

Royal Netherlands Navy



Walrus Class

LCDR Jos Bogaert

Walrus class submarines

-) Dutch design (R.D.M. and Nevesbu) and build approx. 1988 - 1992;
-) Four submarines, Hr. Ms. Walrus, Hr. Ms. Zeeleeuw, Hr. Ms. Dolfijn and Hr. Ms. Bruinvis;
-) Diesel-electric, 2800 ton, 67 meters, crew of 52;
-) Modernisation planned period 2010 - 2014, implementation optronic mast (feasibility study completed), improved sonar, conversion blue - brown water operations, implementation results "quick scan" (cost drivers and availability killers)

Walrus class submarines



Request for Information

For Small navies who operated submarines, not always the right expertise is present to address all subjects that are involved in running submarines.

The atmosphere on board of a submarine is a very important key factor for the well being of the crew.

If you haven't got the right expertise at hand you have to depend on industry to provide you with a system that will cover your needs. To start this process you have to approach industry with a request for information.

The following RFI was send out the NL MOD this summer.

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The Defence Materiel Organisation of the NL MOD desires the turn-key design, engineering, delivery, installation and commissioning of four (4) new air monitoring systems on board four (4) RNLN Walrus class submarines, i.e. one system on each of the submarines.

The system shall be able to simultaneously measure the concentrations of the below list of substances and the absolute ambient pressure inside the submarine at seven different locations.

These locations are (from aft to forward) the aft main electrical motor room, the switch room, machinery room (2x), living spaces, central command room and torpedo room.

The DMO considers an air monitoring system that consists of a central control and monitoring system in the central submarine command room and of seven (7) decentralised measuring subsystems that each measures the list of substances simultaneously.

RFI

The system's central control and monitoring system shall be connected to, and be able to be controlled and monitored from the submarine central command and control system.

The decentralised subsystems are connected via a network and are controlled and monitored from the central command room.

However, the subsystems shall also be able to operate independently of the central system, allow for local control and monitoring, and allow for monitoring of the other subsystems and the central system. It should be easy to extract data from the system, and exchange data between the system and other information and measurement systems.

List of substances / measurement range / accuracy / alarm level

Hydrogen (H₂) / 0 - 5 % / max 0.5 % / ≥ 1.5 %

Oxygen (O₂) / 0 - 25 % / max 1.0 % / ≤ 18.5 and ≥ 22 %

Carbon Dioxide (CO₂) / 0 - 8 % / max 0.05 % / ≥ 0.5 %

Carbon Monoxide (CO) / 0 - 150 ppm / max 7 ppm / ≥ 15 ppm

Refrigerant R134a (C₂H₂F₄) / 0 - 1000 ppm / max 30 ppm / > 200 ppm

Refrigerant R404a / 0 - 1000 ppm / max 30 ppm / > 200 ppm

Ottofuel (propylene glycol 1,2-dinitrate) / 0 -2 ppm / max 0.1 ppm / > 0.2 ppm - TORPEDO ROOM ONLY

Relative humidity / 0 - 100 % / maximum 1 % / NA

Environmental conditions

Temperature +2 to +40 deg C (machinery room + 50 deg C)

Pressure 650 to 1400 mbar

Relative humidity 30 to 95 %

Static list 15 deg

Static pitch 35 deg

Dynamic list 30 deg (period 12 s) and 45 deg (period 8 s)

Dynamic pitch 10 deg (period > 10 s)

Response

After sending out the RFI industry will contact you with an offer and dozens of questions you didn't even think off.

Most companies have little or no knowledge of submarines in general and certainly not the submarine you are operating.

A good idea so is to invite industry and let them have a look around your submarine so they have an idea of the outline and available space.

Questions from Industry

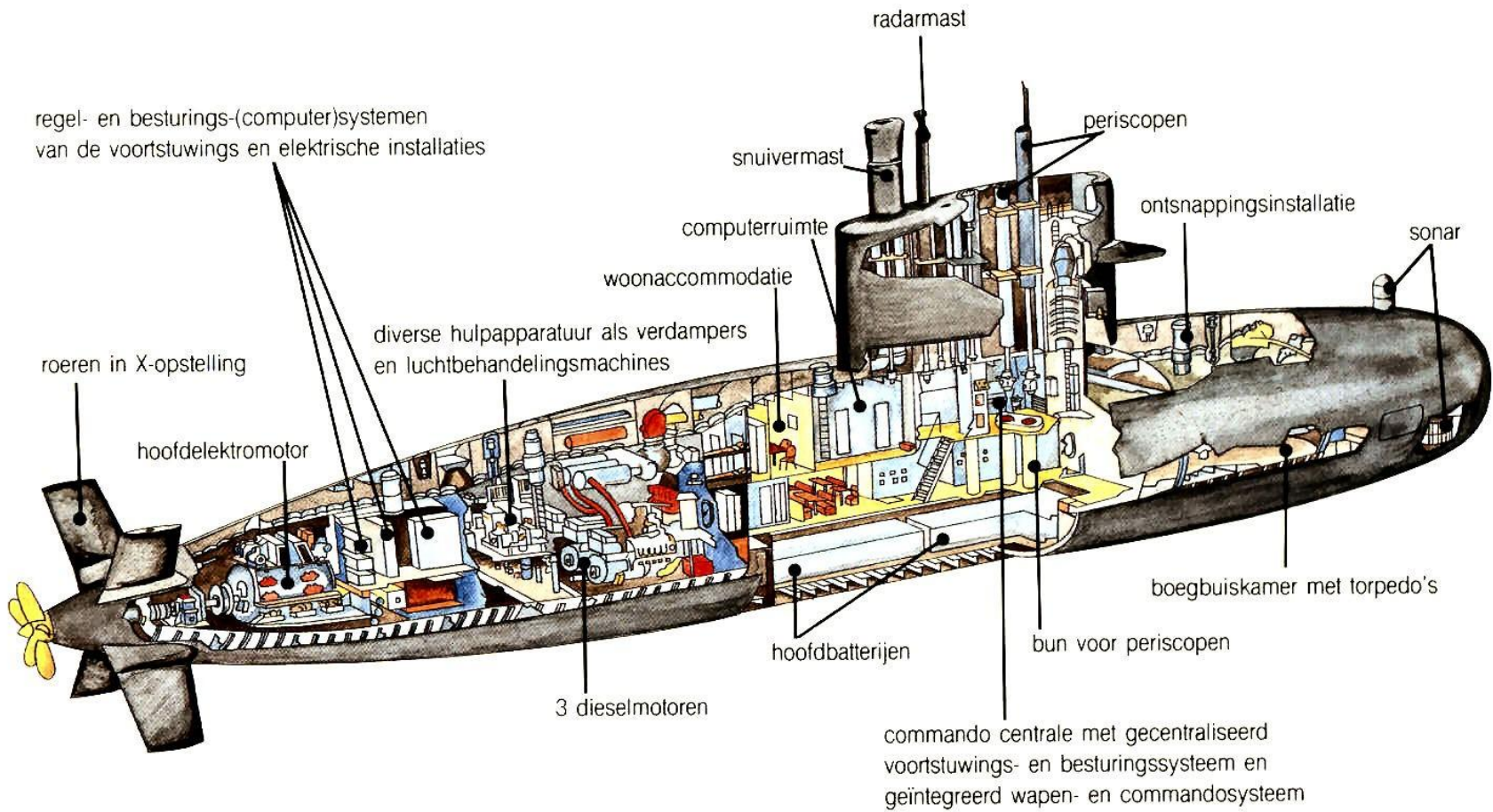
What are the best options for maintaining such a system?

How should you handle the trade off between maintenance intervals & accuracy?

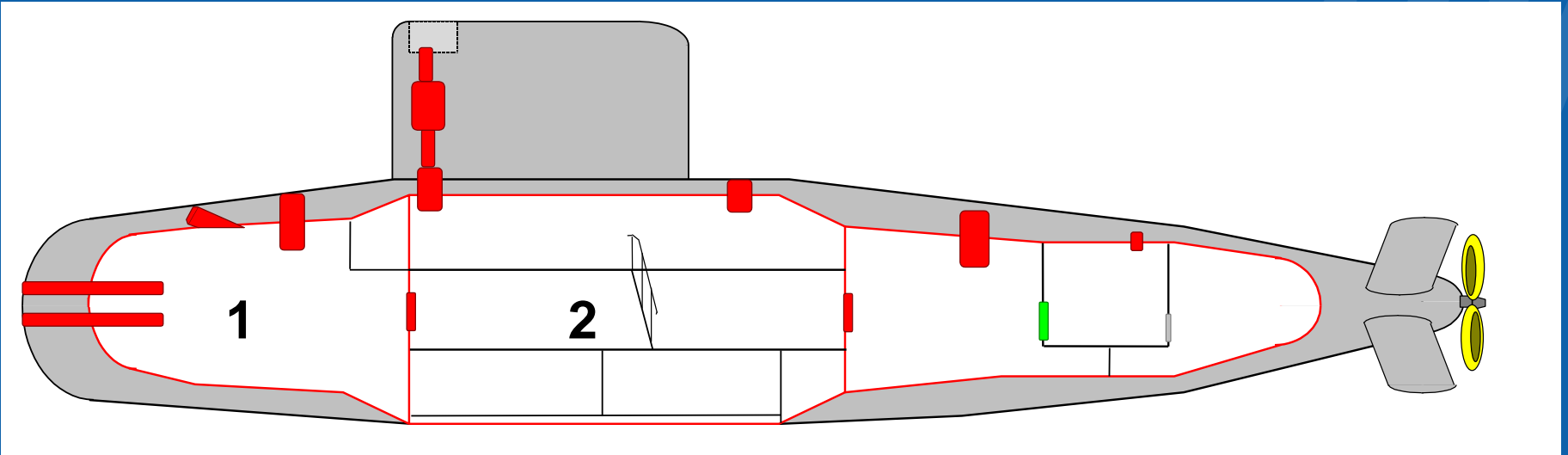
How many sensor locations are required? How effective is the submarines internal air circulation?

Is it desirable to only measure hydrogen, or is a general flammable gas sensor more suitable – ie one that responds to methane and hydrogen?

Is it necessary to measure the different refrigerants individually or is a single refrigerant sensor sufficient? Ie a leakage detector or analysis system?



Compartments



- 1 Forward escape compartment.
- 2 Control room and living compartment.
- 3 Aft escape compartment.

Volumes

	Bruto	Netto
Volume Aft (MMR, SR & ER)	550	435
Volume Controlroom / accommodation	610	495
Volume Battery Hold	?	70
Volume Forward Escape Compartment	245	200

All volumes in m³.

Questions for the workshop

How important is an air monitoring system on board of a diesel submarine?

How much of your budget should you spend on such a system?

What kind of technology is available for sensors?

What is the relation between price and accuracy?

How accurate do you have to measure gasses in a diesel submarine if you snort once a day during 45 minutes?

What is the best location to measure different gasses, High or low or does it differ for the gasses?

How much space is available for your desired system?

Questions and comments

