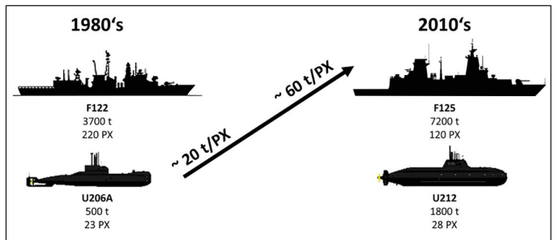
One Services: Maintaining and Upgrading Superiority Throughout The Lifecycle

Double Flip Of Operational Requirements

Operating scenarios and the resulting requirements have flipped at least twice in the last three decades. In the late 80's, most navies were focused on national defence. Accordingly, a significant part of their training took place in the waters where conflicts were expected to take place. With the end of the Cold War came the **first mission flip**. Navies were cut in size, support structures were cut down even more so. Low-intensity, long-term missions became the rule. And these were often far away from home. Warship design reflected this by building vessels for these missions. The **second mission flip** came in the last few years, with a refocusing on national defence. Suddenly, ships for sustained low-intensity warfare needed to revert to long-forgotten high-intensity scenarios.

Naval units are significantly larger than they were just a few decades before. Crewing has been reduced, thus **complexity-per-person has increased significantly**. A simple calculation done for the German Navy shows a factor of three, and this trend can be seen in other navies as well. Complexity costs time. In training, in maintenance. And it costs depth of knowledge.



More complexity by a factor of three – who is to train / maintain / operate this?

The simple questions are:

– If designing and building a superior unit is still possible today, how can we ensure that this capability stays superior over a long lifecycle?
– And with the increased complexity-per-crewperson, how can navy people master this?
– Who can still train, maintain and operate this as effectively as they are supposed to?

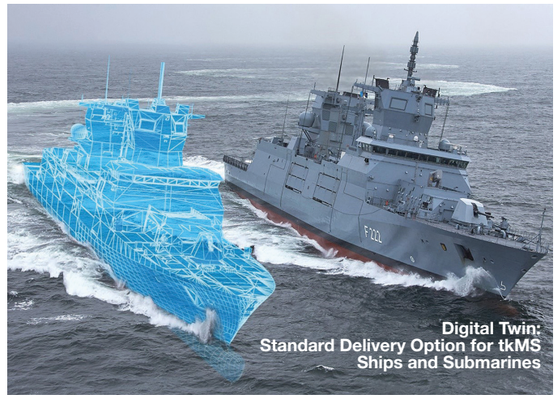
These questions are logical. And logistical.

There Is No Silver Bullet - But There Are Building Blocks

Unfortunately, there is no "Silver Bullet" solution for these problems, especially if units conceived and built in one era are faced with the challenges and missions of another. But there are building blocks. The very challenges of digitalization also provide these building blocks that can help improving the situation.

Knowing the starting point is paramount. In the lifecycle of a military unit, this typically is linked to the **Integrated Logistics Support (ILS)** package and its implementation in the **In-Service Support (ISS)** strategy during the lifecycle. So what, we've had this for decades? Everyone knows the old joke about a system achieving mission readiness only when the weight of the paperwork starts reaching the weight of the system itself.

The point here is that paper is a rather static medium. And the military have seen this and initiated modernization steps more than a decade ago: All modern navies are using systems similar to or based on enterprise resource programs (ERP) to manage their systems. Ideally,


Digital Twin: Standard Delivery Option for tkMS Ships and Submarines

the current configuration of the system, the documentation, training manuals, the whole shooting match of logistics, are linked to these ERP systems – simply to avoid losing situational awareness. Otherwise, the wrong parts are delivered, outdated maintenance procedures are applied. This leads to downtimes and ultimately to a drop in combat value.

Therefore, a **digital twin** is an ideal tool to operate a system successfully over a long lifecycle. Ideally, such a digital twin is not generated after a system has been delivered – this is a costly and possibly error-prone process – instead, this digital twin is generated *in-stride with the design and manufacturing process*. For this, the respective suppliers have to be completely digitized in their processes. The important criterion here is that naval platforms operate with subsets of an ERP database, with non-continuous data connection, i.e. abroad and sometimes under radio silence. The data have to be synchronized smoothly when the unit is "back online". And more importantly, the **upkeep of data** should not be a difficult art in itself: Modern ships simply lack the crew size to afford dedicated specialists trained only for this.

Training was and remains a cornerstone of operational capability. In the past, this was done on the many platforms that were available. Training per se used to be part of fulfilling the military mission, as it was linked to a quasi-continuous presence in the home waters with rather short deployments. Nowadays, platforms are scarce and mission deployments to faraway locations are long. Earmarking one platform as a "white ship" for training purposes is a solution, but it comes at a price: A unit – materially mission-ready – that should be on a mission is now kept in home waters for training. Typically, this will cut the


ViSTIS® - Super-Realistic Training: Using Design Data For High-Fidelity Training

InfoBox: Superior ILS and ISS – Smart Digital Fleet Support by tkMS

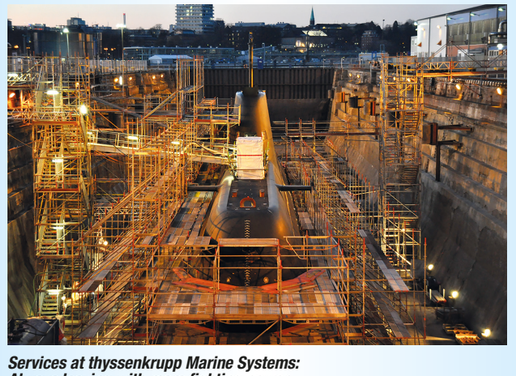
thyssenkrupp Marine Systems (tkMS) and ATLAS ELEKTRONIK as tkMS' naval electronics systems supplier are committed to customer support.

tkMS Ships' Logistics Information System **SLIS™** is the framework for keeping the logistical data up-to-date. Among other things, SLIS™ manages documentation, configuration, PME data as well as spare parts stocks and orders. SLIS™ can be operated both offline and online, providing standardized interfaces to navies' ERP systems such as SAP.

The Virtual Ships' Training and Information System **ViSTIS®** is tkMS' standard training tool. Using the final construction data, it provides a full-immersion training environment. ViSTIS® uses gaming technologies to create the highest degree of realism. There are various use cases, starting from familiarization training – "where is what aboard" – up to complex firefighting team trainings or helicopter deck landing operations. ViSTIS® thus helps cut down the requirements for white ship presence, increasing the efficiency of both off-board and onboard individual and team training.

ATLAS' Remote Maintenance System **RMS** has been refitted to the first batch of K130 corvettes and is an integral part of the second batch. In line with the German Navy's most stringent IT security requirements, the German Navy Marinearsenal has been operating this system successfully since 2016. RMS has successfully been quick-fitted to other ship classes and is awaiting fleet-wide introduction.

One U209 customer, this customer being a navy, decided to add both additional service years and more combat power to their existing 30-year-old U209 submarines. Their "Medium Refit cum Life Certification" **MRLC** project is a multiyear undertaking, including the recertification of the pressure hull for safe full diving depth and the exchange of several thousand items ranging from simple O-rings to complete diesel generator sets. And with the addition of a dived-to-surface missile capability, these submarines have gained a lot of "punch".


Services at thyssenkrupp Marine Systems: Always leaving with more fighting power

All these modules are part of **Smart Digital Fleet Support, putting availability and ease of use first**. The **tkMS and ATLAS support** to our customers will always follow this philosophy: This is what we call **One Services**.

net operational readiness by a third or more. Yes, training on "the real thing" is *the most* important and best training, but this should be limited to the very occasions when it is needed: Typically, the final preparation for and the actual certification in institutions such as FOST, etc.

Building a "stone ship" training centre is another alternative, but again a costly one if all onboard systems are copied / stimulated 1:1. Careful training design calls for analysis and deconstruction – i.e. only train a team if you have to, don't keep the whole crew busy with a certain training segment. This can help creating a more effective and efficient training system. This is especially true if the data of the digital twin are re-used to design the training environment. And more importantly: Keep the training up-to-date with the configuration of the fighting units.

With an increased number of systems and increased complexity, there is a high probability that even the best-trained onboard specialists will encounter problems that they cannot solve. Letting specialists travel – whether within the navy from the Navy Arsenal or from industry – is a costly business, just to get the proper expertise to the site of the problem. Even worse, this disrupts operational patterns, requiring the ship or sub to return to a port until the repair has been effected. **Remote maintenance** seems like a no-brainer, but then there is always the issue of military security. The maintenance channel must not be an in-road to attack. It must be hardened against hacking, but also hardened against manipulation from within the system. And operating the tool again must not be an art in itself, but a foolproof and simple procedure. Solving the problem is the key issue, not the operation of a tool.


Remote Maintenance System: Proven and Deployed in the German Navy Marinearsenal since 2016

The biggest building bock in the arsenal of support measures is obviously a **major refit or midlife conversion**. Based on an up-to-date logistical picture, such multiyear project can easily add a decade or two of additional service life to a system, including increased up-to-date combat capabilities.

Fit Up Front or Re-Fit Later?

With all these modules as stepping stones towards improved support, the simple question is: "How do we achieve this"? If it can be achieved by **designing it into the system** up-front, so much the better. There is one caveat, though. Don't wait too long, nor should you over-design. Sometimes it is better to leave certain aspects unsolved, but then allow for later modification instead.

Therefore **re-fits to existing systems** often are the more probable and practical pathway.

The fundamental change in the support philosophy is the acknowledgement that complexity in the systems cannot be countered by more complexity in the ILS. A complex system requires more support. Yet this support itself must not be hard to get – nor difficult to handle or an art in itself.

This is a challenge, creating such **"barrier-free" ILS and ISS**, in order to sustain and upgrade superiority. However, **navies deserve nothing less**.

About the Author

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