Naval Systems Seminar Turns Potential into Practice

The 8th Naval Systems Seminar was held in Ankara on October 16 and 17. Organised biennially, this year the event hosted many high-ranking guests, including Vice Admiral Adnan Özbal, Commander of the Turkish Naval Forces, and Prof. Dr. İsmail Demir, Undersecretary for Defence Industries. In contrast with previous years, the Naval Forces Command personnel showed great interest in the seminar on both days of the event. The special issue prepared for the seminar by MSI TDR was also greatly appreciated by the participants.

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A total of 46 presentations were delivered during the event by various in stitutions and organisations in the ecosystem, and 36 stands were set up in the foyer area. During the seminar, hints were made on the future of the industry. The National Submarine, İ class frigates, the Fast Patrol Boat, TF-2000 air defence frigate, the ADVENT combat management system and the YAKAMOS sonar were at the top of the agenda. Engineer (M. Sc.) Captain (R) Zafer Betoner delivered the opening speech of the seminar on behalf of the organisation committee, during which he said: "With its unique and unprecedented structure, this seminar has become a regional brand and is taking confident steps towards becoming a world brand... Consumption without production brings disaster. I'm not only speaking about manufacturing the products that are already being produced; what really matters is to generate and create innovation. I wish this gathering will conduce to the production of many newly developed products."

SSM's Projects are Unrelenting

Following the speech by Betoner, Alper Köse, Head of the Naval Platforms Department at the Undersecretariat for Defence Industries (SSM), took the stage. Köse first provided general information on the SSM's procurement approaches and projects.

The periodical procurement approaches of the SSM and example projects carried out in the defence industry based on these approaches are listed as follows:

- **Off-the-shelf Procurement (until 1990):** AH-1W Cobra attack helicopter, AB-412 helicopter, MLRS


Zafer Betoner


Alper Köse


Rear Admiral (Lower Half) Mehmet Sarı

- **Co-production (1990-2000):** Armoured Combat Vehicle, Light Transport Aircraft, Basic Trainer Aircraft, COUGAR helicopter
- **Partial Design (Main Platforms, 2000-2010):** ALTAY, MİLGEM, ANKA, HÜRKUŞ
- **Indigenous Design (Domestic Production, 2010-2020):** Helicopter Development Programme, Turkish Fighter Development Project, GÖKTÜRK-3 satellite
- **Basic and Advanced Technologies (2020-2030):** Absolute indigenousness, life cycle management, performance-based logistics

A total of 530 projects are underway in the SSM. Of these, 300 are already signed with a total contract price of approximately $40 billion and a further 230 projects are continuing to progress in the pre-signing processes. The distribution of the projects by the procuring authorities is given in Table 1. Köse shared other data regarding the industry as shown in Figures 1, 2 and 3.

Twenty-eight of the projects for which SSM entered into contracts are maritime projects. Their total price is in excess of $12 billion. The projects that are in the proposal evaluation phase are as follows:

- Amphibious Ship Projects Group: Floating Dry Dock Procurement Project
- Support Ship Projects Group: Research Ship Project, Fleet Replenishment Ship Construction Project, Multi-Purpose Open Sea Towboat Procurement Project
- Battleship Projects Group: MİLGEM Project İ Class Frigate (5th, 6th, 7th and 8th Ships), MİLGEM Project İ Class Frigate Main Propulsion System, MİLGEM Project İ Class Frigate Vertical Launch System, PREVEZE Class Submarine Mid-Life Modernisation Project, BARBAROS Class Frigate Mid-Life Modernisation Project
- Patrol Boat Projects Group: Turkish Type Assault Boat Project, Fuel Ship Project

The projects that will be on the agenda in the near future are as follows:

- TF-2000 Air Defence Frigate
- Multi-Purpose Offshore Towboat
- Port and Coast Towboat
- Landing Craft Air Cushion
- National Submarine Conceptual Design
- Search and Rescue Boat Project
- Mine-Sweeping Ships
- New Type LCT
- Class 600 Coast Guard Boat

Köse then shared his opinions regarding the future with the participants. Noting that one or two companies lead the maritime sector as platform producers in developed countries, he said: "Currently, many shipyards are active in Turkey; however, we believe that cooperation is necessary. Turkey should have a brand and we support the companies in this field."

Köse concluded his speech by listing the critical subsystems that Turkey needs to develop:

Table 1. Distribution of projects signed or to be signed by the SSM by procuring authorities

Procuring Authority	Number of Projects
Turkish Armed Forces General Staff	26
Turkish Land Forces	102
Turkish Naval Forces Command	83
Turkish Air Force	103
General Command of Gendarmerie	14
Turkish Coast Guard Command	9
Turkish National Police	33
Undersecretariat for Defence Industries	69
Joint	85
Other Public Agencies	6
Total	530

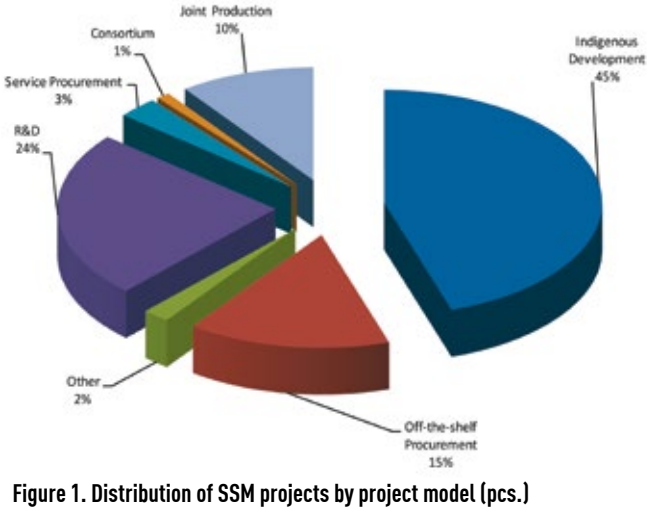
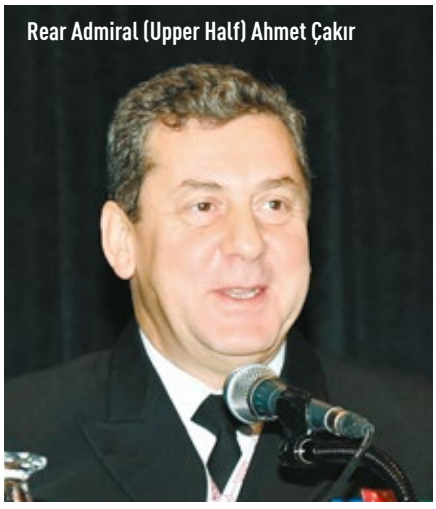


Figure 1. Distribution of SSM projects by project model (pcs.)


Rear Admiral (Upper Half) Ahmet Çakır


Prof. Dr. İsmail Demir


Enver Küçükerman

- Main propulsion and drive system components
- Combat management systems
- Ship electronics
- Integrated platform control and monitoring system
- Unmanned surface and underwater vehicles
- Small submarines
- Composite materials

Restructuring of Military Shipyards

The following speaker in the opening session was Rear Admiral (Lower Half) Mehmet Sarı, Deputy Director General of Shipyards at the Ministry of National Defence (MND). Rear Admiral Sarı gave information on the MND's Directorate General of Shipyards. The Directorate General manages the Istanbul, Gölcük and Izmir Shipyard Commands and has 6,500 personnel in total. Each of these shipyards is capable of performing maintenance and repair operations for numerous platforms and systems. For instance, Istanbul Shipyard can maintain and repair 120-130 different platforms, while Gölcük Shipyard can maintain and repair 80 different platforms. Furthermore, each of them can maintain and repair 1,100-1,200 different subsystems.


Behçet Karataş


Mehmet Görgülü


Cem Gürdeniz

Rear Admiral Sarı also added that they saw many former employees retired from these shipyards in the defence industry companies and that their presence contributed to the projects.

Lessons Learned

Following Rear Admiral Sarı, Rear Admiral (Upper Half) Ahmet Çakır, Naval Technical Commander at the Turkish Naval Forces Command (TNFC), gave a speech. Rear Admiral Çakır summarised the developments in the industry over the last 15 years, highlighting the MİLGEM project, and said that lessons needed to be learnt from deficiencies and mistakes in this process: "While making all this progress, it falls on all of us to see our shortcomings and errors and learn from our mistakes. The criticism and self-criticism we will carry out in this regard should never demoralise us; on the contrary, it should constitute our road map so that we can shape our future correctly. We are sad to witness as one of our major troubles, that despite our limited resources companies operating in the same field are neglecting and destroying each other. When we launched the MİLGEM project, there were two LPI (low probability of intercept) radar producers across the world. With the project, this number rose to five. First, an R&D organisation of ours developed an LPI radar. Then, another company of ours set their mind on developing one, too. We invited them to come together. Let's combine our resources. After working together for a couple of months, they separated their processes on the ground that they were developing antennae of different polarisations. In the end, we selected one of them, and the other company's work went to waste. Meanwhile, a third company emerged. We have seen this in the National Submarine Workshop as well. I guess six or seven companies claimed that they were producing sonars... Therefore, we need to choose our areas of operation very well. When we have a look at the world, we see mergers and acquisitions in almost every sector. We experienced an example of this with regard to the mine-hunting vessel. Lürssen and Abeking companies had submitted proposals individually. Then the State's Minister of Commerce called them and set their shares as 51% and 49%, guiding them to form a consortium... I would like to emphasise once again the importance of guiding and shaping of the industry by the SSM in this regard. As far as we are concerned, the SSM is the patron of this industry. As such, it needs to guide the entire industry and determine how many more companies should be allowed to operate in which areas, and which areas will be open to competition... To be honest, these are being done, but need to be done more effectively."

Rear Admiral Çakır also spoke of the use of the subsystems developed in the projects as components of future projects: "We see and hear that domestic companies submit higher bids than their European counterparts, particularly with regard to electronic systems. This makes the bidding prime contractors submit their bids with systems of European origin, rather than national and domestic systems. As a result, it is our country that loses... [On the other hand] The fact that the products of other companies, including those of foreign origin, are preferred in national projects rather than systems that have successfully completed their certification and test processes, just for the sake of reducing costs, results in losses for our domestic companies... We tagged the products made in Turkey and used on class ADA corvettes with Turkish flags [to be able to show them to the visiting committees]... It should be one of our goals to get rid of trivial cost concerns and increase the percentage of use of domestic products in the ships built by the private sector in a way that ensures the continuity of our national systems. Of course, our domestic producers offering affordable prices will be an important factor in achieving this goal."

Rear Admiral Çakır also touched on the compatibility of platform and subsystem development processes: "It is crucial to draw road maps for the future of the fundamental areas to be determined, such as sensors and weapons. In

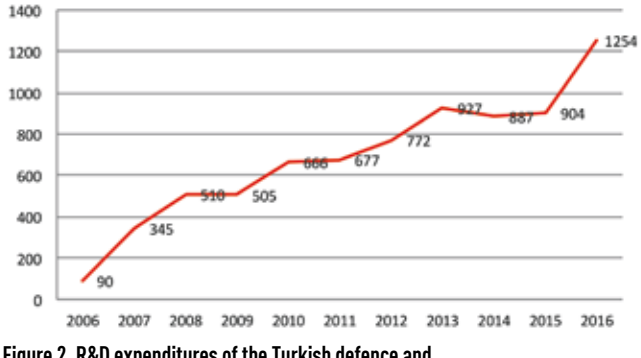


Figure 2. R&D expenditures of the Turkish defence and aerospace industry (million dollars)

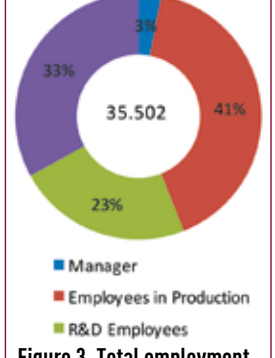


Figure 3. Total employment in the industry


Gökhan Bodur


İlteriş Mirzaoğlu


Engineer (M. Sc.) Captain Nilüfen Çotuk

this scope, we should act in line with a vision for at least 15-20 years with respect to command and control systems and electronic warfare systems. In this basic vision, we need to use our limited resources effectively and manage our development processes accordingly in order to succeed. We should transform some of our platform-based projects in this context and steer and manage them according to the road map, integrating ready products to the existing and newly constructed platforms... for example, the national diesel project. If we connect this project to the İ class, we need to forget the ships until the national diesel project is put into practice. Both of these are a necessity, but when one of them is delayed, the project is delayed, too. That's why they should progress in individual channels. When the national diesel project is put into practice, efforts should be made to integrate it to the ongoing project."

Rear Admiral Çakır also emphasised that the purchase agreements for imported systems and components should be drawn up carefully. As an example, he cited the limited manufacture of the parts of MTU motors, as they had not been included in the scope during the procurement process, even though the Turkish Naval Forces Command makes extensive use of them.

The last topic on Rear Admiral Çakır's agenda was the role to be played by military shipyards in the future. "With regard to the combat elements that have high combat effectiveness and will be constructed for the first time, particularly corvettes, frigates and submarines:

Military attachés serving in Ankara also showed interest in the seminar.

- their design and integration by the Design Project Office under the TNFC through maximum utilization of the sector's capabilities,
- the assumption of responsibility for design and performance by the TNFC,
- the construction of the initial ships in military shipyards and then shifting of production to private shipyards after tests and experiences,

are considered to be the most effective solution for enhancing the experiences gained in the design and construction of the national ship, ensuring sustainability of this capability and making the most of national resources. In the event that this method is not applied, particularly in costly projects such as the air defence frigate, in other words, in the event that the design and integration responsibility is delegated to private shipyards, it is expected that:

- the costs of the risk will be very different;
- in technical terms, private shipyards will put themselves at great risk;
- and they may join consortiums or joint ventures with foreign partners to submit bids in an attempt to minimize such risks, resulting in the proposal of proven foreign designs."

As an example, Rear Admiral Çakır cited that the cost of the TF-2000 air defence frigate would be approximately $3.5-4 billion, and said that such a project would pose a great risk to the private sector.

Rear Admiral Çakır concluded his speech by describing the vision of the TNFC as follows: "After the national submarine, our vision is to manage the feasibility process of the platforms to be procured, to develop the technical specifications, to take part in the design, construction and test/experience process to inspect the project and to develop standards. It is also to engage numerous sub-contractors and ensure transfer of information up to this phase."

Naval Platforms Encompass the Whole Sector

The final speech for the opening session was delivered by Prof. Dr. İsmail Demir, Undersecretary for Defence Industries. He noted that the industry as a whole was involved in the sector: "Considering that the platform itself is 20% of the entire work and taking into account the combat management systems, weapon systems and various integrated systems on the platform, we are actually talking about both a platform and an integrated system, and this exceeds the area of responsibility of merely one shipyard or the TNFC... We are talking about a huge concept. In that case, we are in a position where every element of the defence industry is and should be integrated."

Prof. Dr. Demir shared his assessment of the current status of the sector as follows: "When we go abroad to market MİLGEM and subjects like the designer and constructor of MİLGEM come to the agenda, we can't show a single point of contact. STM is currently leading. As in other countries, there is the need for an organisation that will lead the maritime sector and function as the flagship of Turkey in exports... Today, there are seven or eight shipyards just in Tuzla. The industry is no longer able to feed this many private shipyards in Tuzla and Yalova. Just as we have seen to date several bad examples regarding exports, we do not want a few of our shipyards submitting bids for the same project in the same country and blocking each other. Of course, there is a free market economy, but we, as SSM, know that we need to function as a regulator... Rather than detrimental and destructive competition, we'd prefer an encouraging and synergy-creating approach."

Regarding the costs of systems, Prof. Dr. Demir added: "At SSM, we address the issue of cost analysis very sensitively and will do so in the future. One of the main reasons for this is to ensure that national systems are developed in a way that is cost-effective and sustainable. This is because exportation is one of the requirements for sustainability."

The special issue prepared for the seminar by MSI TDR was greatly appreciated by the participants.

Touching on the role of the TNFC, Prof. Dr. Demir continued as follows: "To date, we have appreciated the role of the TNFC, but we need to add this: In the long-term it is not sound for an organisation to be one that identifies the need, designs the system, puts it into practice, constructs, checks and accepts it. In this regard, even though the role of the TNFC is undeniable, non-negligible and indispensable, we need to find a way to perform this role in an integrated manner. We know that the TNFC has exceptionally well-intentioned approaches regarding this matter. We will keep on working on this issue. We expect the industry to restructure itself and make this process a more enduring one."

Engineer (M. Sc.) Coaptainlonel (R) Zafer Betoner and Vice Admiral Adnan Özbal, Commander of the Turkish Naval Forces.

Regarding the future, Prof. Dr. Demir said: "We are volunteering to be the place to go for cooperation and coordination. In this context, we are ready to assume a role in which we will unify and support the structures and make moves to achieve success. We believe that this is one of our duties... We will put our heads together and coordinate the actions regarding the needs we will have in 10-20 years time. We will assess them and initiate the development of national systems from this day forward, in order to be prepared for these coming years."

STM's Maritime Activities Keep on Expanding

Sponsor speeches were delivered during the second half of the opening session. Enver Küçükerman, Combat Systems Manager at STM, was first to take the stage. Küçükerman said that STM Maritime Projects Directorate operated in different facilities with 170 white-collar personnel:

- 66 in the Istanbul Shipyard Command,
- 14 in the Gölcük Shipyard,
- 85 in Teknopark Istanbul, and
- 9 personnel in Pakistan.

Küçükerman also provided information on the industrialisation efforts of STM. STM held discussions with 400 companies within the scope of indigenisation activities for the MİLGEM project. Materials were procured from 212 different companies. In the meantime, the products were adapted to military standards. Procurement contracts were signed for 75 systems and pieces of equipment. Apart from contractual purchases, 9,200 different materials were procured. Excluding the sensors and weapons, the indigeneity ratio for the MİLGEM reached 75%.

Küçükerman also spoke about the projects carried out by STM. Among them was the Test and Training Ship, the details of which had not previously been shared. This ship will be constructed in Istanbul Shipyard using the hull form of the MİLGEM. Procurement of the mission systems will be undertaken by ASELSAN.

In Pakistan's AGOSTA 90B Half Life Modernisation project, STM, as the prime contractor, takes on the tasks of integration design, installation, integration, test and experience and ELD services. The sub-systems within the scope of the project are listed as follows:

- Sonar suite
- Integrated Command and Control and Weapon System
- Periscope (Assault and Navigation) System
- Radar and ED System
- Convertors
- Helm Console
- Rescue Buoy (design and production activities)

In Pakistan's Ormara Naval Base, STM will carry out studies for preventing the restriction of the use and manoeuvre area at sea due to siltation, streams and waves and improving the use of the base.

The international business development activities carried out by STM are as follows:

- **Romania:** Modernisation and corvette
- **Pakistan:** Corvette (MİLGEM), submarine
- **Indonesia:** Construction of new submarine
- **Kuwait:** Modernisation
- **Saudi Arabia:** Corvette (MİLGEM)
- **Colombia:** Corvette

ASELSAN Highlights Product Diversity

Next to speak was Behçet Karataş, Group Head of ASELSAN Naval Systems. He began by speaking about the importance of the seas and then provided information regarding the naval projects of ASELSAN and shared the following figures:

- 66: The number of new shipbuilding projects to which ASELSAN supplies systems
- 46: The number of modernisation projects
- >100: The number of platforms to which remote controlled weapon systems are integrated

Karataş stated that they exported remote controlled weapon systems to a total of 14 countries, resulting in sales of approximately $400 million, 75% of which was exports.

He introduced, using broad strokes, the wide range of ASELSAN products from satellite systems, sensors and weapon systems to underwater acoustics, and noted that they would be able to develop short-, medium- and long-range guided missiles, and fire control systems and launch systems within the scope of the efforts for developing national surface-to-air guided missile systems.

Karataş also said that they took the initiative when required. In this scope, ASELSAN is developing systems and creating infrastructure with its own resources to be prepared for the tasks to be assigned by the TNFC in relation to unmanned vehicles.

Karataş also touched on the underwater systems. ASELSAN has 63 full-time underwater acoustics experts. Between 2008 and 2016 the company spent 800,000 work hours on design, gained 18,000 hours of maritime experience and performed 20,000 hours of pond testing. Karataş underlined that they have an infrastructure capable of responding very quickly when the need arises.

Rear Admiral (Upper Half) Ahmet Çakır, Naval Technical Commander, exchanged views with Ümit Bayraktar, Executive Editor at MSI TDR, regarding the process that had started with the MİLGEM project.

In the last section of his presentation, Karataş listed ASELSAN's goals regarding naval platforms:

- Meeting Turkey's needs for surface and underwater naval systems indigenously
  - Adaptation of low- and medium-altitude air defence systems to naval platforms
  - Indigenous guided munition / airburst munition
  - Fire control systems for long-range artillery
  - Electronic warfare suite
- Investing in and preparing for future technologies
  - Underwater acoustic network
  - Hard-kill torpedo (physical destruction torpedo)
  - High-energy laser weapons
  - Armed/unarmed and unmanned underwater, sea and air vehicles
- Growing together with the stakeholders in the industry and enhancing and continuously improving current indigenous capabilities
- Increasing exportation and rendering it sustainable

HAVELSAN Aims to Maintain its Success Underwater

Mehmet Görgülü, Command and Control and Combat Management Systems Program Group Manager at HAVELSAN, gave the last sponsor presentation. Görgülü summarised HAVELSAN's efforts with regard to surface platforms in the GENESİS and ADVENT projects. Görgülü stated that ADVENT had been developed using the logic of product line, and listed the force-focused network-enabled operation approach, distributed architecture and flexibility that enables incorporation of new systems as among the innovations introduced by ADVENT.

Görgülü further noted that what the New Type Submarine Project means for underwater is the same as GENESİS means for the surface, and it was a milestone. He added that HAVELSAN would provide future submarines with national systems under the project.

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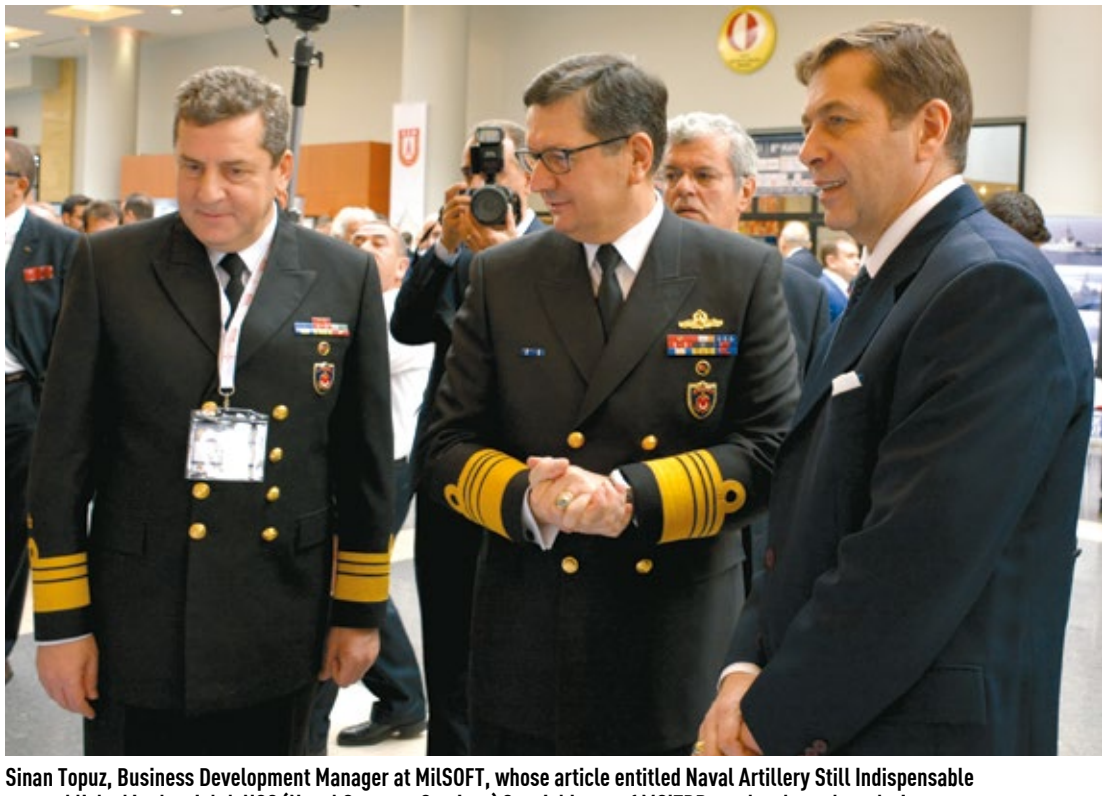
HAVELSAN also works on the national torpedo fire control system. Having developed the Torpedo Fire Control System (TORAKS) with its own resources, HAVELSAN has completed the critical design phase of the Indigenous Sonar Integrated Command and Control System (SEDA). SEDA will be first used in the modernisation of Pakistan's AGOSTA 90B.

Görgülü concluded his presentation as follows: "At HAVELSAN, we truly believe that, like we did in the past, we will meet the needs of TNFC with the products we have developed, following not only current but also future technologies."



Sinan Topuz, Business Development Manager at MilSOFT, whose article entitled Naval Artillery Still Indispensable was published in the eighth NSS (Naval Systems Seminar) Special Issue of MSITDR, spoke about the solutions of MilSOFT to Vice Admiral Adnan Özbal, Commander of the Turkish Naval Forces, and Rear Admiral (Upper Half) Ahmet Çakır, Naval Technical Commander.

TAIS is up for Being the Brand in Demand

The second day of the seminar began with an opening session. During this session, Retired Rear Admiral (Upper Half) Cem Gürdeniz, Director of Koç University Maritime Forum, delivered the first presentation, entitled "What Kind of a Navy for the 21st Century?". Gürdeniz shared with the seminar participants the speech he had delivered at the Rising Technologies in the Naval Defence Industry Workshop, held in Istanbul on March 8, which was covered in the April issue of MSI TDR (2017/37). One of the remarkable points Gürdeniz touched on in his speech was that possessing a nuclear assault submarine should be among Turkey's macro goals.

Gökhan Bodur, Administrative Coordinator at TAIS Shipyards gave the second presentation of the opening session. Bodur noted that TAIS was a joint venture formed by Anadolu Shipyard, Istanbul Shipyard, Sedef Shipyard, Sefine Shipyard and Selah Shipyard, with the catchphrase, Strong Collaboration for a Strong Turkey. He described their goals as follows: "To build ships under a world-renowned brand with domestic content and to equip these ships with domestic components and systems."

Bodur shared the following figures concerning the total capacity of the TAIS shipyards:

- **Total number of personnel: 3,160. White-collar personnel:** 874; blue-collar personnel: 2,286. Depending on projects, an extra of 3,000 to 6,000 people can be provided with job opportunities through the sub-contracting system.
- **Total usable area:** 472,360 square metre. Indoor area: 131,372 square metre; outdoor area: 340,988 square metre.
- There are 12 slipways of different sizes, the largest one being 250-meter-long and 41-meter-wide.
- There are a total of 3 floating docks of different sizes. The largest of them has a length of 285 m, a width of 47 m and a bearing capacity of 40,000 tons.
- There are a total of 4 graving docks of different sizes. The largest of them has a length of 310 m and a width of 50 m.
- In addition, there is a dry dock with a length of 240 m and a width of 42 m.
- There are 10 wharves of different sizes, the largest one being 640-meter-long and 7-meter-wide.
- There are 12 blasting and painting halls of different sizes. The largest of them has an indoor area of 600 square metre.
- There are cranes with various lifting capacities from 3 tons to 550 tons. Additionally, there are 2 block handling vehicles with a capacity of 250 tons and 450 tons.
- The shipyards have an annual steel processing capacity of approximately 300,000 tons. Furthermore, the steel sheet storage area has a capacity of 100,000 tons.
- Design offices have a complete set of design capabilities from principal design to 3D production modelling. The entire design, construction and delivery processes of a ship, including the preparation of user guide and manuals in accordance with the requirements of the class society can be addressed. For planning and project management, enterprise resource planning and material resource planning systems are used.

SSM Provides Support with CEIS as Well

Following Bodur, İlteriş Mirzaoğlu, Defence Industry Expert at SSM's Department of Communications, Electronic and Information Systems (CEIS), came to the stage. Mirzaoğlu provided information on the ongoing projects. Among them were the following projects, not previously covered in MSI TDR:

- **Unmanned Surveillance Radars Project:** This project is about the deployment of radars controlled without any personnel in Coast Surveillance Station Commands, in order to increase the coverage area in the Aegean, Black and East Mediterranean Seas. The decision to start the project was expected in October.

- **Combat Simulator Procurement Project:** This project is currently in the bid evaluation phase and is intended to simulate the real battle environment in virtual environment and deliver shooting and tactical training at individual marksman and squad levels in order to ensure that the personnel of the Marine Amphibious Brigade Command are prepared for combat conditions.
- **Helicopter/Aircraft Underwater Escape Simulator (DUNKER) Project:** The project is about development of simulators for training of personnel on survival from helicopters crashing to sea and crash-landing aircraft, and is currently in bid evaluation phase.
- **Landing Simulator:** The request for proposal document is being prepared for the project, which is about development of a simulator for training of the personnel of ships that will take part in amphibious operations and of landing troops.
- **Tactical Operations Training Simulator (TAHES) Project:** It is about development of a modern TAHES Simulator that will enable use of all platforms, sensors and systems in the inventory, conducting of tactical analyses, assessment of operations' tactical statuses, development of concepts and tactics, and formulation of operation plans. The project is also intended to ensure that the components to be deployed in Gölcük, Karamürsel, Aksaz and Foça can work on the same mission as each other. The targeted requirements of the Naval War Games System-2 (DEHOS-2) are also addressed under the TAHES Project. The project is currently in the preparation phase of the request for proposal document.
- **Air-Independent Propulsion Submarine Diving System Simulator Project:** This is a project for which a request for proposal document is being prepared and in which a diving simulator will be developed for submarines that are currently being procured.

TNFC Wants to Shift to Product Line Order

Engineer (M. Sc.) Captain Nilüfen Çotuk, Head of Electronic Warfare Group at TNFC Research Centre Command (RCC) delivered the last presentation in the opening session of the second day, entitled 21st Century Naval Combat Systems Technology Prediction and Product Line Approach.

Captain Çotuk listed the predictions of the TNFC concerning game-changing technologies, which he described as "the technology that radically changes the balance of power between rivals when applied on a problem site", as follows:

- Wide area reconnaissance and surveillance
- Sensor networks
- Directed energy weapons
- Electromagnetic defence and attack systems
- Use of unmanned systems singly, in squads or in regiments
- New generation sonar suites
- Cyber defence and attack technologies
- Network-enabled systems

Captain Çotuk listed the general principles of the product line approach that they wanted to introduce as follows:

- Ensuring development of required skills by the industry, instead of acquisition of skills developed by the industry,
- Development of skills long before the development of platforms, instead of development of both together,
- Possessing skills that have not been developed yet and will give a surprise effect, instead of best skills ever developed.

Captain Çotuk noted that warfare systems were currently procured in conjunction with platform projects, excluding a few exceptions such as ATMACA missile and ÇAFRAD, and that warfare systems would be developed separately from platform projects in the proposed product line model. As an example, he cited the integration of sensors and weapons to GENESİS. Currently, sensors and weapons are added when platforms require them and under platform projects. In the proposed model, this integration will be done independently from platform projects, and components will be added to platforms, as they are ready.

Captain Çotuk listed the advantages of the product line approach as follows:

- Centralised management of requirements,
- Prevention of repeated activities,
- Full control of non-reoccurring engineering works and their costs,
- Implementation of technological developments to systems through the incremental model,
- Ensuring the product is ready initially in the projects related to the platform to be integrated,
- Payment of only the integration cost in the projects related to the platform to be integrated,
- Ensuring strong coordination between institutions.

In the following pages, we have compiled the news related to the presentations and stands of the companies in the seminar.


Dr. Tahir Çonka

AYESAŞ Showcases the Future of Operator Consoles

AYESAŞ's stand was one of the exhibits that attracted the greatest interest from participants at the seminar. Following IDEF 2017, the company presented the Next Generation Operator Console (ADVENT Console) at the Naval Systems Seminar, as well as a virtual reality application that simulated the console in Combat Operations Centre of a naval platform. By wearing virtual reality glasses, the participants were given the opportunity to experience the console for themselves.

The ADVENT Console is designed to be used in all surface platforms of the Naval Forces Command and from 2018 in new ship construction and modernization projects, particularly class İ frigates, i.e. the 5th, 6th, 7th and 8th ships of the MİLGEM project. The console will also be able to be used in land platforms. The main features of the console are that it is:

- Compact, modular, adaptable to different requirements,
- Compatible with the ADVENT Combat Management System of the Turkish Naval Forces, and
- Architecturally integrated with data and video networks.

Dr. Tahir Çonka gave a presentation entitled New Approaches to Domestic Design and Production of Combat Management Systems' Equipment", in which he gave details of how the Next Generation Operator Console has been developed. Dr. Çonka summarised the previous and the new approach in equipment design, as shown in Table 1. In the new approach, a preparatory stage is utilised, specifically for virtual reality applications and Dr. Çonka listed the steps of this process as follows:

1. Transferring the product's design files via the Internet,
2. Transforming the product files to a model suited to the virtual environment,
3. Adjusting the settings for light, texture and interaction,
4. Testing the application, and
5. Use in the virtual environment.

Following this preparatory phase, the process of presenting the virtual application to the project stakeholders, together with the equipment design, comprises the following five steps:

AYESAŞ's Next Generation Operator Console experienced by many participants.

1. Simple mock-up production for the application,
2. Media installation for the virtual application,
3. Testing in the virtual environment,
4. Receipt of feedback, and
5. Revision of the design in the same environment.

Table 1. Previous and New Approach in Equipment Design

PREVIOUS APPROACH	NEW APPROACH
■ Demonstration with drawings on paper	■ 3D demonstration with touch-and-feel feature (virtual reality)
■ Demonstration on computer	■ Demonstration with actual dimensions
■ Mock-up demonstration	■ Virtual demonstration of equipment component in actual size
■ Revision with Engineering Change Proposals	■ Virtual demonstration of the entire system with other subsystems
	■ More realistic modelling
	■ Demonstration of layout design

Dr. Çonka listed the advantages of this new approach, which he described as an application of Industry 4.0, and of the process they had been experiencing with the Next Generation Operator Console, as follows:

- The efficient use of resources (time, money and manpower),
- Reduction of the probability of error and response time,
- Presentation of the design process prior to production with full visuality,
- Facilitation of the processes of the production team and stakeholders,
- Ensuring more reliable and testable demonstration,
- Paving the way to ensure full use in virtual reality.

Finally, Dr. Çonka summed up the contributions made by the new approach to future studies:

- Virtual reality ensures lasting, easily understandable and interactive training, and contributes to the instruction of qualified personnel;
- Using virtual reality, the training costs of processes such as maintenance and repair can be reduced to a minimum;
- With virtual reality, contributions can be made to the design process prior to production; and
- Human errors can be kept to a minimum and all possible scenarios can be experienced.

The Berkin Engineering team

Berkin Engineering: The Place to Go for Data Distribution Systems

Berkin Engineering was given the opportunity to introduce their products and services at the seminar they attended as an exhibition participant. During the breaks between sessions the company's stand attracted many visitors.

At the event, the solution highlighted by Berkin Engineering, a company that provides integration solutions for civil and military ships, was the Data Distribution System (DDS) product family. This family includes a Mini DDS with 18 inputs/outputs for small ships, as well as a Midi DDS with 30-60 inputs/outputs for medium ships and Real-Time DDS models for corvettes, frigates and more complex ships. Yücel Atalay, Managing Director and Owner of Berkin Engineering, noted that the DDS solutions selected for the Logistic Support Ships project meet real-time requirements with lags of less than 500 microseconds. Mesut Zafer Sarı, Business Development and Programs Director at Berkin Engineering,

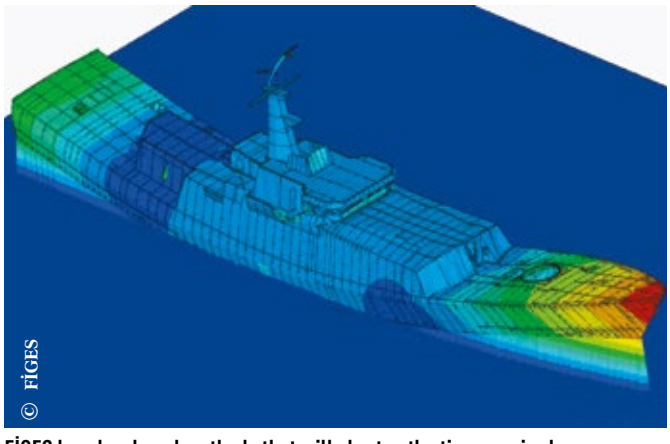
In the breaks between the sessions, Berkin Engineering's stand attracted many visitors.

emphasised that they would ensure "as is" supportability for at least 20 years because no commercial product is used in the Mini DDS selected for a new project involving two ships. Although the use of commercial-off-the-shelf (COTS) products, manufactured for civil needs, in military products is addressed as an option - mainly because of the lower initial purchase costs - this could lead to some problems in the future. This is particularly due to the fact that the life cycle of systems used in civil sectors is shorter than that of military systems and this could result in the termination of product support for COTS components while the military system is still in the inventory. Berkin Engineering's solution is intended to prevent this.

Carrying out their operations in their headquarters in Tuzla, Istanbul, Berkin Engineering offers DDS-based integration solutions, as well as solutions for naval communication subsystems and Integrated Platform Control and Monitoring Systems.

FİGES Enters the Age of Ingenuity

Having made significant contributions to the MİLGEM project with their analyses, finite element modelling studies and advanced engineering services and being one of the primary solution partners of the Turkish military shipbuilding industry, during the seminar FİGES demonstrated the level of maturity that their efforts have reached. The company continues to make a difference by further optimising their engineering services with the experience they have gained.



FİGES has developed methods that will shorten the time required for developing a 3D model of a military ship.


Burak Tunç Çekirdekçi

At the event two presentations were delivered on behalf of FİGES. One of these, entitled Code Development Studies Aimed at Process Improvement in Developing Finite Elements Model (FEM) for Ships, was delivered by Burak Tunç Çekirdekçi, Senior Structural Analysis Engineer at FİGES.


Ahmet Yusuf Gürkan

With the aim of shortening the procedures required to develop a finite element model for a military ship, FİGES has developed special software that will accelerate these processes. Çekirdekçi provided information on this software in his presentation.

Ahmet Yusuf Gürkan, CFD Application Engineer at FİGES, delivered the other presentation for FİGES, entitled A Comparison of Stationary and Moving Self-Actuation Analyses in Ship Hydrodynamics Analyses". Using the studies conducted by FİGES, Gürkan made a comparison of the stationary and moving analyses.

Participants from the Turkish Naval Forces Command took a close interest in these presentations, asking various technical questions and receiving information on the details of the FİGES solutions .


Levent Tanın


Mert Yenen


Ahmet Muhtar Erdoğan

HAVELSAN Looks to Future for Combat Management Systems and Submarines

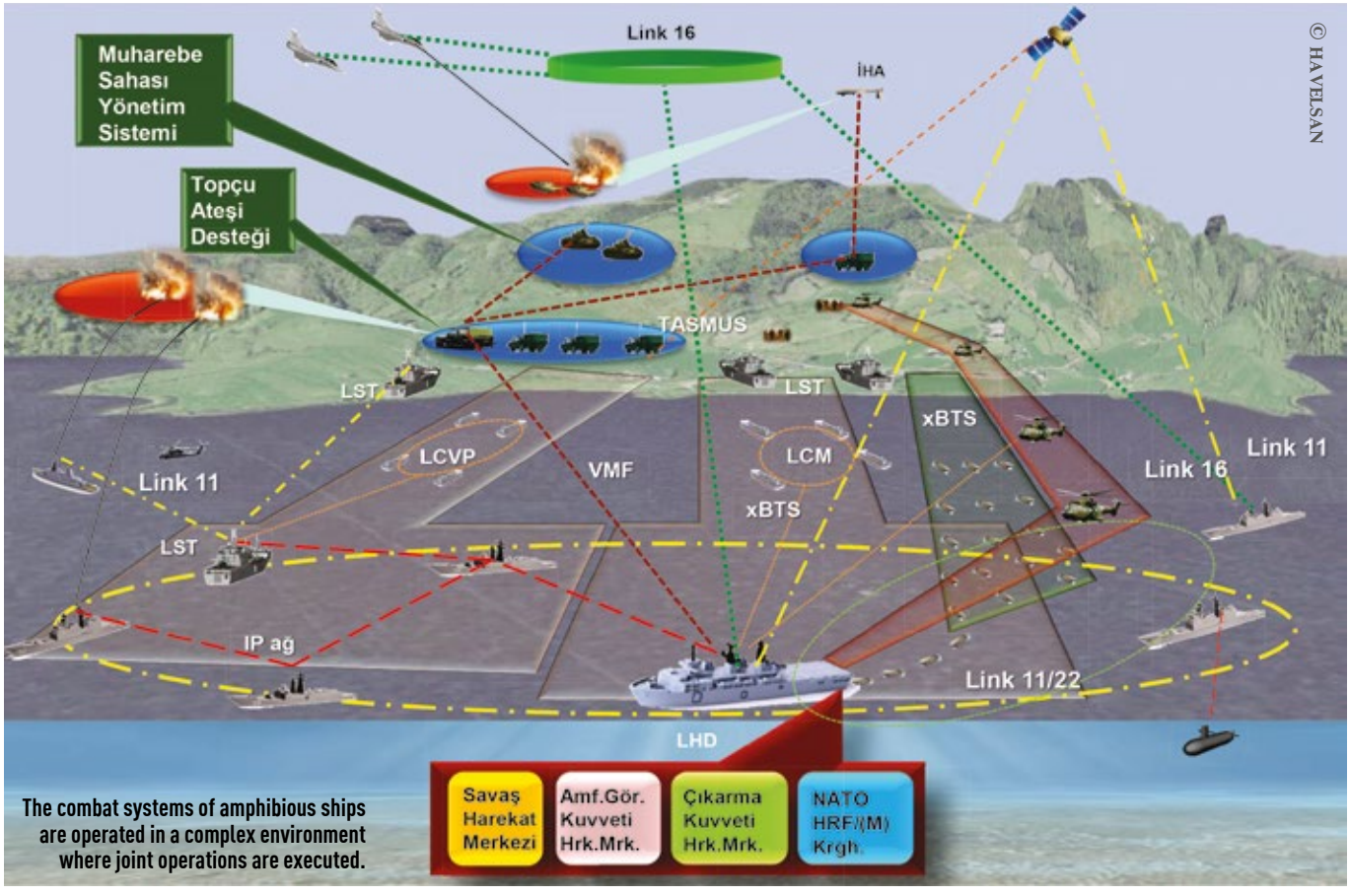
At the event, HAVELSAN, the primary supplier of the command and control and combat management systems (CMS) for the Turkish Naval Forces Command (TNFC), described the point they had reached regarding surface ships and the point they would like to reach regarding national submarine endeavours.

Future's Combat Management Systems

In his presentation entitled Integrated Command and Control System Solutions for Creating Common Picture in Naval Applications, Levent Tanın, Naval Warfare System Engineer at HAVELSAN, spoke of the direction in which HAVELSAN's efforts are going concerning combat management systems.

HAVELSAN's vision regarding the features of the next generation CMS can be outlined as follows:

- Enabling the joint use of sensors and weapon systems across the Task Force and the transition to network-centric warfare,
- Enabling the fully integrated use of next generation sensors and weapons,
- Fully integrated Link 11/16/22, JREAP, VMF, Simple capability,
- Supporting the use of new communication methods that will emerge in the future, as well as tactical data links, and the sharing of data using these methods,
- Facilitating fast and correct decision-making by the user, utilizing decision support systems,
- Operators capable of assuming more than one role simultaneously and the capability to dynamically assign roles to operators,



The combat systems of amphibious ships are operated in a complex environment where joint operations are executed.

FOTONIKS

FGS

Fusion Goggle System

Night Vision

Fusion

Fusion Outline

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- Advanced decision support functions,
- Use of modern COTS technologies in CMS equipment, and
- The facilitation and acceleration of users' access to information and accomplishment of tasks.

The capabilities of the next generation CMS in relation to various functions include the following:

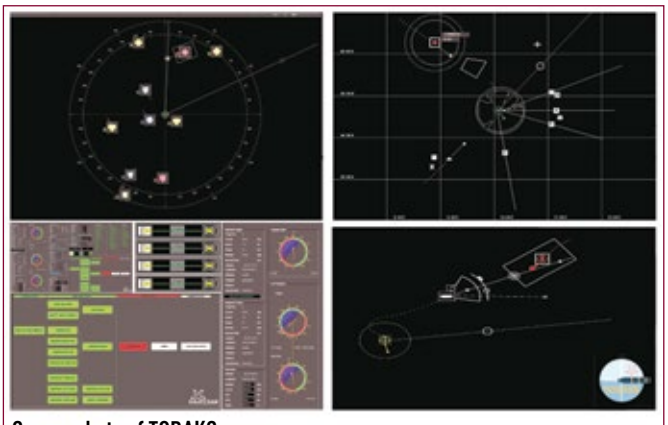
- Status Display
  - 3D display of tactical status,
  - Multiple views,
  - Adjustable geographical status display area,
  - Supporting of various map formats.
- Track Management (multi-sensor across the CMS, multi-platform across the task force)
- Warfare Support
  - Threat Assessment (Regarding to the platform on which the CMS is located or another platform)
  - Weapon Management
    - Engagement of threats by different platforms together
    - Supporting engagement with different sensors
    - Joint use of weapons and sensors on different platforms
- Training and Simulation
  - Capability to Use in Real and Training Mode Simultaneously
  - Training Across the Force

In his presentation, Tanın described HAVELSAN's DOOB product as an integration solution for separate command and control systems. Designed for strategic and operational levels, DOOB can be used on the land and sea and in the air. DOOB has several operational achievements:

- With this system, which participated in NATO's CWIX exercises in 2012, 2013, 2014, 2015, 2016 and 2017, more than 350 dual tests and scenario tests were carried out.
- DOOB was used successfully in 2013 in the Combined Endeavour exercise.
- DOOB was established in January at the General Staff Armed Forces Command Operation Centre (AFCOC) as a Joint Picture Prototype, and training courses were provided for users.

A contract was entered into between HAVELSAN and Pakistan Land Forces Command in September 2013 for use of DOOB at seven points and within this scope, installation, training and support services were provided. In February this year, a contract was entered into with the Sultanate of Oman Ministry of Defence for the adaptation of the DOOB system and its dissemination across all departments of the ministry. Tanın listed the contributions that DOOB-Next Generation CMS integration would make:

HAVELSAN exhibits TORAKS at various events.



Screen shots of TORAKS

- Execution of integrated naval operations by two-way integration
  - Ensuring the CMS accomplishes tasks more effectively
  - Monitoring of the maritime picture in different details
- Creation and instant revision of Common Picture in naval applications
- Sharing of Common Picture with other forces and the General Staff.

Warfare Systems of Amphibious Ships Mature

While the TNFC modernises its amphibious fleet with LST and Multipurpose Amphibious Assault Ship projects, HAVELSAN develops its CMS solutions specifically for these ships. The fact that these ships will also function as a command and control centre for amphibious operations imposes new tasks on HAVELSAN's CMS solutions. In his presentation entitled LHD – Joint and Non-combat Operation, Cooperation Between Forces and Network-based Capability, Mert Yenen, Senior Engineer for Application Software at HAVELSAN, spoke about the final point reached in their efforts. Yenen noted that since the previous seminar they had successfully completed the deliveries and tests under the LST projects, highlighting the level of maturity reached by their solutions. Another subject Yenen touched on was the integration of the CMSs on amphibious ships with other command and control systems, such as Battlefield Management System (BMS) and Air Force Information System (HvBS) within the scope of the cooperation between the forces.

HAVELSAN Ready for National Submarine

Ahmet Muhtar Erdoğan, Project Manager for TORAKS/NTSP/AGOSTA at HAVELSAN, reported on the efforts of HAVELSAN in the domain of submarines, in his presentation entitled On the Brink of the National Submarine: Investments for and Gains from a New Type of Submarine. With regard to surface platforms, most notably CMS, HAVELSAN has become the sole authority in the areas in which it specialises and aims to reach a similar position with respect to submarines as well. Relating to submarines, within this scope it operates in the following areas:

- Command and Control and Combat Management Systems
- Underwater Sensor and Weapon Integration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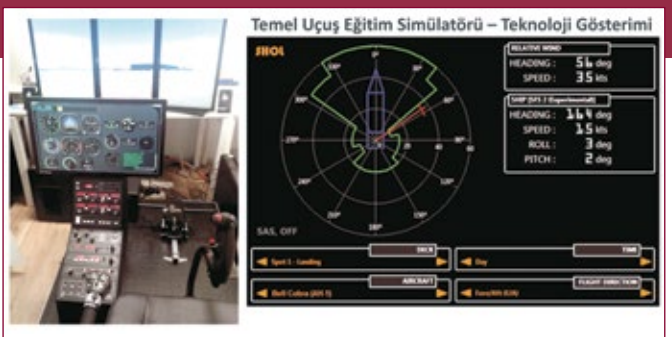

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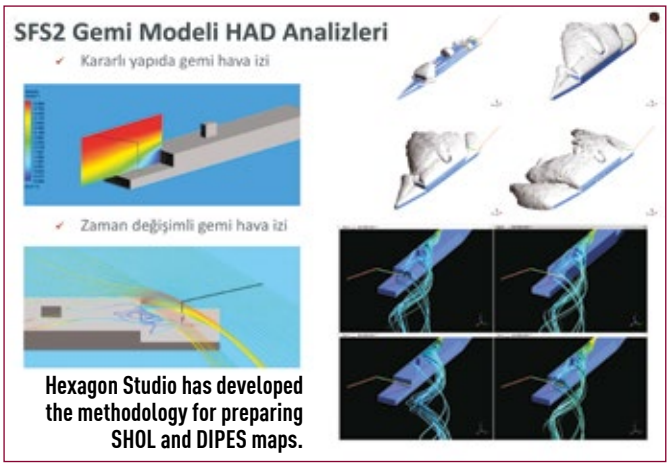
Hexagon Studio exhibits the technology demonstration of the SHOL and DIPES maps in the Basic Flight Training Simulator at IDEF 2017.



© Hexagon Studio

Hexagon Studio has developed the methodology for preparing SHOL and DIPES maps.

- Submarine Data Distribution System
- Torpedo Fire Control System
- Submarine Diving Simulator
- Signal Processing and Technological Solutions

HAVELSAN is undertaking key tasks in the New Type Submarine Project (NTSP):

- Development of CMS software of the Integrated Underwater Command and Control System (IUCCS),
- Development of the Submarine Data Distribution System,
- Installation, maintenance and sustainment of the Land-Based Test System (LBTS),
- Delivery of training courses on the software and system use of the IUCCS,
- Configuration control, maintenance and sustainment of the entire source code of the IUCCS,
- Following the integration and test efforts made successfully in Bremen for the initial system, the performance of integration and testing activities for the remaining five submarines (to be carried out in Turkey).

In addition, HAVELSAN, as the subcontractor of Raytheon, carries out the integration process of Mk48 Torpedo Fire Control System.

Another important project of HAVELSAN with respect to submarines is the modernisation of the AGOSTA 90B, in which it takes part as the subcontractor of STM in Pakistan. In this project, HAVELSAN is developing the Integrated Underwater Command and Control System and the Submarine Data Distribution System. Erdoğan revealed that they had successfully completed the preliminary design phase in September, and that their aim is to comple the critical design phase during the first months of 2018. In the project, the first submarine is scheduled for delivery in 2020.

The ultimate goal of HAVELSAN with regard to submarines is to develop the IUCCS for the national submarine indigenously. Having taken the initiative regarding the Torpedo Fire Control System, one of the main components of this system, HAVELSAN has developed the Torpedo Fire Control System (TORAKS) with its own resources. TORAKS, which has been developed for a generic torpedo, will be able to be adapted to different torpedoes, owing to its modular structure.

At the end of his presentation, Erdoğan voiced the company'sproposals regarding the work on submarines: HAVELSAN has suggested the use of the submarines removed from the inventory of the TNFC as testing platforms by the industry, under the control of the TNFC.

Hexagon Studio's Assurance for Helicopter Operations on Ships

Hexagon Studio's agenda was the Ship-Helicopter Operation Limits (SHOL) and Deck Interface Pilot Effort Scale (DIPES) maps, which are closely connected with the safety of helicopter operations on ships. The engineering approaches developed by the company to issue both maps were described by Ünal Elbeyli, the Business Development Manager.

The following conditions on ships have adverse effects on helicopter manoeuvrability during operations:

- Structure on the water surface (i.e. the ship) disrupts the flow of wind;
- Impact of funnel gases on the helipad, and
- Rough sea states.

The solution lies in the SHOL and DIPES maps, which should be developed individually for each ship. These maps are also published in NATO documents and used in joint operations.

In his presentation, Elbeyli described the methodology developed by Hexagon Studio to prepare these maps, the implementation of this methodology on selected ship and helicopter models and the results obtained. Hexagon Studio showcased the technology demonstration of these maps in the Basic Flight Training Simulator, at IDEF 2017.

At the end of his presentation, Elbeyli emphasised that SHOL maps should be issued to all ships carrying out helicopter operations, as well as the various helicopter types to be selected by the Naval Forces Command, and that Hexagon Studio was ready for this task. In Elbeyli's presentation, the ships on which this work maybe carried out,were listed as the MİLGEM, the Multipurpose Amphibious Assault Ship, Logistic Support Ship, Fleet Replenishment Ship, Amphibious Ship, MOSHIP, RATSHIP and the TF-2000.

Surface Platforms: A Leonardo Product for Every Need

During a presentation at the seminar given by Lorenzo Cozzella, Marketing Manager for Leonardo, he explained the company's solutions regarding radar, fire control and combat management systems, all of which are critical components of surface ships.

With the Italian Navy's recent launch of new platform projects, Leonardo has started to develop innovative solutions that will meet the requirements of these platforms. The company's solutions concerning radars range from navi-


Lorenzo Cozzella

gation radars and 3D surveillance radars to fire control radars and ballistic missile early air warning radars. The main features of Leonardo's product family of radars for surface platforms include:

- In the last two years, Leonardo has developed innovative solid state radars, the antennae of which are conformal in their work for the Italian Navy. These radars enable compatible integration with ship designs that reduce the radar footprint. As for the radar performance, it is not impaired by the integration in any way.
- Among the newly developed radars, there is the dual-band design, which boosts the detection and diagnosis performance to the top level.
- Another radar system that has been recently developed is the RAN 40 L EVO. The RAN 40 L EVO, operating on the basis of the active electronically scanned array principle and on the L band, can be used for early warning and ballistic missile defence missions.
- Leonardo has also developed an IFF system that can be integrated with these radars and uses a circular and static antenna.

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Leonardo also works on innovative designs in the field of the human-machine interface.

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Leonardo has developed the KRONOS radar family to meet different requirements.

The radar solutions offered by Leonardo for surface platforms form the KRONOS product family:

- KRONOS Power Shield, which provides early warning against tactical ballistic missiles and air-breathing targets,
- KRONOS Dual Band, which offers an effective dual-band solution against ballistic threats and air-breathing targets,
- KRONOS GRAND NAVAL, which is also used as the main radar of PAAMS (Principal Anti-Air Missile System), and
- KRONOS NAVAL, which can be used on ships of 400 gross tons and above.

Fire control systems also receive their share from the developments in radars. The NA-30S, Leonardo's next generation fire control system, operates on dual band; namely, Ka and X bands. Thus, it is easier for the radar to automatically track close as well as remote targets. Leonardo's solutions can be used for directing a wide range of weapons, with calibres from 12.7 mm to 127 mm, to the target.

The exceptional features of Leonardo's combat management systems and the ones that attracted the most attention during the presentation, were modularity and being able to easily integrate to any combat system. Leonardo works on innovative designs, especially in the field of the human-machine interface.

Luciad Increases Awareness


Mehmet Emin Halitligil

Usually avoiding direct contact with end users because their solutions are used as a component by developers in system design, Luciad increased awareness at the seminar. In his presentation entitled "Advanced Situational Awareness at Sea and Support for Analysis Tools", Mehmet Emin Halitligil, Sales & Country Manager at Luciad, described the company's products and services for the maritime sector.

Luciad develops geospatial situational awareness software components used in applications processing high volumes of data in mission critical areas. Developers can easily integrate these software components into the applications on which they work. The company is known for its performance and the technical competence of its solutions, as well as by the fact that it has not cut support for any of its products since 1999, the year in which it started to operate.

Among Luciad's international customers from the defence and aerospace industry are Airbus, BAE Systems, Indra, Leonardo, Lockheed Martin, Navantia, NATO and Thales. Some of its customers from Turkey are ASELSAN, AYESAŞ, HAVELSAN, Meteksan Defence, STM, TÜBİTAK and YALTES.

During the month of October, there was a development at Luciad on the corporate front, when the company became a part of Hexagon AB, which is a global organisation supplying information technologies for enhancing efficiency and quality among geographical and industrial corporate applications.


Emre Topçu


Emrah İlbey


Mesut Görateş

Meteksan Defence Expands its Product Family

Having been designated as Turkey's underwater acoustics centre of excellence by the Undersecretariat for Defence Industries, Meteksan Defence described their activities concerning underwater acoustics and security of coastal facilities in three presentations during the event. The company demonstrated the following solutions at its stand:

- Fire training simulator,
- Damage control training simulator,
- Hull-mounted sonar,
- Underwater early warning and communication systems,
- Submarine sonar systems and
- Underwater weapon, sonar and sensor systems.

During the seminar, Meteksan Defence did not highlight its world-renowned products, for example the damage control training simulator recently purchased by the Republic of Korea; and rather talked about the new solutions it has recently developed. This gives us the clues about the coming period. Meteksan Defence proved that it would continue to be one of the key business partners of the naval forces with its existing products and new solutions in the future.

Meteksan Defence is on the Way to Become a Global Sonar Company

Senior System Engineer Emre Topçu delivered the company's first presentation, which was entitled "MİLGEM Sonar from the Past to the Future". The presentation had two main emphases:

1. Sonar development is a long process in which field experience makes a difference.
2. Meteksan Defence has already planned the future efforts or YAKAMOS sonar, which it took from the Turkish Naval Forces Command (TNFC) to industrialise it, and is on the way to become a global sonar company.

Topçu listed the processes of developing a platform sonar as follows:

- Conceptual Design
- Development of Wet-End
- Development of Dry-End Compatible with Wet-End
- Completion of Prototype Production
- Performance of Subunit Tests
- Performance of Prototype Tests Using an External Platform
- Performance Optimisation
- Performance of Prototype Tests Using an Existing Platform
- Performance Optimisation
- Integration with Ship Systems
- System Acceptance Tests

System acceptance tests are actually not the end of the process. The data obtained from different areas and under different conditions when the system is put into operation are of great importance for further improving the sonar.

Meteksan Defence's efforts on sonar development have accelerated with the decision to industrialise YAKAMOS sonar developed for the MİLGEM project by the TNFC. Prior to this decision:

- With the initiative of the TNFC, the Turkish Naval Research Centre Command initiated the conceptual design efforts for the sonar in 2005. The conceptual design, prototype production and a part of the tests were completed in two years.
- Development tests started using the open sea towboat TCG DARICA in 2007. Tests and performance optimisation were completed in two years.
- In 2009, Meteksan Defence won the tender for the industrialisation of the underwater section called "wet-end", which is the sensor part of the sonar, and started to supply this component to the MİLGEM project.
- In 2010, the sonar was integrated to HEYBELİADA, the first ship of the MİLGEM project. Its tests and optimisation were completed. Its acceptance tests were completed in later 2010.
- Using the data collected with the first ship from different seas and different conditions, as well as the polygon data and user feedback, improvements were made on the system until the integration of the sonar to BÜYÜKADA, the second ship of the MİLGEM project, in 2013
- In 2016, Meteksan Defence was selected again to industrialise the entire sonar, including its dry-end sections.

Meteksan Defence completed its preparations before taking on the entire responsibility for the sonar:

- Under MİDAS (Indigenous Piezoelectric Ceramic Development) project, composition development, characterisation, test and production skills were gained for Navy-I and Navy-II type piezoelectric ceramics.

- Sensor and index design, modelling, analysis and test skills were gained during the process of industrialisation of the wet-end units of YAKAMOS.
- Under the MST-01 project, transducers were supplied as spare parts for SQS-56 sonars in the inventory.
- The test infrastructure with a depth of approximately 15 m, which enables performance of acoustic tests between 2-100 kHz thanks to its sensitive positioning system, was established on Bilkent Pond (Bilkent Pond Open Water Test and Calibration Facility). Moreover, pool and pressure tank infrastructures were also put into use.

Having taken over YAKAMOS sonar through technology transfer by the TNFC and had a solid grasp of the system, Meteksan Defence will carry out the following activities for YAKAMOS-1 sonar used in the MİLGEM project:

- The sonar of the third ship of the MİLGEM project will have a series of novelties. Meteksan Defence started from the scratch with the sonar software and rendered the software units depending on the hardware used independent from the hardware. It developed on its own the PGA cards that were procured from abroad and are no longer possible to purchase from the same source. Since the noise level of the cards developed is lower than the previous cards, the sonar's performance has been enhanced. Similarly, the ADC-DAC cards that were procured from abroad but are no longer possible to purchase from the same source have started to be procured from a different source. Meteksan Defence also developed a dummy load that simulates wet-end to easily test all these modifications in the laboratory environment.
- The sonar of the fourth ship of the MİLGEM project will have active tracker feature. Furthermore, the sonar will also have a simulation mode that will enable continuation of training activities during deployments as well.

All capabilities of the last ship of the project will also be added to the sonars in the other three ships.

The future plans of Meteksan Defence concerning YAKAMOS, which will become a product family, are as follows:

- YAKAMOS-2 sonar will be integrated to ships under modernisation program for BARBAROS class frigates. YAKAMOS-2 will be a version whose equipment is indigenised sticking to the architecture of YAKAMOS-1 and resistance to environmental conditions is improved.
- İ class frigates will be equipped with YAKAMOS-3, a modular, scalable and integrated sonar suite whose software and algorithms have been improved. YAKAMOS-3 will be interoperable with different wet-end units on different platforms, thanks to its modularity. The sonar will be able to be operated with a wet-end that has fewer sensors on a ship of the size of a corvette and with a wet-end that has more sensors on a platform of the side of a destroyer.
- Considering TF-2000 frigate will be used in high seas as well, Meteksan Defence will develop the low-requency active sonar YAKAMOS-L which increases the detection range in such seas.

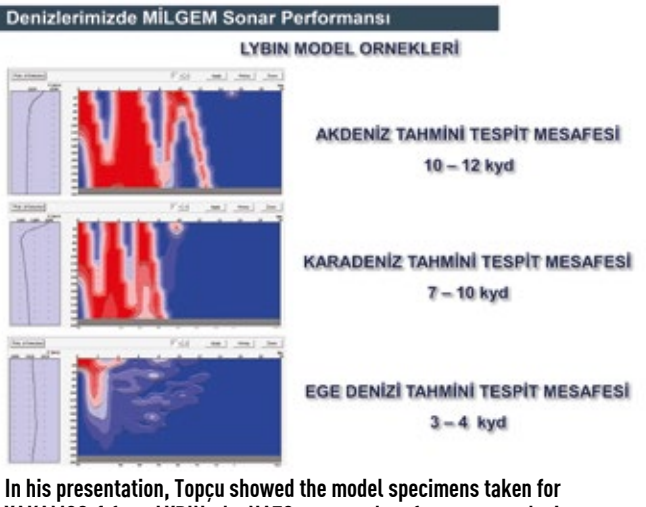
The Future is in Fibre Optic Sensors

While developing the YAKAMOS sonar family using current technologies, Meteksan Defence also invests in future technologies. In this scope, Meteksan Defence, which works on fibre optic technologies in relation to the sensors of sonars, told about the point it had reached in Senior System Engineer Emrah İlbey's presentation entitled "New Generation Fibre Optic Sonar Solutions for Underwater Platforms".

Fibre optic sensors are known with their high precision, low noise level, immunity to electromagnetic interference and ease of multiplexing (supporting of more than one sensors using a single fibre cable). Furthermore, such sensors enable generation of a thinner and lighter array that does not need electric power when used in towed arrays.

Meteksan Defence uses Mandrel-Based Acoustic Sensing method on these sensors. In this method, fibre cable is wound around a cylindrical mandrel. All mandrels on the system have the same characteristics. One of them is on the dry-end and functions as the reference mandrel. When an acoustic wave hits the mandrel under the water, the mandrel's diameter changes, which changes the length of the fibre coil. Thus, the optical path in the reference mandrel is extended, and a phase difference from the reference mandrel occurs.

Meteksan Defence uses temporal multiplexing to drive through a single fibre that connects more than one mandrel.



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In his presentation, Topçu showed the model specimens taken for YAKAMOS-1 from LYBIN, the NATO-approved performance analysis software. These model specimens showing the estimated detection ranges of the sonar indicate that YAKAMOS-1 is an appropriate solution for the waters surrounding Turkey.

Furthermore, the signal of the reference mandrel is transmitted on the same fibre for isolation of outdoor noise.
Meteksan Defence conducted the tests for its sensors at the underwater acoustics test infrastructure installed in Bilkent Pond Open Water Test and Calibration Facility. The results indicate that high precision and low sensor self-noise values have been reached.
İlbey stated that Meteksan Defence was ready to integrate these sensors to final products under the projects to be launched.

Meteksan Defence's sensor design for New Generation Fibre Optic Sonar

Protection of Strategic Coastal Facilities by Meteksan Defence

Another subject brought forward by Meteksan Defence in the seminar was the security of strategic facilities against underwater and surface threats. Mesut Görateş, Naval Forces Command Customer Relations Manager at Meteksan Defence, started his presentation on this subject with the following words: "In this presentation, we will tell about the solution of Meteksan Defence for the security of ports, bases and coastal facilities that are in need of an integrated security solution because of their location on a coast. This solution, which meets the basic system requirements accepted among NATO countries, includes the subsystems developed by Meteksan Defence."
The solution offered by Meteksan Defence provides strategic coastal facilities with early warning, detection, classification and defence capabilities against threats from underwater, surface, land and air. The subsystems supplied by Meteksan Defence and its business partners for this solution include the following:

- RETINAR area surveillance radar family developed by Meteksan Defence,
- Self-contained or radar-integrated night and day vision cameras supplied by business partners,
- Unmanned aerial vehicles supplied by business partners,
- Underwater acoustic sensor arrays developed by Meteksan Defence (passive early warning sensor network systems),
- Underwater digital communication modem developed by Meteksan Defence,
- Diver detection sonar systems supplied by business partners,
- Handheld terminals supplied by business partners,
- IP-based communication network developed by Meteksan Defence,
- Command and control centre supplied by business partners, and
- Laser dazzling systems developed by Meteksan Defence, Meteksan Defence supports the communication infrastructure of this integrated solution with critical components. The software-based communication architecture developed by the company under another project is among the capabilities that can be used in this scope. Meteksan Defence is still working on the delivery of a communication solution possessing this architecture as the subcontractor of ASELSAN under another project. The features of the said architecture are as follows:
- Supports point-to-point and point-to-multiple points communication between different users;
- Scalable bandwidth and channel width;
- Cellular communication technique;
- Radio-link operating mode;
- Electronic warfare protection;
- Ethernet-based data interface;
- Possibility to position internal and external units in separate architectures;
- High output power;
- MIMO-compatible.

Having actively taken part in the efforts of NATO to develop an underwater digital communication protocol, Meteksan Defence has become the first company to develop a model capable of digitally communicating under the water compatibly with the protocol named JANUS, which was developed as a result of these efforts. Meteksan Defence continues its efforts to equip this product with a national underwater digital communication protocol in addition to JANUS.
The most remarkable subject in this presentation was the laser dazzling system being developed by Meteksan Defence. The details of the system, which is currently being developed for the Turkish Naval Forces Command, are not disclosed for confidentiality reasons. Meteksan Defence will adapt the system that it developed for a certain surface platform in the first phase to stationary and mobile land-based applications in the second phase. In the final phase, it will make it a subsystem that can be used on any surface platform. Laser dazzler will be able to be used against asymmetrical threats and guided munitions with electro-optical guidance.

The solution offered by Meteksan Defence for protection of strategic coastal facilities includes the subsystems supplied by the company and its business partners.


Jorge Garcia-Monedero


Jose Antonio Pagan

Navantia Looks Beyond ANADOLU

This year's agenda of Navantia, one of the regular participants of the seminar, was the through-life management of ANADOLU, constructed by Sedef Shipyard under the Multi-Purpose Amphibious Assault Ship project. Having taken part as a subcontractor of Sedef Shipyard in the project and being the creator of the design on which the ship is based, Navantia explained its approach and solutions concerning through-life management in the two presentations delivered in the seminar.

Navantia supports its customers with a series of technologies and solutions developed under the title Through-Life Support Services. Jorge Garcia-Monedero, who had been appointed as Through-Life Support Services Business Unit Director from his position as Turkey General Manager of Navantia, talked about these technologies and solutions in his presentation.

Navantia deals with the issue of through-life support starting from design. Garcia-Monedero stated that they were in close collaboration with the Royal Australian Navy regarding this matter, and that the force played an important role in the shaping of Navantia's products and solutions in this area. Navantia offers solutions and services for the ships it designs. In addition, the company's competences and the trust it builds have resulted in engagement of Navantia with maintenance of the US Navy's ships deployed in the Naval Station Rota in Spain.

The solutions and services offered by the company are grouped under the following five categories:

- Through-life support management
- Through-life support engineering
- Maintenance
- Supply chain
- Training and simulation

Technological developments in particular clear the way for innovations in through-life support. Various systems on the ship, most notably the Integrated Platform Control and Monitoring System (IPMS), generate high volumes of data. The processing of these data by means of developing information technologies clears the way for proactive solutions, such as protective and preventive maintenance.

Garcia-Monedero summarised the efforts of Navantia regarding through-life support under the following titles:

- **IPMS:** After successfully completing the integrated control and monitoring of ship subsystems, Navantia has shifted its focus in IPMS solutions to the operator. Navantia's IPMS solutions are now intended to relieve the operator of the burden of checking the entire system periodically and searching the location of the problem. As a result, the operator will be able to be fully focused on the work they need to carry out at that moment. Another shift of focus regarding the IPMS is the transition from inward look to outward look. Garcia-Monedero cited a diesel engine as an example. The engine's status within the scope of its operation dynamics as well as its effect on the entire ship or the effect of the ship on the entire fleet are among the things that will be able to be monitored and controlled by the IPMS.
- **ARGOS21:** Offered by Navantia as a software solution for platform data analysis, ARGOS21 was described in detail in another presentation delivered by the Reliability Engineer Jose Antonio Pagan. Operated in integration with the IPMS on platforms designed by Navantia, ARGOS21 assesses together the data coming from both the platform and outside the platform using data fusion algorithms, statistical methods and artificial intelligence algorithms. Following the assessment, it warns the user about existing or potential problems. Consequently, it prevents substantial failures and increases the readiness rates of systems. The system has a central unit deployed on the land, from which the entire fleet can be monitored. Having started to be developed in cooperation with the Spanish Naval Forces in 2006, ARGOS21 V2 was issued in 2016. The V3 version will be issued in 2018.
- **Digital models:** Navantia models digitally its designs and all features of the sub-systems that constitute these designs, and keeps these models up-to-date throughout the life cycle of the platform.
- **Training simulators:** Navantia clears the way for the delivery of training courses for different ships on the same equipment by integrating the IPMS and navigation training.

Garcia-Monedero stated that they, as the company that had created the design on which ANADOLU was based, were ready to offer the solutions and services he described throughout the life cycle of the ship. In this process, the aim of Navantia is to work with Turkish business partners and increase the number of its business partners.


ARGOS21 enables monitoring of the entire fleet's status.

© Navantia


Kurt Worden


Süleyman Bayramoğlu

Health of Electric Power of Critical and Sensitive Systems on Ships is Entrusted to NOVA Power

Having kept the issue of electric power quality in the agenda and raised awareness on this subject since 2015 when its Turkey office started its operations, NOVA Power Solutions continued its efforts in this area at the Naval Systems Seminar as well. Süleyman Bayramoğlu, the company's Business Development Manager in the Europe, Middle East and Africa Region, and Kurt Worden, Business Development Director at NOVA Power Solutions, told about the specific status of ships and what could be done to the participants in their presentation entitled "Choosing the Right Continuous Power Supply for Ship Applications".

Problems experienced in power quality may result in frequent and comprehensive equipment failures, low reliability of equipment, high maintenance and ownership costs, and failure to accomplish tasks. One of the main reasons for impairment of power quality is the network size. These problems are experienced more frequently in ships that have a relatively small electricity infrastructure. Therefore, electricity infrastructures of ships are considered to be the most critical electricity networks. These small networks accommodate numerous electronic systems and many switched power supplies that affect each other or cause noise. For this reason, the issue of low power quality, which causes reliability and performance problems, is more frequently addressed in ships and is considered to have critical importance.

Typical uninterruptible power supplies are not a remedy for all potential problems. The solution is to use smart power conditioners. NOVA Power provides these systems and adapts them to its customers' needs. The company's operating model is different from the typical one in which a range of products are released and customers choose the product that is most likely to meet their needs. By working with the project team taking into account the customer needs when required, NOVA Power comes up with the most suitable solution and develops the product. It also makes use of off-the-shelf systems and components in this process.

Worden shared his assessment of their products' performance, saying: "We closely keep track of our solutions and products, particularly those used in defence systems, during the periods of use or operation, and I can say that failure rates are far below the sector average. The products in our solutions are usually used without seeing any failure for a period of more than 10 years, which is something very rare particularly in the defence industry."

Regarding their operations in Turkey, Bayramoğlu said: "To date, we have supported many defence system integrators and producers in developing special power units for various systems starting from the design phase, particularly in programs predominantly involving ships." We have very successful cooperation with these companies with respect to the design of systems that enable resolution of performance problems concerning power quality and distribution of high-quality power. It is very important that what underlies the high reliability and performance of the systems developed in Turkey is the power units that are specially designed and developed. I would like to add that we, as NOVA Power, are delighted to contribute to the Turkish defence industry in these areas and that we are very pleased to be seeing the results of our efforts."

ONUR Brings DETTA to the Seminar

Continuing its efforts under the Naval Tactical Radio Network (DETTA) project, for which an agreement was entered into with the Undersecretariat for Defence Industries (SSM) in 2016, ONUR exhibited at its stand two DETTA units communicating with each other. Due to this installation, in which the visitors showed great interest, the Naval


Barış Dinç

ONUR exhibited two DETTA units named Aydın and Burak side by side in accordance with the phonetic alphabet (Aydın denotes the letter A and Burak denotes the letter B), and had these two units communicate with each other. In the simulated environment, the communication was carried out in the form of IP data communication through HF and V/UHF analogue radios. Moreover, the first prototype of the new generation broadband wireless communication unit to be delivered under the project was exhibited at the seminar.

Having been visited by high level officials from different departments of the Ministry of National Defence and the Turkish Naval Forces Command, ONUR's booth was one of the stands in which visitors showed great interest. ONUR personnel had the opportunity to give information on DETTA and explain the network-enabled capabilities that would be gained to visitors at their stand.

Forces Command personnel in particular had the opportunity to try the DETTA before it was put into service.

Continuing its activities under the DETTA Project, ONUR exhibited the DETTA's proof of concept application at its stand, which they had developed for the early phases of the project. In the simulation of two platforms, participants examined the DETTA's functions for managing ad-hoc and mesh networks over non-heterogeneous communication media within the scope of network-enabled capability. Thanks to this installation, visitors from foreign navies and the especially Turkish Naval Forces Command personnel were given the opportunity to try the DETTA before it was put into service.

The new generation combat management system, for which development activities for the Turkish Naval Forces Command are continuing and will have network-enabled capability, will be operated on the data communication infrastructure to be created by the DETTA. The system is expected to be far more efficient with the capabilities to be added to network management by the DETTA.

With the DETTA Project, HF and V/UHF radios on ships will gain the IP data transfer feature. Additionally, the DETTA will manage satellite communication systems and new generation broadband communication systems all together, thereby minimising operator response. It will also ensure effective operation of data requirements by ensuring the effective use of the limited resources of data communication. The DETTA will also have the necessary functions to fully meet the needs and requirements of naval forces in relation to cyber security and electronic warfare.

ONUR delivered a presentation at the seminar. Barış Dinç, Leader System Engineer, introduced the company and its competences in the first section of his presentation. In the second section, he provided information on the efforts made under the DETTA Project.

STM is on the Way to Become the Only Address of Naval Platforms

SWith the crucial roles it has recently taken on, STM has become the prime contractor of naval platforms, particularly with regard to the MİLGEM, Pakistan's Auxiliary Oiler Replenishment Ship and Pakistan's AGOSTA 90B Submarine Modernisation project. With its ongoing activities, the company is advancing toward extending this role to new platforms. The focus of the presentations STM gave during the event was submarine and fast patrol boat platforms.

Specific Solutions to Specific Problems of Submarines

In submarines, which are usually isolated from the atmosphere while on missions, the quality of breathable air is adversely affected by the impacts caused by the operation of equipment, as well as respiration and other vital human activities. Since the air cannot be refreshed while under water, the sustainability of life in the submarine is ensured by life support systems. Emre Öztürk, Leader Machinery Systems Design Engineer of Submarines at STM, gave information on these systems. At the end of his presentation, Öztürk underlined that they were ready to cooperate with companies working or wishing to work in this area.

STM's Solution for the Turkish Type Fast Patrol Boat: FAC 55

STM offers FAC 55 design for the Turkish Type Fast Patrol Boat project. In his presentation entitled "High Speed Requirement at Seas", Hakan Altınköprü, R&D Manager at STM, spoke about how this design had matured and its performance during the tests.

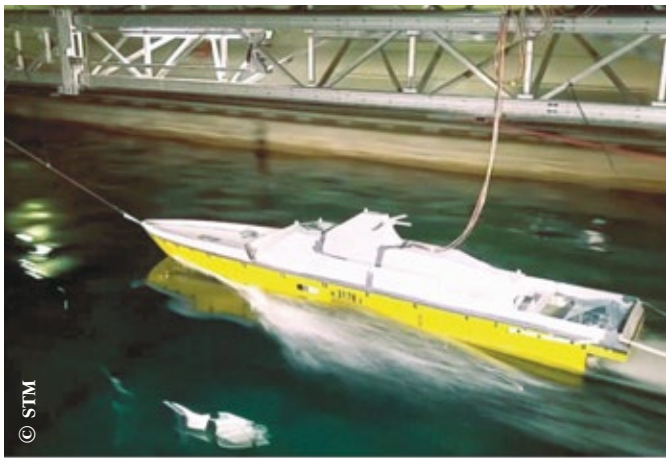
Due to the high speed requirement in the project, STM initially worked on the hull form that would enable this speed. In the meantime, the SES (Surface Effect Ship) design was also addressed. This type of application, in which there is an air cushion between the two hulls in a catamaran design, reduces contact between the ship and the surface of the water to a minimum, thereby enabling high speeds. However, STM did not choose the SES for the following reasons:

- The payload of the hulls is limited due to the limited buoyancy of air cushions, and
- Air cushions need to be replaced frequently due to friction.

STM chose the planing hull form for the FAC 55. Altinköprü stressed that to maintain speed, this hull form was the most appropriate design, particularly under different sea conditions.

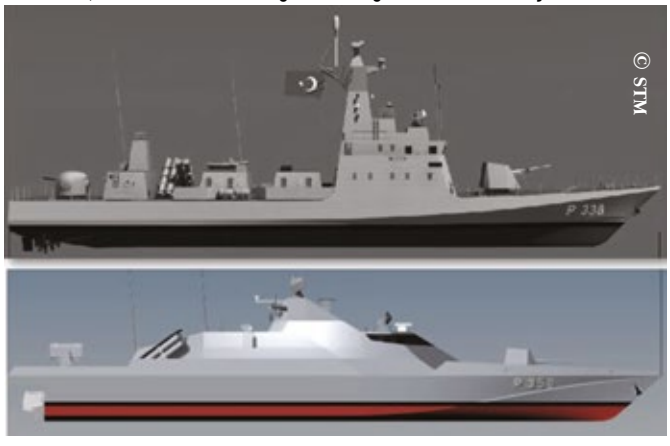
In the pool trials, STM's FAC 55 hull form proved that with current propulsion technologies the boat could reach a speed of 60 knots. The design was tested under high sea conditions, and it was recorded that the boat could reach 55 knots under sea state 3. It was also tested at 30 knots under sea state 5. For the FAC 55, STM chose COGAG propulsion system in which gas turbines can be operated simultaneously.

STM chose to use steel as the construction material. Altınköprü stated that they had chosen to use steel in the hull



In pool tests the FAC 55 could reach a speed of 55 knots under sea state 3.

Unlike the fast patrol boats in the inventory of the Turkish Naval Forces Command, the FAC 55 has a design featuring low radar visibility.



In the fast patrol boat, which has a limited internal volume, STM also worked on the layout of other components that would support the sensors and weapons.

with a view to ensuring better strength and flexibility in the event of crashing onto rocks in the water.

Apart from underwater systems such as sonar and torpedo, the FAC 55 will be able to include the same systems and weapons as a corvette. Within this scope, the design includes a 76-mm bow gun, fire control radar, 3D search radar, IFF system, electronic support system, HF/VHF/UHF communication systems, navigation radar, STAMP, electro-optical sensor, surface-to-surface missile, point air defence system and decoy launchers. In the fast patrol boat, which has a limited internal volume, STM also worked on the layout of other components that would support these sensors and weapons. In his presentation, Altınköprü showed the endeavours they had made regarding the layout of the combat operations centre.

STM completed the analyses such as on the radar cross-section area of the hull.

Brain Storming Concerning Future of Submarines from STM

Delivered by Eray Yalçın, Senior Submarine Design Engineer, the presentation entitled "Feasibility of Transformation from Conventional to e-Submarine", was one of the most eye-catching at the seminar.

Yalçın started his presentation by noting that the expression that described the concept of submarine concisely was "silent and deep", but a diesel generator was noisy, in sharp contrast to this description. In the rest of his presentation, he addressed how the performance of the submarine could be affected if diesel generator was removed.

Yalçın defined the submarine to which power is supplied only from batteries and air-independent propulsion (AIP) as an e-Submarine. To transform a conventional submarine to an e-Submarine, the diesel generator, associated auxiliary systems and fuel tanks are removed from the design. In the design described in the presentation, the weight of these components is approximately 600 tons and the volume occupied is approximately 288 cubic metres.

This free space needs to be used, taking into account the characteristics of the submarine such as weight and buoyancy. This area can also be used for accommodating additional batteries and the AIP. Various technologies with different energy densities are considered in relation to batteries. They affect the costs as well. Considering the costs of the components removed from and of the components added to the submarine:

- The total cost of the e-Submarine is $18 million lower than that of a conventional submarine if lead-acid batteries are used; however, this does not include the cost of the work carried out in relation to the change of design.
- If lithium-ion batteries are used, the e-Submarine costs $25 million higher. This also does not include the cost of the change of design.

The e-Submarine requires a smaller crew because of the components that have been removed, and may have a longer mission time. The effect on its cruising range varies, depending on the batteries used and the AIP (Table 1).

Yalçın listed the subjects that could be addressed more thoroughly in relation to the e-Submarine:

- The e-Submarine, which is examined for how it can be derived from a conventional submarine, can also be addressed as a new design starting from scratch.
- For redundancy, the presence of AIP is important, but AIP can also be removed if battery groups can be rendered independent from each other. The weight loss obtained by removing the AIP is approximately 300 tons.
- The e-Submarine's mission time and range can be extended by solutions such as charging stations installed on the sea bottom, or charging through auxiliary vessels.
- The battery technologies and battery production infrastructure in Turkey should be assessed within the scope of the feasibility study of the e-Submarine.

Table 1. Comparison of Conventional Submarine and e-Submarine

	Conventional Submarine	e-Submarine
Length Overall	~60 m	Same as the conventional
Pressure Hull Diameter	~6.5 m	Same as the conventional
Pressure Hull Len gth	~48 m	Same as the conventional
Height	~14 m	Same as the conventional
Backbone Height	1 m	Same as the conventional
Displacement	1,650 tons	Same as the conventional
Cruise Speed (submerged)	4 knots	Same as the conventional
Maximum Speed (submerged)	19+ knots	Same as the conventional
Propulsion Engine Power	3 MW	Same as the conventional
Nominal-Test Diving Depth	350-420 m	Same as the conventional
Mission Time	30 days	Minimum 18, maximum 80 + 13 days
Personnel	Minimum: 31	Maximum: 28
Cruising Range (Diesel + AIP)	6,000 + 1,250 miles	(AIP @4 knots) 1,250 miles
Cruising Range (Battery @4 knots)	400 miles	Minimum: 1,100 miles; maximum: 4,850 miles
Cruising Range (Battery + AIP @4 knots)	1,650 miles	Minimum: 2,350 miles; maximum: 6,100 miles

From left: Marco Strijker, SMART-L MM Product Manager, Thales, and Lower Half : Rear Admiral Mehmet Sarı, Deputy Director General of Shipyards, Ministry of National Defence. Strijker is describing the company's solutions and capabilities to Rear Admiral Sarı.

Thales SMART-L Keeps Evolving with the MM Variant

During the event, Thales' focus was on introducing the new MM (Multi Mission) variant of the SMART-L radar that features enhanced capabilities thanks to its updated software and hardware. The capabilities of the SMART-L MM and the successes it achieved in tests were shared with the visitors both at the company's stand and in the presentation given by Marco Strijker, SMART-L MM Product Manager.

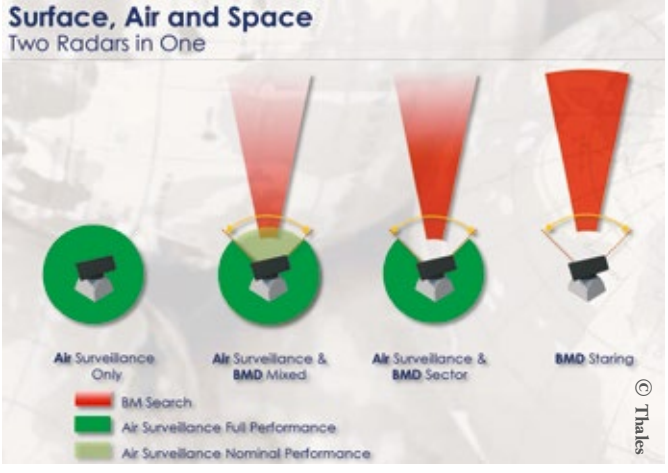
The latest developments regarding the SMART-L MM happened just before the seminar took place. During the tests conducted at NATO's Formidable Shield 2017 exercise, which took place between September 24 and October 18, the land-based SMART-L MM radar at the Thales facilities in Hengelo, the Netherlands, successfully detected and tracked a ballistic missile. The Formidable Shield 2017 exercise was designed to improve the coordination of allied units during an air and ballistic missile defence operation likely to be conducted by NATO.

The SMART-L MM is seen as land deployed at the Thales facilities in the Netherlands.

In the first of these tests, conducted on September 25, a ballistic missile was launched towards the west from the Hebrides region in the north of Scotland. Located 1,000 km south-east of the launching point, SMART-L MM detected the ballistic missile as soon as it appeared over the horizon and locked on to the missile. When the missile reached an altitude of 300 km, it started to descend towards its target. The radar maintained its tracking lock on the missile that was moving away from it for a period of 300 seconds, until the missile descended below the horizon line at a range of 1,800 km from the radar's location. In the related press release, it was stated that the lock on the missile was good enough (i.e. precise enough to ensure guidance for an air defence missile) to enable the launching of an air defence missile from other platforms at different locations as well. When the radar tracking the ballistic missile and the missile used to hit this missile are located on different platforms and at different geographical regions, this is called Launch on Remote (LoR) in the literature.

During the second BM firing, the SMART-L MM in Hengelo again detected and tracked the BM with similar results as the first firing. The SMART-L (ELR) radar mounted on the LCF De Ruyter (F804), a vessel of the Royal Navy of the Netherlands, also detected and locked on the Terrier Oriole ballistic missile, again launched from the Hebrides. The system on board the LCF De Ruyter (F804) was a standard SMART-L that was equipped with the Extended Long Range (ELR) processing as developed for the BMD capability of the new SMART-L MM. Then, the USS Donald Cook (DDG-75), a vessel of the US Navy, launched an SM-3 air defence missile. At the moment of the SM-3 launch the SMART-L track quality was sufficient for Launch on Remote (LoR)using the data received from the SMART L-(ELR). The terminal guidance of the air defence missile was provided by the USS Donald Cook's own radar.

The SMART-L MM offers its users the capability to carry out air surveillance 360 degrees with a single radar, and the capability to detect ballistic missiles at ranges of up to 2,000 kilometres.



The latest news about the SMART-L MM was the delivery of the first radar to the Royal Navy of the Netherlands on November 28.

SMART-L MM for Coverage from Surface to Space

Designed for a multi-mission role, the SMART-L MM offers ballistic missile detection and air surveillance capability in the battlefield ranging from surface to space, through a single radar platform. With a single search mode, the radar is capable of detecting air-breathing targets, such as aircraft or cruise missiles at a short range, as well as ballistic missiles and satellites outside the atmosphere. Offering these capabilities in a variety of ways, the radar has four main operating modes:

1- **Air Surveillance Only:** In this mode, the radar can search an area of 360 degrees and track aircraft-like targets within a range of 480 kilometres.
2- **Air Surveillance and Ballistic Missile Defence Mixed:** In this mode, the radar can carry out air surveillance again in an area of 360 degrees and detect ballistic missiles within a specific sector. While operating in this mode, the radar can detect the ballistic missiles in the related BM search sector up to a range of 2000 kilometres In and around this sector, air surveillance is carried out up to 480 km but with reduced sensitivity compared to the Air Surveillance Only mode.
3- **Air Surveillance and Ballistic Missile Defence sector:** The only difference between this mode and the previous one is that, when air surveillance capability is not applied in and around the BM Search sector, the detectability of ballistic missiles in the BM Search sector is improved.
4- **Staring mode:** In times when the possible direction of ballistic missile threat can be predicted and air surveillance is not required, the radar can be set to this mode. By focusing on the direction of the threat, the detectability of ballistic missiles in the BM Search sector is improved even more. With the long detection ranges, even a limited sector covers a large potential missile launch area.

The radar also does not require a cue for the initial detection of ballistic missiles. Furthermore, when the radar is in any of these ballistic missile detection modes, it can also detect satellites with a speed of up to 7.5 kilometre per second (in other words of up to 22 Mach).

Another feature of the radar is its scalability. While there are 28 antenna panels arranged in a 7x4 configuration in the SMART-L MM variant of the radar, there are 12 antenna panels arranged as 3x4 in the SMART-L Mk2 variant. The Mk2 radar can be used against surface targets and for air defence purposes, whereas the MM radar can also detect ballistic missiles and satellites outside the atmosphere. In addition, if need be, the Mk2 radars, which can be purchased at a lower initial cost, can be upgraded by adding 16 more antenna panels and making the necessary software updates.

The firing test conducted on September 25 during the Formidable Shield 2017 ballistic missile defence exercise, displayed the ballistic missile detection and tracking capability of the SMART-L MM radar. The radar based in the Netherlands detected the missile fired from a range of 1,000 km as soon as it appeared over the horizon, and maintained a stable track until the missile descended below the horizon at a range of 1,800 km. In the presentation given at the seminar on behalf of Thales, a visual designed to show the firing test was used.

YALTES Digitalises the Combat System Video Network

YALTES came to the seminar celebrating the 15th anniversary of its establishment. The company keeps its products that serve successfully in world's seas up-to date in line with technological developments and in this manner, its agenda at the seminar was about the digital version of its solution called Combat System Video Network (CSVN). Orhan Barış, System Engineering Manager at YALTES, delivered a presentation on the new generation CSVN.

CSVN system basically ensures display, recording and distribution of video-type data to the necessary locations within the ship. Within the authorisation defined on the ship, users can watch the screen images of operator consoles and the videos coming from electro-optical receivers, weapon systems and closed circuit television camera system of the ship on the operator consoles or other defined screens.

The analogue version of the CSVN is operated successfully on eight GABYA class frigates modernised under the GENESİS project, first two ships of the MİLGEM project and the two ships constructed under the LST project. YALTES developed the renewed version of this system that is fully digitalised, IP-based and has a distributed

Mehmet Yenen, Strategy Advisor at YALTES, informed Alper Köse, Head of the Naval Platforms Department at SSM, about the solutions offered by YALTES.

YALTES executives were given the opportunity to speak about their solutions with Vice Admiral Adnan Özbal, Commander of the Turkish Naval Forces, Prof. Dr. İsmail Demir, Undersecretary for Defence Industries, and Rear Admiral (Upper Half) Ahmet Çakır, Naval Technical Commander at the Turkish Naval Forces Command.

Block diagram of the new generation CSVN

architecture. The opinions and feedback received from the field, the Research Centre Command and HAVELSAN were also taken into account in creating the digital version. Thus, the system has become more capable of meeting developing needs. The digital version of the CSVN will be integrated to the third and fourth ships of the MİLGEM project and to ANADOLU, constructed under the Multi-Purpose Amphibious Assault Ship project. A comparison of the two versions is given in Table 1.

Apart from the elimination of various restrictions, such as the number of defined operators, display and recording points, the major advantages of the second generation CSVN over the analogue system are that it has a distributed architecture and is modular and software-based. These features will ensure that the second generation CSVN will be easily adapted to the systems that may be added to the ship through modernisation in the future. Furthermore, the live and recorded images on the system can be transmitted not only to the operator consoles, but also to different screens such as the touchscreens in the commanding officer cabin or execute officer cabin. Even another personnel, assigned as an administrator, can add new cameras and remove existing ones from the system. Thanks to its scalable structure, the system does not experience any capacity problem when new video sources are added. Since commercial codecs are used in the system, it is easier to classify and filter recorded videos afterwards or export them to other systems for training purposes. ◆

Table 1. Comparison of the First and Second Generations of the CSVN

	First Generation (Analogue) System	Second Generation (Digital) System
Number of users authorised to record and display video	Limited	Unlimited
Number of recording consoles	Limited	Unlimited
Number of screens on which recorded images can be displayed	Limited	Unlimited
Capability to display live images	No	Yes
Scalable structure	No	Yes
System architecture	Centralised, static and hardware-based	Distributed, modular software-based

"The only sustainable competitive advantage is learning faster than the competition"
Arie de Geus

MRTP

A Turkish Concept,
A World Technology Leader
To Protect The Peace And The People

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