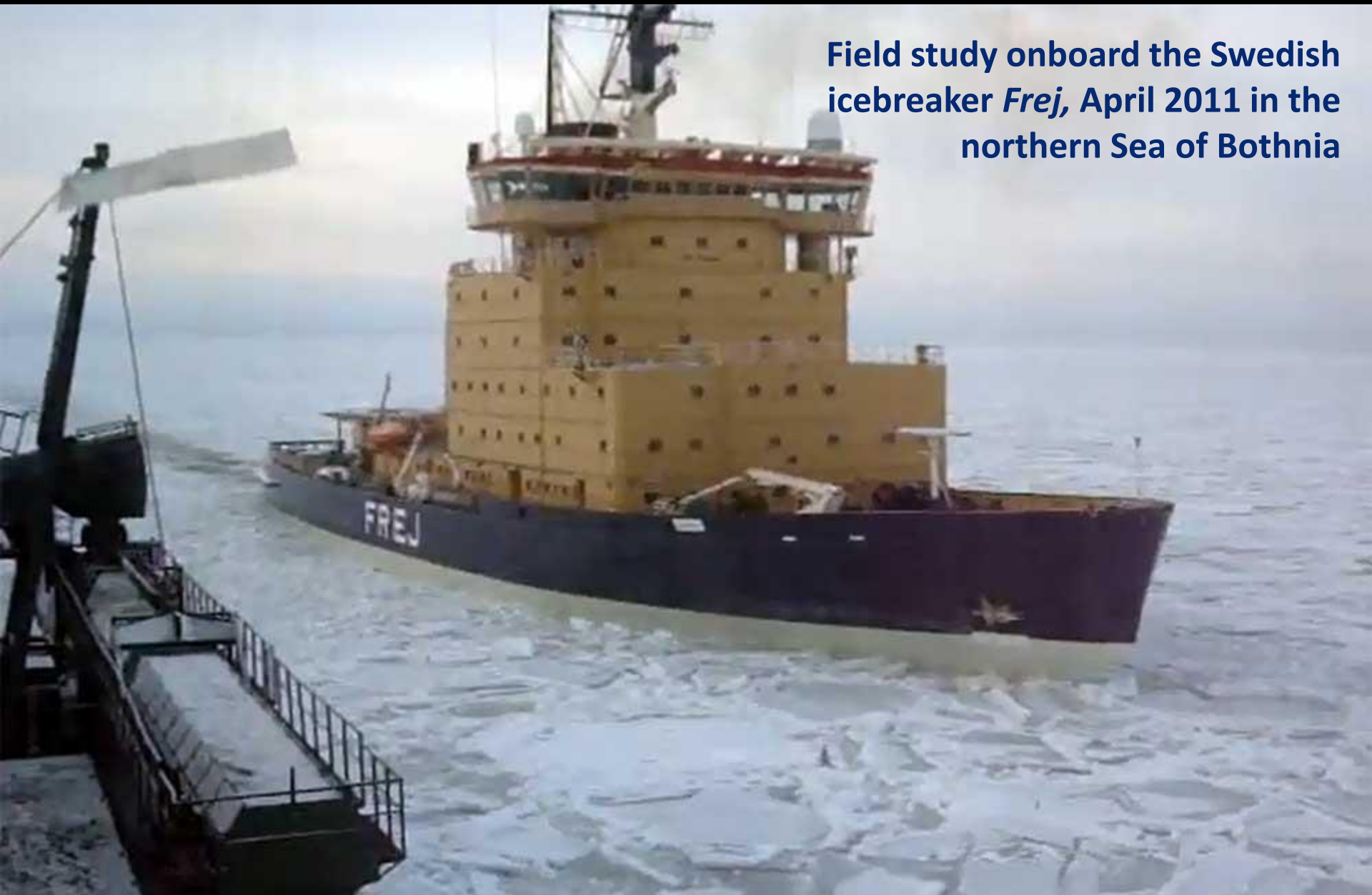


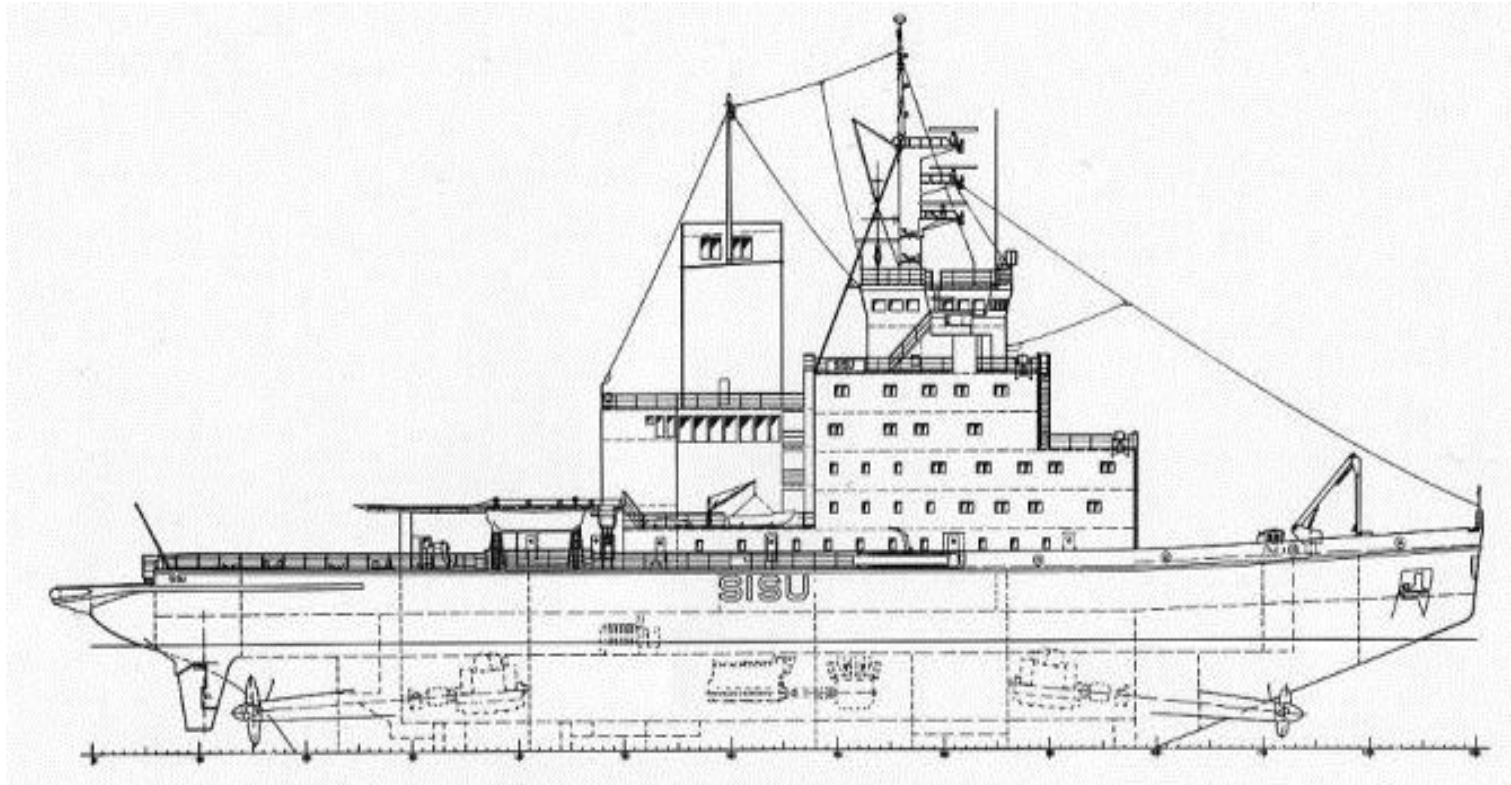
Dismukes, Berman, Loukopoulos

Some Human Factors methods used at Chalmers:

- Collecting user needs (field studies, context analysis)
- (Prototype development)
- Usability testing i simulator ("System simulation")
- Usability testing at sea

Field study onboard the Swedish icebreaker *Frej*, April 2011 in the northern Sea of Bothnia







First-year ice:
Norra Kvarnen April 2011: 30-55 cm thick ice (< 1 m)



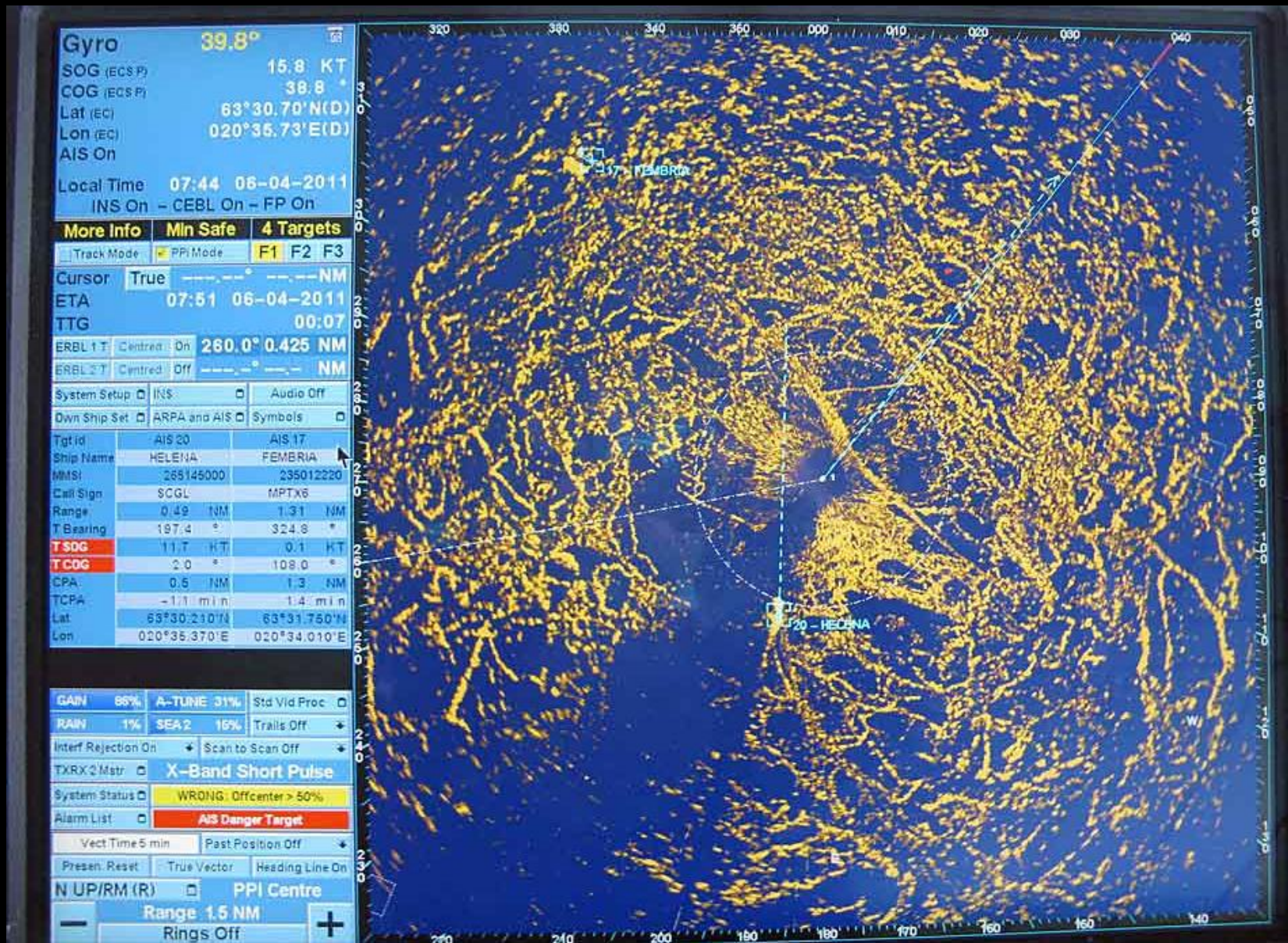








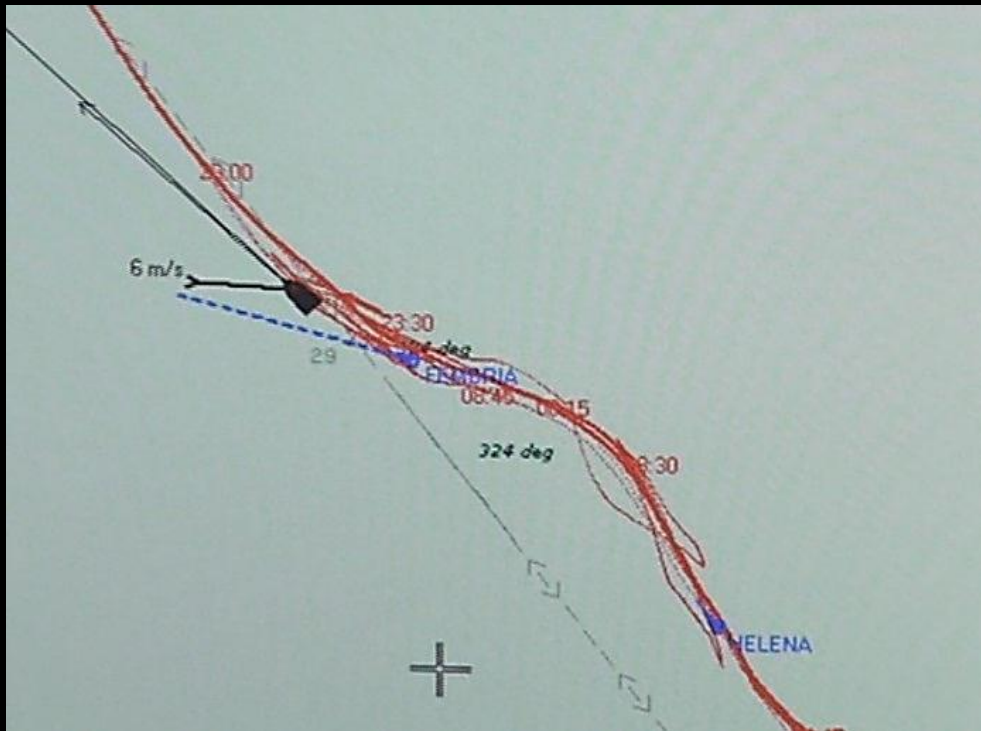


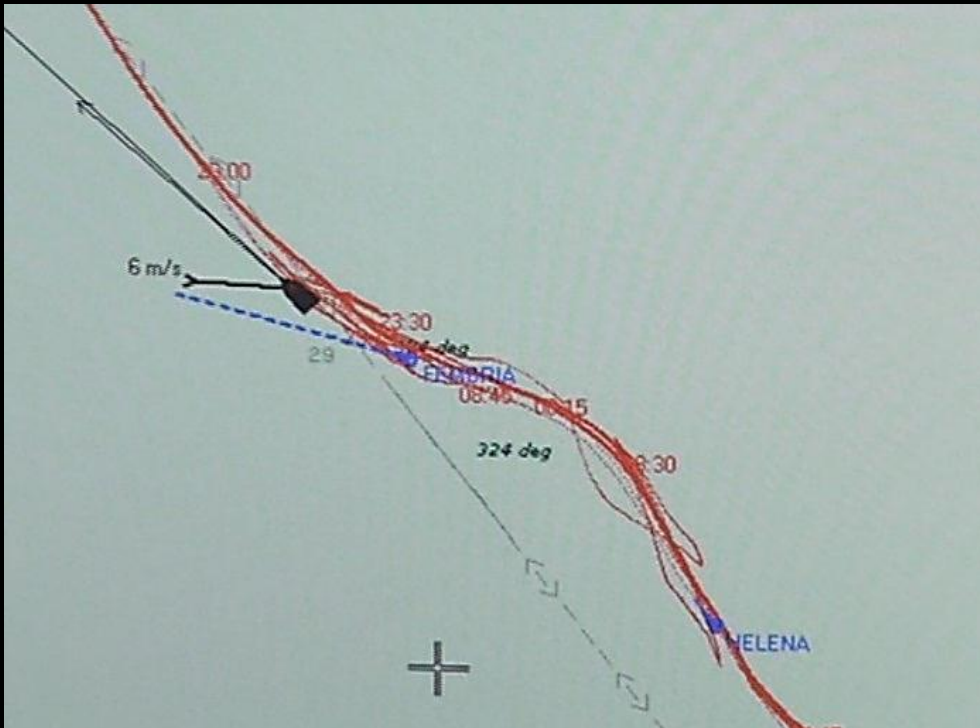


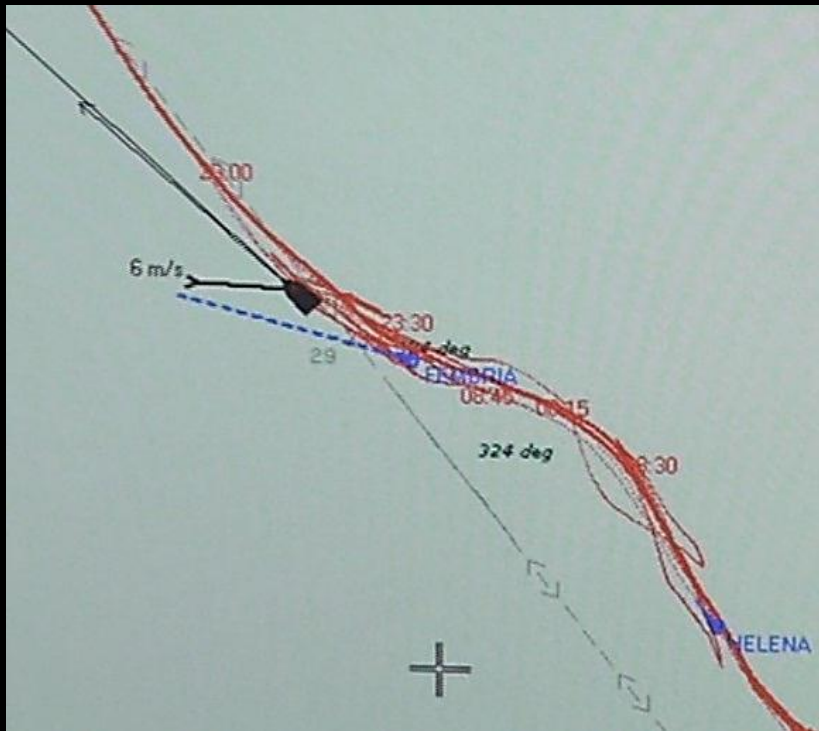












Found user needs:

1. Ability to transmit high resolution ice-route to addressed ships
2. Ability to see ships' past-tracks, color coded based on propulsion effect used (difference from "normal" effect use)

Usability test at Chalmers simulator facility

Method: "System simulation" (qualitative, exploratory approach, observation (ethnography), data collection and analysis tool





Professional VTS operator
with experience from The
Sound VTS

Researcher/observer

2011-09-06, 09:36

Two bridges: one tanker, one cruising ship,
each manned with one experienced captain and one Sound pilot



2011-09-06, 13:55



2011-09-06, 13:38



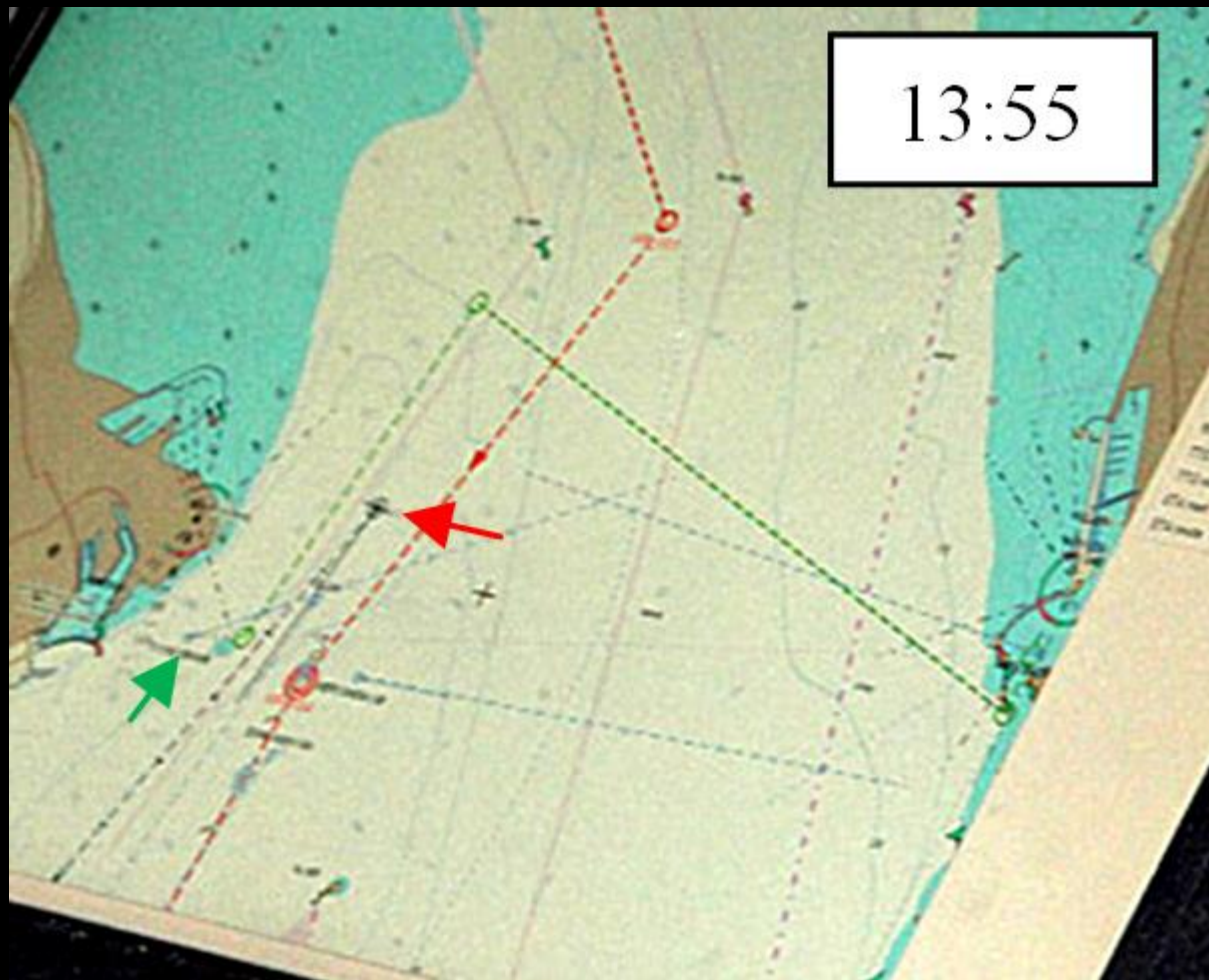
2011-09-06, 13:49





2011-09-06, 13:53







2011-09-06, 13:55

The screenshot displays the VSL Site Explorer software interface. At the top, a timeline shows VHF calls on four channels and individual reports from observers. A red arrow points to a specific event on the timeline. Below the timeline, a 'Reports' window shows a list of communication events with timestamps and text. A red arrow points to a report entry. To the right, a 'Photos - DSC_7946' window shows a photograph of two people working at a computer workstation. In the center, a 'Channel 16' window shows a network diagram of communication links between various ships and stations. A red arrow points to a link in the diagram. At the bottom left, a clock shows the current simulation time as 2009-03-19.

Timeline with VHF calls on four channels and individual reports from observers

Observer reports from current time

Links for VHF communication

Photo from current time

Current simulation time

2009-03-19

Analysis tool: VSL Site Explorer™



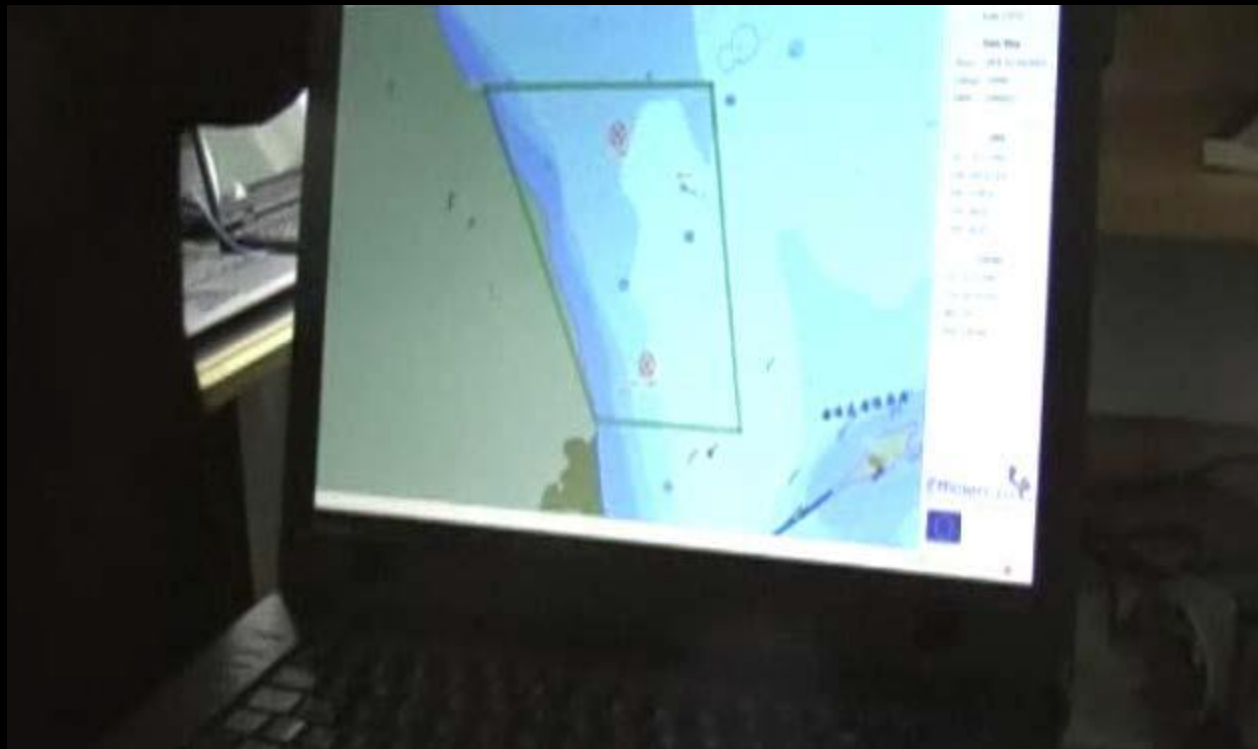
Findings:

1. Use of *Intended* and *Suggested routes* showed some new interesting behavior that needs further investigation. The services received positive response from involved professionals
2. Concern was expressed about screen cluttering on the VTS screen showing all ships intended routes.

User tests at sea:

Testing route exchange during a SAR exercise,
Denmark May 2011













Findings:

1. Users found the system tested very beneficial decreasing cognitive workload and risks of misunderstandings
2. The prototype system is now used by the Danish Home Guard SAR organization.