DYNAMIC POSITIONING CONFERENCE
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RISK

Risk Mitigation for DP in Arctic

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ABS

Risk Mitigation for DP in Arctic

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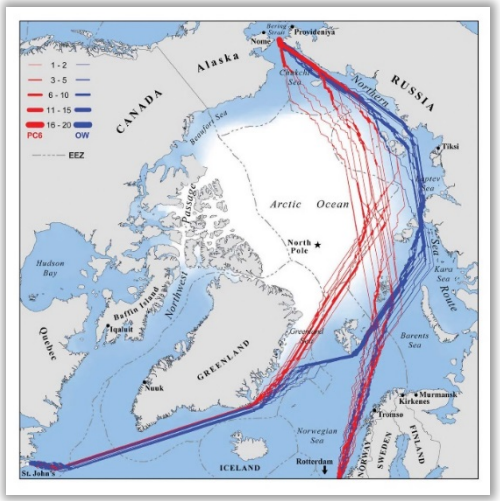
Overview

- Interest in Arctic
- Arctic and DP challenges
- Existing Rules and Guides for DP in Arctic
- Software focused risk mitigation methods
- Ice management
- Feedback versus feedforward control systems

Interest in Arctic

- Arctic research and exploration since the 1960s
- Substantial O&G reserves in the Arctic
- Technological Innovation
- Gaining new knowledge
- Commercial development
- Pave the way to new untapped resources



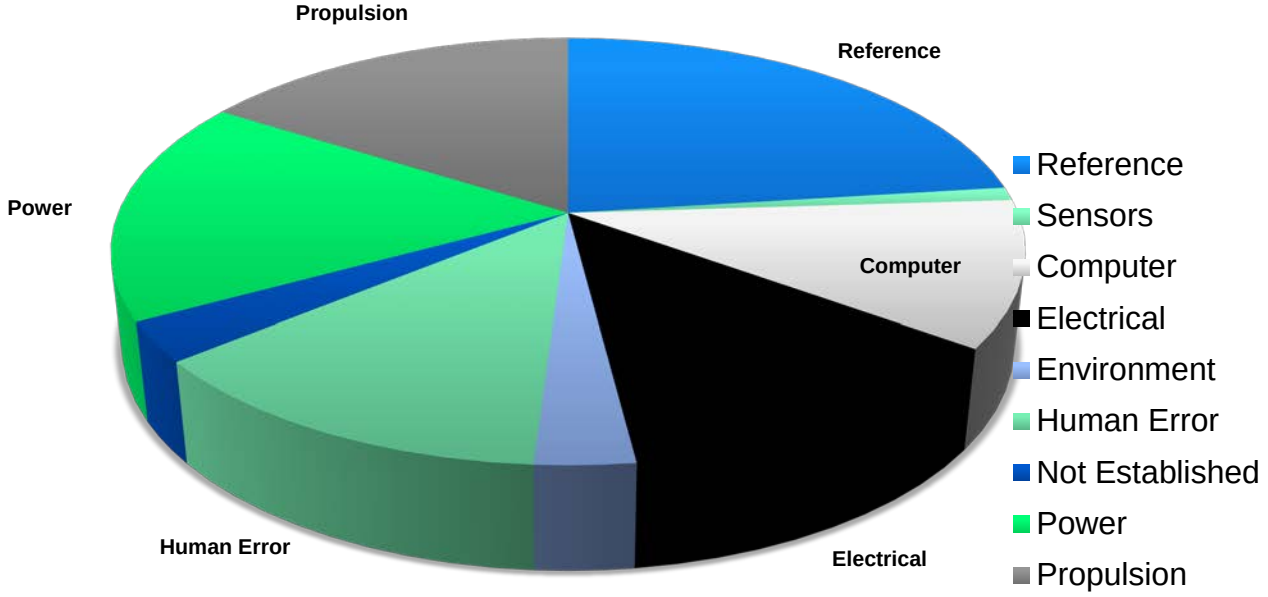
Arctic & DP Challenges

- Extreme temperature (-30 C to -55 C)
- Sea ice conditions and management
- Complex integrated systems
- Limited infrastructure (no quick fixes)
- Damaging equipment due to weather conditions
- Sensitive environment
- Long distances to transport

Existing Rules & Regulations

- IMO has adopted the Polar Code
  - Will take effect 1 January 2017
- IACS has issued common set of Polar Classes (PC)
- ABS has published guide for vessel operating in low temperature environment
- DNV-GL proposed a guide for winterization of ships
- ISO 19906:2010 – Arctic offshore structures
- Proposal for new guides for operations in Arctic

Documented DP Failures in Open Water



From M 218 Station Keeping Incident Database for 2010 – (Courtesy IMCA)

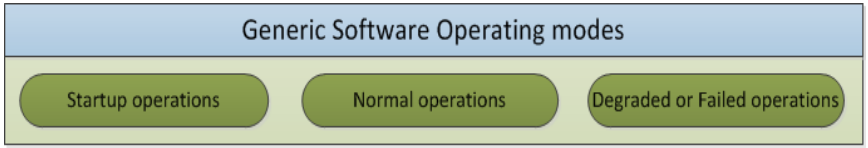
From other industries, the expected Computer fault rate is around 19%
[TechOps - TECHOP_ODP_07_(D)_(SOFTWARE TESTING) SEPTEMBER 2014]

Data does not represent any one DP system or DP manufacturer

Some Pitfalls on a Traditional FMEA

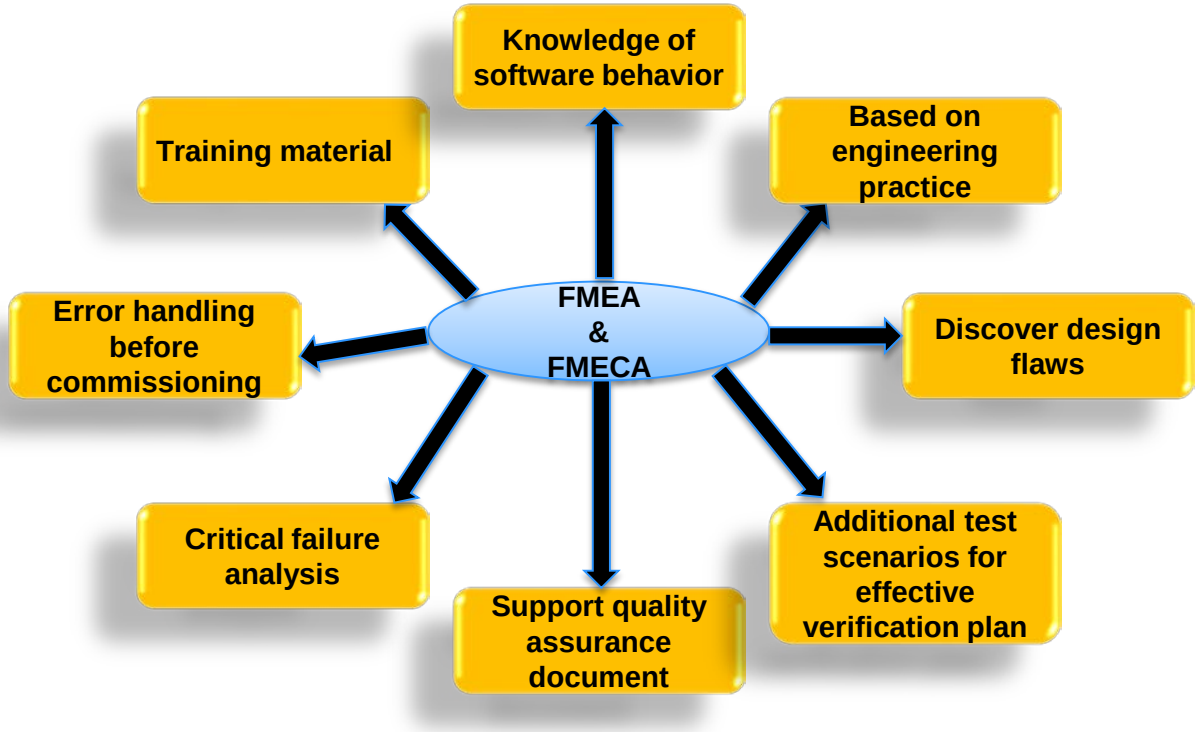
- System design or process improvement is incomplete
- Guiding the FMEA process to address the software failures
- Interface issues with other control systems are not considered especially with software
- Sub-Systems and other cascading failures are not considered (global effects of a failure)
- FMEA done late in the process to make proper changes to the software
- Incomplete or outdated documentation as it is missing the key section – software failures

Software Focused Risk Mitigation



- Lack of Functionality
- Improper Functionality
- Timing of execution of function
- Sequence of execution of function
- False Alarm/Action
- Faulty Logic and ranges
- Incorrect Algorithm
- Memory Management
- Interface Failure
- Software Virus

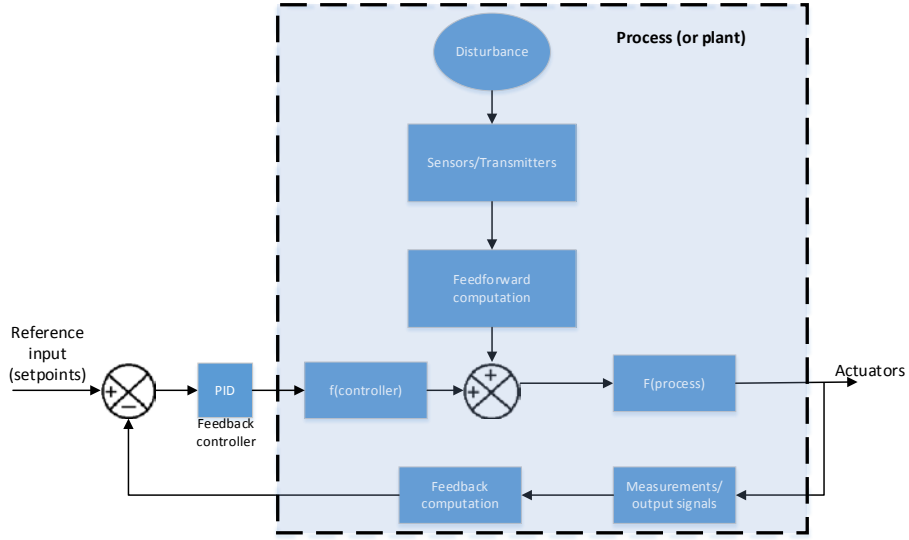
Outcomes of Hardware FMEA & Software FMECA



Ice Management

- Ice detection technology
- Ice observation and monitoring
- Ice Management is the sum of all these activities performed where the ultimate goal is to reduce or avoid actions from any ice features
- Ice management data can be incorporated into the DP control system as additional input

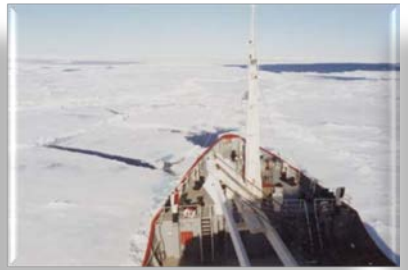
Feedback & Feedforward Control System



- A model of combining feedback and feedforward control system
- By adding the feedforward controls, we are able to accommodate for the unpredicted disturbances from ice movements
- This can help the DP control system to be much more rapid in decision making to avoid collision

Summary

- DP control system parameters (such as sensors and related equipment) need to be updated and tested.
- A software focused risk assessment combined with the existing hardware FMEA methods can provide a much more effective risk analysis.
- Rigorous model-based testing is needed with test scenarios specific for Arctic environment.
- With new and challenging Arctic, safety of the personnel, the environment and the asset should always be the priority.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