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To: Vaste Commissie Defensie | Tweede Kamer der Staten Generaal
Subject: Position Paper on the future of the Netherlands Submarine Service

The ocean going expeditionary submarine in four future scenarios

The Netherlands Ministry of Defence (MOD) has expressed the ambition to replace the current Walrus class submarine capability from 2025 onwards. TNO is – based upon legislation - a strategic partner for the MOD, not only as the Ministry's main research institution, but also as a sparring partner for the continuous assessment of emerging Technologies and *Future Force Capabilities* (for example as a follow-on of the Future Force Conference 2015). TNO assists the MOD in assessing these capabilities with advanced applied research & development methods, ranging from modeling and simulation to serious gaming using four scenarios: the three traditional constitutional tasks of the armed forces, and one new scenario: securing assured access to the global commons including sea lines of communication.

Based on the view of the government and parliament on the ambition and tasks of the Dutch armed forces, and with our knowledge of the current and future state of technology TNO can make recommendations on the means the armed forces need. Using the future scenarios we used in the capability assessment for the MOD, the ocean going expeditionary submarine is an important basic capability of the Netherlands armed forces.

The importance of sustained strategic knowledge base for the submarine capability

Military capabilities are more about knowledge than about hardware. Traditionally, Dutch naval capabilities, including the Walrus class submarines in the 1980's, are built, maintained and overhauled in The Netherlands by the Dutch shipbuilding industry, supported by the R&D and innovation of the three main knowledge institutes TNO, MARIN and NLR. This *triple helix* – or “ecosystem” in the new jargon - builds and maintains a strategic knowledge base that enables the MOD to have the latest innovation and knowledge inserted in each new ship design at the lowest possible cost. This knowledge base also allows the MOD to integrate advanced allied weapon systems technology into a Dutch design against relatively low investment and life cycle costs compared to foreign designs. It has allowed significant reductions in crew size, while maintaining or even increasing operational effectiveness. It is also the solid basis for predictable and manageable life cycle costs – the Walrus class submarine is the most affordable diesel electric submarine worldwide in terms of cost per sea day. The Netherlands Dutch Underwater Knowledge Center (DUKC, part of the NIDV) is the custodian of this knowledge base that was used and reinforced during the present successful upgrade of the Walrus class. It comprises the Walrus safety concept, weapon and sensor system integration, submarine structural design, hydrodynamics, acoustic signature management, energy management and

the specific national manning concept. The Minister has stated in her letter to Parliament that the government the Netherlands intends to build, maintain and operate submarines in close international cooperation. TNO is convinced that the present strategic knowledge base in the Netherlands on the Walrus class submarine can and must be a defining element of the procurement strategy. The actual detailed design of a submarine is a complex matter that as 'a hands on'- experience is no longer available in The Netherlands in all its facets. However, the successful Walrus upgrade program and the internationally esteemed skills of the Dutch shipbuilding industry with regard to special designed ships, reinforced by (timely identified) co-operative partners, provide the knowledge base that is necessary to build, maintain and upgrade submarines and therefore provide jobs, technology and turnover for decades to come. Regardless of the selection of an industrial partner, the design process must incorporate this Dutch submarine knowledge base from the earliest phase onwards, to reduce risks and costs. It will strengthen the competitive edge of companies and enterprises in the Dutch maritime and high-tech industry that are involved in the submarine replacement.

The expeditionary submarine knowledge base in the DUKC is vital to the success of an expeditionary submarine capability and must be inserted in any design for the submarine replacement program. The strategic submarine knowledge base is a key enabler for the national interest of the Netherlands, but also for a strong and long term competitive position of the Dutch naval industry.

Present and future contribution of TNO

TNO is a strategic partner for naval programs because of its continuous naval R&D knowledge base, programs and projects, its inherently objective scientific assessment and its unique understanding of the Royal Netherlands Navy throughout the full life cycle of its capabilities, including submarines. TNO stands ready to assist DMO in the cost-benefit analysis of the most likely industrial partners and to make sure the connection is made between our national knowledge base and the build and design experience of the selected (inter)national partner. In the longer term, TNO has the ambition to assist industry in technology concept development, possible integration of innovative algorithms and other activities, together with (inter)national partners in the submarine construction consortium. This will not only add to the safety, affordability and quality of critical mission elements of the future submarine, but also ensure that the strategic knowledge can increase in the Netherlands.

TNO is ready to assist MOD in the objective cost-benefit analysis of the international submarine industrial partnerships from a strategic knowledge perspective. In the longer run and in close coordination with MOD, TNO can also engage in innovative concept development for the future submarines together with industry, to ensure the long term strategic knowledge base is preserved.