Crew Resource Management in CRIOP from 2004

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Agenda

- Why CRM focus in CRIOP in 2004?
- Experiences of use
- Suggested use of CRM
Human Factors and CRM

Human Factors – (in short) a discipline focusing on the nature of interactions between humans, technology and organizations – (see definition at IEA - International Ergonomics Association – copy at www.hfc.sintef.no)

Human Factors domains:

- Physical ergonomics
- Cognitive factors (perceptions, information processing, ..)
- Organizational factors (communication, teamwork, CRM…)

More teamwork/more collaboration - CRM

- What is CRM:
  - CRM is team training to improve crew coordination and performance. (Salas 2006)
  - A goal is to reduce accidents through preventing errors, trapping errors or mitigating errors.

- CRM use and focus:
  - Aviation, Medical fields, Bridge Resource Management, US Navy, Nuclear Power Plants, Rail, Space
  - Common themes: Communication, Situational Awareness

- Oil and gas
  - Increased collaboration and performance demands
Collaboration and higher performance

What to do in a more "networked" environment in the future?

- In 2003-2004 performed review of theory, practices in medicine/aviation, review of accident reports and review of successes (i.e. high reliability organizations)

- Two projects to explore health and safety issues in future operations of oil and gas:
  - "Threats and opportunities of eOperations (Integrated Operation) in the oil and gas industry" Review to Petroleum Safety Authority (2004)
  - "Health, Safety and Environmental issues in the future" – Project trying to identify key issues in design and operation of control centres (2003-2004) - Restructuring the method CRIOP

- Implemented CRM issues in design an operation of control rooms – in the CRIOP method (from 2004)

CRM in organization, design and operation of control centres

A. Clarification
B. Analysis
C. Conceptual design
D. Detailed Design
E. Operation, Feedback

Verification & Validation in CRIOP
*Job Organization, Procedures, Training, Control systems, Layout, Working Environment

www.criop.sintef.no
CRM – perspectives from risk communication and improved teamwork

- **Perspective: Risk communication** Fischhoff, Brewer and Downs (2011)
  - Share information - inform about risks
  - Change beliefs, attitudes and understanding
  - Change behaviour - reduce risks, when we know the best course of action

- **Communication process**: attention, comprehension, attitudes/beliefs, motivation and behaviour, (Wogalter 2006).
- **Mental models of risks** used in risk communication (See Breakwell 2007)
- **Teamwork** in high reliability organisations (Weick, Roberts, 1993) & “The big five of teamwork” (Salas et al 2005).

CRM specific elements in oil and gas

- **Suggested CRM topics based on accident analysis** (Flin 1997; Mearns et al 2001)
  - communication
  - situational awareness
  - teamwork
  - decision making
  - leadership
  - personal limitations (stress)

- These CRM topics is implemented and checked when designing and implementing CCR/ Drillers cabin through CRIOP
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CRM discussed in CRIOP

- New - functions distributed in a team
  - Responsibility in Teamwork – who does what, support
  - Communication - who, why, how?
  - Situational awareness – How, what and why?

- CRM must be designed in:
  - Responsibility through - Organisation, Procedures, Training
  - Communication - based on responsibility, working procedures and technical issues (Control systems, CCTV, Network...)
  - Situational awareness based MTO (Awareness, HMI..)
  - Layout and working environment

- CRM training suggested in different arenas – classrooms, scenarios/ simulations, part of AR ..
Issues when discussing CRM

- **What is a crew?**
  - **Oil and gas:** Control room offshore and onshore, then onshore operation centres and...

- **Is CRM accepted/prioritized in oil and gas?**
  - Acceptance by stakeholders – users, management, regulatory authority?
  - Development - Maturity

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**Crew in CCR - Remote operations**

- **BP – Valhall:** “The crew in offshore CCR and onshore CR is one team”

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[Diagram of crew in CCR - Remote operations]

Onshore

- Offshore CCR
- Offshore OC
- Onshore CR
- Onshore EC

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**BP – Valhall:** “The crew in offshore CCR and onshore CR is one team”
Adaptation/development of CRM

- CRM Maturity: Team is expanded, focus on human factors, user development, proactive approach, regulatory focus

- CRM adaptation and development aviation (Helmreich 1998)
  - 1st generation - Cockpit resource management – junior flight officer vs. experienced pilot
  - 2nd generation, more team oriented including decision making
  - 3rd generation, Human factors issues – stress and situational awareness – and extension to other teams such as air traffic controllers and maintenance personnel
  - 4th generation, CRM program customized based on FAA mandates
  - 5th generation, emphasis on error management and safety
  - 6th generation, identifying/preventing threats to safety at the earliest time and managing errors (TEM)

Experiences of use

CRM issues prioritized when discussing Control Rooms?

- Performed CRIOP analyses of (10) control rooms in addition to interviews – findings prioritized by participants

- Performed (CRIOP) analyses of collaboration (2) between drillers and onshore support (OC)/expert centres (EC) extended by interviews and observations
Prioritized issues by participants
(“Member Checks” in groups 10-30; Action Research)

In CCR operations – CRM prioritized

- Around 30% of control room operators wanted to discuss problems and challenges in a team setting (needed access to experts locally or onshore) – one instance “13% - only 2 of 15 operators was confident that they could handle the CCR (13 of 15 was not confident) – 87%”

- In 6 of 10 projects, some sort of CRM training explicit suggested and prioritized (collaboration, communication)

- CRM issues:
  - Design for CRM - Clarity in responsibility, procedures, design for situational awareness (common mental models, risk perceptions, HMI), communication in distributed setting (MTO perspective)
  - Training needs: Communication in distributed setting, Anticipation and attention (Situational awareness), Response/Decision making, Team working, Personal limitations
Drilling – Preparing for CRM

- From drillers onshore operation centre: Different procedures and systems between rigs – difficult to establish common situational awareness
- Collaboration driller OC/operators EC: Poor common perceptions – missing communication and support of situational awareness
- Drillers Cabin: Poor sharing of data between offshore and onshore – also as suggested by PSA (2007, 2005) – Poor alarm systems; poor support in critical situations; poor proactive indicators

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Collaboration in/between teams to increase safety

- Communication and culture
- Involvement – Action Research
- Measurement

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CRM – Shipping, Helicopter, ...

- CRM in helicopter
- CRM in shipping
- CRM onshore process plants
- CRM in CCR/Drillers Cabin/..??
Suggested use of CRM

- CRM is used in the oil and gas industry – i.e. by crews in helicopters, in shipping (supply ships) and parts of CRM are used in training. CRM has been prioritized when discussed with control room staff, but: **CRM must be supported (by MTO)...**

- A **standardized set of CRM training** should be designed and implemented by the industry – among control room operators and drilling crew (including team onshore)

- Since CRM training impacts key areas to improve safety – the regulatory authority should support **CRM as a requirement** for teams involved in safety critical operations such as in control rooms and driller cabins.

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Why wait 20 years to implement CRM?

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- Longford accident 1998
  - Risk awareness

- Deepwater Horizon 2010: Group think, Responsibility, Confirmation bias, Mental models, HMI,

- Piper Alpha 1988
CRM to avoid accidents & support resilience

- Humans as barrier to anticipate and respond – (learn from successes)
- CRM topics designed by users
  - Communication (in distributed environment, MTO perspective, closed loop communication)
  - Anticipation/situational awareness (risk perceptions, shared mental models)
  - Resilience – handling of surprises
  - Attention and response – in teamwork
  - Decision making, responsibility, confirmation bias, group think
  - Trust
  - Personal limitations (stress)

Integrated operator and vendor centers and delivery chains

Proactive CRM to build resilience and avoid accidents

This is what we do when we are good!

Before laying out 2 1/2' id pipes from the drilling deck to the pipe deck, Svien Toye decided, on his own, to remove the bollard to prevent the pipes from sliding off the opening from the catwalk, machine to the gangway and container workshop immediately behind it.

"During the lay-out one of the pipes got caught in an open elevator door, causing it to bounce and slid down onto the catwalk. The pipe finally crashed into the container workshop. "It was clear that good preparation and coordination during the operation." Although the area had been cordoned off and was empty of people, Svien Toye's initiative still prevented the pipe from sliding onto the gangway.
References


PSA (2005) "Human Factors in drilling and well operations"

PSA (2007) "Human Factors i bore- og bønnoperasjoner – boremes arbeids situasjon" ("Human Factors in drilling and well operations") DnV and PSA.


