



# Seventeen to zero



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Eliminating DP incidents in Offshore Loading by combined training, system development and regulations

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Intro: Earlier this year, Kongsberg Maritime acquired SMSC – the Ship Modelling & Simulation Centre, based in Trondheim. The story I am now going to share is about a successful cooperation between SMSC, oil companies, field operators and other vendors resulting in a significant reduction of incidents over a given time period. This long-term project is a success story other parts of the offshore industry can learn from.

# My background



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- Flight/Navigation training in Norwegian Air Force, US Navy and US Air Force
- Air Force Academy and Naval Academy (Norway)
- Worked in Royal Norwegian Air Force, Royal Navy (UK), Kongsberg Defence & Aerospace and Kongsberg Maritime



- Navigator in Air Force and Navy for 15 years
- Kongsberg Group for 9 years.
- Although my operational background is from military aviation and not from the offshore or maritime industry, the P-3 Orion is really “a boat” operating 60 m above the waves, at 240 knots, with a 10 person crew.
- As far as training goes for crew in military aviation, training has been for some years where the maritime industry now seems to be headed – for instance assessment has always been a fully integrated part of the training. And realistic training/operation specific in a simulator before doing the real operation has also been a typical pattern for 40-50 years give or take, so for the purpose of training principles I believe my background may be useful/relevant.

# Kongsberg Maritime Training



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E-LEARNING – System principles and basic knowledge

PRODUCT TRAINING - General and vessel specific training

LEARNING SERVICES - Instructor training, Assessor training, Training Need Analyses

ONBOARD TRAINING (TECHNICAL AND OPERATIONAL) – OTS (ONBOARD TRAINING SYSTEM), DP CAP

OPERATIONAL TRAINING - Normal and Emergency Procedure training in Class A simulators

ADVISORY SERVICES - Procedure development, operation risk reduction, scenario training using advanced simulation, consultancy

- Teaching and developing people for over 35 years
- 14 training centers globally
- 6000 people attend classes every year
- Product training and operational training
- General courses and vessel specific courses
- Advanced simulators creating realistic operational environments
- Instructor pool with a mix of technical expertise and operational backgrounds



KM Training has been there since 1980, providing training to those who have bought equipment from Kongsberg Maritime. The last few years we have expanded from mainly providing pure product training to offering more operational training – many of our instructors are now ex seafarers, with real experience on how to use the equipment.

# A global network of training centers



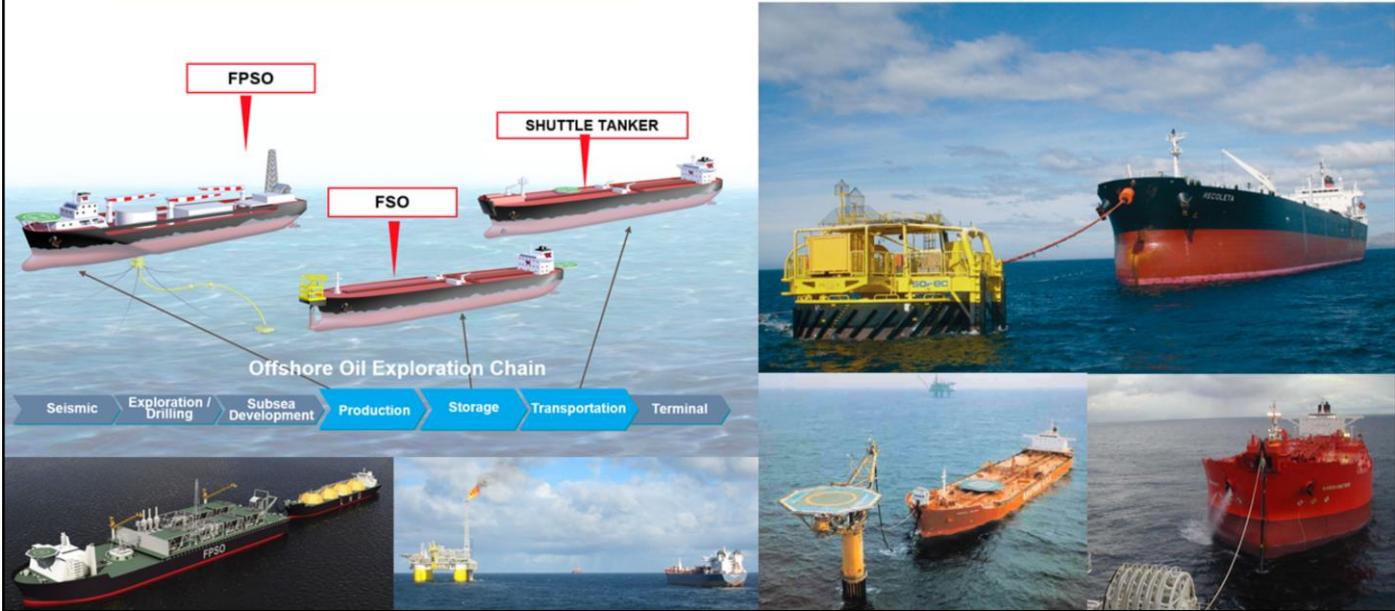
Our Training locations as of today.

# What is Offshore Loading?

- «The floating pipeline»



• [https://www.youtube.com/The\\_Art\\_of\\_Offshore\\_Loading](https://www.youtube.com/The_Art_of_Offshore_Loading)



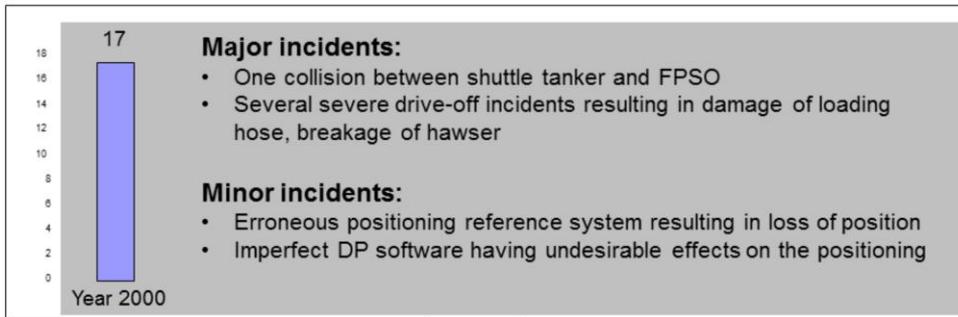
OK, back to the subject at hand. There are lots of installations offshore, more than one third of the worlds oil is produced offshore. The oil must be transported to shore somehow – How? Pipeline.

- However- the Norwegian Trench, and large water depths in general have been challenges for pipelaying
- Therefore, a lot of the transportation .. Using tankers
- Many variants of this, but they all involve very big ships going very close to an even bigger ship or a platform of some kind, in potentially very rough weather
- This means there is some risk involved – several things can go wrong, involving interruption of the operation, damage to equipment, oil spillage, even loss of life – all of which costs a lot of money
- The majority of these operations are now done by the use of DP (Dynamic Positioning) systems

## Statistics; Dynamic Positioning incidents (Teekay)



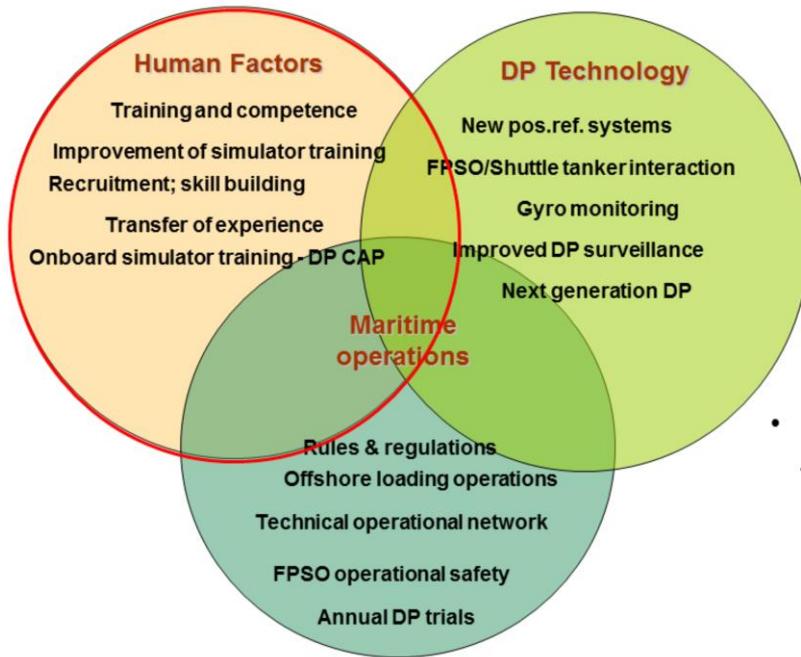
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Around year 2000 there were several challenges within offshore loading:

- From 1980 to 2000 - # of shuttletankers went from 4 to appx 60, which led to a challenge of establishing enough competent personnel
- Alarming increase in # of incidents
- In 2000 Navion alone (now Teekay) had 17 incidents, incl collision, drive offs, - with serious equipment damage, interrupted ops
- They therefore took the initiative to a Joint Industry Project, involving Oil Companies, Field operators and vendors, incl SMSC. Project name DP 2000.

## DP 2000 JIP; participants and main focus areas



- Final result of the DP 2000 JIP was 32 recommendations for improvement which were all implemented by end of 2003.



Some participants not shown were later acquired by those shown.

Up until year 2000 no legislation regulated use of DP onboard shuttle tankers; DP was seen as a pure assisting tool. The DP 2000 project concluded with three main focus areas with room for improvements; Human factors, DP Technology and Maritime Operations.

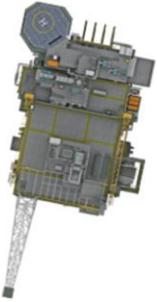
DP technology – not so many things – some sw glitches, adapt SW to user, improve HMI, new and improved pos ref systems.

However; Stricter rules and regulations came into force. (From 1st January 2001 new legislations came into force demanding shuttle tankers to comply with IMO DP class 2 and Class 1 requirements; DP class 2 is required for tandem operations, DP class 1 elsewhere) And a lot was done on the Human factor side, including Training & Assessment.

The project concluded in 32 proposals to modifications/improvements/upgrades which were all installed by year 2003.

We will take a closer look at the measures taken within HF

# Human Factor improvements as a result of DP 2000 JIP



- Training and Competence
- Improved Simulator Training
- Recruitment/ selection
- Transfer of experience
- Assessment
- Onboard Simulator Training – DP CAP™

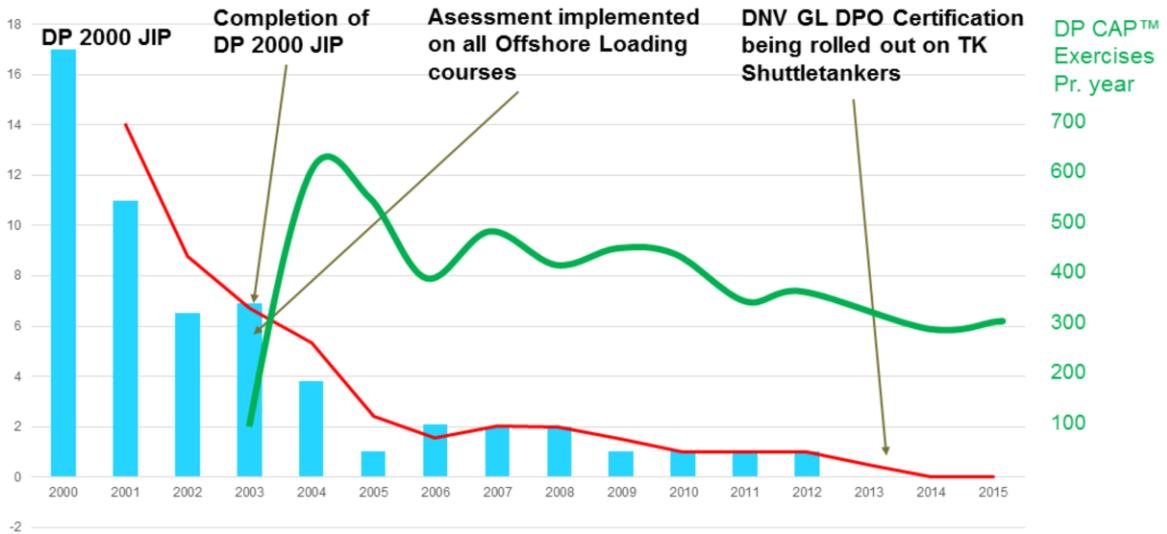


1. A lot was done within development of procedures/checklists, and training. Statoil made procedures, the operators made checklists, SMS(C) made and revised checklists and tested and adjusted both procedures and checklists in simulators.
2. The focus was to create realistic training, using simulator, discussing and redoing real incidents from the past. A lot of crew interaction, discussions on the scenarios
3. They improved the recruitment process, by implementing elements of selection from aviation (testing of abilities and skills among candidates (SMS together with Navion, Bergesen).
4. Transfer of experience - The fact that the procedures were exercised in a safe environment led to discussions and captains sharing their own experiences openly with the youngsters all of a sudden during the simulator exercises, sharing of experiences and stories, discussions. One other bieffect was that having done these exercises together in simulator, the captains would trust the younger crew to try as well, allow them to do things they would never be allowed before. They saw very positive effects on the cooperation between experienced and younger crew, both in the simulator and on the actual ship.
5. Assessment – introduced to all offshore loading courses in 2003. This was a cultural challenge – «assessing colleagues», however Teekay demanded assessment. If failed: If junior: new course within 6 months, if senior: new course and assessment before next sea tour. Gradually – understanding of the need for verification of skills – consequence – less partying, more focus and attention during courses.
6. Onboard simulator training – SMSC and Global Maritime –developed the DP CAP (Competence Assurance and Practice).  
DP CAP, is now an integrated part of the training (reduces the need for simulator training somewhat) Practice the approach to an oil rig, FPSO, buoy, at a safe offset distance. (however on the DP system it all looks like it's the real approach). This meant that DP officers would get their hands on the DP system a lot more often than before – it could be 6-8 weeks without operating the DP, leading to insecurity and insufficient skills.
7. Offshore Loading was the first offshore branch to introduce elements of BRM, as well as recurrent training, based on SAS (Scandinavian Airlines) training program.

## Numbers of Loss of Dynamic Position incidents per 1000 DP operations



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18.10.2016

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This shows the statistics after 2000 – a significant reduction of # of incidents in the Teekay fleet. The last years there have been none reported.

We believe the measures taken in DP 2000 JIP is the main reason for the statistics showing such positive trend.

2003 theoretical & practical assesment on all offshore loading courses

Juniors 2003 – 2007 Seniors today – have had lots of DP practice and training onboard throughout.

2013 – TK wanted examined and certified DPOs in accordance with defined competency standards..



## Different perspectives on safety (from own experience)

- Navy attitude: Safety focus reduces operational effect
- Air Force attitude: Safety is an enabler/provider of, or a basis/prerequisite for operational effect

«Operational effect» may translate to «Efficiency» or «Profitability» in our context

I'd now like to take a quick sidestep to a parallel reality, from my own experience.

We were two Air force officers attending the Naval Academy after a few years of flying experience and we noticed the difference in culture there, compared to our upbringing in the Air Force. There was a tendency in the Navy to put safety up against efficiency/operational effect. High operational risk seemed to be the favourable and encouraged mindset in the operational navy, while safety was seen as something hindering/reducing operational effect (in our context operational effect may translate to efficiency or degree of profit).

The logic and the red line in the entire pilot and navigator education in the Air Force is that if you crash your airplane you will not have much of a positive contribution to the war you should be fighting, in fact you will actually have a large negative impact, as someone would have to try and save you and you have lost an airplane. In other words – safety is an enabler of, a prerequisite for operational effect. However, the Navy attitude was the other way around. The navy would regard the Air Force as way to careful and restricted. And yes it is true – The Air Force will stay on the ground if they are in doubt whether it will be safe to take off.



Now, we could see some of the results from the Navy culture – the Navy had sunk one of their own frigates as they drifted ashore, their Fast Patrol Boats ended up on islands and on land, they managed to burn one of their own minesweepers (KNM Orkla). They described a culture where they would try to hide and cover up those cases where they had made mistakes and ended up on land etc if they could.

My Air Force colleague and I decided to write our main thesis on the safety culture in the navy. We interviewed many operational officers about how they perceived the safety culture, with questions about reporting culture, openness about near misses, proactive use of near misses etc.. We expected they would confirm our hypothesis about a poor safety culture in the navy, however no – all answers were quite positive, so we were a bit surprised and frustrated, it didn't make sense. However, we concluded in a somewhat dramatic way – on one side we have objective evidence that they have a bad safety record – the Oslo class, the FPBs, the Orkla class.. On the other hand, they all think they're really good with safety. Our conclusion was –they do not understand the concept of safety and learning from each others near misses and so on. It should be noted that these observations were made in 2004 and the navy has probably changed a lot since then.



# Competency identification

## Dunning – Kruger effect, 1999

For a given skill, incompetent people will:

Fail to recognize their own lack of skill

Fail to recognize the genuine skill in others

Fail to recognize the extent of their inadequacy

Recognize and acknowledge their own lack of skill

after

they are exposed to training for that skill

You may have heard about this study – by David Dunning,  
Justin Kruger (Cornell University, NY, USA)

As soon as people get some training, they start to realize how  
little they know.



**We must train and educate people  
in order for them to understand  
that they need training**

Meaning that we must train and educate people in order for them to understand that they need training

# The Royal Navy Flying (UK)



18/10/2018

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I'm going to round this up with one last parallel:

- Fortunate enough to work 2 years for the RN, in the part of it that operates in the air – as an instructor for their young helicopter navigators
- The flying part of a navy is a happy mix, with good parts from the air – sound regulations, procedures, checklists – adequate for building sound training programs.
- However their culture – from the sea, with a flexible attitude, mindset towards the rules, they will be rather pragmatic to the rules and operate on the borderline of the rules, but they know what they are doing and they will not do it unless they feel it's safe to do it.  
Starting to conclude:
- It may seem that this happy mix, this balance is what the offshore loading business has found – good regulations, good procedures, high quality training, good attitudes towards sharing experiences openly – still with the flexible and pragmatic mindset from the sea, meaning the job gets done.
- – the result being high safety standards AND high efficiency, hence profitability.

## North Sea oil fields (still) served by Shuttle tankers



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- UK sector;
  - Alba - FSU
  - Anasuria - FPSO
  - Banff - FSU
  - Captain - FPSO
  - Curlew - FPSO
  - Fife - FPSO
  - Gryphon - FPSO
  - Pierce - FPSO
  - Ross - FPSO
  - Schiehallion - FPSO
  - Triton - FPSO
  - Foinhaven - FPSO
  - Leadon - FPSO
- Norwegian sector;
  - Norne - FPSO
  - Aasgaard A - FPSO
  - Aasgaard C - FSU
  - Njord B - FPSO
  - Jotun - FPSO
  - Balder - FPSO
  - Glitne - FPSO
  - Varg - FPSO
  - Alvheim - FPSO
  - Volve - FSU
  - Skarv FPSO



And the result may be seen here -

Today, many of these fields could have been served by pipelines, the technology for that was established years ago. (Schiehallion, Foinhaven..) However, because Offshore Loading is so safely and effectively done, it still outperforms the pipelines. It remains more cost effective than laying pipelines, because of its high safety standards, high reliability, high regularity and the low number of incidents.



## The Offshore Loading Business in the «Safety vs Profit» perspective:

They understand Safety as an enabler of efficiency and profit, not an obstacle. They are no longer amateurs, they are professionals.

### Conclusion:

Operation specific Training, along with assessment works.  
Safety should be understood not as a hindrance for efficiency/profit – it's an enabler!

### End notes:

Accidents are expensive – «You think Training is expensive – try an accident!» BTW – The Deep Water Horizon movie is coming in november!

One Offshore loader – 15-20 M USD (the cargo)

VLCC – load more worth than the ship! (with today's oil price)

Exxon Valdez – Exxon does no longer exist as a shipping company, the name became to much of a burden .. Cost of clearing up the mess, reprofiling Exxon to something else..!

Today: lots of accidents at sea – more and more of which are caused by human error. The rate is not decreasing, it's increasing.



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