



Operations and Requirements

FPSO and Shuttle Tanker Positioning

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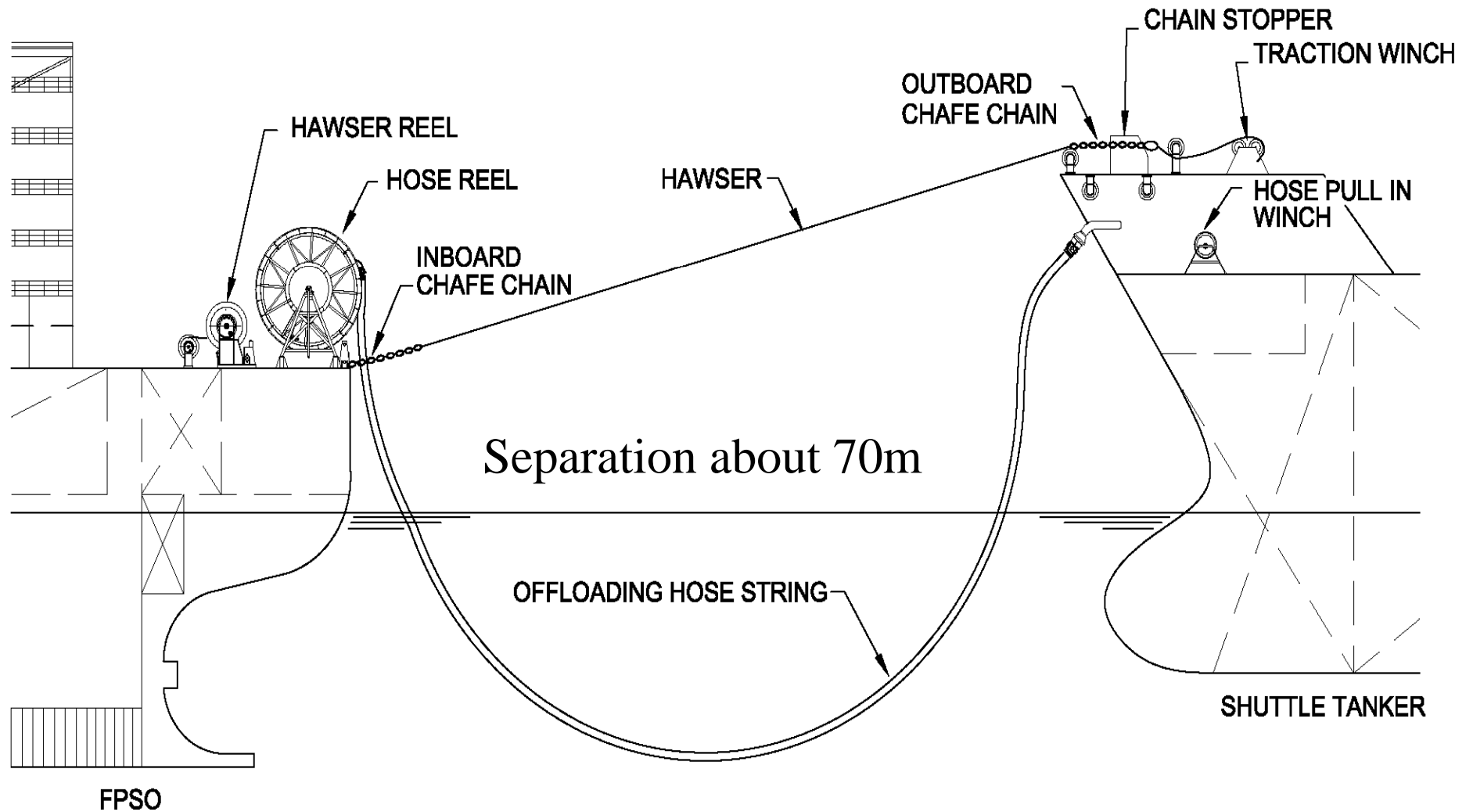
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FPSO & Shuttle Tanker Positioning

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FPSO and Shuttle Tanker

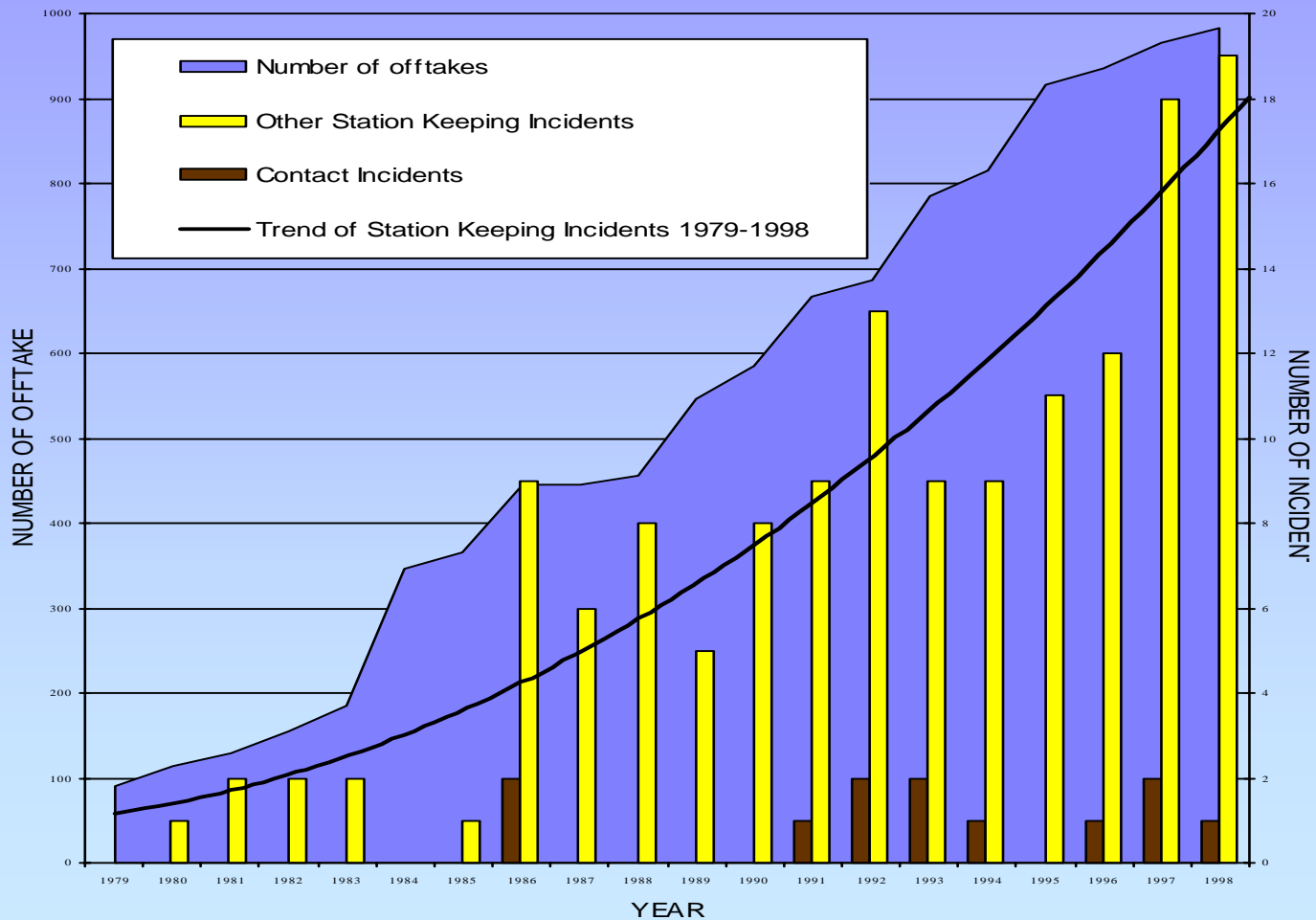


Background

- Ref 1 QRA of shuttle tanker collisions published 1998 (all types all areas)
- HSE in the UK set a target for improvement
- Contracted Global Maritime in 2001 and 2004 to independently assess improvement
- FPSOs & DP tanker offtake increasing
- What are the present risks?

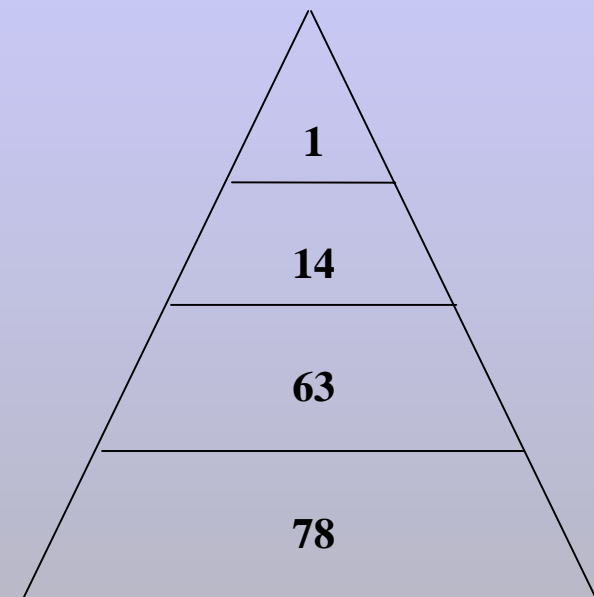
Position from 1998 Report

OFFSHORE OFFTAKE TANKER OPERATIONS - NUMBERS OF COLLISIONS and OTHER STATION KEEPING INCIDENTS BY YEAR 1979 - 1998



1998 Shuttle Tanker QRA Report

- Loss of Life
- Collision
- Major Near Miss
- Minor Near Miss
- Collision frequency per DP hour 5.89×10^{-5}



Incident Types

- Re-categorised (expanded) the four levels

L1 - Loss of Position and Loss of Life or Major Pollution

L2 - Loss of Position and Collision with Loading Point, ESD and Minor Pollution

L3 - Loss of Position causing ESD, near miss or high Hawser Tension

L4 - Station Keeping problem causing concern to operator

Incident Frequencies

L1 3.92×10^{-6} Loss of Position and Loss of Life or Major Pollution

L2 5.89×10^{-5} Loss of Position and Collision with Loading Point, ESD and Minor Pollution

L3 4.94×10^{-4} Loss of Position causing ESD, near miss or high Hawser Tension

L4 3.06×10^{-3} Station Keeping problem causing concern to operator

Problems

People, procedures, position references & propellers

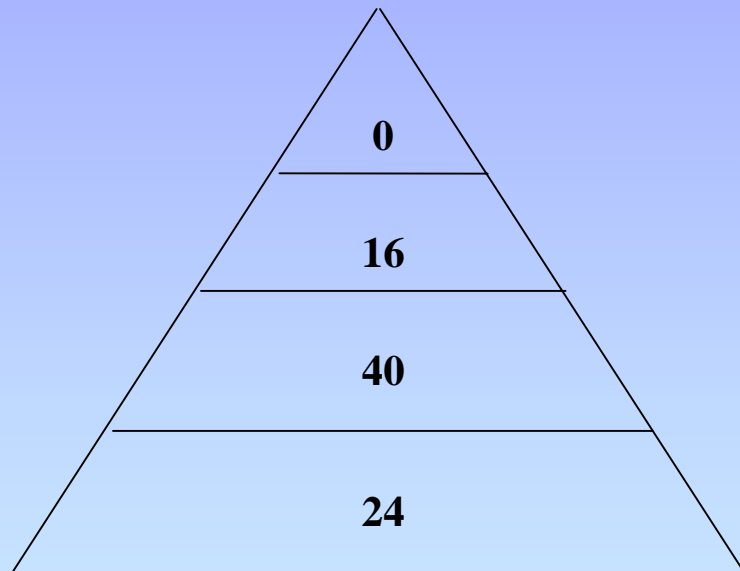
The collision frequency of 5.89×10^{-5} per DP hour was far too high especially with an increasing number of tankers offtakes being performed.

The incident frequency was also too high; the expectation of the 1998 QRA study was 7 incidents per vessel per year.

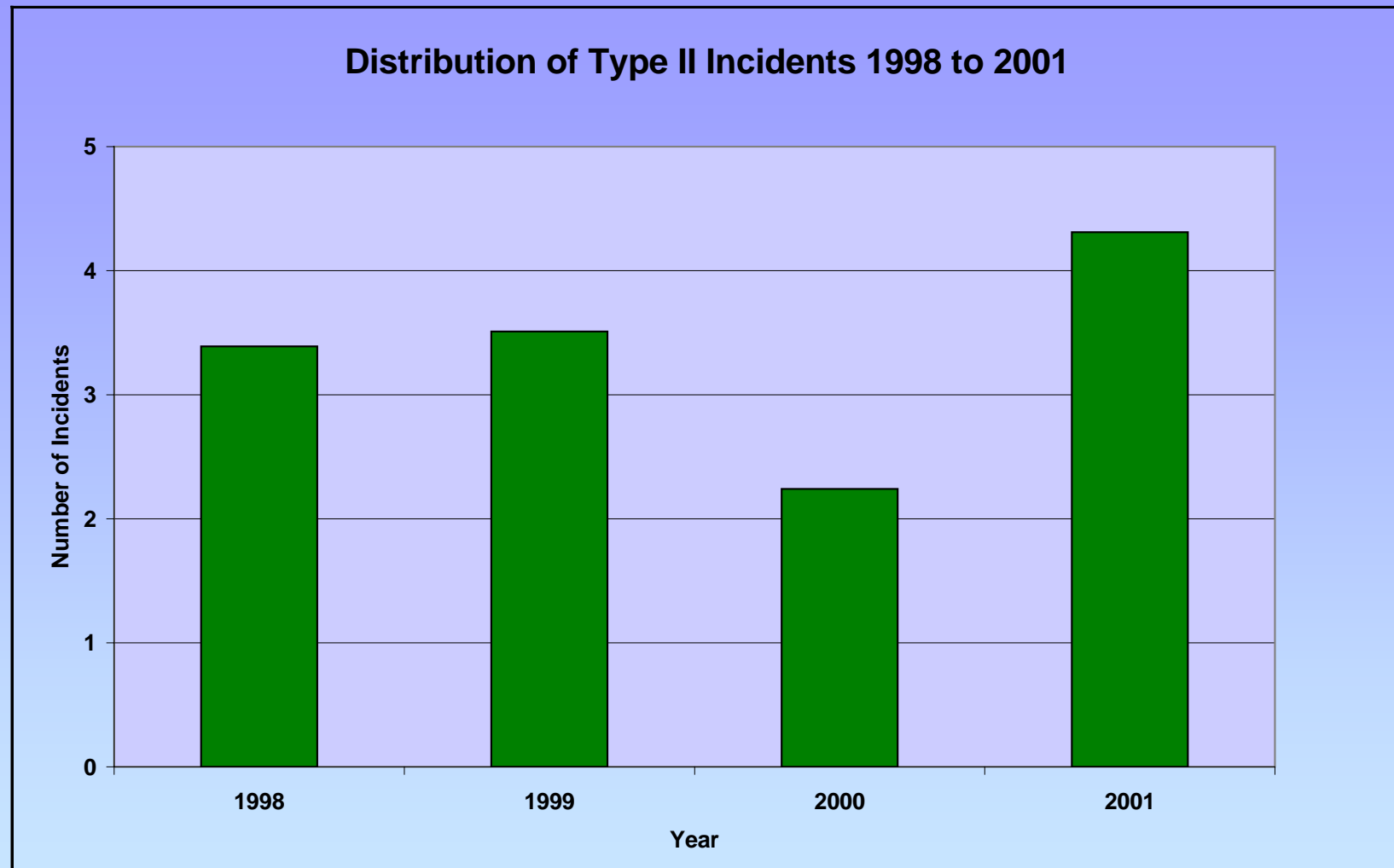
The UK HSE had set a target to deliver a 25% improvement and wanted to prove it had been achieved.

1998 - 2001 Data

Distribution by level



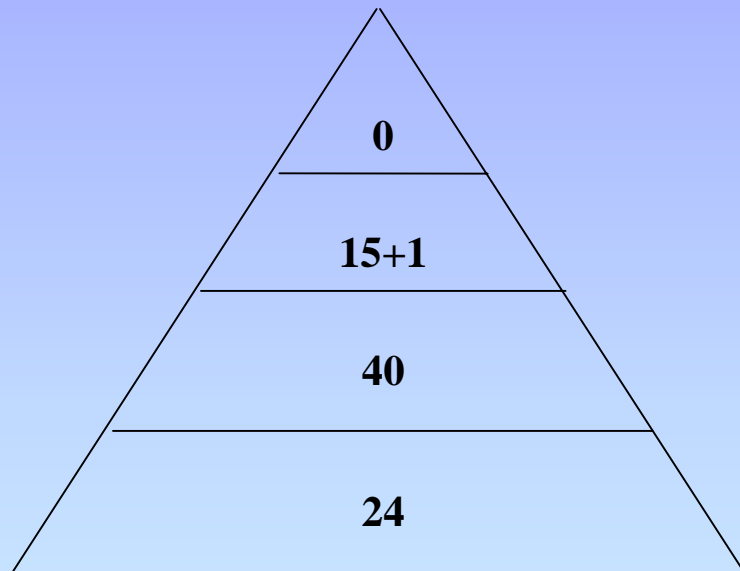
- 6 of 16 reported to HSE (37.5%)
- Total hours 41,638
- Frequency of level 2 incidents 3.84×10^{-4}
- About once in every 108 loadings



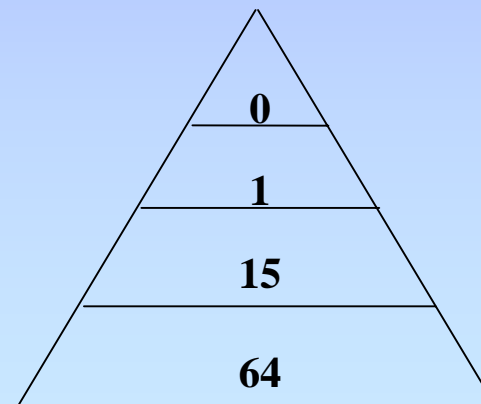
There was only one incident that resulted in collision

1998 - 2001

Distribution by level

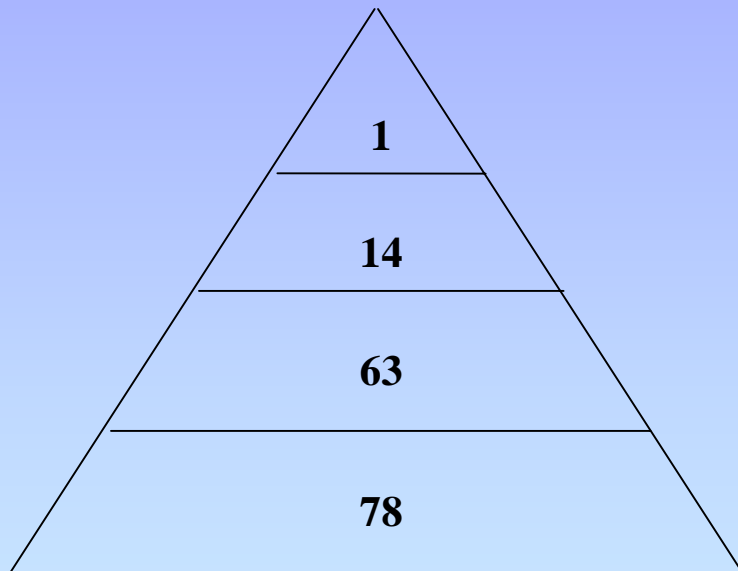


- To compare with the '98 work only collisions should be placed in Level 2



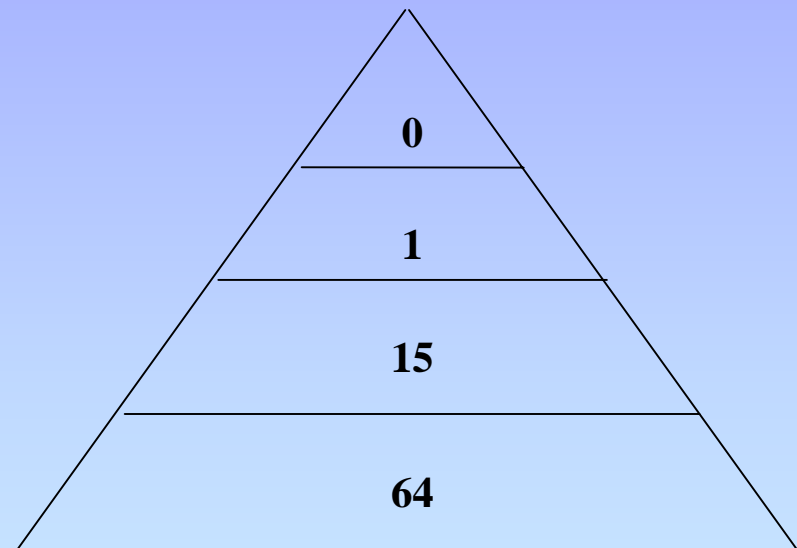
Comparison before and after 1998

- To 1998



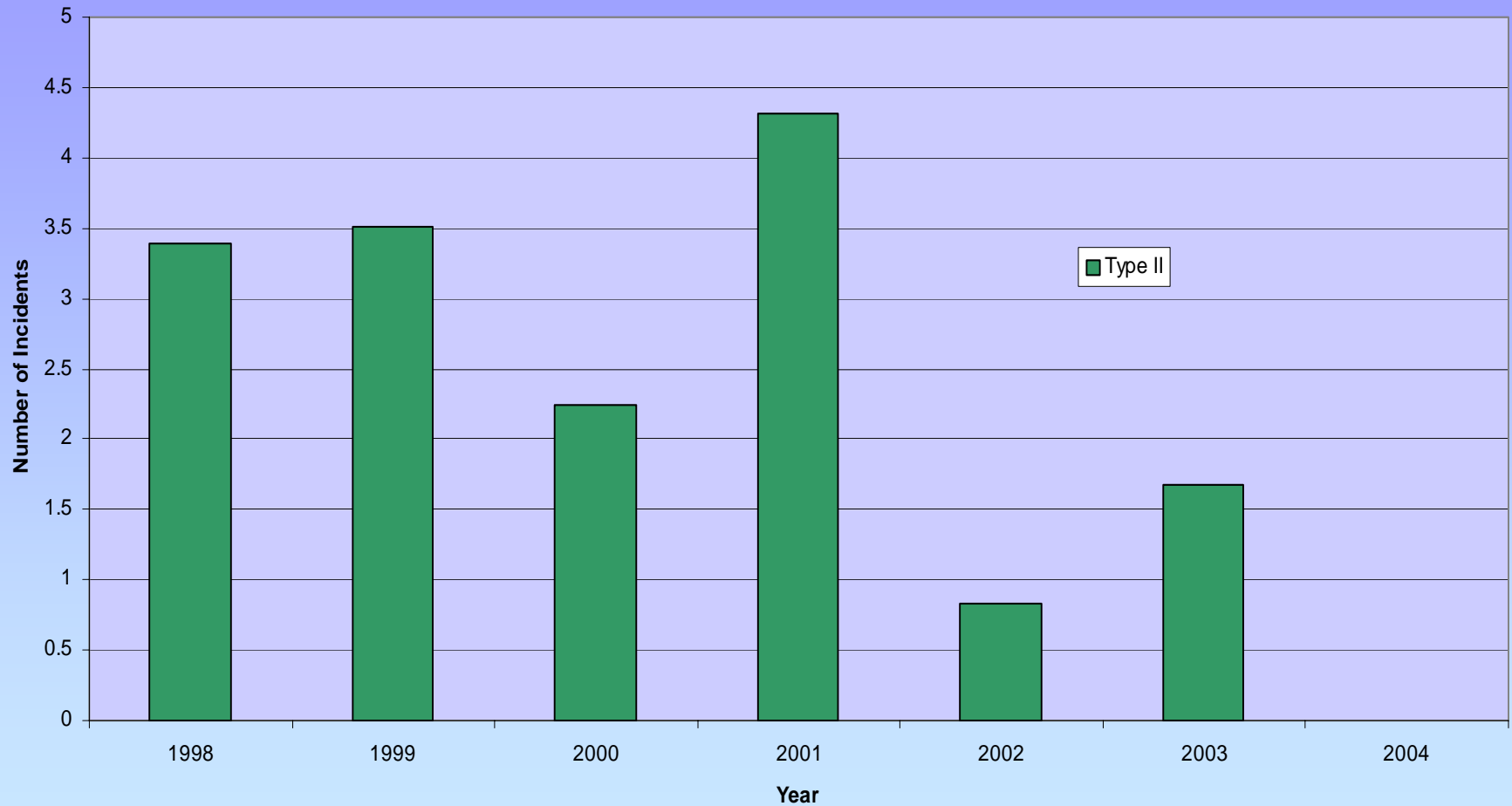
- Collision frequency
 5.89×10^{-5}

- 1998 - 2001



- Collision frequency
 2.4×10^{-5}

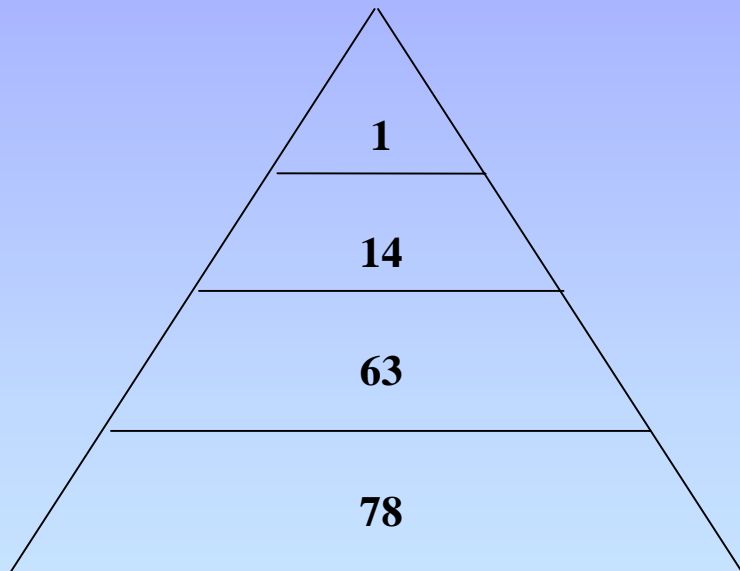
Distribution of Type II Incidents 1998 to August 2004



There were no level II incidents reported in 2004

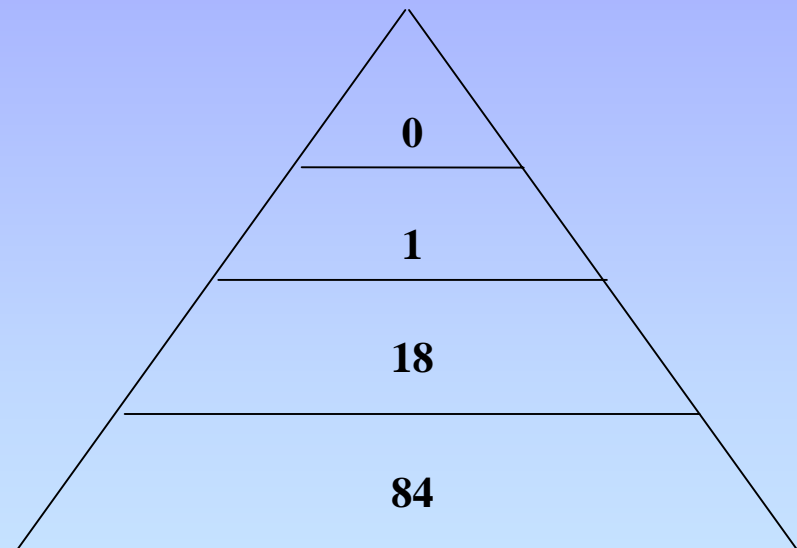
Comparison before and after 1998

- To 1998



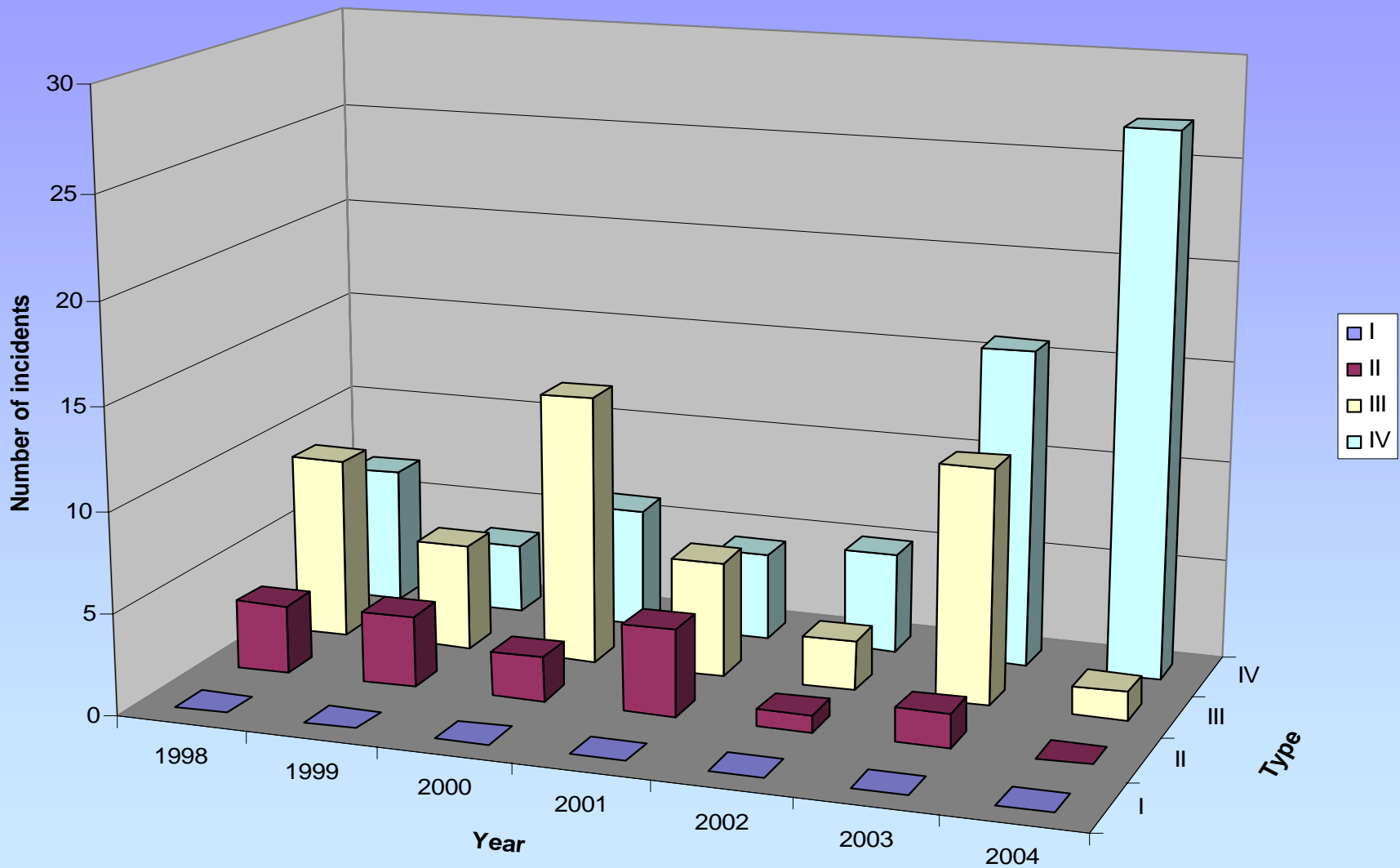
- Collision frequency
 5.89×10^{-5}

- 1998 - 2004



- Collision frequency
 1.45×10^{-5}

Distribution of Incidents 1998 to August 2004



Causes of Improvement

- Close attention by Oil Companies backed by good budgets and pushed by authorities.
- Training and Auditing by owners and Oil Companies.
- Better procedures and DP CAP
(DP Competence Assurance Practice)
- Tanker Offtake simulator training.
- Improvement in hardware and software.

DP CAP™; Scope of Work for the development programme

- **Create a programme to secure practical DP experience to the Shuttle Tanker DPO's.**

- Shuttle tankers are operating as little as 5-10% of total operational time on DP.

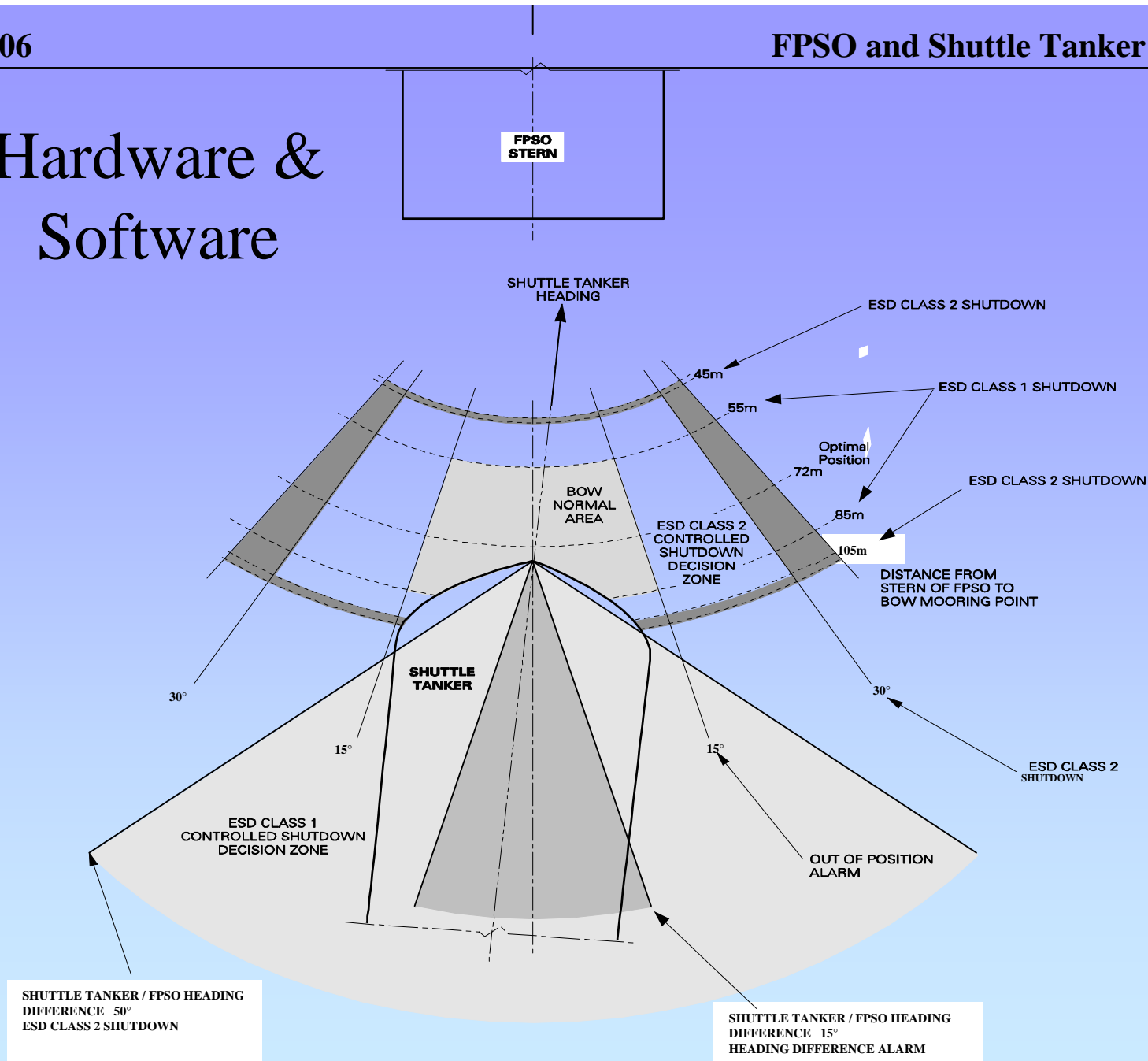
DP Cap™ aim :

- **increase the DP practice time**
- **make DP practice time more qualitative**

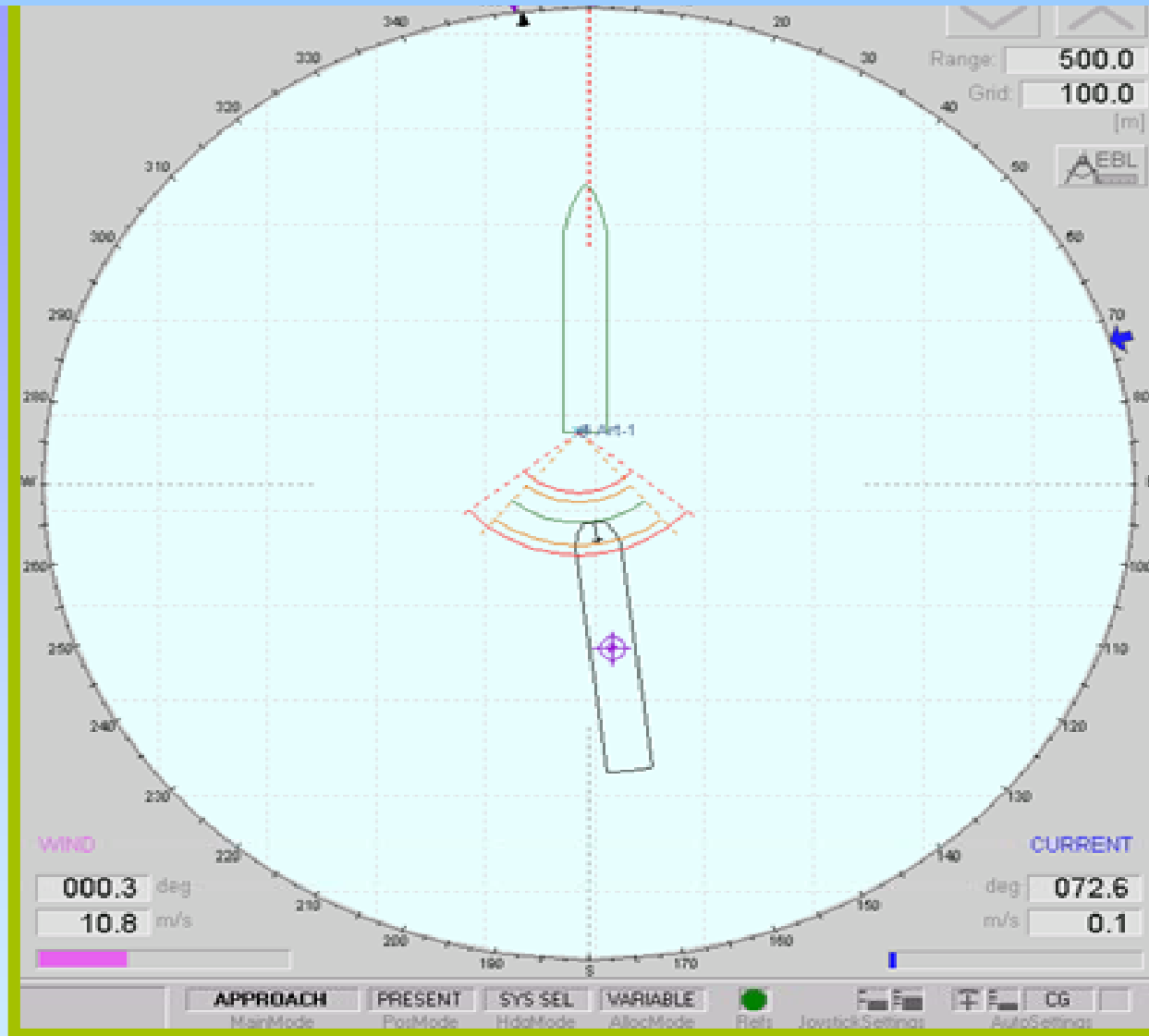


Taken from IMCA seminar 2004 Teekay presentation

Hardware & Software



Typical DP Display showing short and long distance alarms



Remaining Problems (FPSO)

- Heading control
- Marine Personnel
- Weather (limits & visibility)
- Position References
- Consistent Standard
- Thruster reliability

Shuttle Tanker Approaching FPSO



Approach Continues Satisfactorily



FPSO Changes Heading and Approach is Lost



Remaining Problems (Shuttle Tanker)

- Maintaining the improvement
- DP Class 2 or Class 1 or 1.75?
- Personnel Changes
- DP Control System differences
- DP experience
- Position References
- Consistent Standard
- Thruster reliability
 - control 4.35×10^{-5} - ME/DG 4.35×10^{-5} - Thruster fail 1.45×10^{-5}
- Misalignment

Conclusions

- There has been a marked improvement in DP shuttle tanker safety
- There are still some areas that need attention
- The biggest challenge is to maintain the improvement
- If there is a significant collision one of the likely findings will be inconsistency