As the Turkish Naval Force (TNF) updates its fleet with new domestically built frigates, corvettes, patrol craft, landing ships, and submarines, the country’s shipbuilding industry is undergoing a radical transformation (see figure 1). For the first time, Turkish yards are being tasked with building highly sophisticated, modern warships in numbers. As domestic naval construction capabilities ramp up to the anticipated TF-2000 Air Defence Frigate, industry will have to provide designers, engineers, and skilled workers in the highly complex systems integration and construction techniques necessitated by the advanced designs scheduled to enter the fleet during the next 15 years.

ENTHUSIASM FLOATS...

The TNF will be one of the best-equipped sea services in the Middle East North Africa (MENA) region. Technological and capability gaps are being filled by new acquisitions. During the Cold War years of the 20th Century, Turkey was a key ally in the NATO southeastern strategy of bottling up the Russian Navy within the Black Sea. No longer facing an imminent threat to the nation’s maritime interests, now Turkey expands its horizon to act regionally and as a NATO member to the Black Sea Force (BLACKSEAFOR) in addition to broader missions in the Eastern Mediterranean and Aegean Seas (see figure 2).

The TNF modernisation programmes and procurement strategies will help the service maintain its status as a regional power and as Europe’s third largest Navy.

Additionally, the TNF will seek greater self-sufficiency by investing on technology transfer via the Turkish Undersecretariat for Defence Industries (SSM – Savunma Sanayii Mıstesharlığı) local content/offset policies. Over the next two decades, Turkey can be expected to import less defence-related equipment, while equipping the sea services from more domestic sources. Turkey operates a myriad of shipyards that can or will be called upon to build various sized naval and coast guard vessels up to and including large combatants, patrol boats, amphibious, and auxiliary vessels. As domestic naval shipbuilding programmes advance, Turkey can be expected to increase marketing of these platforms and naval systems to blossoming MENA and Central Asian sea services.

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OVER NAVAL CONSTRUCTION PROGRAMMES

Type 214TN Submarine: On 22 July 2008, Germany’s Type 214 submarine developed by ThyssenKrupp Marine Systems’ Howaldtswerke-Deutsche Werft GmbH (HDW) was selected as the preferred supplier over DCNS and NAVANTIA for a programme to jointly build and supply six air-independent propulsion (AIP) submarines to follow the Type 209/1400 ("Preveza" class) diesel-electric submarine (see figure 3). After intense cost negotiation, a construction contract was in place by July 2009. However, work was delayed until January 2011 when the Undersecretariat for Foreign Trade attained a US$2.7Bn loan with Germany’s Bayerische Bank and the former WestLB Bank of the UK enabling the construction project to move forward.

The construction programme involves six material packages HDW will assemble for delivery to the Gölcük Naval Shipyard near Istanbul for integration and completion. Propulsion and combat system components will be provided by companies that supported previous Turkish submarine construction programmes, including ATLAS Elektronik, L-3 KEO, Siemens, THALES, and Tognum MTU. Each boat is estimated to cost approximately US$450M, or US$2.7B for the entire procurement of six units to be completed by 2023, with one hull commissioning per year after 2017.

The Type 214TN submarines will have an AIP capability and combine many of the proven features of diesel-electric submarines with some advanced features. The class will have partial double hulls composed of high-strength, highly elastic, amagnetic steel, permitting a diving depth of over 400m. The hull shape is optimised to improve hydrodynamic and stealth characteristics and a low-noise propeller to decrease the submarine’s acoustic signature. The boats will be equipped with the ATLAS Elektronik ISUS-90 integrated underwater C2 system. It is estimated that the next generation of submarines to be built completely in-country these submarines will be the final class for which Turkish yards require foreign assistance to build. It is anticipated the Gölcük Naval Shipyard will be well positioned to produce the Type 214TN and other submarine designs upon completion of the current six-boat order.

Submarine Rescue Ship (MOSHIP): The TNF has a parallel requirement for a submarine and rescue ship. With the expansion of the submarine force, the TNF began planning for a modern MOSHIP in early 2006 when a Request for Information (RFI) was released to private Turkish shipyards. By 2008, a Request for Proposal (RFP) was issued with four private shipyards responding, including RMK Marine Shipyard, Dea Russian Shipyard, Istanbul Shipyard, and Desan Shipyard.

In early 2010, the SSM selected Istanbul Shipyard as preferred supplier for the MOSHIP programme. Negotiations concluded on 28 October 2011 with the signing of a construction contract. Based on the SNR-MOSHIP design, the MOSHIP design developed by Istanbul Shipyard is estimated to be 91m in length with a 4,000 tons displacement (see figure 4). The new
Fig. 2: According to Turkish strategists, the creation of new countries in the Black Sea area, following the end of the Cold War, has imposed new missions on the Turkish Navy. Best suited for any of these tasks, the "Tufan" class (KILIC II-type) missile FAC (Fr. Lürssen Werft FPB 57-052 Mod) are suitable for operating in the open seas and under extreme weather conditions, with the ability to cruise at speeds of up to 24 knots (44kmlh) in estimated to cost US$100M and is expected to join the fleet in 2013. These hulls were built at Istanbul Naval Shipyard. As the Defence Industry Executive Committee (SSIK - Savunma Sanayii Icra Komitesi) decision was announced on 3 January 2013, contract negotiations for the six corvettes (from third to eighth MILGEM ships) commenced between SSM and the RMK Marine Shipyard. A total of 12 MILGEM vessels are planned at the moment. For an in-depth review of the MILGEM corvette TCG "Heybeliada" see this issue of NAVAL FORCES, pp. 99-101.

MILGEM Corvette: Turkey's indigenous MILGEM corvette programme continues to move forward. Commissioned in 2011, TCG "Heybeliada" (F 511), the first unit built is now being extensively tested and sea tested (see again figure 1). A second hull, TCG "Buyukada" (F 512), launched in 2010, is expected to join the fleet in 2013. These hulls were built at Istanbul Naval Shipyard. As the Defence Industry Executive Committee (SSIK - Savunma Sanayii Icra Komitesi) decision was announced on 3 January 2013, contract negotiations for the six corvettes (from third to eighth MILGEM ships) commenced between SSM and the RMK Marine Shipyard. A total of 12 MILGEM vessels are planned at the moment. For an in-depth review of the MILGEM corvette TCG "Heybeliada" see this issue of NAVAL FORCES, pp. 99-101.

MILGEM Frigate: Although not a funded programme of record, the next large TNF project, the TF-100 frigate, is envisioned as a larger MILGEM corvette variant, eventually replacing the four "Yavuz" class MEKO 200T frigates in service since the 1980s. Sources close to the discussions indicate the TF-100 may be fitted with a Lockheed Martin Mk41 vertical launch system (VL-ASROC). These systems will give the TF-100 the advanced AAW and ASW capabilities which the MILGEM corvette design is lacking.

The TF-100 will act as a gap filler between the MILGEM corvette and the TF-2000 as the air-defence frigate programme is slipping to the right from an original 2015 start date, now expected by 2020 or later (see figure 5). To date, two teams have formed to provide the system capabilities for the TF-2000 programme, with Lockheed Martin/Havelsan offering AEGIS/SPY-1 and THALES Nederland/ASELSAN developing a CAFRAD phased array radar based on APAR MFR system.

Should the Turkish government truncate the MILGEM programme at eight units, a very limited timeframe will be available to initiate the TF-100 programme without any gap in surface combatant production, meaning initial TF-100 could begin construction as early as 2015. The four-unit class would be complete prior to construction starting on the TF-2000 from about 2020.

Yet, this represents a 'best-case scenario' and ambitious production schedule. Despite the wider range of builder choices for the ship, the transition of naval surface combatant construction (starting with MILGEM) to designated commercial yards will not be accomplished easily. The TF-2000 will be the most sophisticated warship ever built in Turkey, and its projected AAW suite, centred on either AEGIS or CAFRAD, represents a big technological leap forward, and with associated programme schedule risk. If newly developed, the domestic AAW suite would be considered for TF-2000 rather than a mature system. Then, local naval industry will have tremendous challenge to build, test, and deliver the first TF-2000 frigate.

Currently, the TNF is committed to acquiring four TF-2000 frigates. It appears, the programme hinges on the success of the MILGEM corvette. The SSM will continue as planned with six follow-on corvettes at RMK Marine Shipyard and establish a project model for design, construction, integration, tests, and final performance in order to successively manage the...
The Turkish Shipbuilding Industry 2013

Active Naval Shipyards

Istanbul Naval Shipyard: Primarily specialised in naval shipbuilding and repair (frigates, corvettes, amphibious ships, patrol vessels, minehunting vessels, mine countermeasures vessels), with the yard recently completing the initial two MILGEM corvettes; the yard may be selected for the construction of TF-2000 AAW frigates.

Gölcük Naval Shipyard: Located at the Gölcük Naval Base, the yard is the sole site for submarine support and domestic submarine construction. The yard has a floating dock with a lifting capacity of 7,500 tons and can build vessels up to 30,000 tons, including frigates, FAC, patrol vessels, and landing craft.

Izmir Naval Shipyard: As a component of the TNF Command, the yard is equipped with docking facilities for vessels up to 4,500 tons and pier side support facilities, serving as the repair facility for the TNF.

Active Commercial Shipyards Capable of Naval Construction

RMK Marine Shipyard: Ship construction and repair, selected to build remainder of the “Ada” class

Dearsan Shipyard: Currently building New Type Patrol Boats (NTPB)

Istanbul Denizcilik Shipyard: Ship construction and repair, contracted to build the single submarine rescue ship (SNR-MOSHIP) and two rescue & towing ships (SNR-RATSHIP)

Celik Tekne Shipyard: Ship construction

ADIK Shipyard: Ship construction of eight 80m LCT and two LST

Desan Shipyard: Ship construction

SEDEF Gemi İnşaatı A.Ş.: Ship construction and repair

Yonca-Oenik J.V: Construction of small- and medium-size vessels and repair services

Naval Defence Equipment Manufacturers

Similar to indigenisation of the shipbuilding industry, over the past decade, Turkey has made great strides in developing its system houses through joint ventures, technology transfer, and offset agreements.

Aselsan: External and internal communications, radars, EW systems, EO/IR sensors, acoustic countermeasure systems, gun fire control systems, gun control systems

Ayesas: System integration, surface ships and submarine multi-function consoles

C2Tech: Satcom X-band EPM modern, radar simulators

Elektroland: Unmanned systems

GATE Elektronik: ROV

Havelsan: Weapon and electronic system integration, GENESIS-based C2 systems for “Perry” class and MILGEM frigates, surface ship and submarine data distribution systems, simulation and training systems

KOC Savunma: Underwater acoustics

Meteksan Savunma: Underwater acoustics, sonar systems, simulators

Milsoft: Link 11/16/22, C2, simulation and modelling

Roketsan: Underwater weapons

Savronik: Marine systems integration, data links

SELEX Komünikasyon A.Ş.: External and internal communications

STM: Naval design/engineering and support

Tubitak BILGEM: Cryptographic products

Tubitak MAM: Underwater acoustics

Yaltes: System integration, multi-function consoles, Integrated Bridge Control

For additional information on the Turkish Navy see “World Defence Almanac 2012”, Pages 206-208.
The TF-2000 is envisaged to satisfy the TNF requirement for an area air-defence capability with a complex AAW capability and CMS suite. (Graphic: Courtesy of M. Celik)

Melara 40mm/70 twin guns and two 12.7mm machine guns. Up to 1,200 tons of cargo and 350 troops can be carried. Ship-to-shore transfer is facilitated by one medium-size helicopter, four vehicle/personnel landing craft (LCVP), and four melexfletes. Each LST is estimated to cost approximately US$400M.

Amphibious Transport Dock (LPD): Construction of an LPD may prove to be among the most challenging programmes shipbuilders undertake. Two design options are on the table, one from the NAVANTIA/SEDEF Gemi Inşaat A.Ş. team, the second from RMK/BMT. The TNF has long-standing interest in a carrier-based offensive capability; it is possible the selected design may accommodate the requirement as the sea service looks toward eventual acquisi-

The T-2000's Missile Issue

The long-delayed TF-2000 project envisions the frigate as a regional AAW vessel that would respond to airborne threats and also provide support functions such as C4I and early warning (see figure 6). The ship would be bigger, heavier, and more efficient in terms of combat capacity than the vessels the TNF has today. The SSM has come close to formally selecting Lockheed Martin, but it needs to hear the TNF's decision on the choice of missile systems, which is the most critical part of the project.

Selecting Lockheed Martin's SM-2 missile system would simplify everything, as it is not a heavy weapon system. The other option, the longer range SM-3 missile system, would mean more negotiations on many aspects, including missile integration. While Lockheed Martin proposes its passive AN/SPY I phased array radar (forming part of the AEGIS combat system), Aselsan has started working on the smaller CAFRAD Multifunctional Phased Array Radar. The TNF may be in favour of the latter to be inserted into AN/SPY I, with the AEGIS combat system replaced by GENESIS, a development of Havelsan. This combination could then be integrated with the SM-3 missile system. (Stefan Nitschke)

Fig. 5: The TF-2000 is envisioned to satisfy the TNF requirement for an area air-defence capability with a complex AAW capability and CMS suite. (Graphic: Courtesy of M. Celik)

Fig. 6: Concept of a 6,000 tons full displacement TF-2000 AAW frigate design, indicating its inherent capability to carry the latest weapon systems for AAW, ASuW, and ASW, including the Standard Missile family of vertical launch anti-air effectors. (Graphic: Mönch Archive)
tion of a conventional aircraft carrier. A small-deck short take-off and vertical landing (STOVL) platform, similar to those in service with the Spanish, Italian, and Thai Navies may be considered. The design selection for the LPD will largely determine whether the TNF will require a second programme based on a new or modified hull to support fixed-wing aviation. AMI anticipates the concept will achieve programme status by 2020. A preferred LPD supplier selection was expected by mid-2012, however; this date has slipped, a construction contract is expected in 2013. The LPD project, like all Turkish naval procurement programmes, emphasises technology transfer and the development of indigenous design and construction. The single unit is estimated to cost US$500M.

The LPD will be a large monohull with a well dock aft. The ship will be able to conduct unlimited amphibious operations in conditions up to S5S and unlimited helicopter operations. It will also have a full-length flight deck with four landing spots and a hangar for up to four helicopters (see figure 8). The LPD will be capable of operating and storing up to seven UAVs/UAS. The programme also includes the acquisition of four Landing Craft Medium (LCM), 27 Amphibious Assault Vehicles (AAV), two Landing Craft Personnel Vehicles (LCVP), one command boat, and one RHIB.
**Fleet Replenishment Ship:** ISNY is responsible for the design and STM signed a contract to support design phase. With initial design studies and programme management plan are now complete, a TNF requirement for an AOR to support sustained at-sea operations is one step closer to becoming a reality. The release of an RFP for a single AOR is expected in 2013, with responses due in 2014. AMI believes that Istanbul Naval Shipyard, which has developed a new replenishment and logistics tanker design (SNR-FRT19800) to meet the needs of the TNF requirement, will likely be the builder. Initial studies for the acquisition of a Future Logistics Support Ship (LLS) have also commenced, although the SSM does not list this as an active programme.

**Logistic Support Ship:** Two such ships will be constructed at a private shipyard. The selected yard will be the main contractor responsible for the design, construction, integration, tests, and final performance. A RFP is expected in 2015.

**EMERGING PROJECTS**

In early May 2012, AMI received information concerning three new TNF projects that have just started feasibility studies in 2012.

**Indigenous Minesweeper:** The “Aydin” class is based on the German “Frankenthal” class, with one unit built by Abeking & Rasmussen and Fr. Lürssen Werft in Germany and the last five at Istanbul Naval Shipyard. The TNF will follow the “Aydin” class with a new Turkish design expected to be similar in characteristics (amagnetic steel hulls) and capability. A design for the new class is expected by 2016, with construction beginning in 2017 and Istanbul Naval Shipyard the expected builder.

**Turkish Type FAC:** Designed and built locally, this acquisition will consist of 10 units to replace eight “Kartal” and 10 “Dogan” class missile FAC, the latter representing Fr. Lürssen’s FPB57 design. The TNF completed nine units of the “Kiliç III” classes at Istanbul Naval Shipyard, with only the first unit being built at Fr. Lürssen Werft. Feasibility studies could be completed by 2015, with a final Turkish design as early as 2017 and a construction contract in place by 2018.

**Collection and Surveillance Ship:** A single unit has been discussed and may be constructed at Istanbul Naval Shipyard with possible design and construction assistance from a foreign builder.