DESIGN

Design Issues and Failure Modes in OSV Propulsion Systems

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Dynamic Positioning Committee
Marine Technology Society

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Marine Technology Society

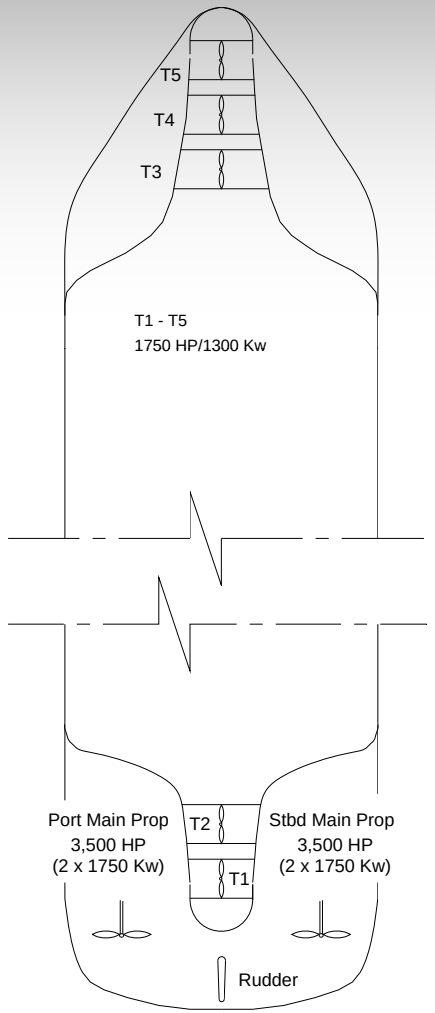
DP Conference 2009

PSV Design Considerations

Russell Hodge

C-MAR Group

Gusto 'Pelican' Class 1974



Diesel-Electric

5 Generators – Twin Bus

3 Bow Thruster, 2 Stern

2 Main Propulsion

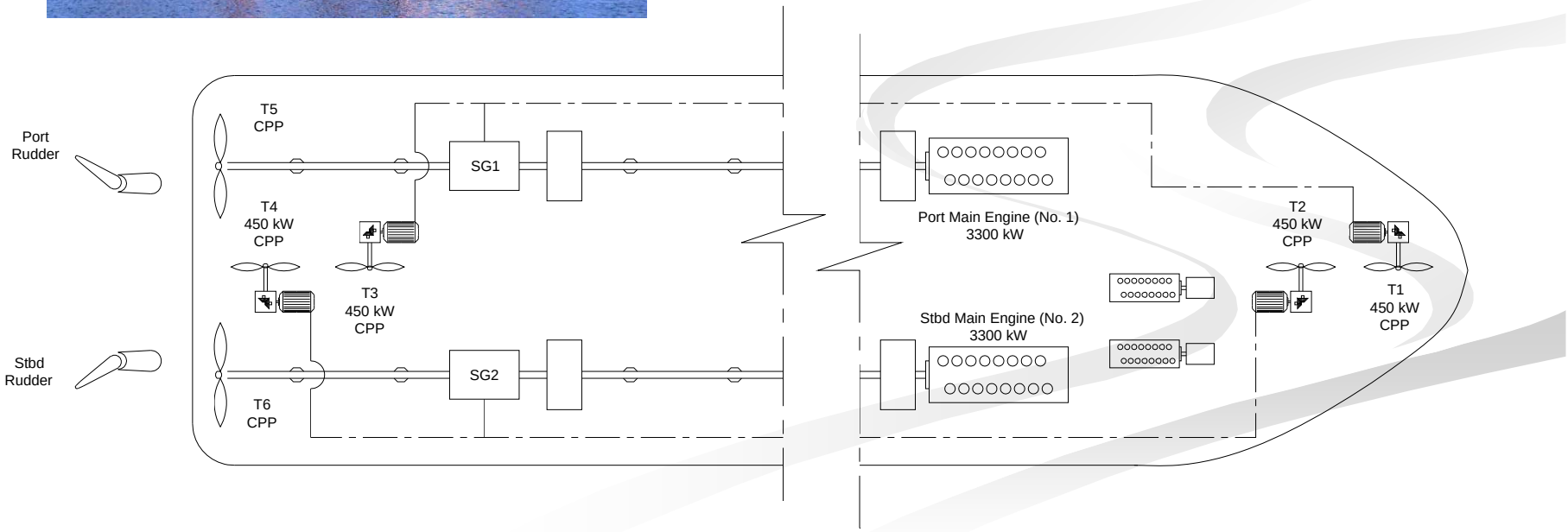
Ulstein UT 755 - 1980

Diesel – Electric (Shaft Generator)

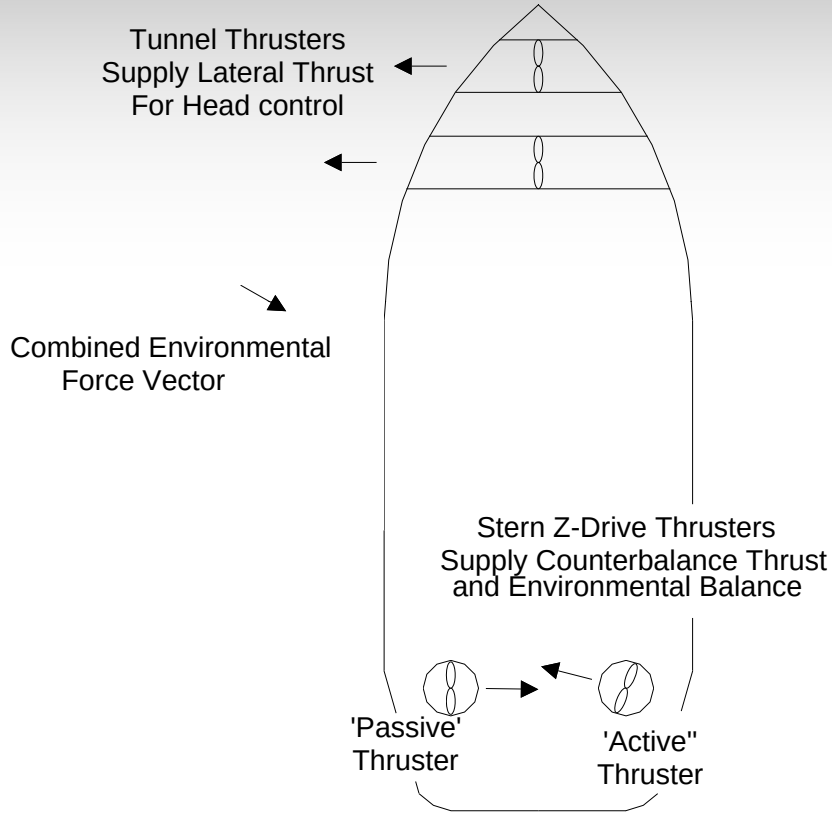
2 Bow Thruster

2 Stern Thruster

2 Main Propulsion



Force Bias



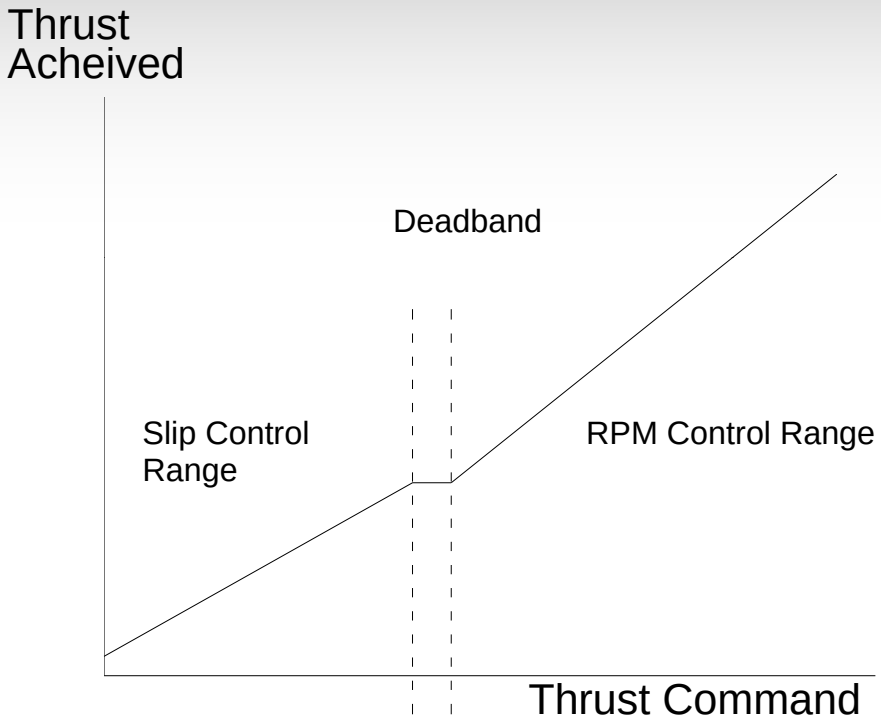
Fixed Pitch Variable RPM

Loss of Thruster – Drive off

Loss of ‘Active’ RPM – Drift Off

Loss of ‘Passive’ RPM – Hidden drift failure

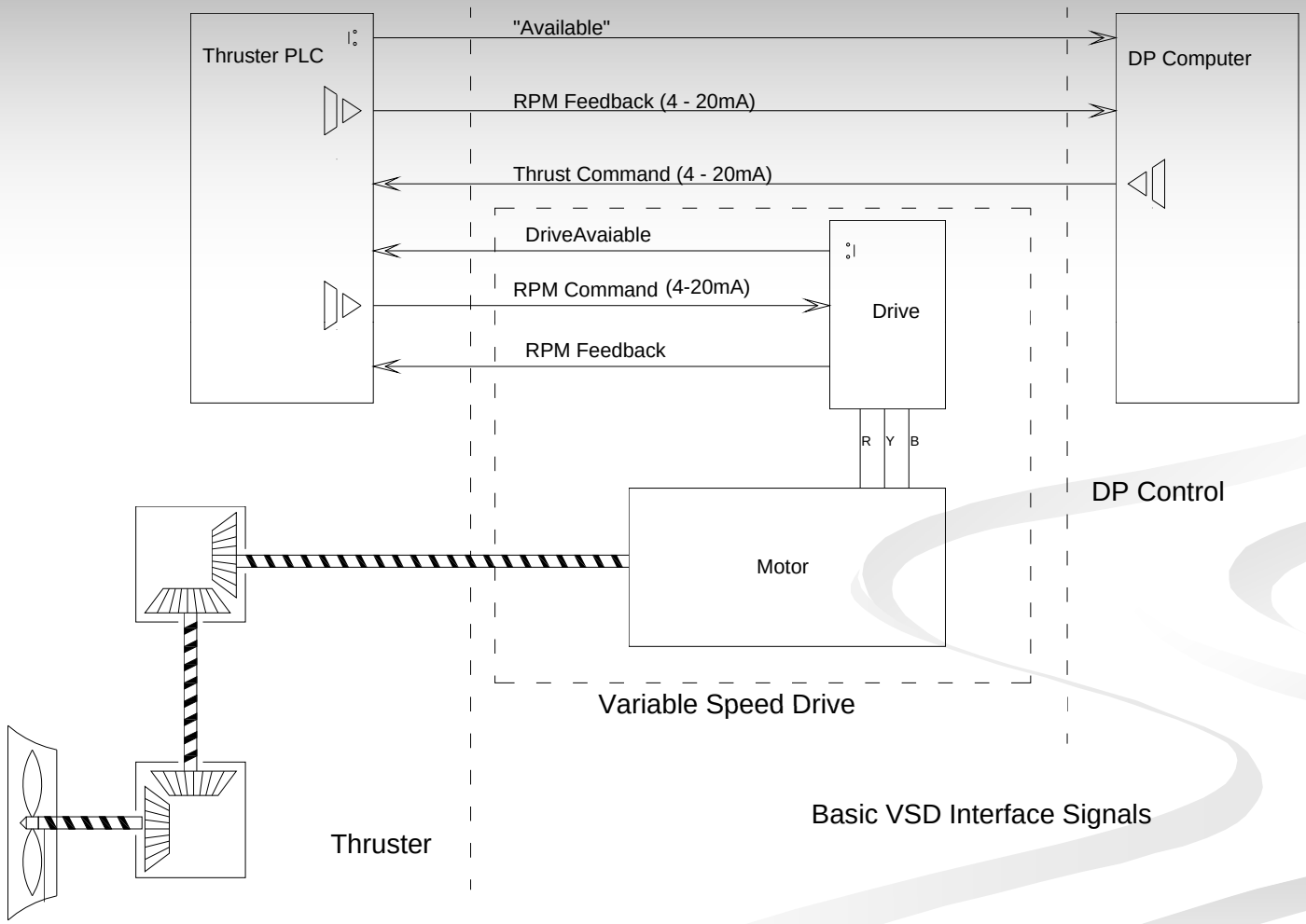
Slip-Thrust Power Curve



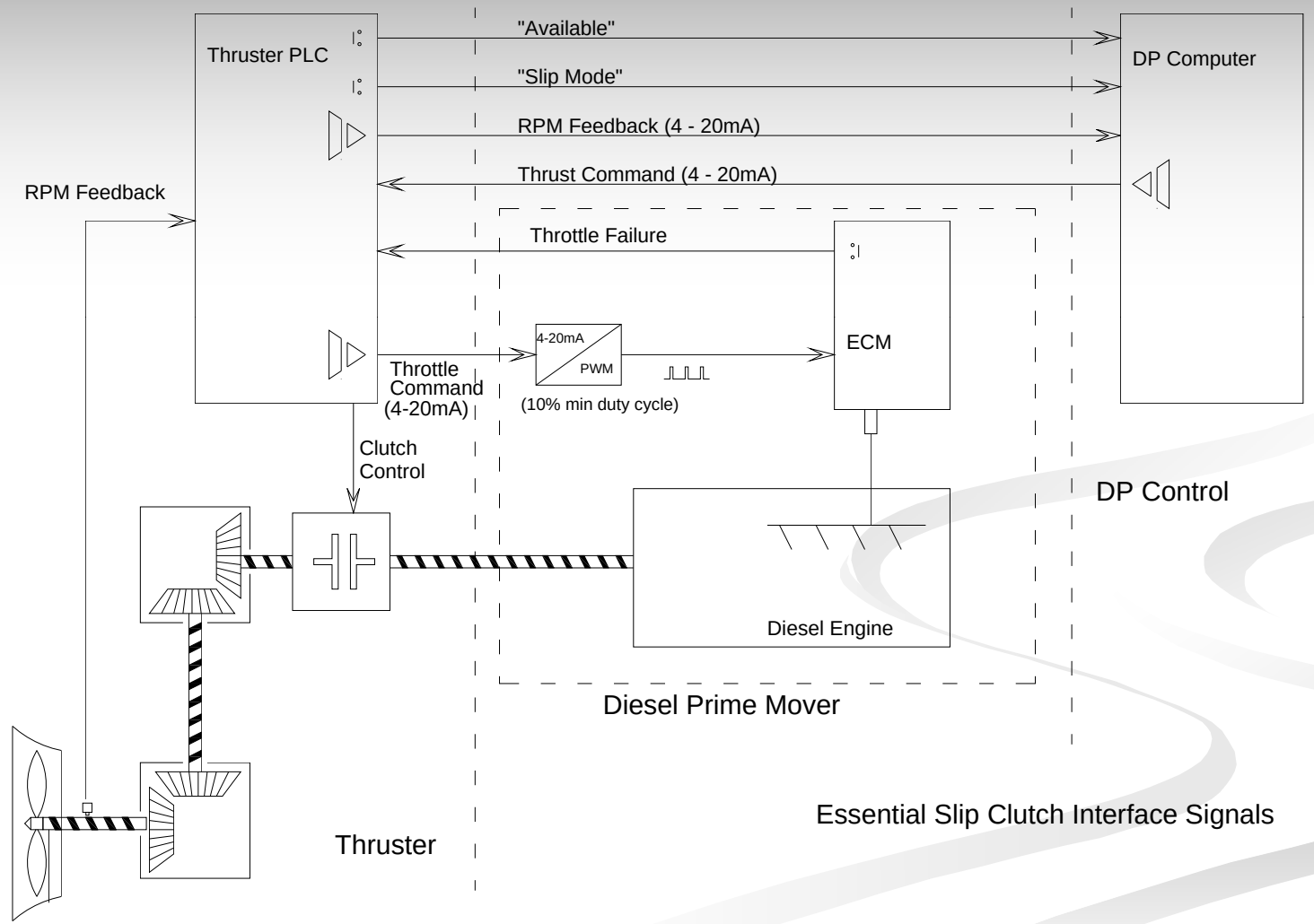
DP Computer operates

two command/power curves

VSD Interface



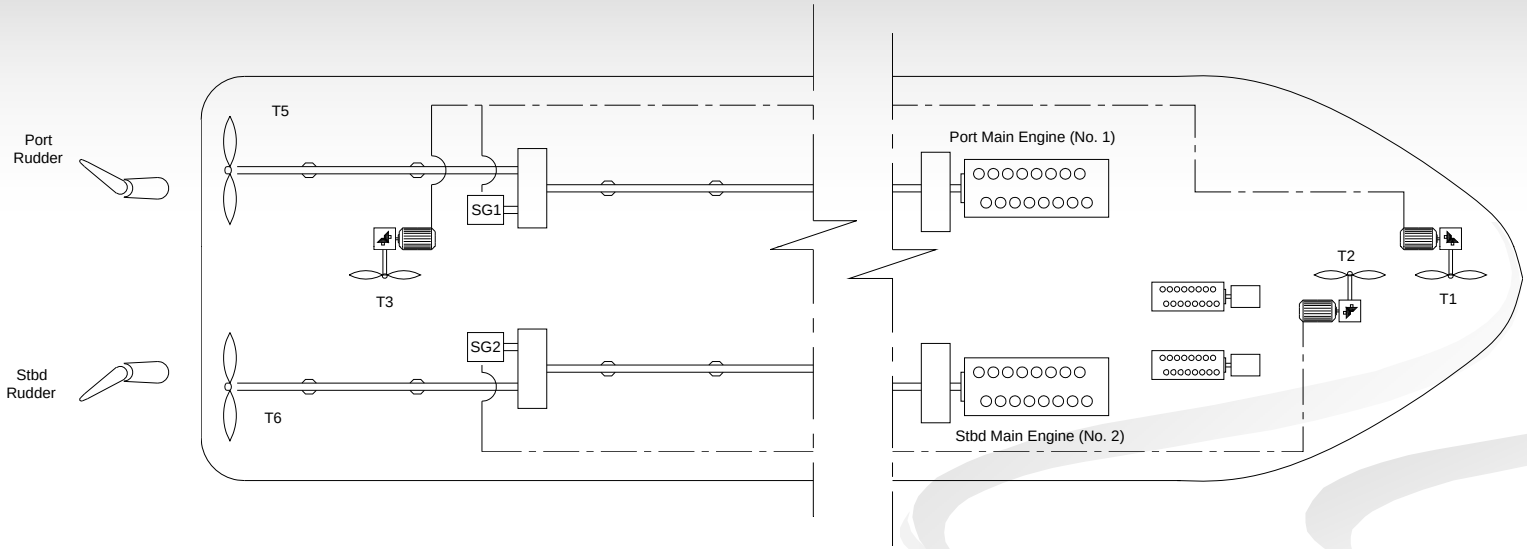
Slip-Clutch


Thruster PLC
"Available"
"Slip Mode"
RPM Feedback (4 - 20mA)
Thrust Command (4 - 20mA)
DP Computer
RPM Feedback
Throttle Failure
ECM
4-20mA
PWM
Throttle
Command
(4-20mA)
(10% min duty cycle)
Clutch
Control
DP Control
Diesel Engine
Diesel Prime Mover
Thruster
Essential Slip Clutch Interface Signals

Trolling

- Slip Clutch
- Shaft Brake Disabled
- Crash Gearbox
  - Used only when main prop fails
  - Clutch Control Redundancy

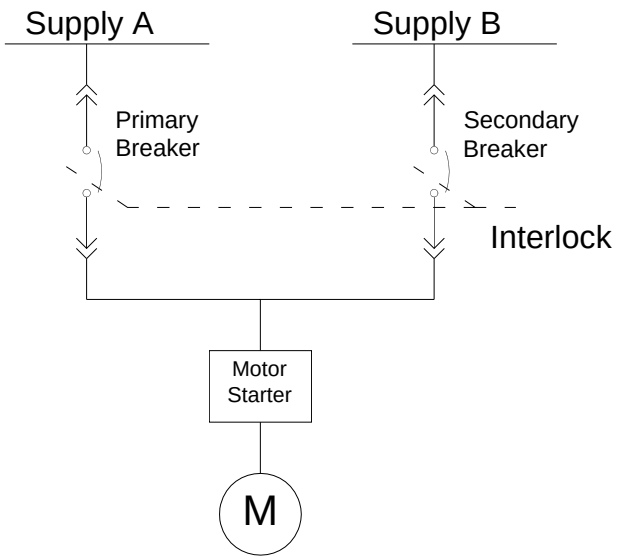
Shaft Generator – Single Thruster

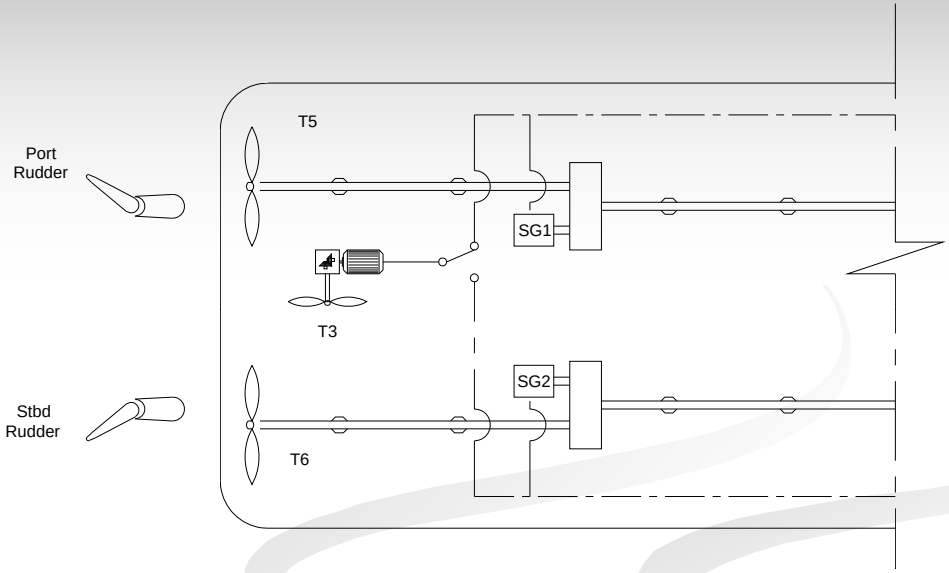


Loss of Port Main Engine

Results in loss of stern lateral Thrust

Switching Thruster





Thruster is switched to alternate supply on power failure

Switching Thruster

Condition Changes:

- Synchronisation of Engines
- Dynamic Load Change on operating units
- Thruster slow-down
- Back EMF
- DP Thrust Ramp

Minimal Power Management risks overloading Shaft Generator on load transfer

Issues

- Increasing need for FMEA at design stage
- Should Specification be driven by FMEA
- Limitations in extension of Class Rules