Defence Materiel Organisation
Ministry of Defence

BURNSi

Objective:

1. To announce BURNSi
2. To present the scope and Methodology
3. Show related measurement results

CSSM Conference

Kiel, 25 September 2019

Hans Hasenpflug

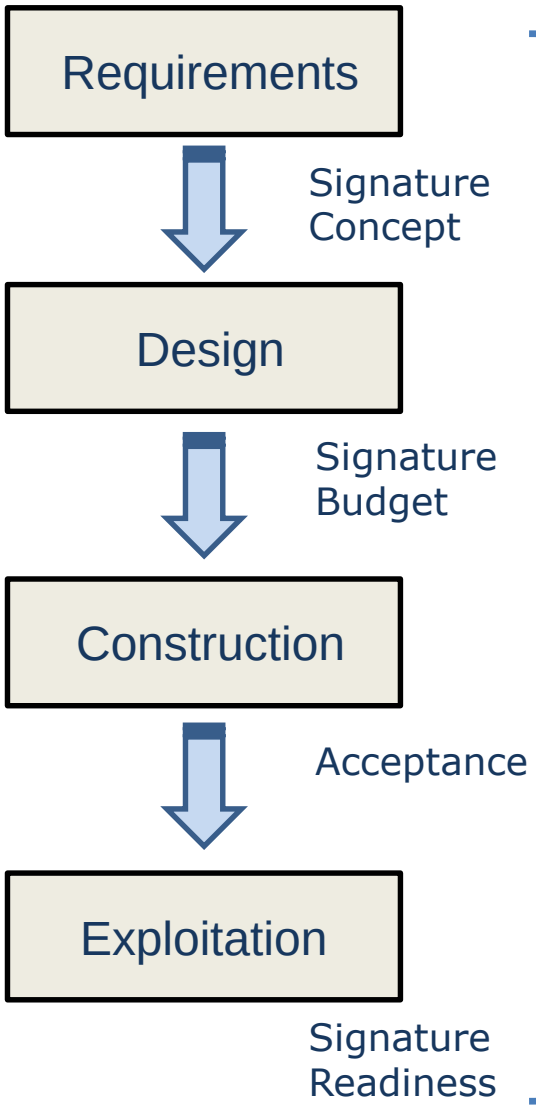
DMO

Content

- Introduction
- Objective
- Underwater Radiated Noise
- Methodology
- Orca
- Workshop

Introduction

Technology:



Tools:

- Standards
- Mathematical models
- Reduction measures
- Measurement facilities
- Database (Historical data)
- Signature Management System

International cooperation:

- CSSM Workshops
- RIMPASSE (SET-panels)
- COSIMAR
- MEASURE (MCDV)
- TESSMEX
- BURNSi

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Introduction

Quest

Planet

Deep water

Herdla & Heggernes

Aschau

Clyde ranges

Brest

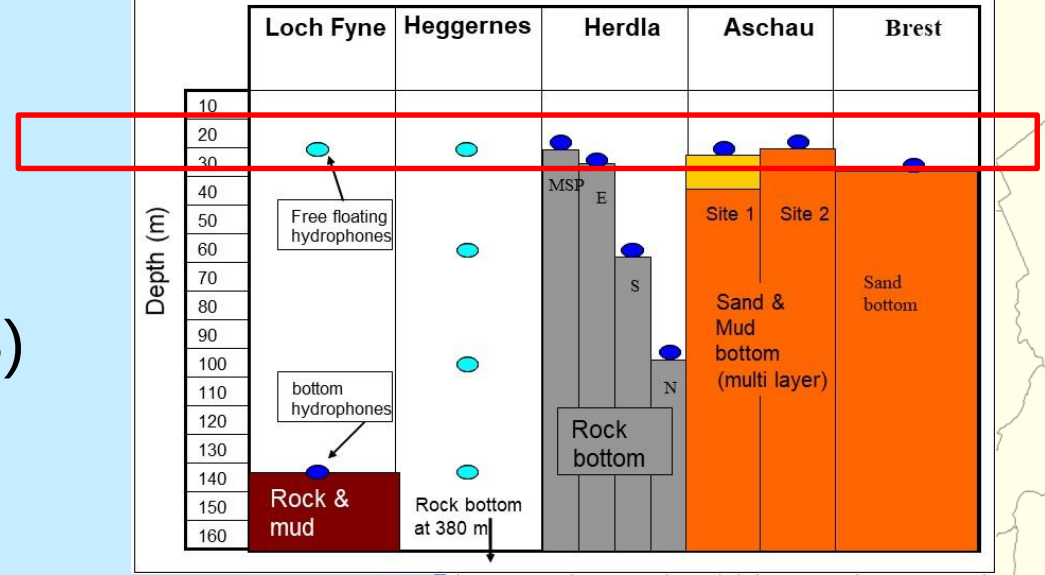
Ferguson

Sint Eustatius

Average spreading

In keel-aspect @ 20m:

- Deep water (2 dB)
- Shallow water (5-7 dB)



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- Introduction
- Objective
- Underwater Radiated Noise
- Methodology
- Orca
- Workshop

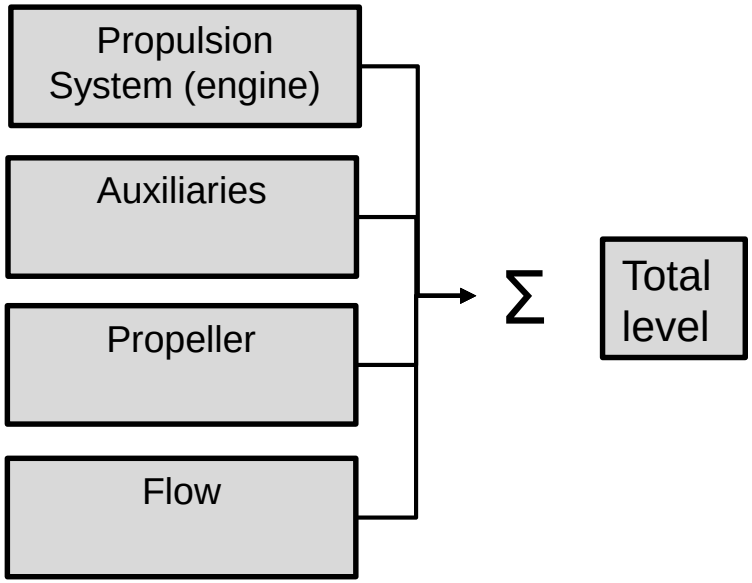
Objective

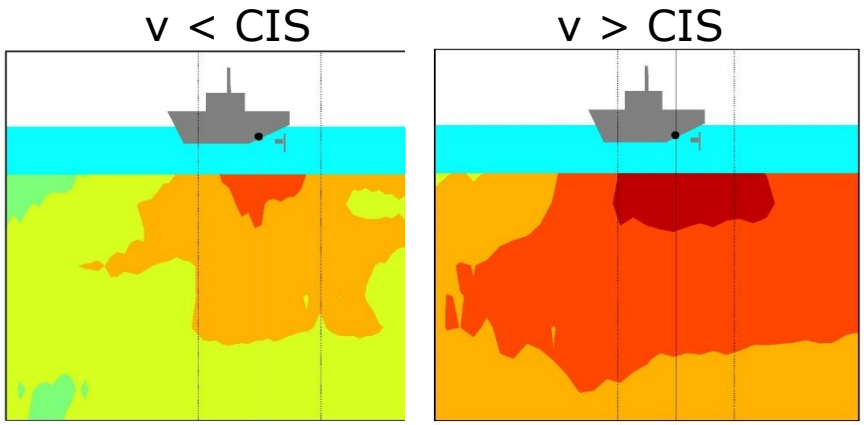
The long-term goal of the BURNSi workshops is the validation and improvement of national prediction models for the analysis and realistic calculation of **underwater radiated noise** levels of naval platforms and the effect of noise control measures.

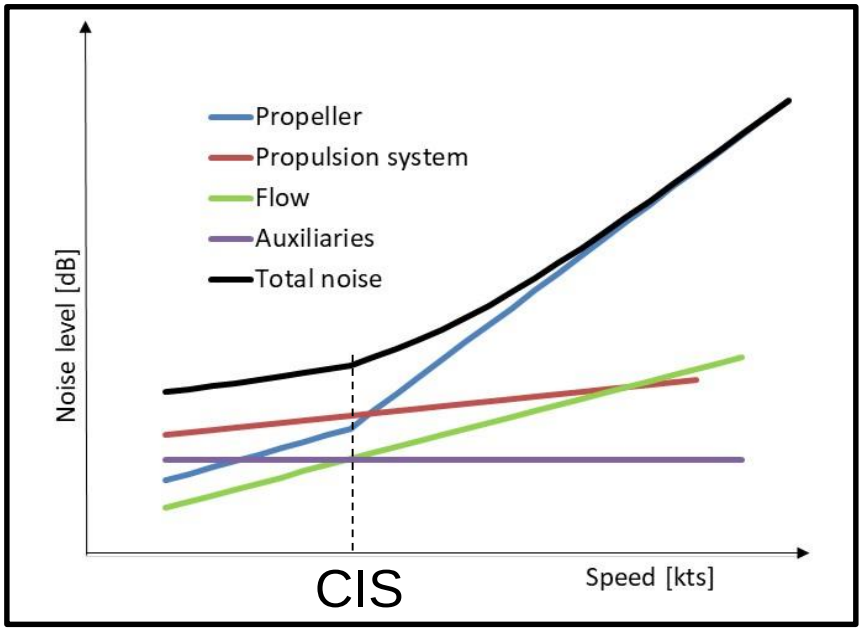
In analogy with the Benchmark Target Strength Simulation (BETSSi) workshops, organized by WTD71(FWG) in cooperation with DRDC and TNO.

Underwater Radiated Noise

Noise sources:







Underwater Radiated Noise

Machinery sources:

Propulsion system

- Motor

- Gearbox

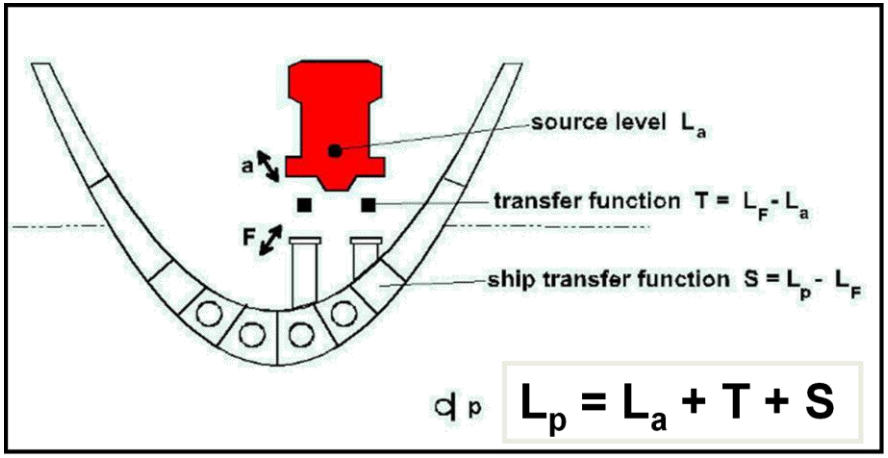
Auxiliaries

- DG-sets

- Pumps

BURNSi

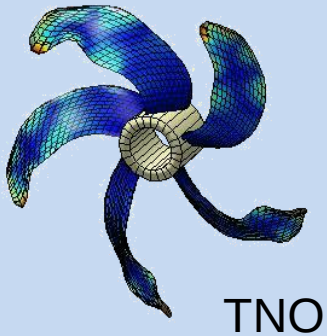
- Structure-borne
- Air-borne
- Fluid-borne



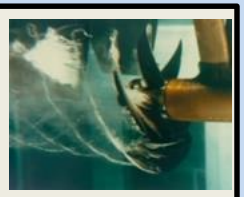
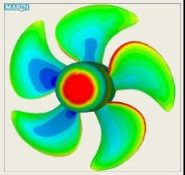
Underwater Radiated Noise

Hydrodynamic sources:

Propeller



TNO

Cavitation noise (v > CIS)		- Tip vortex cavitation - Sheet cavitation - Bubble cavitation
Propeller noise (v < CIS)		- Inflow turbulence - Trailing edge noise - Tip noise - Noise banding

Flow

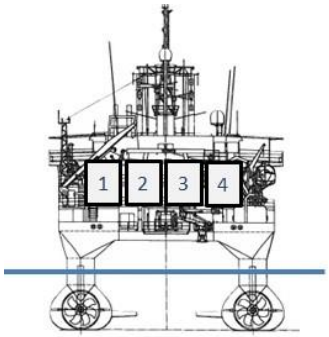
Flow induced noise	- TBL excitation - Structural re-radiation
Flow noise	- Turbulence direct rad. - Bubbles

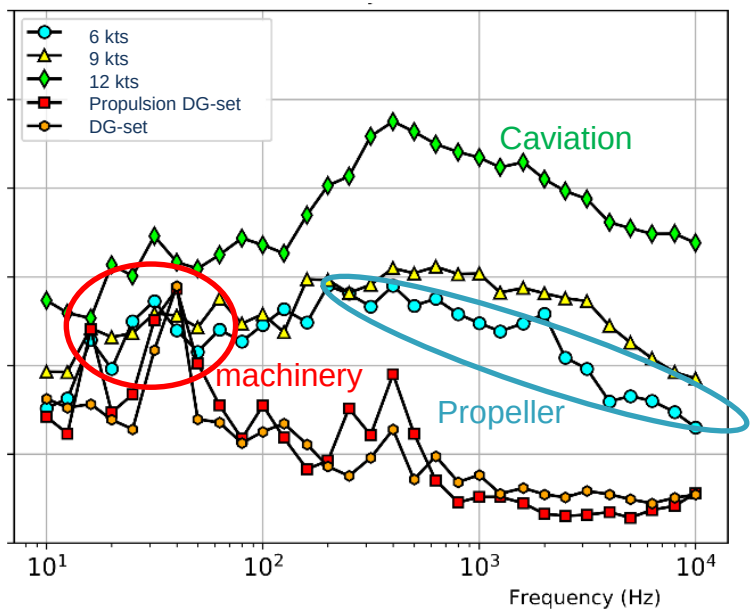
Underwater Radiated Noise

RIMPASSE:

Planet

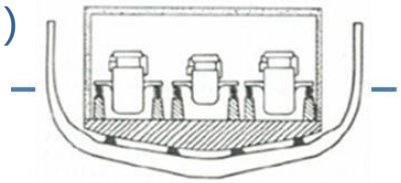
- Swath (3850 ton)
- PM propulsion
- DG set double mounted and enclosed located above waterline

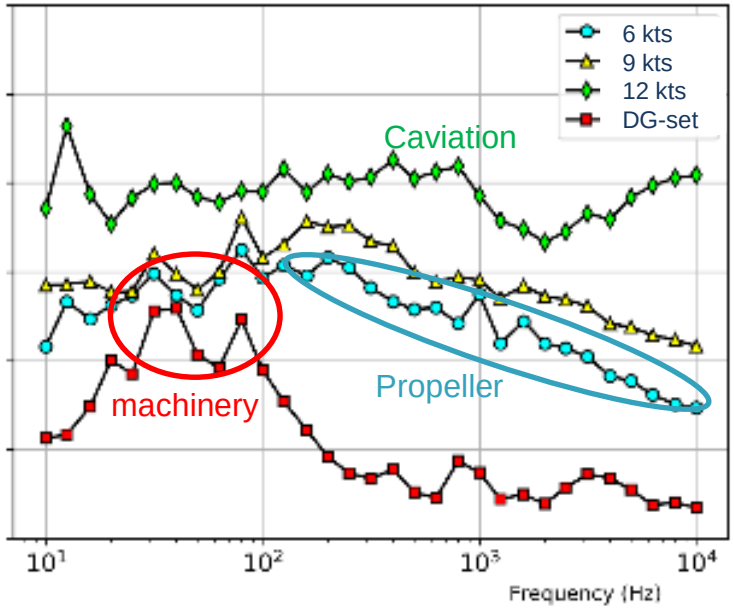




Quest

- Monohull (2200 ton)
- DC propulsion
- Damping tiles
- DG sets on common enclosed raft





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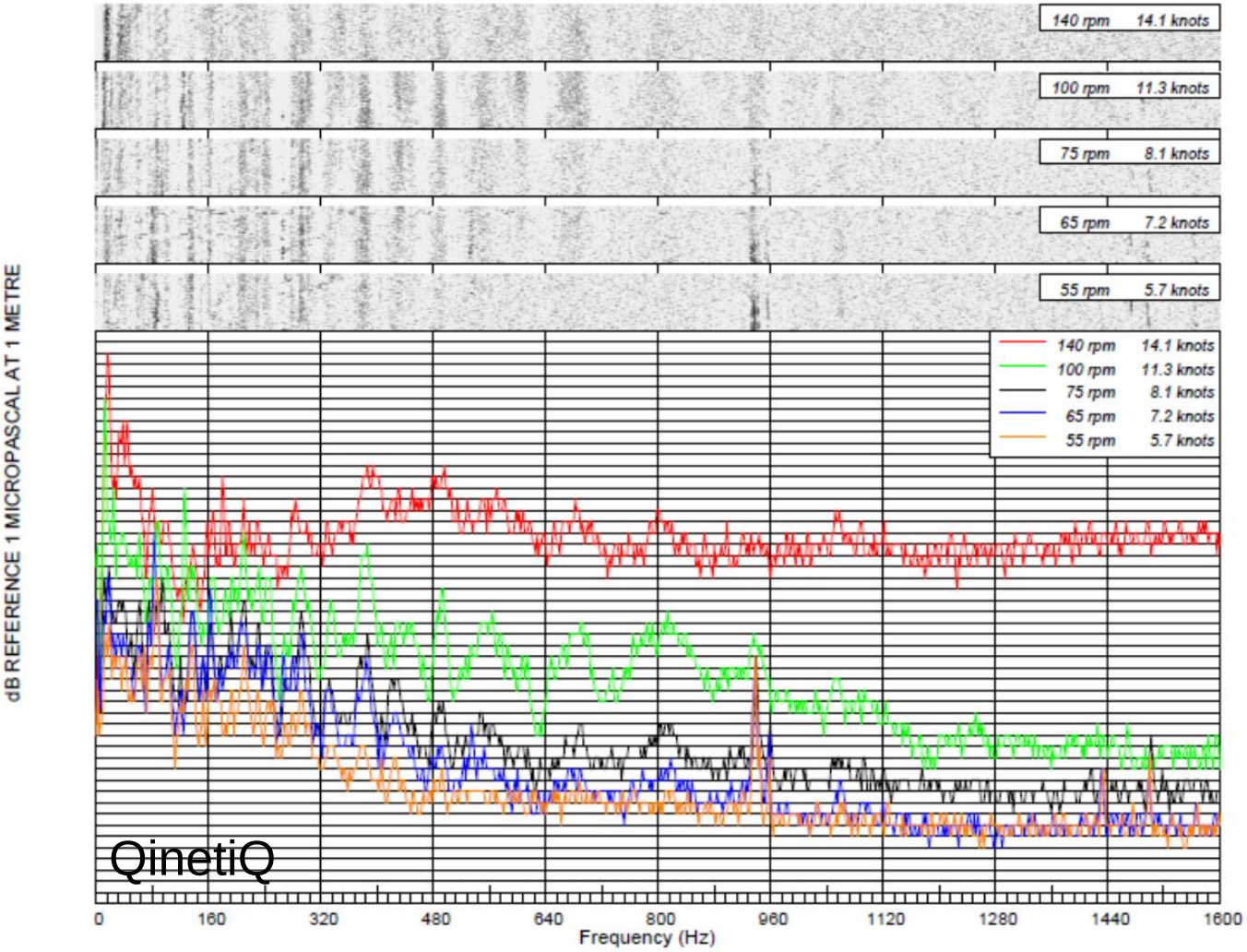
Underwater Radiated Noise

Propeller noise:



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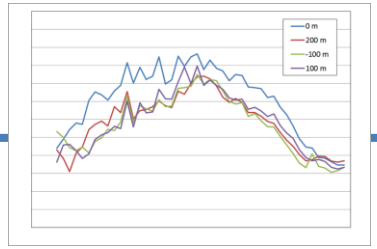
Methodology

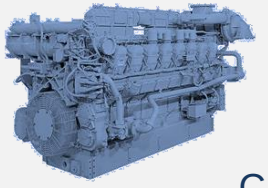
Radiated noise measurement data



Data & Info

Ship information

On-board acoustic measurement data

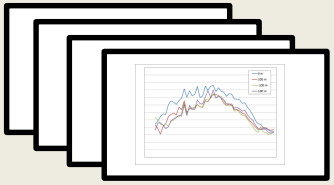


CDF

Simulations

Prediction model

Radiated noise predicted results



CDF

Benchmark & validation

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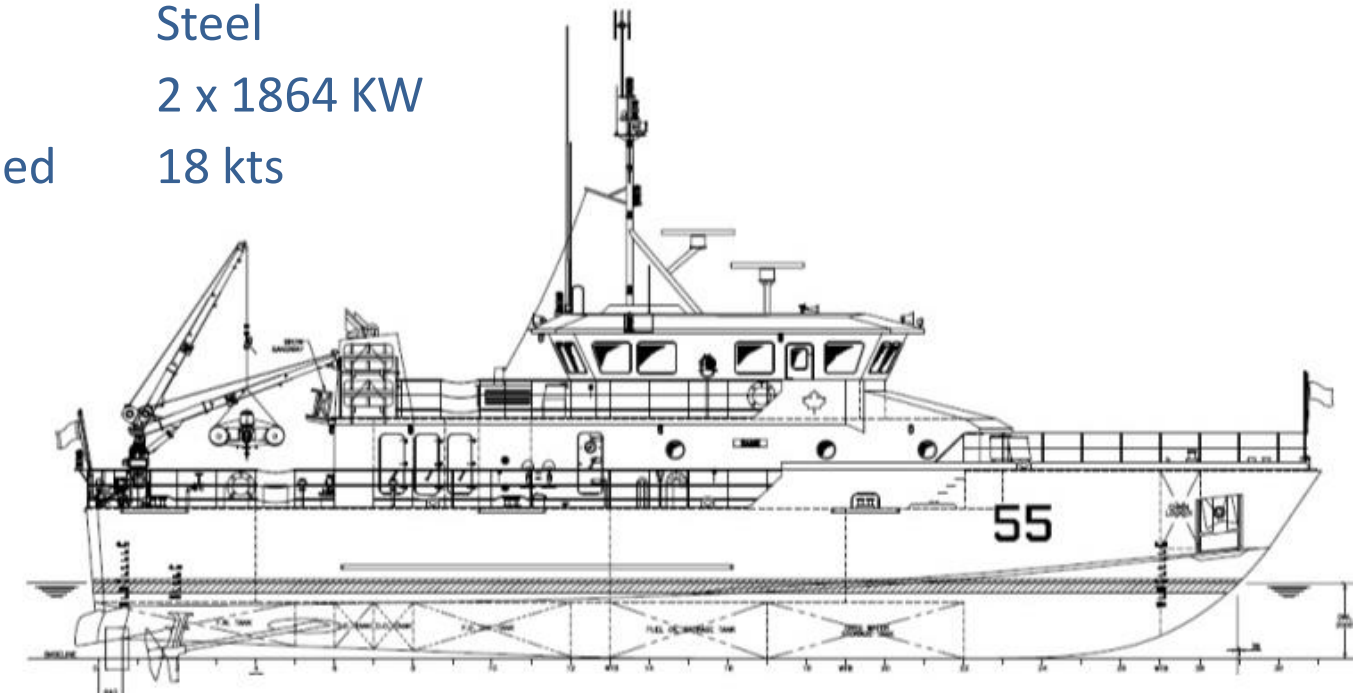
Orca class

Main Characteristics:

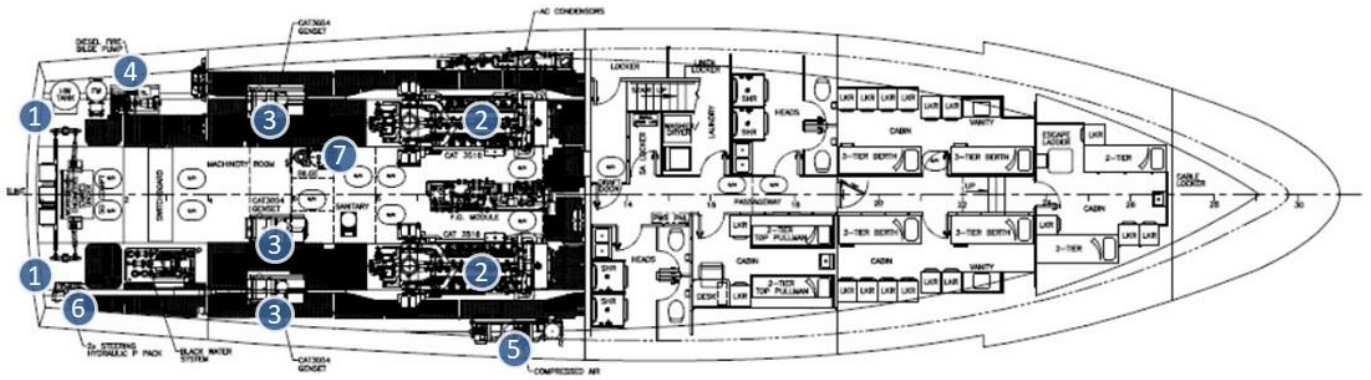
Displacement	210 Tonnes
Length	33 m
Breath	8.3 m
Keel depth	2 m
Hull material	Steel
Propulsion	2 x 1864 KW
Maximum Speed	18 kts



Orca class

Machinery:

1	Propellers (5 bladed fix pitch)	2x
2	Propulsion Diesel engines (CAT3516)	2x
3	Diesel Generator sets (CAT3054T)	3x
4	Diesel Fire Bilge Pump	1x
5	Air Compressor unit	1x
6	Steering Hydraulic Power Pack	2x
7	Bilge pump	1x



Workshop

Tasks:

1. Global assessment of overall radiated underwater noise levels of ORCA taking in account all machinery and hydrodynamic noise sources for different specified operational conditions.
2. Detailed prediction of the radiated underwater noise levels of Diesel Generator sets.
3. Detailed prediction of the radiated underwater noise levels of propulsion diesel engines for different speeds.

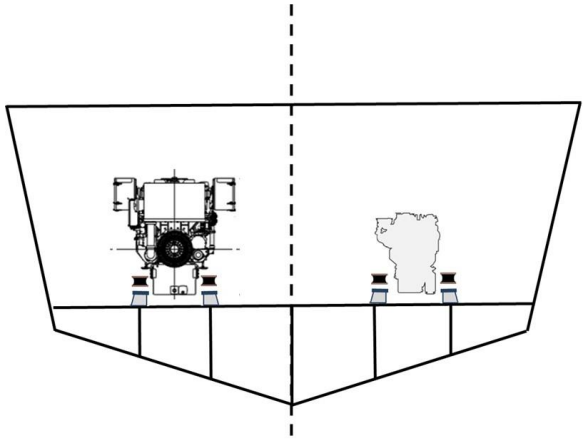
Workshop

Provided information & data:

1. Structure borne noise levels mounting and flanking path
2. Airborne noise levels
3. Dynamic stiffness of flexible elements
4. Drawings
   - Machinery room layout
   - Ship hull and machinery foundations
5. *Mechanical impedance ship foundations*

Diesel engine (CAT3516)

DG-sets (CAT3054T)



Workshop

Results:

1. Each participating organization shall provide results for all specified test cases and all parameter settings as far as their modelling capabilities allow.
2. Results shall be delivered to the workshop organizers prior to the workshop according to a specified format.
3. All gathered results shall be distributed/shared among all participants of the workshop for use within their organization.

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Workshop

Schedule:

Announcement:	December 2019
Possible participants:	Defense Material Organizations, Ship Yards, R&D institutes, …….
Specification:	February 2020
Workshop:	September 2020
Location:	The Netherlands

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Questions?