

**To** : Vaste Kamercommissie Defensie  
**From** : Dr.ir. Bas Buchner, President Maritime Research Institute Netherlands (MARIN)  
**Date** : March 2016  
**Subject** : The Vision on the future of the Netherlands Submarine Service,  
International cooperation and development on submarines worldwide

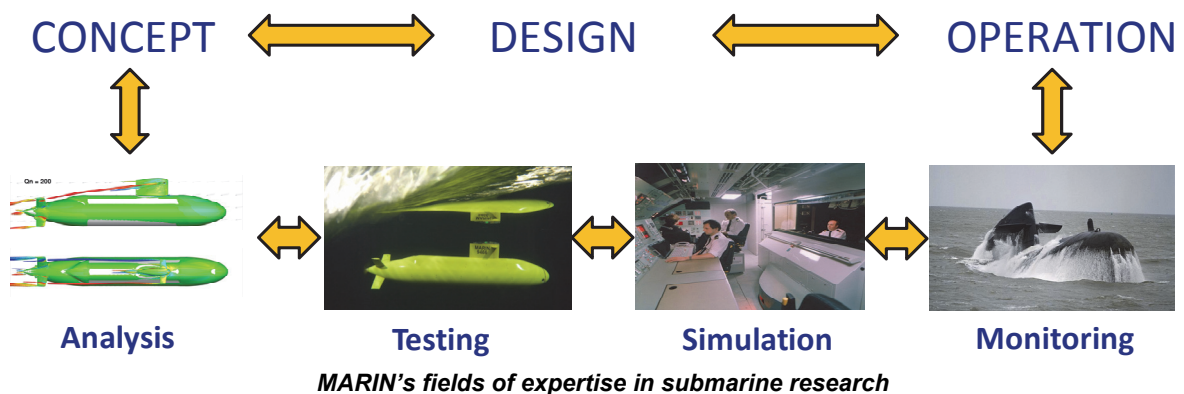
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***'For some the coast is the end of the land, for others it is the beginning of the world.'***

This inspiring quote from former prime-minister and submarine commander Piet de Jong<sup>1</sup> relates to the strategic expeditionary role of the Netherlands Submarine Service, the international position of the Dutch Maritime cluster and the role of (inter)national cooperation. Its message: The Netherlands is still a maritime nation and should not live 'with its back towards the sea'<sup>2</sup>. The Maritime cluster in the Topsector Water used the quote to launch its Maritime Innovation Contract 'The Netherlands: the Maritime World Top'. And also the Dutch government shows this ambition in its Maritime Strategy 2015-2025: 'An international sustainable leading maritime position for the Netherlands, achieved by an integral cooperation between the national government and the maritime cluster on a basis of a shared maritime strategy'.

MARIN was involved in the development of the Maritime Innovation Contract and Maritime Strategy but is, as largest independent maritime research institute in the world, also leading in international cooperation. This includes the Cooperative Research Ships (CRS, since 1969), the Cooperative Research Navies (CRNav) and the Submarine Hydrodynamics Working Group (SHWG, including Australia, Canada, Germany, France, The Netherlands, the UK and the US). From this perspective, my recommendations on (inter)national cooperation for our future submarines are as follows:

- *To investigate, design, build, equip, operate and maintain effective and affordable submarines for the future, it is important to make use of the strong maritime knowledge base in The Netherlands. Although our country does not have a submarine end manufacturer at the moment, it has extensive experience and expertise in most of these phases. This applies for all strings in the triple helix: navy, industry (including specialised SME's) and research.*
- *International cooperation is important to strengthen this knowledge base and to fill the gaps that are identified. This cooperation should, however, not lead away from the goal of effective and affordable submarines, for instance by trying to fit too many requirements of different partners into one design.*
- *Through transparent public-private cooperation in the concept stage and early involvement of an international partner, the functional and technical requirements can be translated in a focussed concept design. This prevents surprises and cost overruns at a later stage and assures manageable life time costs. Active involvement of the Dutch maritime sector in all phases of the project also stimulates maritime innovation and assures high level maritime employment in The Netherlands.*



In the remainder of this document, I will highlight the backgrounds of these recommendations.

### **Submarine knowledge base in The Netherlands**

Without doubt, submarines are complex vessels. They have sophisticated systems, are driven by safety and are sensitive to details. This requires a very high level of knowledge in all phases of their life time. If we consider the submarine knowledge base in the Netherlands, it is important to realise that all partners in the triple helix have a contribution:

- The Royal Netherlands Navy and the Defence Materiel Organisation have important operational and maintenance knowledge with the Walrus class. This resulted in an effective platform with a high utilisation (70% availability, top of class). This knowledge is vital for the definition of the future submarines.
- The Maritime industry has been heavily involved in the recent upgrade of the Walrus class and is often involved in foreign submarines because of its unique equipment and services. This includes steering and control systems, hydraulic systems, Combat Management Systems and system integration of complex naval vessels. Naval surface ships, complex offshore vessels and advanced maritime equipment from The Netherlands are considered world class because of their integrated design.
- The two applied research organisation in this field, MARIN and TNO, have internationally recognized knowledge in their fields. TNO is specialised in signature management and sonar processing, human factors and manning concepts, structural and shock analysis and system automation and integration. MARIN focuses on hydrodynamic and nautical research: the interaction between the sea, the ship and its crew. This involves for instance hull design, resistance & propulsion, hydrodynamic noise, manoeuvrability, survivability and seakeeping in waves. This knowledge is used from early concept development to operational feedback. MARIN's free sailing scale model of a submarine to investigate complex underwater manoeuvres, funded by DMO, puts The Netherlands in the forefront of this field (with the US, the UK, France and Canada).

### **International cooperation**

It is important to realise that international cooperation can take different forms. It can be focussed on knowledge development, design, building, operations, training and maintenance. Its aim should be an effective and affordable Dutch submarine. If cooperation is enforced in the wrong way, it can result in an ineffective submarine for unmanageable cost, for instance by trying to fit too many requirements of different partners into one design.

The Dutch maritime cluster has given a realistic overview of its capabilities and its knowledge gaps<sup>3</sup>. Gaps in capabilities are related to energy generation and storage, the development of Air Independent Propulsion (AIP: Stirling, fuel cells, batteries), pressure hull fabrication, submarine detailed design and submarine design integration issues. It is important to work together with trusted international partners to fill these gaps.

In the field of knowledge development, The Netherlands is a leading partner in international cooperation. MARIN is leading the Cooperative Research Ships (CRS) of 25 partners since 1969. This includes navies (NL, UK, Canada, Germany, US, France), Shipyards (Damen, DCNS, Meyer Werft, Navantia, STX France, Fincantieri), classification societies (DNV GL, BV, Lloyds, ABS) and equipment manufacturers (ABB, Wärtsilä, Caterpillar) and research organisations (TNO, QinetiQ, MARIN). The related Cooperative Research Navies (CRNav) is focussed on naval ships and includes Australia, Canada, France, UK, US Coastguard, NL. As organiser of the Submarine Hydrodynamics Working Group (SHWG, including Australia, Canada, Germany, France, The Netherlands, the UK and the US), MARIN is involved in the concept development of expeditionary submarines.

<sup>1</sup> In 'Langs de kust, De Nederlanders en de zee', VN journalist Thijs Boer

<sup>2</sup> Interview Thijs Broer: 'Met de rug naar de zee', NRC, 15 november 2014

<sup>3</sup> DUKC document 'The capabilities and participation objectives of the industries in the Netherlands'