

# DEFENCE TURKEY

**AN EXCLUSIVE INTERVIEW WITH  
BOSNIA AND HERZEGOVINA  
DEPUTY OF MINISTER OF DEFENSE  
FOR RESOURCE MANAGEMENT  
MR. MIRKO OKOLIĆ**



**ATMACA ASCM  
BOOSTS THE SUB-STRATEGIC  
NAVAL STRIKE CAPABILITY OF  
THE TURKISH NAVAL FORCES**

**POWER BALANCE  
HOW WOULD THE REİS-CLASS  
SUBMARINES AFFECT THE  
EAST-MED & THE AEGEAN SEA?**

**AN OVERVIEW ABOUT  
THE HMS QUEEN  
ELIZABETH CLASS  
CARRIERS**

**NUROL TEKNOLOJİ  
NATIONAL ARMOR SOLUTIONS  
WITH NATIONAL BALLISTIC  
CERAMICS**

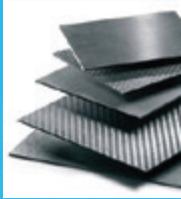


# MERSEN WORLDWIDE SPECIALIST IN MATERIALS SOLUTIONS

Expertise, Performance and Innovation



Iso and Extruded Graphite



C/C Composites



Insulation Board



Flexible Graphite



SinteredSiC

**Material Enhancement**

- Densification
- Impregnation
- Purification
- Coatings

**Solutions  
for your needs**



**Engineering  
and precise  
machining**



Rocket Nozzles



Ceramic Armour



Semiconductor



C/C Carrier



Hot Pres Mold



SiC Mirror

GOSB Ihsan Dede Caddesi 900 Sokak  
41480 Gebze-Kocaeli/TURKEY

T+90 262 7510262 F+90 262 7510268

[www.mersen.com](http://www.mersen.com)

[sales.istanbul@mersen.com](mailto:sales.istanbul@mersen.com)

**MERSEN**  
Expertise, our source of energy

aselsan  
sivas



# Tabanca Refleks Nişangah

## Pistol Reflex Sight

Tabanca Refleks Nişangahı, refleks nişangah optiği üzerindeki kırmızı noktayı hedefe hizalayarak daha hızlı nişan alma ve atış imkanı sağlayan bir üründür.

Pistol Reflex Sight is a product that provides faster aiming and shooting by aligning the red dot on the reflex sight optics to the target.

Source of Light	: LED	Environmental Conditions	
Magnification	: 1X	Operating Temperature	: -40°C / +55°C
Optical Coating	: Anti-Reflection Coating	Storage Temperature	: -40°C / +70°C
Lens Type	: Polycarbonate or Glass	Environmental Conditions Standard	: MIL-STD-810 H
Battery	: CR2032		
Brightness Adjustment	: Yes		
Housing Material	: Aluminum		
Weight	: 35 gr		
Size	: 42x25x23 mm		

- The red dot size <math>< 3 \text{ MOA}</math>
- Adjustable Brightness Level
- Light Weight
- Azimuth / Elavation  
1 Click / 1 MOA
- Waterproof for 30 minutes  
at a depth of 1 meter
- Motion Sensor

aselsan  
sivas

Aselsan Hassas Optik A.Ş. [www.aho.com.tr](http://www.aho.com.tr)



**Yayıncı / Publisher**  
Hatice Ayşe EVERS

**Genel Yayın Yönetmeni / Editor in Chief**  
Hatice Ayşe EVERS (AKALIN)  
a.akalin@defence-turkey.com

**Şef Editör / Managing Editor**  
Cem AKALIN  
cem.akalin@defence-turkey.com

**Uluslararası İlişkiler Direktörü / International Relations Director**  
Şebnem AKALIN  
sebnem.akalin@defence-turkey.com

**Kıdemli Editör / Senior Editor**  
İbrahim SÜNNETÇİ  
ibrahim.sunnetci@defence-turkey.com

**İdari İşler Koordinatörü / Administrative Coordinator**  
Yeşim BİLGİNOĞLU YÖRÜK  
y.bilginoglu@defence-turkey.com

**Muhabir / Correspondent**  
Saffet UYANIK  
saffet.uyanik@defence-turkey.com

**Çeviri / Translation**  
Tanyel AKMAN  
info@defence-turkey.com

**Redaksiyon / Proof Reading**  
Mona Melleberg YÜKSELTÜRK

**Grafik & Tasarım / Graphics & Design**  
Gülsemin BOLAT  
Görkem ELMAS  
info@defence-turkey.com

**Fotoğrafçı / Photographer**  
Sinan Niyazi KUTSAL

**Yazarlar / Authors**  
Cem DOĞUT  
Cem Devrim YAYLALI  
Feridun TAŞDAN

**Yayın Danışma Kurulu / Advisory Board**  
(R) Major General Fahir ALTAN  
(R) Navy Captain Zafer BETONER  
Prof.Dr. Nafiz ALEMDAROĞLU  
Cem KOÇ  
Asst. Prof. Dr. Altan ÖZKİL  
Kaya YAZGAN  
Ali KALIPCI  
Zeynep KAREL

**DEFENCE TURKEY**  
İdari Ofis / Administrative Office  
DT Medya LTD.STİ  
Güneypark Kümeevleri (Sinpaş Altınoran)  
Kule 3 No:142  
Çankaya Ankara / Turkey  
Tel: +90 (312) 557 90 20  
info@defenceturkey.com  
www.defenceturkey.com

**Basımevi / Printing House**  
Demir Ofis Kirtasiye  
Perpa Ticaret Merkezi B Blok  
Kat:8 No:936 Şişli / İstanbul  
Tel: +90 212 222 26 36  
demirofiskirtasiye@hotmail.com  
www.demirofiskirtasiye.com

**Basım Tarihi**  
Şubat/Mart 2021

**Yayın Türü**  
Süreli

DT Medya LTD. ŞTİ.  
© All rights reserved.  
No part of publication may be reproduced by any means without written permission.

**ATMACA**  
Anti-ship Missile

**ATMACA ASCM Boosts the Sub-Strategic Naval Strike Capability of the Turkish Naval Forces**

6

**How would the REİS-Class Submarines Affect the Power Balance the East-Med and the Aegean Sea?**

30

**Coşkunöz Holding leads the way with state-of-the-art indigenous technology in key industries**

38

**Nurul Teknoloji: "We Produce National Armor Solutions with National Ballistic Ceramics"**

20

**"The process of Reform & Transformation Requires Constant Adaptation to New Situations and Circumstances"**

26

**Turkey Unveils 10-Year National Space Program**

46





48

**COVID-19**

The Turkish Defense and Aerospace Industry's 2020 Export Performance Despite the Substantial Decline in Figures due to COVID-19, Recent Figures Look Promising



72

**HÜRJET New Generation AJT's CDR Phase Completed**



64

**HMS Queen Elizabeth Class Carriers**



78

**VICTA Will Start Sea Trials in August 2021!**



66

**Initial Training For Combat Readiness Turkish Air Force Pilot Training Program**



92

**SAHA Istanbul, Thrives in Continued Growth with Participation of New Companies**





# Turkish Defense & Aerospace Industry Maintains Upward Trend in Exports with the Sales of Indigenous Defense Products

Ayşe AKALIN

Publisher & Editor in Chief



During the last decade Turkey has turned out to be a significant manufacturer of state-of-the-art, NATO-standard compliant and cost-effective systems and equipment in the defense industry. Making its presence felt in the fields of land, air and naval platforms, as well as in defense electronics (including combat management systems) and weapon systems the Turkish Defense & Aerospace Industry is steadily increasing its efforts to become self-sufficient. According to current estimations, the local content ratio reached 70% in 2020.

To celebrate its 36th anniversary in November 2021, the Presidency of Turkish Defense Industries (SSB), the procurement authority under the Turkish Presidency, is now (as of March 2021) managing over 750 defense and security programs valued at over US\$60 Billion (According to President Recep Tayyip ERDOĞAN with the addition of on-going high-value projects the volume of the program has reached US\$75 Billion) in land, air, space, sea, electronics and weapon systems areas for the Turkish Armed Forces (TAF), SGD (Turkish National Police), National Intelligence Organization (MIT), and other Governmental Organizations, including but not limited to, the General Directorate of Forestry and General Directorate of Mineral Research and Exploration (MTA). In 2008 the SSB was managing some 194 projects valued at US\$19 Billion with a local content rate of 44%.

Exporting its defense products to over 140 countries around the world Turkey is targeting to become one of the top six countries in the world in terms of defense and aerospace exports. According to the "Strategic Plan 2019-2023" document issued by the SSB on December 4, 2019, Turkish Defense and Aerospace Sector's annual turnover will rise to US\$26.9 Billion, from US\$8.761 Billion in 2018, in defense and aerospace (both military and commercial) exports to US\$10.2 Billion and the local content

rate in defence and aerospace projects will reach to 75% by the end of 2023, the year that will mark the first centennial of the Republic of Turkey.

Having closed 2020 with a 16.8% drop in exports of defense and aerospace products compared to 2019, the Turkish Defense and Aerospace Industry has managed to begin 2021 with a considerable increase in exports (3.7% in January, a 34.1% increase in February and a 74.6% increase in March) compared to the same period of the previous year despite the negative effects of the COVID-19 pandemic. According to Turkish Exporters Assembly (TIM) data, the Turkish Defense and Aerospace Industry exported approximately US\$2.740.144 Billion in 2019 (this represents a 34.6% increase compared to 2018) and US\$2,279.027 Billion for the year based on data from January 1 - December 31, 2020. On February 9, 2021 Industry and Technology Minister Mustafa VARANK disclosed that Turkish Defense & Aerospace Industry achieved turnover results of over US\$11 Billion and 30% of this figure was obtained through exports. In the Presidential Annual Program of 2021, prepared by the Turkish Presidency, Presidency of Strategy and Budget and published in the Official Gazette on October 27, 2020, the export volume was projected as US\$6.2 Billion and turnover as US\$19.7 Billion for 2021. According to TIM data during first three months of 2021 the Turkish Defense and Aerospace Industry exported \$647.319 Million USD worth of defense and aerospace products, which represents a 34.2% increase compared to the same period in 2020. According to President of Turkish Defense Industries İsmail DEMİR, Turkey's defense and aerospace exports have increased 30% during last 5 years, while the imports in defense and aerospace have decreased 60% during last 5 years.

In a bid to start developing its own/indigenous designs, which is a direct result of country's heavy investment

in the defense & aerospace industry over last decade, the Turkish Defense and Aerospace Sector has started to promote and export its NATO-standard compliant, state-of-the-art products at a more competitive price than the standard market prices, and more importantly, the Turkish Defense and Aerospace Sectors is capable of offering technology transfer and local production options, and this is a key factor as many of the world's major players are not flexible enough to easily meet these requirements.

Today, Turkey is developing and producing a wide variety of systems, including the 5th Generation fighter jet TF-X, Advanced Jet Trainer & Light Attack Aircraft HÜRJeT, 10-Ton Class (with 12,000kg MTOW and around a 1,500kg payload) national heavy combat helicopter T129 Mk-II (ATAK-II), 6-Ton Class Light Utility Helicopter T625 GOKBEY, 6-Ton Class Light Attack Helicopter T629, AIP powered National Submarine (MILDEN), National 3+ Generation MBT ALTAY, short medium and long-range air defense missile systems (HISAR-A, HISAR-O, HISAR-RF and HISAR-U/SIPER) and 533mm National Heavy Weight Torpedo AKYA, MALE and Tactical Class UAVs in both Reconnaissance and Armed versions (ANKA, ANKA-S, BAYRAKTAR TB2, TB3 and KARAYEL-SU), Self Propelled Howitzers FIRTINA-I and FIRTINA-II, IIR+ Data Link Guided Long Range Anti-Tank Missile MIZRAK-U/UMTAS, Semi Active Laser Guided Laser UMTAS/MIZRAK-L and the Medium Range Anti-Tank Missile MIZRAK-O/OMTAS, Semi Active Laser Guided Missile CIRIT, Tactical Ballistic Missile BORA (export version named as KHAN), new generation air launched cruise missiles SOM-A/B and SOM-J (F-16s will be equipped with the SOM-J missile), RF guided ATMACA Block-I and IIR guided ATMACA Block-II Long Range Anti-ship and Land Attack Cruise Missiles, IIR guided Medium Range Anti-Ship Missile (OMGF), GEZGIN Sea & Land Based National Cruise

Missile, GOKTURK-II and IMECE EO Earth Observation Satellites, TURKSAT-6A Communication Satellite, Simulation Systems, and the National Infantry Rifles (such as 7.62mm MPT-76 and 5.56mm MPT-55) and Machine Guns (such as 7.62mm PMT-76/57A). These are some of the products developed indigenously in recent years and which are already entering the service of the Turkish Armed and Security Forces.

It should be noted that whatever the Turkish Defense & Aerospace Industry has produced for the Turkish Armed and Security Forces, Turkey has been able to sell internationally in the global defense industry market.

The Final live firing tests the ATMACA Anti-Ship Cruise Missile (ASCM), before its entry into service in 2021 Q2 were successfully performed on February 3-4, 2021 from ADA Class Corvette TCG Kinaliada off the coast of Sinop in the Black Sea region. You can read a comprehensive article with full details about these firings and a comprehensive analysis about the ATMACA Program and informative exclusive articles about naval, aerospace, land topics as well.

I would like to thank, Mr. Selim BAYBAŞ, -General Manager of Nurol Teknoloji, Mr. Erdem ACAY- CEO of Coskunöz Holding and Mr. İlhami KELEŞ, General Secretary of SAHA Istanbul for their valued contributions with their interviews.

We hope you enjoy this issue, it's full of new content and recent industry updates.

Enjoy it... ■



# ATMACA ASCM

## Boosts the Sub-Strategic Naval Strike Capability of the Turkish Naval Forces

*Final Test Fires Successfully Performed Before Its Planned Entry Into Service in 2021 Q2*

Under the ATMACA Surface-to-Surface Guided Missile Project, which was launched on May 8, 2009 to meet Turkish Naval Forces Command (TNFC)'s requirement for a new generation anti-ship cruise missile (ASCM) with land attack capability through national means and capabilities the last two guided test-firings of the ATMACA missile from the TCG Kinaliada Corvette with a telemetry system and a live warhead was successfully conducted on February 3-4, 2021, off the coast of Sinop in the Black Sea region before its planned delivery in 2021 Q2. These launches were also recorded as the 2nd and 3rd guided test-firings of the ATMACA ASCM from a naval platform.

During the telemetry test performed on February 3rd in the Black Sea, northeast of Sinop, the ATMACA ASCM was fired from a 4-cell launcher (similar to the Mk-141) placed on the port side of the TCG Kinaliada

Corvette and successfully scored a hit on the Roketsan made stationary floating target platform, which imitates a surface target. On February 4, 2021, the second launch test was carried out against a similar stationary floating target platform with the ATMACA ASCM fitted with a live warhead, and this time, the target was also destroyed successfully. With the last live firing test, the effectiveness of the ATMACA missile's warhead was also tested for the first time on the missile. Both launches from the TCG Kinaliada Corvette were monitored live by the test measurement equipment at the Sinop Missile Test Range (such as radar systems and high-speed cameras that can measure the missile's trajectory and speed) and from the air by a UAV (Call Sign: Cenah 2) using the Star Safire 380 HLD FLIR payload. President of Defense Industries Prof. İsmail DEMİR announced the tests on his official social media account and congratulated all staff

involved for the successful test. "Our first indigenous anti-ship missile ATMACA successfully destroyed the target after it was fired from our national ship TCG Kinaliada. I congratulate everyone who contributed. Godspeed to our Heroic Navy!" President Prof. DEMİR also shared a short video of the test-fires performed on February 3rd and February 4th between 14:00 and 14:30. In the footage recorded by a UAV flying at an altitude of 18,129ft, the passive ranging maneuver performed by the ATMACA missile at the terminal stage before hitting the platform type stationary floating target can be clearly seen (during the firing test conducted on February 4th).

TCG Kinaliada Corvette, which performed the launches, sailed to the Black Sea by passing through the Bosphorus at around 21:40 on the evening of January 23, 2021. In fact, I was expecting the decommissioned TCG IŞIN (A-589) to be used as the target ship at the



by İbrahim SÜNNETÇİ

live firing test. Prior to the firing test planned for August 30 last year, the decommissioned IŞIN was pulled to Sinop by TCG Alemdar (A-582) on August 27, 2020, to be used as the target ship. However, due to an undisclosed reason, this test was canceled at the last minute.

The first controlled flight test with the ATMACA Anti-Ship Missile was performed in 2016. Later in parallel with the maturation of the design and the product, three different guided firing tests were conducted with the prototypes of the ATMACA Surface-to-Surface Guided Missile (I believe guided test missiles were equipped with dummy warheads, not with live warheads) in 2019, in May, September 18th, and



November 3rd, respectively, in which different features and attack concepts/profiles were tested. While the previous firing tests were carried out toward the Black Sea from a land-based launcher at the Sinop Missile Test Range, the first Naval Launch Test was conducted with the ATMACA Anti-Ship Missile on the morning of November 3rd, 2019. The guided firing tests using prototype missiles without live warheads were carried out against a stationary floating net target fitted with a radar reflector (orange object). Within the scope of the ATMACA Surface-to-Surface Missile Project, three guided firing tests were conducted at the Sinop Missile Test Range in 2020, on July 1st, September 25th (previously stated as September 28th), and December 18th, respectively. Thus, ATMACA passed the first product qualification test by successfully hitting the targets. In the 17th issue of Roketsan Magazine, published in July 2020, it was stated that during the guided firing test carried out from the Sinop Missile Test Range toward the Black Sea on July 1st, 2020, the ATMACA Guided Missile performed all its functions correctly and approached the target 200+ km away with the sea-skimming mode and successfully hit the target by attacking with a pop-up maneuver (it has been claimed that the target was deployed at the furthest distance to date at 220km).

Since multiple waypoints are defined instead of a straight-line during flight/firing tests, a route similar to a diamond is followed in the NOTAM test area. As each waypoint (depending on its angle) reduces the total range of the missile from 4 nm (nautical miles) to 17 nm, for example, when two waypoints are defined, the total distance traveled is actually around 60 nm even though the missile cover a 75 nm distance. Since a diamond flight pattern has been defined for the guided flight test, the ATMACA missile must have followed at least 4 or 5 waypoints, which means that the total range is reduced by an average of 60-70km. Technically, since the ATMACA missile cannot follow so many waypoints and strike from the maximum range, either the announced 220km is the direct flight distance to the target or the maximum range of the ATMACA missile in actuality reaches 280-300km.

*Below, shots from ATMACA ASMC's live wiring test with live warhead performed on February 4, 2021. Above, ATMACA ASMC's firing test is monitored and recorded live from the command room at Sinop Test Range. Right, ATMACA ASMC performs super sea-skimming before hitting RF reflector on the floating target at July 1, 2020.*





ATMACA ASMC mock-up displayed for the first time at the Roketsan stand during IDEF '19 Exhibition.

However, in the video shared by the SSB, it was seen that the ATMACA missile skimmed the surface and approached the target from a very low altitude (only a few meters above the water level) and fell into the sea immediately after hitting the radar reflector on the floating target (possibly due to the maximum range). The guided flight test on July 1st, 2020, also has great importance in terms of being the first flight test in which the ATMACA missile engaged a new target by updating its mission in-flight via the Data Link. According to the article on page 8 of the 17th issue of Roketsan Magazine, within the scope of the aforementioned guided flight test, where the ATMACA missile is aimed to successfully follow the flight route with the help of its inertial navigation system (INS) and hit the target, the ATMACA missile, which performs pre-launch mission planning and firing with its Fire Control System, was directed to a new target with the mission update transmitted over the data link during the flight (however, no information was shared in the article if the data link used during the test is a KEMENT Data Link).

The ATMACA ASMC is one step ahead of other anti-ship guided missiles in the market with this feature and has proven that it is ready to serve as the protector of Blue Homeland, considering the images of it scoring a direct hit with perfect accuracy recorded by the cameras on the target.

On August 30th, 2020, another ATMACA Anti-Ship Missile launch test was planned. In this context, a NOTAM was issued between August 29th and September 5th, 2020, restricting an area off Sinop by land and sea for missile firing, and the decommissioned TCG İŞİN (A-589) was pulled to the Black Sea to be used as the target ship. However, due to an undisclosed reason, this test was canceled at the last minute.

On September 25th, 2020, in an electronic warfare environment scenario mimicking real combat conditions with electronic and GPS jamming, a guided firing test was carried out with the ATMACA Anti-Ship Missile toward the Black Sea from a land-based 4-cell launcher, similar to the Mk-141 which was placed at the Sinop Missile Test Range. In accordance with the scenario, the ATMACA

missile successfully hit the surface test target during the test with its onboard Inertial Navigation System (INS) and GPS-free limited navigation support. President of Defense Industries Prof. İsmail DEMİR described this test as the penultimate firing test of the ATMACA missile. At the press breakfast held at Roketsan's Lalahan facilities on September 29th, 2020, Roketsan Chairman of the Board Faruk YİĞİT, Roketsan CEO Murat İKİNCİ, and President of Defense Industries Prof. İsmail DEMİR stated that the project is nearing completion and they expected the serial production activities to start in the near future. During the "Evaluation of 2020 and 2021 Projection Meeting" held on January 11th, 2021, the President of Defense Industries Prof. İsmail DEMİR announced that the first deliveries under Turkey's first national Anti-Ship Missile ATMACA and AKYA National Heavyweight Torpedo Projects would begin in 2021. In addition, Roketsan CEO Murat İKİNCİ gave technical information about the firing test at the press breakfast where Defence Turkey Magazine was also present and said: "This test was actually based on a

scenario involving the test of ATMACA under the most challenging conditions. It was able to find and hit the surface target precisely from quite a considerable distance with only its own internal inertial navigation (INS) system, completely independent of GPS. This was an indication that ATMACA was able to hit the target with its very limited navigation capability even in environments where Electronic Warfare was very intense!"

## ATMACA ASMC Project

The €80 million contract of the ATMACA ASMC Development Project was signed on May 8th, 2009, and entered into force on October 14th, 2009. The number of missiles to be procured at that time was planned to be 100 according to the SSB, and the first delivery was expected to start on December 31st, 2016.

The first test-firing activities with the ATMACA Guided Missile (I think Ballistic Test Missiles were used) were carried out in 2014 by the Main Contractor Roketsan, after the production of the first prototypes and the completion of the



# CAN NOT BE JAMMED



TUALAJ 8300



The world's leading company with performance and product range of **GNSS Anti-Jamming**.



TUALAJ  
4100-MINI



TUALAJ  
4200-MINI



TUALAJ  
4100



TUALAJ  
4200



TUALAJ  
4300



TUALAJ  
8100



TUALAJ  
8300-D

laboratory tests. In the second flight test campaign, which was carried out in the summer of 2015, the problems in the first tests were mostly eliminated.

In the design of guided missile systems, test and evaluation activities have a very important place in terms of providing the necessary data for the system design, revealing to what extent the design meets the requirements, and giving feedback for further design improvements. The main test activities used in the missile systems design are Wind Tunnel Tests, Hardware-in-the-Loop Tests, and Flight Tests.

During the flight tests conducted with real missiles, data-acquisition systems are installed on the missile to collect information about the missile's flight characteristics. These data collection systems generally consist of RF-based telemetry systems. In some cases, certain data-acquisition systems that are designed to withstand the high-speed missile impact can also be used to keep the flight data intact.

Radar systems and high-speed cameras that can measure the trajectory and velocity of the missile are also used in the launch tests. The missile prototypes used in guided missile development projects change in parallel with the development of the design process. In the early stages of the project, Ballistic Test Missiles (BTM) are used to verify the missile's ballistic and aerodynamic characteristics. Subsequently, Controlled Test Missiles (CTM) are used to test the missile's stabilization, autopilot, and control algorithms.



The Computer Generated Image of GENESIS ADVENT CIC

Next, Guided Test Missiles (GTM) are used to verify the missile's guidance algorithms and its terminal guidance system. The telemetry system used in the BTM, CTM, and GTM prototypes is usually located in the modular test seekers mounted instead of the missile's warhead. The prototype missiles, which are used to verify the warhead's effectiveness, are equipped with live warheads.

Under the ATMACA Surface-to-Surface Guided Missile Project, the first controlled/guided flight tests were carried out in 2016 (I think Controlled Test Missiles are used). Under the Prototype Production Phase, I believe that around 30 ATMACA ASCMs were produced for flight/firing tests and qualification activities. Domestic companies and institutions such as Aselsan (Ku-Band Active RF Seeker, Fire Control System, Missile Computer and Power Distribution Unit), ArMerKom (Fire Control System and Operator Console prototypes), and Femsan (brushless direct current motors for control surfaces) also took part in the project. The prototype ATMACA missiles used a modified version of the variable-speed (the speed can be changed in flight depending on the mission profile) TR40 Turbojet Engine specifically built for

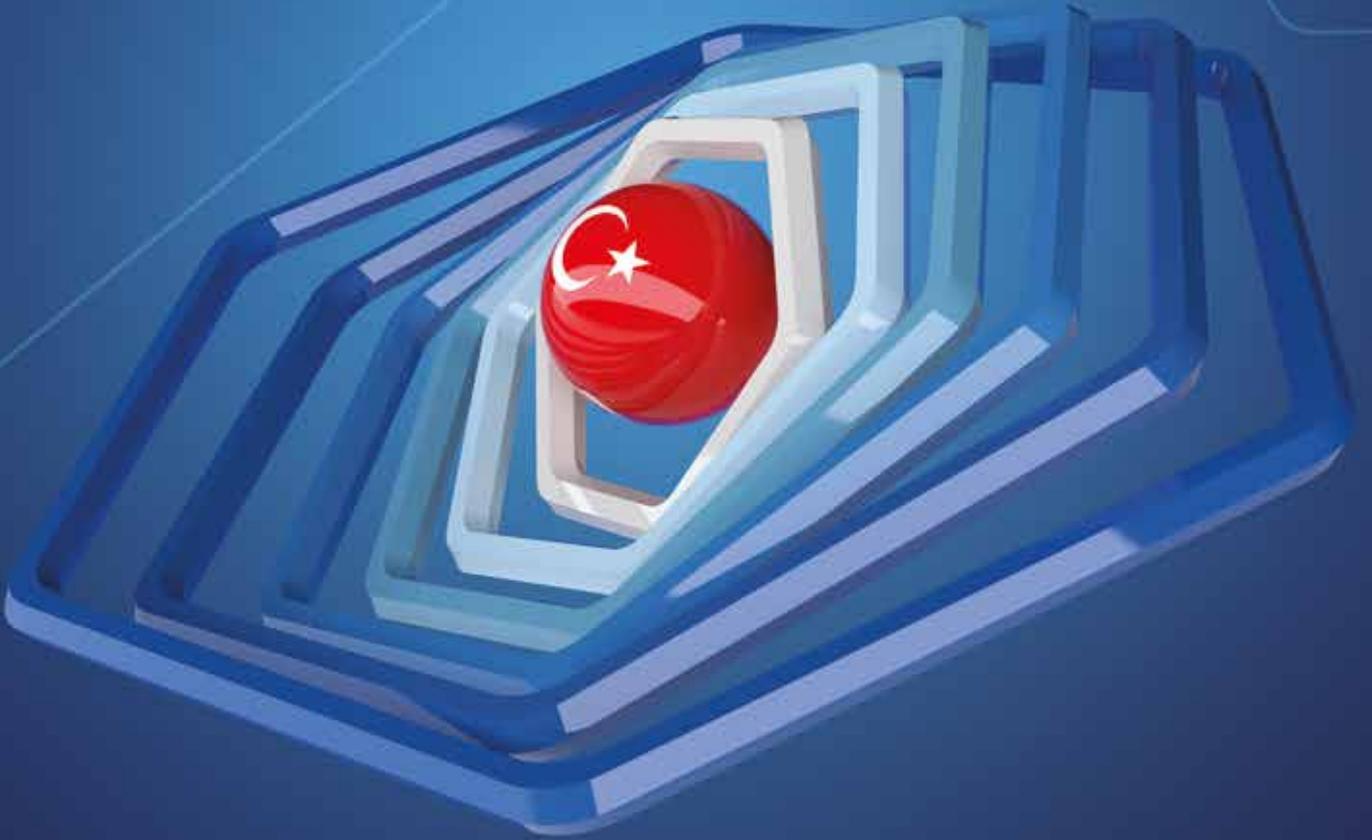
Turkey by SAFRAN Power Units (formerly Microturbo) under the agreement signed in the summer of 2013. The Serial Production Contract for the ATMACA Anti-Ship Guided Missile, which proved itself with the firing tests, was signed between the SSB and the main contractor Roketsan on October 29, 2018.

Currently, Low-Rate Initial Production (LRIP) Phase studies are continuing in the project, and the first serial production ATMACA ASCMs (powered by spare TR40 engines), were planned to be delivered to the Turkish Navy during the second quarter of 2021. Initially, a total of 64 ATMACA missiles (32+32) were expected to be supplied under the LRIP Phase for use in İ-Class (İSTİF) Frigates. However, when the delivery date of the TCG İstanbul Frigate was delayed from 2021 to 2023, a decision was made to integrate the ATMACA ASCM into the ADA Class Corvettes equipped with the ADVENT Combat Management System (CMS), and a contract modification was issued in this context. Since the ATMACA missile will also be integrated into TCG Kinaliada and then TCG Burgazada (ADVENT CMS retrofit process is expected to be completed in 2020) Corvettes, additional missile production is expected. The TCG Kinaliada Corvette,

which is equipped with ADVENT CMS with Network Enabled Capability and Integrated Data Capability, does not have a separate operator console (AN/SWG-1A) for the Harpoon Anti-Ship Missile, and the launching/firing functions of the ATMACA and Harpoon missiles can be performed from all operator consoles in the Combat Information Center (CIC). Similarly, TCG Burgazada Corvette, which had GENESIS CMS before being retrofitted with the ADVENT CMS, also does not include the AN/SWG-1A Harpoon Weapon System Console; however, there are two small cabinets placed under a desk in the CIC, and other functions of the Harpoon console are embedded in GENESIS CMS software.

Deliveries under the LRIP Phase were expected to begin in 2019 and to have been completed in 2020, but this calendar was postponed due to additional missile requirements and embargoes. According to the information we received, due to the implicit embargo imposed by the French Government because of the political tension between the two countries, there are some problems with the procurement of the TR40 Turbojet Engines required for the Serial Production Phase, which also delays the production and delivery

# TURKEY'S CERAMIC TURKEY'S BALLISTIC SOLUTION



schedule. As a matter of fact, although the SSB's official Twitter account announced that the ATMACA missile was planned to be put into service in the second half of 2020, the delivery schedule was updated as 2021 at the 'Evaluation of 2020 and 2021 Projection Meeting' held on January 11, 2021. In the 18th issue of Roketsan Magazine published in January 2021, Roketsan Chairman of the Board Prof. Dr. Faruk YİĞİT announced that they will start delivering ATMACA missiles to the Turkish Navy as of the second quarter of 2021.

Additionally, the delivery schedule within the scope of the indigenous design KTJ-3200 Turbojet Engine Program, which will replace the TR40 engines, was unfortunately delayed. The two operational KTJ-3200 Turbojet Engine prototypes were scheduled to be delivered to the SSB in June 2016 for flight tests (previously announced as April 2016), but this schedule was later subsequently updated as late 2017, first half 2018, late 2018, and then early 2019. Lastly, speaking at the panel held on December 26, 2020, during the 8th Turkey Innovation Week, Kale Group Vice Chairman and President of Technical Division, Osman OKYAY, announced that the first engine would be delivered in mid-January or at the end of January at the latest, following the completion of the qualification tests. However, as of March 3, 2021, neither the SSB nor Kale Group has shared any information regarding engine deliveries. OKYAY also emphasized that only a single part of the engine, which consists of around 300 parts, was procured from a foreign country. The

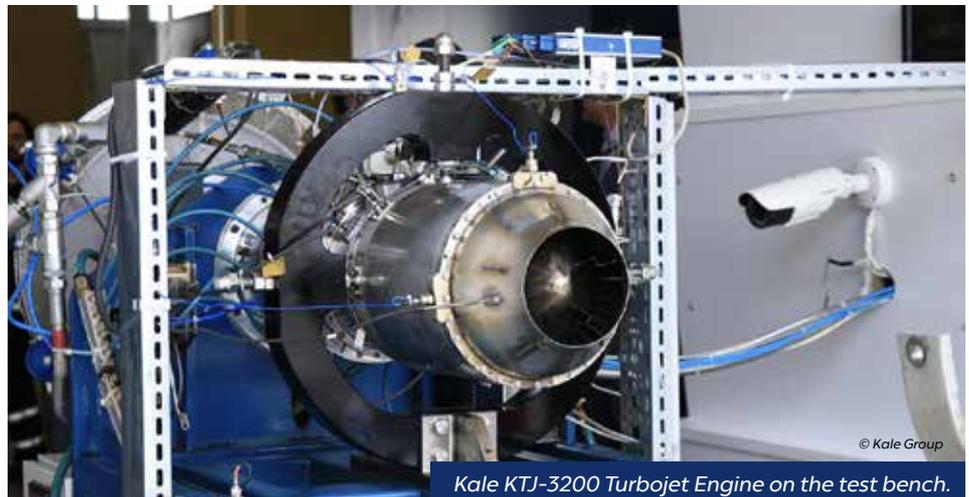


KTJ-3200 will replace the TR40 engines used in both the ATMACA ASCM Project and the Precision-Guided Stand-Off Missile (SOM) Project, which is Turkey's first national Air-Launched Cruise Missile (ALCM) study. During the "Evaluation of 2020 and 2021 Projection Meeting" held at Presidency of Defense Industries, it was stated that the KTJ-3200 Turbojet Engine to be used in SOM and ATMACA Missiles would be delivered for the first time in 2021.

However, following the delivery, the KTJ-3200 Turbojet Engine, with a thrust capacity of 3,200N (3,2kN/719,3lbf), must first be integrated into SOM and ATMACA missiles through a series of flight

and firing tests to qualify this integration process. Although the KTJ-3200 engine has a similar French-style design characteristic just like the TR40, it is not interchangeable with the TR40, and a series of modifications are required to integrate it into both SOM and ATMACA missiles. I predict that this process will continue until the end of 2021 at best. Therefore, if the TR40 engine procurement problem with France cannot be solved, the total production of both ATMACA and SOM Missiles will remain limited (depending on the number of available spare TR40 engines) until the KTJ-3200 engine reaches the serial production/delivery phase and is qualified for these

two munitions (currently, a total of 495 SOM Series ALCMs are expected to be produced, including 80 in the first batch and 415 in the second batch). Meanwhile, the SSB also continues negotiations with Ukraine for engine procurement. In a statement he gave to SavunmaSanayiST.com in November 2020, the President of Defense Industries Prof. İsmail DEMİR pointed out that there are enough TR40 engines to continue the Serial Production Phase for a certain period and emphasized that they are also looking for different suppliers for alternative engines. President Prof. DEMİR said, "We are talking with Ukraine in order not to put all our eggs in one basket. On the one hand, we also need to make sure that our own engine is used operationally. We are currently assessing the engine issue from three different angles and continue our activities to provide different solutions and increase our engine's performance. The first is using the existing engine, the second is purchasing engines from Ukraine and even establishing an assembly line in Turkey, and the third is increasing the thrust of our indigenous



Kale KTJ-3200 Turbojet Engine on the test bench.

engine and making engines that will run longer."

According to Roketsan, the high-precision ATMACA missile was indigenously developed to meet the Turkish Navy's operational requirements for Anti-Surface Warfare with its anti-ship and coastal attack capabilities and can be deployed from different surface vessels such as destroyers, frigates, corvettes, and fast attack crafts. ATMACA has a length of 4.8m (5.2m with booster) and weighs around 800kg. I estimate that the ATMACA Guided Missile has a 350mm diameter and a 1.4m wingspan. The ATMACA missile, which is stated to have a low radar cross-section (RCS), can operate

in all weather conditions thanks to its Aselsan made Ku-Band active radar (RF) Seeker. With the addition of Meteksan Defence/MiLSOFT made ATMACA Data Terminal (ADT), which is developed under the KEMENT-A Phase of the KEMENT Project, in addition to the active RF Seeker + GPS/INS Guidance System and Radar Altimeter, the ATMACA missile will also acquire in-flight Target Update, Re-Attack (new target identification), Re-Target and Mission Abort capabilities via the fully encrypted two-way data link.

Thanks to its effective range of more than 200 km, the ATMACA guided missile poses a significant threat

to targets beyond the line of sight with its 250kg high explosive penetrating warhead. During the flight, the ATMACA missile navigates using the Inertial Navigation System (INS), Global Positioning System (GPS), Barometric Altimeter, and Radar Altimeter and provides the user with the most efficient mission profile with its three-dimensional (3D) Mission Planning capability. The ATMACA missile, which is believed to have a cruise speed of Mach 0.85-Mach 0.95 at the terminal phase, has several operational modes (including Time on Target [ToT], Designated Time on Target [DTOT], Simultaneous Time on Target [SToT] and Ripple [Salvo, thanks to ToT

capability all the missiles can arrive at the target at roughly the same time] Fire) and attack modes (such as direct attack [sea-skimming], top attack [pop-up maneuver], and re-attack). Thanks to its advanced navigation equipment, the ATMACA missile can fly in sea-skimming mode at altitudes of 5m and under (I believe that at that altitude, special guidance algorithms and "suppression mode" are used to suppress the radar echo [sea clutter] that can blind the RF Seeker). In the video of the flight test conducted on November 3rd, 2019, it is seen that the ATMACA missile performs evasive maneuvers (first to the left and then to the right) by lowering its cruising

## AShM/ASMC Technical Specifications



	Exocet MM40 Block III	RGM/UGM-84L Harpoon	YJ-83A/C-802A	RBS-15 Mk3	ATMACA	NSM
<b>Diameter:</b>	350mm	343mm	360mm	500mm	350mm	406mm
<b>Wingspan:</b>	1.1m	91.4cm	72cm/1.22m*	1.4m	~1.4m	69,8cm/1.36m*
<b>Length:</b>	5.95m (w/Booster)	3.84m/4.63m**	6.383m (w/Booster)	4.35m (w/o Booster)	4.8m/5.2m**	3.96m (w/Booster)
<b>Weight:</b>	780kg (540kg)**	691kg	800kg	820kg (660kg)***	<800kg	407kg (344kg)***
<b>Warhead :</b>	165kg	225kg	190kg	200kg	250kg	120kg
<b>Engine Type:</b>	TR40/263	J402-CA-400	TR60-2/CTJ-2	TR60-2/077	TR40	TR40
<b>Range:</b>	4-200km	13km-140km	180Km	250km	220+km	3-185+km
<b>Guidance:</b>	INS/GPS+RA	INS/GPS+RA	INS/GPS+LA+	INS/GPS+RA	INS/GPS+BA+RA+DL	INS/GPS+LA+DL
<b>Seeker</b>	J-Band Active RF	J-Band Active RF	?-Band Active RF	Ku-Band Active RF	Ku-Band Active RF	IIR (18.5km)
<b>Speed</b>	Mach 0.93/0.95	Mach 0.85	Mach 0.8/0.9	Mach 0.9	Mach 0.85/0.95	Mach 0.7/0.9
<b>Cruising Alt.</b>	30m	<15m	10-20m	30m	<15m	10-15m
<b>Sea-Skimming Alt.</b>	2-5m	2-5m	3-5m	1m	1- 5m	5m
<b>Manufacturer</b>	MBDA	Boeing	CPMIEC	SAAB-Diehl	Roketsan	Kongsberg
<b>Country</b>	France	USA	China	Sweden/Germany	Turkey	Norway

\*Wings Folded/Deployed

\*\*Without Booster/With Booster

\*\*\* Launch Weight (Flight Weight)

altitude considerably at the terminal phase a few nautical miles from the target and passes just a few centimeters over the radar reflector (orange object) on the fixed floating target. It is claimed that the ATMACA missile can withstand 12+G at the terminal phase, and the missile was flying only 93 cm above the sea surface at the time of impact. In a statement he gave in November 2019, President of Defense Industries Prof. İsmail DEMİR pointed out that the unit cost of the ATMACA Surface-to-Surface Guided Missile was under US\$500,000.

The KEMENT Project was initiated to domestically develop and produce a fully encrypted two-way tactical data link and its related terminals to provide midcourse guidance capability for SOM ALCM and ATMACA missiles. Within the scope of the KEMENT Project signed with the SSB on January 21st, 2014, Meteksan Defense completed the Factory Acceptance Tests (FAT) in August 2018 and the Field Acceptance Tests in June 2019 (both tests were conducted with the participation of TurAF and SSB representatives). The KEMENT-A Phase covered the development of ATMACA Data Terminal (ADT), Ship Data Terminal (SDT), and Relay Data Terminals (RDT) that can be integrated into relevant platforms, including the ATMACA Surface-to-Surface Guided Missile. However, no information regarding the completion of the KEMENT-A Phase

has been publicly disclosed as of February 5th, 2021. Therefore, it is currently not possible to make a clear assessment of whether the system used during the guided flight test conducted on July 1st, 2020, was the ATMACA Data Terminal (ADT) developed under the KEMENT-A Phase.

The ATMACA Phase II (ATMACA Block II) Project, which I believe was launched in 2019, includes the development of the submarine-launched version of the ATMACA ASCM. The new missile, dubbed the "ATMACA Block II" can be launched from the 533mm diameter torpedo tube of submarines through a special buoyant capsule (Encapsulated ATMACA Block II, like the Encapsulated Harpoon). According to the information I have obtained, ATMACA Block II missiles will be fitted with a more advanced dual-mode (Ku-Band Active RF +

IIR) seeker. As far as I know, TÜBİTAK SAGE started working on the IIR seeker to be used in ATMACA a few years ago. On the other hand, there was some news on social media in February 2020 that Ekinoks-AG Company developed a cooled Medium Wavelength Infrared (MWIR) Seeker for the ATMACA Block II Guided Missile. In this case, the ATMACA Block II missile will use a cooled MWIR sensor as its IIR seeker.

The submarine-launched cruise missiles, even with conventional warheads, are accepted as strategic weapons. By integrating ATMACA Block II ASCMs, with land attack capability, into existing submarines, TNF will gain its first ever indigenous submarine-based sub-strategic deep-strike capability before the deployment of GEZGIN SLCMs at MILDEN submarines some time in 2030s.

## RGM/UGM-84 Harpoon AShM & the Turkish Naval Forces

US defense giant Boeing product RGM-84 Harpoon series Anti-Ship Missiles (AShMs) with an effective range of 65nm (125km) - 75nm (140km, can reach its target in approximately 6 minutes depending on its speed) and a 225kg (100kg of explosives) warhead currently constitutes the backbone of the Turkish Naval Forces Command's operational requirements for Anti-Surface Warfare with its anti-ship and coastal attack capabilities (Block II version only). It is believed that Boeing has delivered more than 7,500 Harpoon AShMs to be used in over 800 surface and submarine platforms, 14 different aircraft types, and land-based mobile launch platforms in 30 countries.

According to open sources, the Turkish Navy has around 200 RGM-84A (Block 1, no waypoint identification feature, 65nm maximum range, they are now gradually being taken out of service), RGM-84D (Block 1C, can define three waypoints for navigation, 75nm maximum range), RGM-84G (Block 1G, up to 8 waypoints can be defined for navigation, capable of flying in the sea-skimming mode under 50ft [15m], smart seeker with late activation



TCG Heybeliada Corvette performs live RGM-84L Harpoon Block II firing during Sea Star 2017 Naval Drill.

**Radar, Electronic Warfare & Communication  
Systems**

**Mission Systems**

**Simulation Systems & Information Technologies**

**Production Programs**



**SDT**  
SPACE & DEFENCE TECHNOLOGIES

in the terminal phase, re-attack capability - the missile can turn back and attack the target again if misses it), and RGM-84L (Block II, improved target selection, higher probability of scoring a hit on a target than its predecessors, coastal attack capability thanks to its sea clutter and land echo “suppression mode” with GPS, capable of flying in sea-skimming mode below 50ft [15m]), surface-launched anti-ship missiles (fired from ships), as well as about 30 UGM-84C and UGM-84G (fired from submarines) in its inventory currently. The RGM-84A missile canisters have gray nose caps, while the RGM-84D, RGM-84G, and RGM-84L missile canisters have red nose caps. The unit cost of a Harpoon Block II Anti-Ship Guided Missile, which is capable of attacking coastal targets, was given as US\$1.2 million in 2007. The versions after Block 1G have been upgraded with the HAFO (High Altitude Fly Out) capability to ensure that the missile can fly over the friendly elements on its flight path without hitting them or avoid the hills on its route while attacking the land targets.

The latest version of the Harpoon Guided Missile is named RGM-84Q-4 Harpoon Block II+ ER (Extended Range). RGM-84Q-4/Block II+ ER, which includes several improvements in the guidance, engine (a new sustainer engine that consumes less fuel), and control sections, has new capabilities such as data link, new GPS/INS equipped with the Selective Availability



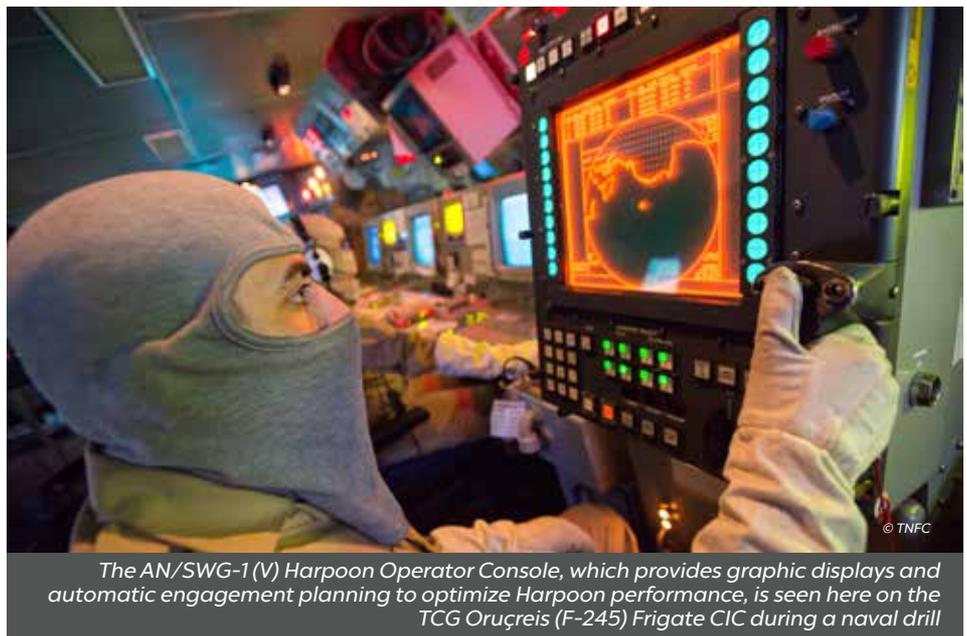
RGM-84L Harpoon Block-II AshMs on Mk-141 missile launchers (2x2 tubes) aboard TCG Heybeliada Corvette

Anti-Spoofing Module (SAASM), and improved target selectivity. The RGM-84Q-4 Guided Missile, controlled by the Advanced Harpoon Weapon Control System (AHWCS), has a range of 134nm (248km, thanks to the new engine and additional fuel) and a 140kg (300lb) warhead, which is said to be lighter but more lethal than previous versions (500lb in previous versions). Block

II models can be upgraded to Block II+ with the Tactical Missile upgrade kits. Deliveries of the RGM-84Q-4 Harpoon Block II+ ER Guided Missile, which achieved Initial Operational Capability (IOC) in 2019, are expected to begin in early 2024.

In June 2007, the U.S. Department of Defense, Defense Security Cooperation Agency (DSCA) notified the

U.S. Congress about the sale of 51 Harpoon Block II Guided Missiles (8 in TARTAR launcher configuration for Gabya Class Frigates, 38 in Mk-141 launcher configuration for BARBAROS Class Frigates and ADA Class Corvettes, and 5 of them in Encapsulated/Sub-Harpoon configuration) to Turkey through the FMS channel with an estimated value of US\$159 million if all options



The AN/SWG-1(V) Harpoon Operator Console, which provides graphic displays and automatic engagement planning to optimize Harpoon performance, is seen here on the TCG Oruçreis (F-245) Frigate CIC during a naval drill



## SOM

TURKEY's First Cruise Missile



## SOM-J

The Cruise Missile for Next Generation Fighters



## GÖKDOĞAN

TURKEY's First Beyond Visual Range Air-To-Air Missile



## BOZDOĞAN

TURKEY's First Within Visual Range Air-To-Air Missile



## SARB-83

TURKEY's First 1000 lb Tandem Penetrating Bomb



## HGK

TURKEY's First Precision Guidance Kit



## NEB

TURKEY's First Concrete Penetrator System



## KGK

TURKEY's First Wing-Assisted Guidance Kit



THERMAL  
BATTERY



ATLAS IMU



KÂŞIF

# ATMACA FLIGHT PATTERN

## FROM LAUNCH TO IMPACT

100-150 meter

< 30 meter

< 5 meter

12 G+ Weave  
Popup

Moving End Point

600m

150m

Contrary to Harpoon ASHM, which climbs to an altitude of 600m after launch, ATMACA follows a low altitude profile when launched. ATMACA ASCM climbs to 100m to 150m after launch according to our estimation.

5m

Once the target is acquired by the Ku-Band Active RF Seeker ATMACA drops to 5 to 10m for its final run. More accurate inertial navigation enables late active seeker activation.

12G+

During the terminal phase, evasive maneuvers (12G+) are performed to escape the ship's hard kill defenses (CIWS). The missile shall descend to about 1m before impact or can follow a pop-up/dive-attack profile.

30m

Soon after the booster separates and sustained flight begins, ATMACA drops to a cruise profile at below 30m.



The INS/GPS guidance system, assisted with Barometric Altimeter and Radar Altimeter, controls the missile during the midcourse and active radar seeker with ECCM capability takes over for the terminal phase.



Thanks to its over-the-horizon engagement capability where another platform, such as P-72 MPA or a S-70B SeaHawk ASW/ASUW Helicopter took off from the launching vessel, can provide the targeting data via data link (KEMENT).



turn into final orders. However, according to the 2009 Annual Report published by the Ministry of National Defense in 2010, only 25 RGM-84L Harpoon Block II missiles were procured through the FMS channel. The report stated: "According to the contract signed for the procurement of 25 Harpoon Block II Guided Missiles through the FMS channel, nine guided missiles were delivered in 2008, and 16 missiles are expected to be shipped within 2010." Therefore, Harpoon Block II capability is only available on surface platforms, and PREVEZE and GÜR Class Submarines can only use Sub-Harpoon/UGM-84 Guided Missiles (Block 1C and Block 1G). On the other hand, REİS Class Submarines will be able to use Harpoon Block 1C, Block 1G, and Block II guided missiles via the Guided Missile Control System. Although it was claimed that UGM-84L Harpoon Block II would be procured for the GÜR Class in the first half of January 2019, no further information regarding the official order has been mentioned in the national or foreign press, so far. On March 31st, 2017, within the scope of the Deniz Yıldızı (Sea Star) 2017 Exercise organized by the Turkish Naval Forces Command, an RGM-84L Harpoon Block II Ship-Anti-Guided Missile from the TCG Heybeliada Corvette (F-511) and a UGM-84 Sub-Harpoon Guided Missile from the submerged GÜR Class TCG Çanakkale Submarine (S-358) were fired against the target ship, the FFG-7 Class Duncan Frigate.

## **AShM/ASCMs & "Passive Ranging" Maneuver**

Anti-Ship Missiles (AShMs) such as ATMACA, Harpoon, and Exocet increase their thrust in the terminal phase while lowering their altitude and flying close to the water surface (sea-skimming) and start tracking the target by activating their own radars (Active RF Seekers) at a certain distance from the target.

For example, according to open sources, the Harpoon Anti-Ship Guided Missile starts tracking its target with its own radar by activating the Raytheon's PR-53/DSQ-28 J-Band (10GHz-20GHz) Active RF Seeker (two-axis gimbal) 12nm (starting from RGM-84G/UGM-84G late activation capability gained which allows user to activate RF seeker at less than 12nm distance) away from the target. Again, according to open sources, the MM-40 Exocet Guided Missile activates its Thales product J-Band RF Active Seeker 12-15km away from the target, while the old generation MM-38 Exocet Guided Missile activates its I-Band (8GHz-10GHz) RF Seeker at a maximum distance of 13nm (24km) and starts tracking its target.

In the terminal phase, the AShM/ASCMs approach surface targets by performing a maneuver called "Passive Ranging" (suddenly moves to the left and then to the right) to check and

confirm the position of their prey from different bearings and break the lock of the illumination/fire control radars of the Close-in Weapon Systems (CIWS) deployed on the target ship such as the 20mm Mk-15 Phalanx System, that can only track their target at a very narrow-angle. While the Harpoon AShM performs the maneuver in 2 dimensions, the Exocet MM-40 Block II Guided Missile can perform a 3-Dimensional Passive Ranging maneuver (in other words, while the missile is approaching the target at high speed, it quickly moves left and right, then suddenly increases its altitude, performs a right-left maneuver repeatedly, and decreases its altitude again). When examining the videos of the guided flight tests shared by the SSB, we can say that the ATMACA Guided Missile also has 3D Passive Ranging maneuver capability in the terminal phase.

The RGM-84 Harpoon AShM attacks its target, either by performing a pop-up maneuver (Block 1A missiles climbs up to 1.800m before diving on the target ship, Block 1B omitted the terminal pop-up; and Block 1C provided a selectable terminal attack mode) a few kilometers away or by directly hitting it in sea-skimming mode. When the Harpoon reaches its maximum altitude during the pop-up maneuver, it makes a move called the "whale body" before diving to the target. This moment is defined as the missile's weakest

moment against the CIWS threat (also when the RCS is highest). It is stated that if a Harpoon AShM could not be hit during the "whale body" movement, it will be extremely tough to hit it later when diving on the ship at high speed from the top. However, hunting down an incoming AShM, which performs evasive maneuvers against the CIWS threat in sea-skimming mode at low altitude, is also not an easy task. According to doctrines, sea-skimming mode is preferred against surface platforms with larger and higher hulls such as corvettes and frigates, while the pop-up maneuver is more preferred against low-height surface platforms such as torpedo boats. This is because the radar/laser altimeters used in AShMs detect echoes from the waves for missile safety in sea-skimming mode and adjust the flight altitude according to the highest wave, not the water level. Therefore, if the sea is calm, the Harpoon missile flies to its target at a 3-4m altitude during the terminal phase in sea-skimming mode, while in a wavy sea where the wave height reaches 3m, it will have to fly at a 6-7m altitude in sea-skimming mode with the guidance of the radar altimeter. In this case, small surface platforms such as torpedo boats and patrol boats with low hull height may be blocked by the waves and cause the AShMs to pass over them, so the "pop-up" attack mode with the top diving maneuver is preferred for such surface targets ■



## Nurol Teknoloji: "We Produce National Armor Solutions with National Ballistic Ceramics"

We have done an exclusive interview with CEO Selim BAYBAŞ Nurol Teknoloji, which is the first and only ballistic armor solutions designer and manufacturer in Turkey. With expertise in ballistic ceramic and composite armor design and manufacturing capabilities the company uses existing production infrastructure, production capacity as well as the latest technologies.

**Defence Turkey: Could you give us information about Nurol Teknoloji, which was founded by Nurol Holding in 2008 and performing indigenous design and production activities in the field of "Advanced Ballistic Armor Solutions," and about its footprint in the Turkish Defense Industry today?**

**Selim BAYBAŞ:** We are a Nurol Holding company established in 2008 with fully domestic capital to produce advanced technique ballistic ceramics. Since the day we were founded, we have prioritized research and development, and we have been performing activities to fill a significant gap in the field of ballistic protective solutions, especially in our country. We design

and produce personal ballistic protection, vehicle platform ballistic protection, and structural ballistic protection solutions with "National" and "Domestic" sources.

We produce advanced technology ballistic ceramics and hybrid ballistic protective armor solutions such as Alumina, Silicon Carbide, and Boron Carbide, which are needed by the Turkish Security Forces and all friendly and allied countries in the world, under a single roof in three production facilities located in Ankara. We are the only manufacturer in Turkey in this field and are one of very few companies in the world. Thanks to our Boron Carbide, Silicon Carbide, and Alumina ceramics which we produce by

our in-house developed special processes, we made our country's mark among the few countries that can produce advanced technique ballistic ceramics.

Our facility has Facility Security, NATO Secret and National Secret clearances for production and sale, and has ISO 9001, ISO 14001, and OHSAS 18001 certifications. With our machine park, qualified human resources, quality infrastructure, accredited ballistic laboratories, and R&D center, we have been performing in the fields of personnel protection, vehicle protection, and structural protection. The ballistic solutions that we develop as per the requirements of our customers are used with full confidence by the



© Defence Turkey

security forces both in our country and in various countries of the world.

**Defence Turkey: Nurol Holding has stepped into a different defense industry activity field and special product portfolio with Nurol Teknoloji. What can you say about the motivation and objective of this initiative? How has Nurol Teknoloji played a complementary role in Nurol Holding's current defense industry activities in the past period?**

**Selim BAYBAŞ:** As you also mentioned, we are one of the four defense businesses operating under Nurol Holding. We produce modern ballistic armor systems, which are the most critical requirement of our security forces, by making our country foreign independent in the field



© Nurol Makina

of ballistic ceramics with advanced technology that is unattainable from other countries in the field of ballistic protection.

In the personnel protection and vehicle armor protection solutions, we produce Alumina, Silicon Carbide as well as the Turkish miracle Boron Carbide ceramics, which provide 1/3 weight and durability advantages compared to the armor steel used instead. We process primary raw materials into ballistic ceramic powders with our own methods and formulas. In this way, we are not affected by some specific import embargoes increasingly imposed on defense industry intermediate products since the powders we produce are for general use.

Our main objective is to develop new materials in order to protect the Turkish Security Forces with protection armors that are the lightest and resistant to the evolving and increasing threats.

The ballistic solutions we produce are not limited to ceramics; we also

attach great importance to progress in the field of composites that we produce under the same roof. There is no other business in the world that is able to perform numerous and diverse activities under a single roof. With the delivery of such products, protecting human life, and not tolerating even a single failure to our Turkish Security Forces, we ensure that they are protected against the highest level of threat and have a competitive advantage against threats in the field.

As the first and only ballistic solution designer and manufacturer in Turkey and limited globally, our company considerably minimizes the foreign dependency with its entirely local and national ballistic protective solutions and contributes significantly to our country's economy. To achieve this, we invested approximately US\$ 125 million in the last 12 years, and we continue to invest.

As Nurol Teknoloji, we design and manufacture various ballistic protective armor systems for the geometric shapes and

threat levels of the vehicles designed and produced by the major tracked and wheeled armored vehicle manufacturers of the Turkish Defense Industry, as well as meeting the ballistic armor needs of our country's defense industry for all platforms.

**Defence Turkey: Could you inform us about your company's existing production infrastructure, as Turkey's sole advanced technique ceramics manufacturer, the production capacity as well as the technologies used?**

**Selim BAYBAŞ:** We successfully produce Ceramic Armor Materials with the technologies we own as Nurol Teknoloji. We have the highest RB Boron Carbide capacity in the world, especially with our existing infrastructure and indigenous production methods for Boron Carbide armor materials.

Using powder metallurgy methods, we shape the mixtures prepared entirely with Nurol Teknoloji formulas in high-capacity presses as per the sizes and forms required by our customers. With our

existing presses we have the opportunity to shape ceramics up to 45x45 cm, including also "multi curve" geometries.

With our indigenous sintering method, we perform sintering in vacuum and inert gas atmospheres at temperatures up to 2300 °C in our high-tech furnaces. Therefore, we produce first-class mechanical boron carbide and silicon carbide ceramic armors. In addition, we also produce Aluminum Oxide armor plates in open atmosphere furnaces that can reach a temperature of 1700 °C, and we offer our customers a wide range of options. We continue to increase our capacity and technology progressively with our investments and R&D activities.

In addition to our ceramic production capability that makes a difference in the world, we offer solutions for the needs of our customers with our composite armor production capability under a single roof. We simultaneously apply temperature, pressure, and vacuum parameters in our autoclave furnaces and combine complex-shaped ceramics with composite fabrics.

Our concentration in the production of armor ceramics is to ensure sustainable product quality. We regularly monitor all stages of production, from raw material to final product. We carry out production activities with technological infrastructure, effective



Selim BAYBAŞ with Cem AKALIN

process management, lean production tools, and qualified staff. We implement the Kaizen studies based on the lean manufacturing systematic with the participation of all employees and standard work instructions, and we are working to stabilize production with value flow analysis applied in processes. Furthermore, we carry out our 6S activity delicately to ensure that the production area is clean and tidy.

**Defence Turkey: Having developed a core technology with its strong R&D structure in the field of advanced technical ceramics and**

**subsequently developed materials and products in its own laboratories, Nurol Teknoloji is exerting efforts to serve our country by combining the advanced technology materials and solutions needed by our country with its cutting-edge research capabilities. Could you inform us about the company's vision of R&D as well as the ongoing activities?**

**Selim BAYBAŞ:** We are fully aware that the only way to achieve sustainability is through innovation. Therefore, it is within our priority plan to allocate enough resources to R&D, branding, all

kinds of innovations, and to make investments for the state-of-the-art technologies in our sector. We plan to identify innovative products for the international market, prepare technology road maps, develop projects to implement armor solutions with international high protection levels for land vehicles, and develop projects to improve the ceramics we use in our ballistic solutions such as silicon carbide and boron carbide.

In addition to such efforts, Nurol Teknoloji has become the 1245th R&D Center of our country as of January 2021, under law no. 5746 on supporting research, development, and design activities. We continuously improve our engineering infrastructure, workforce, and human resources. By performing digital transformation in processes and infrastructure, we also support academic collaborations both qualitatively and quantitatively.



© Nurol Teknoloji

**Defence Turkey: Nurol Teknoloji is capable of producing hybrid ballistic solutions for its customers in Turkey and abroad through the ballistic composites it produces. What are the ballistic protection standards/levels that you offer to your users?**

**Selim BAYBAŞ:** As Nurol Teknoloji, we produce all of our personnel ballistic protection, vehicle platform ballistic protection, and structural ballistic protection products with our special formulas and methods, in accordance with the international protection levels and standards.

These standards are as follows:

We can successfully test products at all ballistic protection levels in accordance with the requirements of NIJ 0101.04, NIJ 0101.06, NIJ 0115.00, NIJ 0108.01, TS EN 1063, TS EN 1522, STANAG 2920, STANAG 4569, and MIL PRF46103 standards, which are especially demanded in Personnel Protection, Vehicle Protection, and Structural Protection and accepted as the international ballistic standard. Apart from these standards, we also carry out internal tests according to the ballistic standard tables of other countries.

**Defence Turkey: Do you also carry out the certification process of the ballistic ceramic and composite armor solutions, or do international organizations such as the TNO Netherlands get involved?**

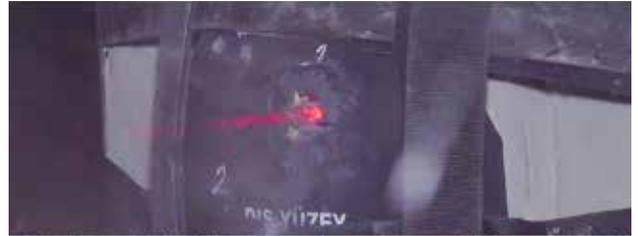
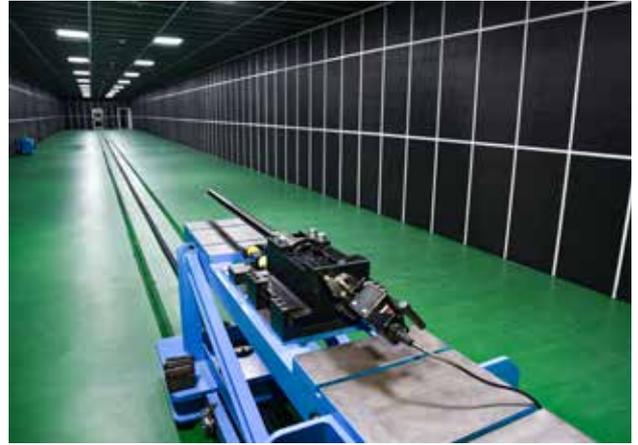
**Selim BAYBAŞ:** In our laboratories at Nurol Teknoloji, we are able to inspect and test raw materials, ceramic products, composite products, and many ballistic panels through high-tech quality control devices and equipment.

We conduct the tests of all ballistic products we design and produce in our Ballistic Test Laboratories at our Şaşmaz and Gölbaşı premises, which have TÜRKAK TS EN ISO/IEC 17025:2012 and NIJ accreditation.

We conduct and report all ballistic tests independently and properly. However, our business partners abroad may, from time to time, request tests from internationally accredited ballistic test centers. In such cases, we send our products to the requested international ballistic test centers for testing.

**Defence Turkey: Could you update our readers about Nurol Teknoloji's position in the international market, its export targets, the features, and superiorities that differentiate it from its competitors in the market?**

**Selim BAYBAŞ:** The defense industry is the fastest growing industry in the world, where technological developments are at the fore. Due to the high added value of defense industry exports, we believe countries that are strong in this sector have a strategic competitive advantage.





Accordingly, the concern of the countries for protecting themselves against internal and external threats creates the need for security and defense, and this need generates to have armed forces for countries and, therefore, mandatory defense spending. The difference and importance of Nurol Teknoloji emerge at this point. The fact that we are a well-known company in the international market

is due to being one of the very few companies that can design and produce advanced ballistic armor solutions produced with Boron Carbide, Silicon Carbide, and Alumina Ceramics. Additionally, we offer cost-effective products which we develop with our special methods and formulas. Most importantly, we produce very effective products that protect human life, and we would like to state that these are

the factors that make us unique in our industry.

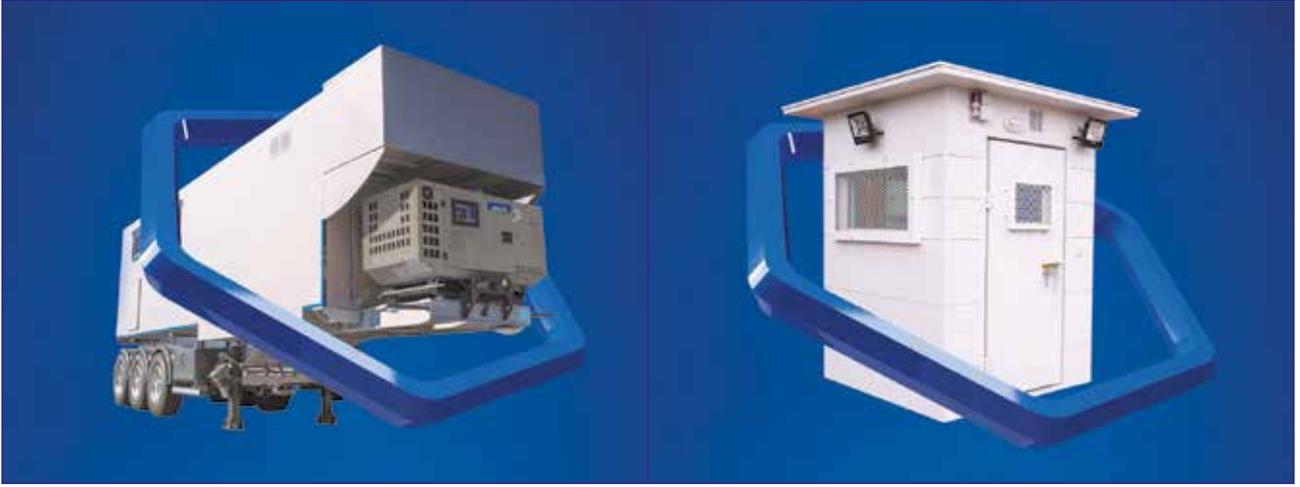
We export 30-35% of the products we produce. We aim to increase this export level to provide foreign currency inflow and minimize our country's foreign dependency. Our priority markets for export are, of course, friendly and allied countries.

In this respect, we also have capacity increase plans, and we plan to use

this capacity increase for export. In addition to the sales, we have made to several countries in the world, we also have ongoing projects. As the world's lightest armor solutions supplier, we aim to be a global company in our field.

**Defence Turkey: What would you like to say about Nurol Teknoloji's strategies and objectives for the next 5 years?**





**Selim BAYBAŞ:** Turkey, due to the geography, is a country that must strive for the modernization of its Armed Forces continuously.

In the field of ballistic protective products, we are one of the few companies in the world that can produce advanced ballistic armor solutions with boron carbide, silicon carbide, and alumina ceramics. We aim to develop innovative, lighter, and more durable products with high added value to lead the market in 2021 and increase collaborations with universities and industrial centers.

The ballistic solutions we produce are not limited to ceramics; we also attach great importance to make progress in the field of composites that we produce under the same roof.

One of our objectives for the following years is to deepen and expand in these domains, to progress faster, to create new business areas with increasing diversity, and to ensure that they become each other's

customers. Our goal is to achieve steady growth and development. In our journey of transforming from good to great company, we wish to create absolute determination, correct companions, corporate and cultural transformation. We plan to transform our organizational structure and corporate processes in order to become a global company.

During this process, we want to continue contributing to our country and the global defense industry with the guidance of technology and science.

**Defence Turkey: Is there anything else you would like to convey to our readers as a remark?**

**Selim BAYBAŞ:** It would be appropriate to say that the foreign dependency of the Turkish defense industry, which was at the level of 70% in the past, fell to 30% as of the end of 2020. We greatly appreciate the self-sufficiency and, most importantly, the nationalization goal of our defense industry in recent years. We would like to proudly express that we also have a contribution to this achievement.

In the new world order, we will continue to protect our

security forces by offering the most innovative, effective, lightest, and most reliable solutions against threats that are increasing every single day, as we can easily see that an effective and strong defense industry is indispensable for our country, considering the special conditions of the geography we are in.

Finally, we specifically want to point out that we are proud of the strength of the Republic of Turkey and to serve our country.

**Defence Turkey: Dear Selim BAYBAŞ, thank you for your time, and we wish you success in your future endeavors** ■



# “The process of Reform & Transformation Requires Constant Adaptation to New Situations and Circumstances”

**Bosnia and Herzegovina** Deputy of Minister of Defense for Resource Management Mr. Mirko OKOLIĆ discusses the country's focus on continuous improvement of the security situation in the region and strengthening of good neighborly relations.



**Defence Turkey: How would you explain your job and official duties? How would you sum up your role?**

**Mirko OKOLIĆ:** Based on the decision of the Parliamentary Assembly of BiH (PA BiH) on the appointment of the Council of Ministers of BiH (SM BiH), I perform the duty of Deputy Minister of Defense for Resource Management. In principle, the management of this department implies the management of human and material resources, i.e. directing the work of three organizational units: personnel management, procurement and logistics, and finance and budget. This, of course, implies full and constant coordination with other organizational units of the MoD BiH in the field of policies and plans.

**Defence Turkey: Could you please provide some key facts about the Ministry of Defense Bosnia and**

**Herzegovina (BiH)? Could you elaborate on the structure, responsibilities and number of personnel working at the Ministry?**

**Mirko OKOLIĆ:** The Ministry of Defense of Bosnia and Herzegovina (MoD BiH) was established on the basis of the Law on Defense of BiH. It is one of the nine ministries in the BiH Council of Ministers. According to the structure, the MoD BiH is the only ministry that has a minister and two deputies with their respective cabinets, for policy and plans and resource management, who, in addition to the Secretary and the Inspectorate General, manage seven basic organizational units and three independent internal organizational units. The MoD of BiH consist of appointed persons, civil servants and employees, but also professional military persons. At this moment, out of the systematized

387 jobs, 320 have been occupied. The special organizational unit of the MoD of BiH according to the Law on Defense is the Joint Staff of the Armed Forces of BiH with 9500 active members.

**Defence Turkey: Can we get an assessment of 2020 from the BiH MoD's perspective? Could you please summarize the 2020 highlights of the BiH MoD 2020?**

**Mirko OKOLIĆ:** The MoD BiH in 2020 was focused on the implementation of program activities, tasks and activities within the competence of the MoD BiH, cooperation activities and fulfilment of obligations under the submitted documents of BiH cooperation with international organizations, activities to implement measures to combat and prevent the spread the pandemic caused by the coronavirus (COVID-19), as well as engagement to assist civilian authorities in preventing the spread

of the pandemic. During 2020, significant activities of assistance to civilian bodies were realized on the territory of BiH, whereby out of 473 requests received, 329 were answered and realized. Activities and scope of engagement of AF BiH resources in providing assistance to civilian bodies in case of natural and other disasters during 2020 include engagement in 14 local communities. During 2020, through various activities, helicopters were engaged for the purpose of providing military assistance to civilian authorities through the execution of three medical evacuations by air. In addition, air MEDEVAC shifts (readiness) were performed for the needs of units of the AF BiH and civilian entities. Helicopters were also engaged in extinguishing fires in the areas of five local communities. During 2020, the AF

BiH demined an area of 2,481,847 m<sup>2</sup> or 75.3% of the 2020 plan. Members of the BiH Armed Forces took part in two international exercises abroad, while 143 members of the armed forces were engaged in peace support operations in Afghanistan, Congo, Mali and the Central African Republic. The functioning of the defense system of BiH and the MoD of BiH, during 2020, were burdened by circumstances that made it impossible to achieve the highest level of implementation of program activities. The activities of the MoD and AF BiH in 2020 were implemented in accordance with the real possibilities and circumstances of the appearance of the COVID-19 virus, as well as the size of the budget. Limited budget funds have prevented the development of infrastructure and equipment, as well as significant improvements in the logistical function of maintenance. Due to these circumstances, the technical condition and age structure of the existing technical material resources is not at a satisfactory level, and there were no preconditions for the development and implementation of significant projects that would initiate the process of modernization of the AF BiH. Despite the aggravating circumstances, a high degree of realization of program activities has been achieved.



**Defence Turkey: The COVID-19 pandemic has caused huge global disruption on critical defense operations and programs. How are defense and security procurements conducted by the BiH MoD within the COVID context?**

**Mirko OKOLIĆ:** Defense procurement activities take place in the aggravating circumstances of a significantly reduced flow of people and services and a slow economy. This situation is manifested in difficult procurement and implementation of procurement plans as well as the process of ensuring the regular functioning of the MoD and AF BiH. Particularly negative impact is in the case of procurement, which includes material assets from abroad and funds from the domain of advanced technologies.

**Defence Turkey: What can you tell us about**

**the national defense policy of Bosnia and Herzegovina (BiH)? What is the biggest threat to BiH and the number one security risk facing the country?**

**Mirko OKOLIĆ:** Security developments in BiH and the surrounding area go in the direction of continuous improvement of the security situation in the region and strengthening of good neighborly relations between the countries. With the stabilization of relations, the existence of a wide range of threats and dangers that may have security implications is evident. This primarily refers to global and regional challenges and risks, instability in the Balkans, problems of economic and social nature in the countries of the region, terrorism and extremism as potentially the biggest threats, and organized crime and illegal trade in weapons and people. Along with developments

at the global and regional level, internal challenges and risks form a complex security environment in BiH, which especially refers to the remnants of the past civil war and the difficulties in the transition of society.

**Defence Turkey: What can you tell us about Bosnia and Herzegovina's 2021 defense budget?**

**Mirko OKOLIĆ:** The dynamics of achieving the required capabilities of the AF BiH will depend on the ability of BiH to allocate funds in a larger amount than projected amount for the realization of the set defense goals. Such conclusions arise from the need to achieve the necessary level of interoperability, to replace obsolete combat systems and other equipment necessary to achieve the necessary operational capabilities. The defense system does not insist on the structure of the funds in the

defense budget, because there is an awareness of the economic and political reality in BiH, but this attitude projects the goal that is necessary to achieve within a reasonable time. The projected budget funds for 2021 are within the framework of budget plans of previous years and amount to about 150 million euros, with certain increases for personnel expenditures in terms of improving living and working conditions for members of the MoD and AF BiH, while funds for the defense budget are reduced due to the impact of the pandemic on economic developments.

**Defence Turkey: What projects do you have on modernization of military equipment? Can you list the most important procurement programs of the BiH Armed Forces?**

**Mirko OKOLIĆ:** The Development and Modernization Plan of the AF BiH is a document that creates the preconditions for the implementation of the Defense Review document. In order for the AF BiH to be fully operationally ready to perform the tasks defined by the Law on Defense, it is necessary to develop operational capabilities that will effectively respond to the assessed risks and threats. The plan is fully in the function of supporting the development and achieving the required operational capabilities of the AF BiH, defined in the Defense Review document. In parallel with the implementation of the process of modernization and equipment, training



and education systems, the AF BiH will fully support the training of personnel to work on new weapons systems and military equipment and thus ensure the achievement of the required operational capabilities. The key operational capabilities of the AF BiH will be achieved through a series of projects and tasks in the main development areas: personnel potentials and material resources, military education, doctrine and training, international military cooperation and contribution to international security. These projects include investments in: armaments and equipment of the infantry, weapons and equipment of the artillery, engineering and demining equipment, equipment of the atomic-biological and chemical defense, weapons and equipment of armored and mechanized units, military intelligence and communication equipment, communications and IT means and equipment, equipment of the military

police service, means and equipment of the traffic service, weapons and equipment of anti-air defense units and means of air surveillance and reporting and means of aviation.

**Defence Turkey: Can you provide some key facts about the BiH's Defense Industry for our readers? Are there both state-run and private companies in BiH's Defense Industry Sector or 100% of enterprises operating in defense sector of BiH are state-run?**

**Mirko OKOLIĆ:** The sector of military industry BiH it is not state-run and it is not under the jurisdiction of the MoD of BiH. The military industry is mostly owned by private capital, and it is under the jurisdiction of the ministries of two entities, their operations are conducted in accordance with the principles of a market economy.

**Defence Turkey: Could you provide a capsule summary of bilateral relations between Turkey and BiH in the field of defense during last decade?**

**Mirko OKOLIĆ:** Relations between Turkey and BiH are at a high level, the Ministry of Defense of the Republic of Turkey provides significant assistance to the MoD of BiH through various forms. First of all, that support is reflected in the education of the staff of the Ministry of Defense of BiH at the military school system of the Republic of Turkey, while the other area is represented through military-technical assistance and cooperation in terms of donation of material resources. The importance of this cooperation and its level are reflected in the recently signed agreement on military-technical cooperation between the Council of Ministers of BiH and the Government of the Republic of Turkey.

**Defence Turkey: How do you evaluate the current state of BiH-Turkey cooperation in the defense field? What do you think could be done to increase the level of this cooperation? What is your forecast for the future?**

**Mirko OKOLIĆ:** The level of cooperation is extremely good and the preconditions for further development of cooperation, in the context of the signed agreement on military-technical cooperation, it will certainly raise that cooperation to a higher level. On this occasion, I would like to express my gratitude to the Ministry of Defense of the Republic of Turkey for the support provided so far in the

field of education and training of personnel in the military education system of the Republic of Turkey. The level of this cooperation in the future can be developed through cooperation in the fields of mutual interest and agreement and to a certain extent reciprocity, as a basic principle of international cooperation agreements.

**Defence Turkey: Is Bosnia and Herzegovina interested in bolstering defense industry cooperation with Turkey?**

**Mirko OKOLIĆ:** As I have already pointed out, the military industry in BiH is mostly privately owned and business is based on the principles of market economy, and therefore the scope of cooperation

is not conditioned by policy from the level of BiH or MoD BiH but by each legal entity of the military industry. These are questions for each company of military industry in BiH or for the competent entity ministries rather than for the Ministry of Defense of BiH.

**Defence Turkey: What can you tell us about the BiH Government and BiH's Defense Industry participation to IDEF '21 Exhibition in May 2021?**

**Mirko OKOLIĆ:** The MoD of BiH responded positively to the invitation letter to participate in the IDEF '21 exhibition, so that the delegation of the MoD of BiH, which I should personally lead, will participate in the

mentioned exhibition. For us in the Ministry of Defense of BiH, it is an opportunity to get acquainted with the current trends in the development of modern technologies in the field of the defense industry, establishing contacts and creating preconditions for potential cooperation in the future. I believe that the participation of companies from the military industry from BiH in that exhibition will also be noticed.

**Defence Turkey: Would you like to add anything in the way of a message for our readers?**

**Mirko OKOLIĆ:** The reform of the defense sector is not and cannot be a complete process, as politicians or media sometimes say

in a populist way. The process of reform and transformation requires constant adaptation to new situations and circumstances, and we are witnessing that in the last few decades, these circumstances are changing extremely fast. Therefore, the defense system must be flexible and adaptable to change. The MoD of BiH will continue in the coming period with the development of friendly relations and cooperation both at the regional and global level, as a basis for creating a country of regional and global security. I wish you and your readers good health and that together we overcome the difficulties caused by the coronavirus pandemic ■



  
**Navantia**  
Innovation where it matters



**LHD**  
**WATER FORTRESS**



*How would the REIS-Class  
Submarines Affect the*

# **Power Balance**

*the East-Med and the Aegean Sea?*

*by Cayroskop*



The physical conditions of naval warfare provide inherent advantages to submarines, making it extremely challenging to fight this invisible element. Although countries try to create new tactics by supporting their navies with sophisticated solutions with technology advancement, submarines still have a significant advantage over surface assets.

It is quite challenging to fight against submarines. Because it is tough for the sonar signals to reach beyond the "layer-depth", which is formed according to daily water conditions. The layer-depth reflects the incoming sound waves, so when a submarine that submerges below the layer-depth becomes almost undetectable from a safe distance with hull-mounted sonars. Therefore, Navies try to penetrate this layer by using sonobuoys (launched from Maritime Patrol Aircraft), towed array sonars, variable depth sonars (towed by ships), and dipping sonars (deployed by helicopters). However, trying to locate a sub in large areas such as the Eastern Mediterranean is like looking for a needle in a haystack. Furthermore, the sonar interference created by the underwater noise in shallow waters such as the Aegean Sea, with a challenging topography for naval warfare, makes it harder to cope with submarines in these waters.

Due to these roughly explained issues, the existence of submarines, regardless of type, is a



significant parameter that changes the regional balances on its own. As the silent hunters of the seas, their unique capabilities such as sinking a ship with a single torpedo, collecting intelligence of critical locations such as coastal batteries and radar facilities undetected, infiltrating behind enemy lines, and reporting valuable target information to strike platforms, as well as altering the course of the war by attacking enemy shores and breaking the enemy's will to fight, makes submarines "strategic" assets, unlike other naval warfare elements.

Therefore, submarine movements are considered as one of the most significant parameters for understanding the level and severity of the tensions in the seas. If one of two countries in conflict sends its submarines to the disputed area, this situation is interpreted as that country considers all options, including war. For example, Russia's Baltic Fleet sent ten submarines

to the Norwegian Sea on 28 October 2019 to respond to NATO's activities in the Baltic Sea. This incident caused great anxiety in NATO and Baltic countries. That is how important the existence and capabilities of submarines are.

Submarines have taken their place in history as the elements that changed the fate of the war. For example, the sinking of Argentine Navy light cruiser ARA General Belgrano (C-4) by the nuclear-powered Royal Navy submarine HMS Conqueror (S48) during the Falkland War on May 2, 1982, forced the Argentine Navy to stay outside the planned operational area and changed the course of the war.

## Air Independent Propulsion (AIP) Submarines

Submarines are generally classified with their main propulsion systems and the strategic missiles they carry. Also known as classical submarines,

the basic submarine type Diesel-electric submarines (SSK) have been used by many countries for decades. Despite the advantage of the silence underwater, these submarines are routinely required to return to periscope depth and perform snorkeling to charge their batteries periodically. This process diminishes the tactical elasticity of diesel submarines and makes them vulnerable to detection and engagement.

Another type, nuclear submarines (SSN), are larger and more sophisticated, and their size allows them to carry numerous strategic missiles. Despite these advantages, both the nuclear reactor and other operating systems' noise causes a disadvantage for nuclear submarines, especially at submarine-to-submarine combat.

Developed as a new type to overcome the other two types' disadvantages, Air Independent Propulsion

(AIP) submarines are considered one of today's balance-changing parameters. These vessels are both silent and can stay submerged for prolonged periods. Although the air-independent propulsion systems were implemented with the closed diesel cycle and Swedish origin Stirling type engines in the 20th century, they did not have a wide range of use in the beginning. However, mainly thanks to the German-Italian co-production Type 212 submarines, which were developed with the German origin fuel cell technology, and later the Type 214 class submarines acquired by South Korea, Greece, Portugal, and Turkey, the AIP submarines took their place in the seas.

AIP submarines are superior to diesel submarines. The most important reason for this superiority is that diesel-powered subs need to return to periscope depth and perform snorkeling at least every 24 hours, while

AIP submarines can stay submerged for weeks. Conventional submarines need off-schedule snorkeling because their battery is emptied before the planned schedule if it exceeds the standard patrol speed while underwater. This situation is especially true in scenarios where the opposing forces conduct dense Anti-Submarine Warfare (ASW) activities. Thus, it is quite difficult for diesel-electric submarines to escape if ASW assets somehow acquire contact with the submarine. However, if AIP submarines encounter hostile ASW elements somehow, they can quickly descend below the layer-depth and escape through the opposite route. The AIP subs' capability to escape from ASW units in this way will widen the uncertainty area to be searched and cause the opponent to make more effort to find it.

Since AIP submarines rarely surface or return to periscope depth, they are less to be mentioned

in intelligence reports, which are the most critical instrument for finding and tracking submarines. Because of their capability to cross the Mediterranean from one end to the other submerged, even if these submarines do not sail, their presence alone is a vital criterion for the enemy to take into consideration. A naval force that knows there is an AIP submarine in its area of interest will have to engage in intense ASW activity before moving its high-value units (HVV) through choke points, even if it does not have any intelligence about the sub or made contact previously. For sure, this extra effort will significantly disrupt its planned operations and cause a delay.

The reactors of nuclear submarines and the transmission system that transfers the energy generated by the reactor to the sub's propellers create much more noise than it should be for a submarine. Therefore,

diesel submarines' popularity does not diminish, although they have limited maneuverability and weapon capacity comparing with the SSNs. Additionally, this situation makes it difficult for nuclear submarines to detect diesel submarines, but the noise created by the routine snorkeling of diesel submarines occasionally reduces this advantage. Since AIP submarines do not need snorkeling, they can fight nuclear submarines underwater for weeks and attack them without being detected.

In addition to these advantages, AIP diesel submarines gained new features in recent years, such as guiding multiple torpedoes simultaneously, launching ballistic and nuclear missiles, satellite communication (SatCom), network-centric warfare, and mine laying capability, which make the AIP submarines a prominent force multiplier in naval warfare.

### Type 214 TN

**LENGTH OVERALL:** 68.35M

**HEIGHT:** 13.1M

**SURFACE DISPLACEMENT:** 1.688T

**SUBMERGED DISPLACEMENT:** APPROXIMATELY 2.050T

**CREW:** 27+13

#### Sensor System

- Cylindrical array sonar
- Flank Array Sonar
- Towed Array Sonar
- Passive Ranging Sonar
- Active Sonar
- Intercept Detection Ranging Sonar
- Optronic Mast
- Attack Periscope
- Mine Avoidance System

#### Integrated Radio Communication System

- Hoistable Communication Masts
- Radar Recognition System (IFF)
- Emergency Communication System
- Loop Antenna & Buoyant Wire Antenna (for VFL)
- Internal Communication System
- +UHF SatCom (AT-4125)

#### Navigation System

- Nav-Commander -Console
- Inertial Navigation System (INS)
- Navigation Sensors
- GPS

#### Armament

8 full-size swim-out weapon tubes in the forward bulkhead for all kinds of torpedoes ( 4 tubes equipped with weapon expulsion systems for missiles and mine laying equipment)



© ASFAT

## Can REIS-Class Subs Change the Maritime Balance?

The Reis-Class submarines (Type 214TN), the first of which was launched in December 2019, are considered a capability that will significantly change the balance in Turkey's surrounding seas. Six of these submarines with a length of 68 meters and a displacement of around 2000 tons will be built for the Turkish Navy. These submarines are planned to be commissioned between 2022-2027. Indigenous weapons such as AKYA Heavyweight Torpedo are also expected to be fitted to these submarines,

intended to have domestic solutions for various subsystems. Although it is not included in the current architecture designed by the manufacturer ThyssenKrupp Marine Systems, the following ships of the Reis-Class submarines, which will be equipped with missiles such as Harpoon Block-II with coastal attack capability, is also expected to be capable of launching Gezgin cruise missile.

As the equivalent of Reis-Class Submarines in the Eastern Mediterranean region, Greece currently has 4 Type 214 AIP submarines and 1 Type 209 AIP modernized submarine in its inventory. Israel actively operates 2 Dolphin-II class AIP

submarines. In the coming years, Israel plans to increase the number of AIP to 6. Other countries in the region (e.g., Syria, Egypt, Algeria) do not have submarines with AIP technology yet.

In addition to 6 REIS-class subs, commissioning national submarines to be produced under the MILDEN project, which is currently in the design phase, will make a significant difference in the region. Implementing various capabilities of the technologically advanced GÜR class submarines to some of the older AY and PREVEZE class submarines under the MÜREN project will reinforce the distinguished position of the Turkish Navy's

Submarine Fleet among the Mediterranean Navies.

Like Turkey's other accomplishments in the defense industry in the last quarter-century, Turkey's balance-changing acquisition of AIP submarines is closely followed by both the countries of the region and the global players. The increased presence of the Turkish Navy in the surrounding seas, especially after the Blue Homeland doctrine's physical implementation, gives a vital clue about how actively the Reis-Class submarines will be used after they entered service.

Greece had to considerably cut its defense expenditure and

# AIP SUBMARINES EAST-MED & AEGEAN SEA



froze its defense industry projects due to the great economic crisis in 2008, which reduced the Greek Navy's effectiveness in the Aegean Sea. Facing the increasing force of the Turkish Navy in this process, Greece sees AIP submarines as a critical advantage, apart from the geographical advantage of the islands. Therefore, it does not want Turkey to acquire this technology. In this context, Greece has increased its diplomatic initiatives in the European Union due to the Oruç Reis seismic research ship's activities in the Eastern Mediterranean, and Greek Foreign Minister Nikos Dendias urged Germany to withdraw its support for the Reis-Class submarine project

on September 11, 2020. In this statement, Dendias expressed his concern that Greece's self-proclaimed strategic advantage in the Southeast Mediterranean and the Aegean Sea might be diminished.

Israel, whose defense doctrine is based on protecting its mainland, and the Leviathan & Tamar oil platforms, has different expectations from AIP submarines. Israel awaits its threat will mostly come from Iran and the armed groups it supports. In this context, Israel aims to reinforce the advanced air defense systems in its mainland with Barak-8 long-range air defense missiles onboard the Sa'ar 6 class corvettes recently purchased.

Therefore, Israel can use its highly technological AIP submarines to counter possible underwater threats against the mainland and respond with strategic missiles on their subs in case of an attack. Israel could deploy these submarines in the Persian Gulf without being detected and strike Iran's critical facilities with cruise or nuclear missiles. As it can be understood from here, Israel's primary advantage over Iran and its neighboring countries is the superiority of its air force and Dolphin-II class submarines' capability to hit strategic targets deep inside the opponent's territory.

After the commissioning of REIS-Class submarines,

the Turkish Naval Forces will have the highest number of AIP submarines in the Aegean Sea and the Eastern Mediterranean, and the only instrument that Greece considers as an advantage will disappear. Although islands provide considerable geographical advantages, they also need adequate protection. Therefore, if Greece dares to increase its territorial waters to 12 nautical miles, which is considered as 'Casus Belli' (the occasion for war) by Turkey, the Turkish Navy's AIP submarines operating in the territorial waters of Greek islands without being detected for days will pose a serious threat and change the balance in favor of Turkey. While Turkey covers the area of



interest with its AIP capable submarines and UAVs/UCAVs, which have been very successful in Libya, Syria, and Azerbaijan, they will be able to provide Anti Access/Area Denial (A2/AD) without the intense presence of the surface assets.

Even though it is generally thought that Israel will use its AIP submarines first and foremost based on its long-standing threat perception, Turkey's lack of AIP submarines provided an edge to the Greek- Israeli side in the Eastern Mediterranean, which started as a natural gas consortium and then turned into a military alliance in recent years. However, the political and military power of a possible coalition between Israel, Greece, and Egypt in the Eastern Mediterranean will be shaken with the commissioning of Reis-Class and MILDEN submarines, and the Turkish Naval Forces will have the upper hand. The uninterrupted patrol that these submarines will establish in critical passages in the region while staying hidden underwater will cut the Aegean-

Mediterranean-Cyprus maritime transportation that Greece will need in case of a possible crisis in the region and may prevent the transfer of strategic forces. Moreover, these submarines will also give vital information to the surface units that will serve in the Aegean Sea under the protection of the UCAVs and S-400 air defense system that may be deployed in the region, which will provide significant advantages in generating the Recognized Maritime Picture (RMP) in times of crisis and making effective engagements in case of aggression.

The AIP submarines, which will become the silent and effective underwater members of the network-centric warfare with their satellite communication and Link-11 capabilities, will change the military balance in both the Aegean Sea and the Eastern Mediterranean. Furthermore, they will provide significant target intelligence together with our military satellites by conducting intelligence missions in peacetime.

Consequently, while Turkey will weaken the influence of the coalition formed against it in the

Aegean Sea and the Eastern Mediterranean politically thanks to the additional tactical elasticity and combat capabilities of the AIP submarines, it will also successfully establish underwater protection at the tactical level similar to the air protection provided by the S-400s. The impact of the submarine strength of the Turkish Naval Forces, which is effective, deterrent, and respected in maintaining peace, will be felt by all the countries in the region and will be a significant milestone for protecting our interests in the Blue Homeland ■





## CRITICAL VISION TECHNOLOGY

To See, Save and Protect.

# TOTAL SOLUTIONS PACKAGE



### TrakkaCam® TC-300

- 4 Axis gyro-stabilized (6 Axis Passive Stabilization)
- Up to 7 Payloads
- Lightweight/compact single LRU design
- ITAR – Free

### TrakkaMaps® TM-100

- Mapping & Recording Video Management System
- Multi map views with augmented reality
- Integration with open and proprietary user databases
- Intuitive control and innovative post-processing

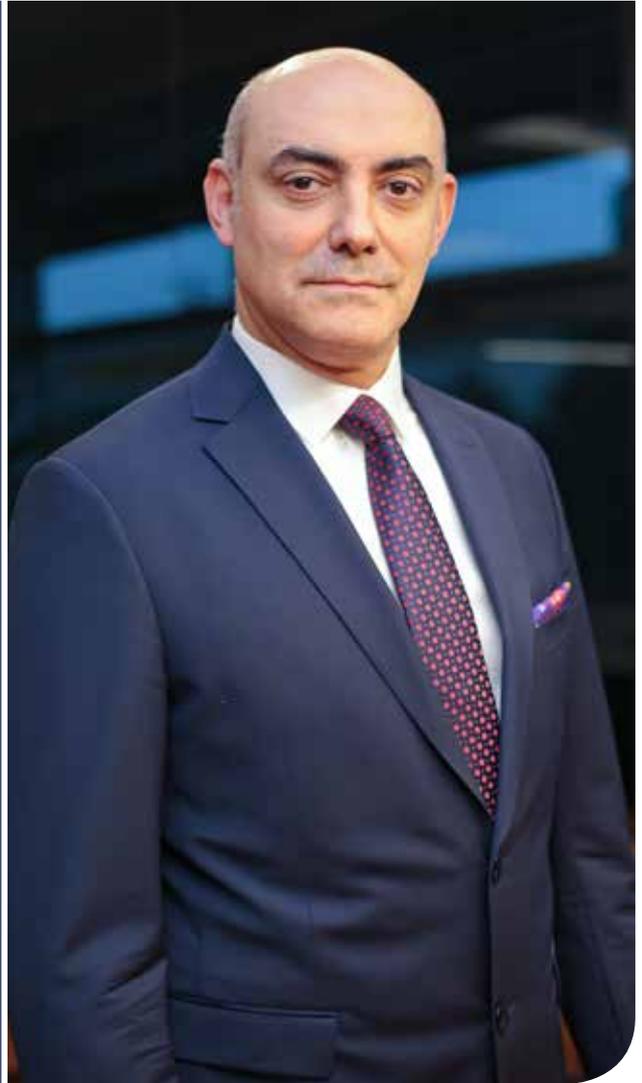
### TrakkaBeam® TLX

- High performance searchlight with superior beam quality
- Lower power draw
- Internal multispectral filters
- Optional new dual EO/IR sensors for full situational awareness

# COŞKUNÖZ HOLDING

## LEADS THE WAY WITH STATE-OF-THE- ART INDIGENOUS TECHNOLOGY IN KEY INDUSTRIES

Coskunöz Holding CEO Erdem ACAY shares insight into the 70 year company history in key industries such as the automotive industry, defense and aviation, environmental technologies and information technologies. With 12 companies Coşkunöz Holding follows technological developments in the new global balance in line with their strategic targets, concentrating on high value-added products and technologies. In this interview we find out more about how UAVERA aims to develop and produce optimum and indigenous products in line with the requirements of military and civilian stakeholders, and the latest developments on the Çağatay VTOL. In addition to UAV and military projects, the company plans to provide services and products to semi-private and private enterprises in areas such as surveillance, detection, tracking and maintenance.



**Defence Turkey: First of all, thank you for your time for the interview. Let's start off with the history of the company. Could you take us back to the roots of Coşkunöz Holding and how it has made a name for itself especially in the automotive industry?**

**Erdem ACAY:** The foundation of Coşkunöz Holding dates back to the 1950s, when our founder M. Kemal Coşkunöz, who was a teacher, established the SKT Company with two partners and afterwards established his own workshop. The first patented fabric marking machine production in Turkey was made in 1950 by our founder Kemal Coşkunöz. He established his own workshop in Bursa

after he separated from SKT in 1960 and started Sheet Metal Bending Steel Joinery Profile manufacturing and the first steel bus body production was made in Turkey in 1963. In 1966, the foundations of the Metal Form factory were laid and for the first time, a driver's cab was produced for Fiat. In 1969, the mass production of the Turkish Tractor Body was initiated. In 1973, after the conversion of K.Coşkunöz Company into a joint stock company, the mass production of Oyak Renault body parts started. In 1990, the first sheet metal forming molds were exported to Isuzu Belford (UK) and Opel (Germany). In 1991, the export of transport and containment crates

produced from aluminum alloys for the defense industry launched. From the 1990's to the 2000's, the Holding continued to grow and pioneered in different sectors with new brands. Coşkunöz Defense and Aerospace Company was established in Eskişehir in 2006. In 2007, it received the AS/EN 9100 Certificate and the TUSAŞ Supplier Approval Certificate. Coşkunöz Metal Form Company received the best supplier award from Citroen in 2011. Coşkunöz Metal Form, performing services for PSA (Peugeot Citroen Group) in mold production, became one of the two companies awarded by PSA in the field of capital goods quality worldwide. In the same

year, Coşkunöz Defense and Aerospace was selected as a "Gold subcontractor" by TUSAŞ. In 2015, Coşkunöz Defense and Aerospace started the mid-body assembly project of KAI's Korean Utility Helicopter KUH Surion. Last year, Coşkunöz Holding acquired İVME İHS, which operates in the field of unmanned aerial systems, and stepped into the production and development of UAV technologies with İVME İHS, with its new name UAVERA.

As Coşkunöz Holding, we are committed to our philosophy of being a pioneer in the sectors we are in. We have created added value in the sectors we have been serving for more than 70 years.

## **Defence Turkey: What are Coşkunöz Holding's fields of activity and capabilities?**

**Erdem ACAY:** We execute significant projects with world-renowned companies in key industries such as the automotive industry, defense and aviation, environmental technologies and information technologies. We have in-depth experience and capabilities in these areas. With our 12 companies, we closely follow the technological developments in the new global balance in line with our strategic targets, and concentrate on high value-added products and technologies.

Coşkunöz Defense and Aerospace, performs activities in the defense industry and gets fruitful results from the technologies it has developed, especially in additive manufacturing, in its defense and aviation activities together with R&D activities.

INEVA, our new investment in the field of energy, attracts great attention with its innovative solution for the disposal of sewage sludge.

Coşkunöz Molding Machine Company goes beyond its profitability and quality targets with its advanced engineering capability.

Coşkunöz Metal Form Company continues to create value for its customers with high quality products and services for the automotive industry.

CITS Information Services offers businesses integrated SAP business solutions and other information technology services. It also performs activities on a global scale with our

companies abroad which create added value for businesses where they operate.

## **Defence Turkey: Could you inform us about the corporate structure, facilities, number of staff and production infrastructure of Coşkunöz Defense and Aerospace, which started to perform activities in 2007?**

**Erdem ACAY:** Coşkunöz Defense and Aerospace (CSH) is a 100% private company established by Coşkunöz Holding. Its main field of activity is defense and aerospace. It offers fuselage assembly solutions for fixed and rotary wing platforms, manufactures structural components, performs fabrication and assembly of finished cabin products, and also produces structural components for satellites. We operate in an outdoor space that spans 33,000 m<sup>2</sup> and an indoor space of 11,750 m<sup>2</sup>. Apart from TUSAŞ, we are the only company in Turkey capable of fuselage assembly, which requires high-precision and advanced technology. We are delighted in adding value to our sector with our services such as precision parts manufacturing, assembly, integration,

welding, design and engineering, with the awareness that we bring advantages to our country. Since we obtained NATO Secret and National Facility Security Clearances in March 2015, we have started subsystem and system production and integration activities in the field of defense. We added a new line to our strategic solutions by expanding our production range to the level of aircraft and helicopter fuselage manufacturing in the aerospace field. As CSH, we provide our customers with effectual and efficient production in our high security facilities, thanks to our modern production technology which provides a high level of automation and the performance of our qualified employees.

## **Defence Turkey: In January 2021, you acquired Ankara-based İVME İHS, operating in the field of Unmanned Aerial Systems, and incorporated under the name UAUVERA. Could you inform us about UAUVERA's objectives, activities and vision?**

**Erdem ACAY:** With an investment of around TRY15 million for the acquisition of UAUVERA, we, as Coşkunöz

Holding, aim to carry Turkey to top positions in the field of defense and aerospace in terms of indigenization. With UAUVERA, we will focus on providing products and services for use in the civilian and military field. By investing approximately TRY15 million in UAUVERA, we have started projects for the production of small class fixed wing UAVs capable of vertical landing and take-off and target UAVs reaching high altitudes and speeds. With our new investment, we aim to break ground in the Turkish defense and aerospace industry. In addition to UAV and military projects, we also plan to provide services and products to semi-private and private enterprises in areas such as surveillance, detection, tracking and maintenance.

Among our targets is to become the market leader and technology developer in small UAV and target the UAV market in Turkey. We aim to develop and produce optimum and indigenous products in line with the requirements of military and civilian stakeholders, and to be able to respond to certain needs with a leasing system in the most professional and cost-effective manner.





© Coşkunöz Holding

Çağatay UAV CGT50

**Defence Turkey: What would you like to say about the current status of your activities for the production of small class fixed wing UAVs capable of vertical landing and take-off, and target UAVs reaching high altitudes and speeds?**

**Erdem ACAY:** Currently, UAUVERA has the production capacity to manufacture 3 systems / 6 aircraft and sub-components per month. On the other hand, our R&D studies on UAV components continue. We aim to offer our products, which will be developed as a result of such studies, to our users with different business models. We will offer our state-of-the-art indigenous UAVs to end users with a cost-effective leasing model.

On the other hand, we continue development studies for our target UAVs, which are used as a target simulation platform in the test, calibration and training of indigenously developed Air Defense Systems. We are making efforts to develop platforms that will reach the speeds of 0,6 and 0,85 Mach, in addition to our UAVs that can currently reach the speeds of 77, 125 and 195 knots.

Furthermore, we aim to minimize the foreign dependency of our country in the target UAV market as well.

**Defence Turkey: In the field of Unmanned Aerial Systems, which capability and technology acquisition are you focusing on? What are your distinguished capabilities in this field?**

**Erdem ACAY:** Our most significant difference and technology is that our UAVs are able to vertically takeoff and land without the need for a runway. The UAV can make a vertical takeoff thanks to its electric motors and starts to move horizontally by activating its gasoline engine after take-off. After completing its task, the gasoline engine is deactivated and the electric vertical-moving engine is activated and can make a

vertical landing. With the software, this capability has become autonomous. It provides ease of use to the pilot with a user friendly simulation interface. Since it is locally developed, it is very affordable compared to its competitors. In addition, the UAVs we have developed can be modified for utilization in different types of tasks.

**Defence Turkey: Let's touch on the topic of your export activities in the field of defense industry and its impact on your annual turnover. What are your target international markets? Could you inform us about your projects abroad?**

**Erdem ACAY:** In 2015, we signed a contract with Korean Aerospace Industries (KAI) for the assembly of the center fuselage for 60 KUH Surion helicopters. We

continue our deliveries in line with our contract. With the competence we have gained within the scope of the project that will continue until 2026, we are one of the two companies that can perform "Fuselage Assembly" in our country. We conduct negotiations for the use of our fuselage manufacturing competence, one of the top competencies in aviation and aerospace, in national air platforms and in the products of global air vehicle manufacturers.

CSH currently serves domestic and international companies with its competence in air vehicle fuselage manufacturing and assembly and is progressing to further develop its competence in this field. Our objective is to become a leading company that will close the mid-tier producer (TIER 1) gap required by main



© Coşkunöz Holding

contractors and SMEs. There is export potential in this area for us.

**Defence Turkey: In which other fields do you perform activities in the defense industry as CSH, other than Unmanned Aerial Vehicles?**

**Erdem ACAY:** As CSH, we are always one step ahead with the competencies and experience we have gained in the defense industry. We are among the defense industry leaders in areas such as precision machining, component assembly, air vehicle fuselage assembly, sub-system & system manufacturing, subsystem & system integration, welding, special processes, quality management, logistics management and supplier management.

We also assume roles in critical domestic and national projects for the defense industry.

We manufacture systems and subsystems within the scope of the MILGEM project, BORA/KAAN Missile canisters, HİSAR Air Defense Missile canister, ATMACA Missile canister, remote control turret systems and missile transport boxes.

**Defence Turkey: What do you anticipate as far as sales targets in domestic and international markets over the next 10 years, your plans on technology acquisition and investment, and also your expectations regarding the added value you aim to provide to our country?**

**Erdem ACAY:** As a company that designs and develops

products using advanced technology in the defense and aviation industry, it is our main priority to always maintain a high level of customer satisfaction with our zero error and timely delivery principle. We aim to become a leading manufacturer in domestic UAV technologies, especially with the strength we derive from our R&D activities.

**Defence Turkey: Do you have any additional comments that you would like to share with our readers?**

**Erdem ACAY:** I would like to give brief overview about the Çağatay UAV CGT50, which UAUVERA continues to develop. We will hear its name much more in the future and see more advanced versions in the

future. With indigenous design and manufacture, the Çağatay VTOL is capable of performing strategic tasks and has a 4.65m wingspan. With endurance of 6 hours, the Çağatay VTOL uses an electric motor for vertical take-off and landing. Thus, it does not require a runway or catapult/launcher. The Çağatay VTOL takes off from a stand and is able to land on a 5 x 5 m space. Thanks to this feature, the Çağatay VTOL is ideal for missions where landing and take-off areas are restricted or dangerous. Our UAV, which has a maximum cruising speed of 58 knots, can operate at an altitude of maximum 18,000 feet with its fully autonomous system. The fact that our vehicle is equipped with a satellite control system is of great advantage for the user ■



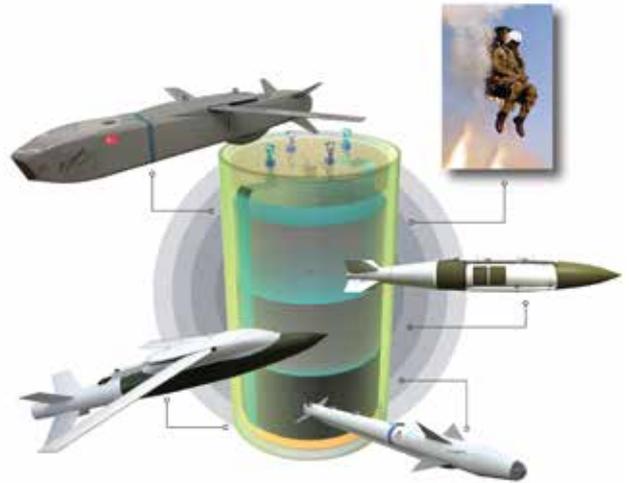
# The Heart of Guided Munitions: Thermal Batteries

Thermal batteries are classified as primary (reserve) batteries due to being single use only. They are extensively used in smart munitions, fuses, torpedoes, acoustic torpedo countermeasure jammers and decoys, artillery munitions, aircraft emergency escape systems and space applications. Thermal batteries are known for their rugged design, capability to withstand and operate under temperature extremes (up to  $-60/+90\text{ }^{\circ}\text{C}$ ) and dynamic environmental conditions such as mechanical shock, angular acceleration and vibration. As well as their mechanical durability, thermal batteries provide high power densities because of their highly conductive molten salt electrolyte, once activated. Before activation, thermal batteries remain completely inert which contributes to their long shelf life of up to 25 years without performance degradation. Preliminary designs of thermal batteries were employed in V2 rockets developed by Germany during the Second World War.

Thermal batteries are activated by mechanical or electrical initiators incorporated into its header. Upon electrical or mechanical input, pyrotechnic pellets inside of thermal batteries receive enough energy to sustain burning until it is

depleted. Heat generated from pyrotechnic pellets melts the electrolyte pellets between anode and cathode establishing an ionic bridge between them. The activation process takes as short as 100 – 700 milliseconds depending on the battery design. An activated battery can power electronics (i.e. seeker), pyrotechnics (i.e. sequence timer for emergency escape systems) and mechatronics (i.e. wing drive systems) ensuring their operations at the right time with a high level of reliability.

TÜBİTAK SAGE's combat proven thermal batteries are designed by utilizing state of art and indigenous simulation software that is capable of solving mathematical models of electrochemical and thermal processes simultaneously. Thermal batteries for specific requirements are carefully tailored using both simulation software and testing capabilities. So far, exceptional reliability

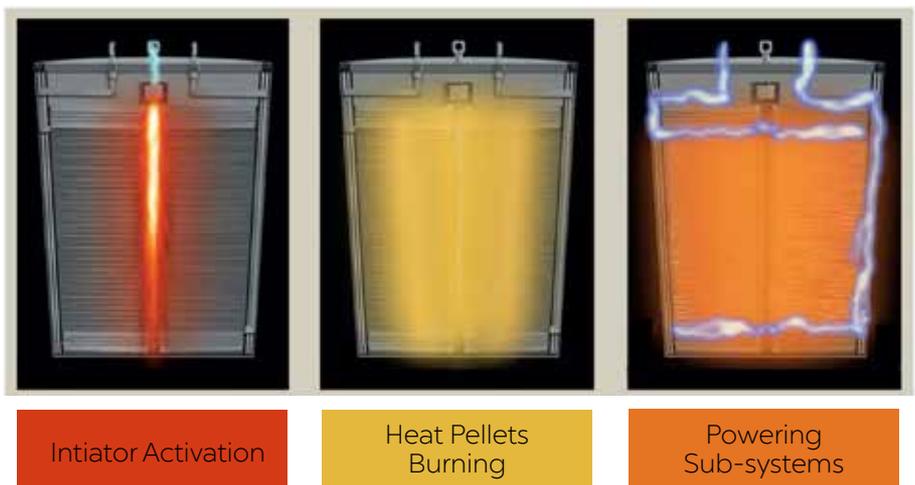


Military Applications of Thermal Batteries

levels (over 99.95%) were achieved for every thermal battery emerging from TÜBİTAK SAGE.

Thermal batteries that are produced in Turkey are designed, produced and validated under the roof of TÜBİTAK SAGE with superior quality and continuing success. Thermal battery production at TÜBİTAK SAGE is rooted in the national initiative

of eliminating critical component dependency on foreign suppliers. In 2002, a laboratory scale design of thermal batteries was created and now, TÜBİTAK SAGE is an accomplished thermal battery producer that not only fulfills domestic requests but is also a value-added foundation that exports its batteries to technology giants such as Spain, Germany and Brazil.



# STRENGTH THROUGH PERFORMANCE



# Highly Reliable Solutions: Pyrotechnic Systems

Derived from a Greek word, meaning "the art of fire", pyrotechnics are in the class of energetic materials, including explosives and propellants. Pyrotechnic compositions consist of an oxidizing agent and a fuel that produce an exothermic self-sustaining reaction when heated to ignition temperature [1].



Pyrotechnics are used to refer not only to pyrotechnic compositions but also to its products, so called pyrotechnic systems. Pyrotechnic systems consist of a broad family of sophisticated one-shot devices that deal with producing heat, light, smoke, sound, motion and/or combination of these [2, 3]. Their unique properties are as follows:

- low weight and small size,
- low activation energy requirement,
- high reliability (Reliability>99, Confidence Level>95),
- short activation time (<20 ms),
- long and maintenance free shelf life (>10 years),
- wide operating temperature range,
- survive and operate at extreme environmental conditions (vibration, mechanical and thermal shock, acceleration, humidity, salt fog etc.),

- ability to deliver more energy in a short time (ms) than any other mechanical devices,
- performance characteristics specific to system requirements

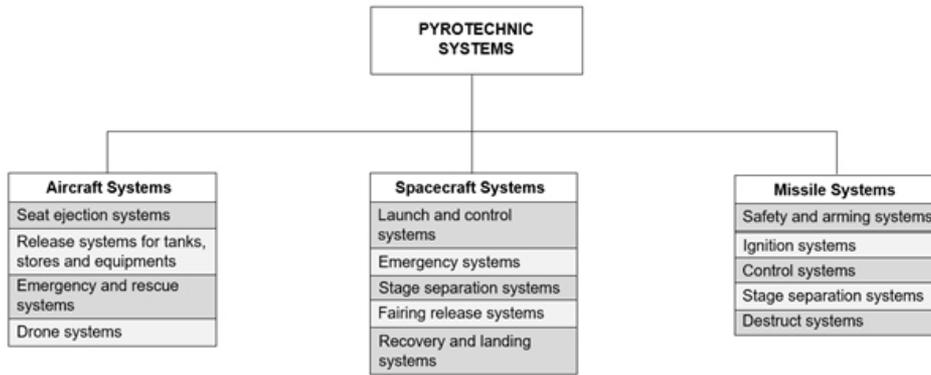
These unique properties make them crucial components especially for the defense industry. Pyrotechnic systems are preferred in military munitions, stand-off missiles, air, space and underwater vehicles to provide ignition, pressure and mechanical requirements including emergency and life-saving applications such as seat ejection systems and

rescue flares [6]. Beyond the defense industry, pyrotechnic systems are also used in civilian systems such as airbags in the automotive industry, in the crafting of fireworks, in blasting in mining via gas pressure and in safety matches etc.

Pyrotechnic systems, have been used for a variety of work functions aboard aerospace vehicles since 1945 [4], and are divided into groups according to their specific performance properties. Most widely used pyrotechnic systems and their missions are listed in below table.

Depending on the munition characteristics more than 30 pyrotechnic systems could be used in one munition. In contrast, in spacecraft there is a higher need for pyrotechnic systems. It was declared that in the Mercury program, which ran from 1958 through 1963, 46 pyrotechnic systems were used whereas in the Apollo (CSM/SLA/LM) program 314 pyrotechnic systems were used [4]. It was also concluded that pyrotechnic systems have been singularly responsible for the success of many of the critical mechanical functions in aerospace programs [5].

Pyrotechnic System	Mission
Initiators	initiation of rocket motor igniters, activation of thermal batteries functioning of pyrotechnic actuated systems
Pressure Cartridges	meet moderate pressure requirements of subsystems
Gas Generators	meet high pressure requirements of subsystems
Pin Pullers	release side forces applied on pin surface
Pin Pushers	rupturing/pushing requirements of subsystems
Cable Cutters	release subsystems by cutting cables/wires
Pyrotechnic Valves	opening or closing of fluid line
Pyrotechnic Bolts	carry high tension loads and separation of loads after activation
Rocket Motor Igniters	ignition of rocket motor



Pyrotechnic systems research and development activities started in 2007 within the scope of initiator requirements of thermal batteries at TÜBİTAK SAGE. Since

of pyrotechnic systems according to military standards especially MIL-STD-810G and MIL-DTL-23659F.

Due to growth in demand of pyrotechnic systems

#### Product Inventory

- Initiators,
- Detonators,
- Exploding Foil Initiators (EFI),
- Pressure Cartridges,
- Gas Generators,



then several pyrotechnic systems were designed, qualified and produced to meet the pyrotechnic system requirements of the national defense industry.

With the know-how gained since 2007, custom-based designs are performed, fulfilling project requirements, following qualification

in national defense projects, the TÜBİTAK SAGE pyrotechnic systems design and production facility was founded in 2017. This facility enables the start-up of mass production activities, and in 2020 the annual production capacity of pyrotechnic systems reached 15,000 products.

Pyrotechnic Systems in the TÜBİTAK SAGE

- Pin Pullers,
- Pin Pushers,
- Cable Cutters,
- Pyrotechnic Bolts,
- Pyrotechnic Valves,
- Through Bulkhead Initiators (TBI),
- Rocket Motor Igniters

In addition, research and development activities for design and production of laser initiated pyrotechnic systems are in progress.

The goal of TÜBİTAK SAGE is to offer highly reliable solutions for national defense industry projects. In line with this purpose TÜBİTAK SAGE pyrotechnic systems research and development, qualification and production activities are in progress. With the growing experience and know-how, TÜBİTAK SAGE stands in a position ready to make future contributions to the National Space Program of Turkey ■

## References

[1] Engineering Design Handbook: Military Pyrotechnics, Part One, Theory and Application, AMCP 706-185, 1967.

[2] Dillehay D.R., Pyrotechnic Chemistry, Pyrotechnic Reference Series No. 4, Journal of Pyrotechnics, 2004.

[3] Lucy M.H., Hardy R.C., Kist E.H., Watson J.J., Wise S.A., Report on Alternative Devices to Pyrotechnics on Spacecraft, 10th Annual AIAA/USU Conference on Small Satellites, USA, 1996.

[4] Lake E. R., Thompson S. J., Drexelius V. W., A Study of the Role of Pyrotechnic Systems on the Space Shuttle Program, Technical Report, NASA CR-2292, USA, 1973.

[5] Bement L.J., Schimme M.L., A Manual for Pyrotechnic Design, Development and Qualification, NASA Technical Memorandum 110172, N95-31358, USA, 1995.

[6] Brauer K.O., Handbook of Pyrotechnics, Chemical Publishing Co., Inc., USA, 1974.





## Turkey Unveils 10-Year National Space Program

President Recep Tayyip ERDOĞAN announced Turkey's National Space Program with a ceremony held on February 9, 2021. In a major milestone, the ambitious 10-year space road map includes missions to the Moon, sending Turkish scientist into international space station (ISS), and developing internationally viable satellite systems by 2023.

The program, prepared by the Turkish Space Agency (TUA) and led by the Ministry of Industry and Technology, was announced at the Beştepe National Congress and Culture Center in the capital Ankara. Speaking at the live event, President ERDOĞAN said the first goal of the comprehensive program was to touch down on the Moon in 2023, the centennial of the founding of the Turkish Republic. "Our first goal is to land

on the Moon by 2023, the 100th anniversary of the Republic of Turkey. I believe Turkish engineers will manage to carry out this mission," he said. ERDOĞAN also declared Turkey's aim to send Turkish Scientist into space with international cooperation, to partner with other countries to build a spaceport, and to create a global brand in satellite technology. I hope that this roadmap will come to life successfully and will propel Turkey into the top league in the global space race. Our feet will be on Earth, but our eyes will be in space. Our roots will be on Earth; our branches will be up in the sky."

### Goals of the National Space Program

Unveiling the program, President ERDOĞAN also outlined its primary objectives saying the

"primary and most important goal in the National Space Program is to make the first contact with the Moon on the 100th anniversary of the Republic. "We will realize the first launch that will bring our spacecraft into close orbit with international cooperation. The first stage of the launch vehicle will be of foreign origin, while the second stage will utilize Turkish rockets. At the end of 2023, we will reach the Moon with our national and unique hybrid rocket that we will launch into near-Earth orbit and will complete a hard landing," he added. "Our second goal in the National Space Program is to create a trademark that can compete globally in the field of next-generation satellite development. In the second phase in 2028, we will take our vehicle into close orbit, and we will conduct the first launch with these

national rockets. The third goal in the National Space Program is to develop a regional positioning and timing system. The fourth objective is to provide access to space and establish a spaceport. The next goal is to increase competence in space by investing in space weather or meteorology. The sixth target is to establish astronomical observation posts and to elevate Turkey's capabilities to a higher level in tracking space objects from the ground. The seventh goal is further to develop the economy of the country's space industry. The next goal in our space program is to establish a space technology development zone. The ninth goal is to develop our effective and competent human resources in the field of space. The tenth and final goal in the Space Program is to send a Turkish citizen into space," ERDOĞAN said.

President ERDOĞAN also underlined Turkey's plan to establish a spaceport while ensuring access to space. "Our national and domestic rockets should be capable of carrying heavy payloads into Earth's orbit," he underlined. Noting that Turkey's geographical location is not convenient for establishing the spaceport, ERDOĞAN said Turkey would cooperate with allied countries in the most suitable geographic areas. Stating that another goal of the program is to increase its competitiveness in space by investing in space meteorology, ERDOĞAN said, "Turkey would boost its efficiency in astronomical observations and tracking space objects from Earth.

We will contribute to identifying and tracking of objects in Earth's orbit." In addition, president ERDOĞAN noted that a Space Technology Development Region will be established to welcome domestic and foreign investors. Noting that the country will develop effective and qualified human resources in space studies, he said the final goal is to send a Turkish citizen into space with a scientific mission. Touching on the government's efforts, ERDOĞAN said TRY2.1 billion has been provided for 56 projects on satellite, space launching systems, and space equipment in the last 18 years. "We have developed and produced several critical subsystems such as a

high-resolution space camera, a new-generation flight computer and software, an ion thruster, a steerable antenna, a reaction wheel, and a sun sensor," he noted. Under the program, Turkey will further develop the economy of its space industry, ERDOĞAN stressed. "We will carry the success we have achieved in the defense industry to the space arena and ensure the formation of a strong and productive ecosystem," he noted.

President ERDOĞAN added that the program also includes the high-resolution provider GÖKTÜRK-3 and TÜRKSAT-6A, which is set to launch in 2022. He said the communication satellite, TÜRKSAT-5A, has

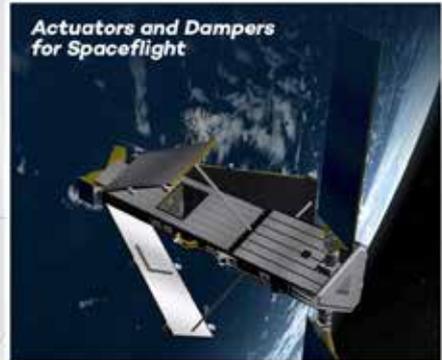
already been launched into space. On January 8, Turkey launched the new-generation communication satellite TÜRKSAT-5A into orbit from the U.S. in cooperation with SpaceX. The TÜRKSAT-5B satellite is planned to be launched in the second quarter of 2021. In addition to TÜRKSAT-5A, Turkey has several other satellites currently in space. Three of the satellites are for communication, namely TÜRKSAT-3A, TÜRKSAT-4A, and TÜRKSAT-4B, while the other three, GÖKTÜRK-1, GÖKTÜRK-2, and RASAT, are for observation. Turkey has also manufactured a domestic high-resolution satellite called İMECE, which is expected to be launched in 2022 ■



**Shock Absorbers for Spaceflight and Ground Support Equipment**



**Zero-Maintenance Landing Gear Shock Absorbers**



**Actuators and Dampers for Spaceflight**



**Taylor Devices Load Isolation System, International Space Station**



**6 Degree of Freedom Isolation Systems**



**Recoil/Counter-recoil Absorbers & Controllers**

[fujiengineering.com](http://fujiengineering.com)  
+90 (216) 464 8042  
[info@fujiengineering.com](mailto:info@fujiengineering.com)

Soğanlık Yeni Mahalle Pegagaz  
Sok. Pegakartal N:6 A Blok D:3  
Kartal, İstanbul, Turkey

 **taylor** devices inc.



# The Turkish Defense and Aerospace Industry's 2020 Export Performance

Despite the Substantial Decline in Figures due to COVID-19, Recent Figures Look Promising

**İbrahim SÜNNETÇİ**

*The Turkish Defense and Aerospace Industry, which broke new records in terms of both turnover and export figures in 2019, has unfortunately faced a severe decline in product exports, especially since March, due to the COVID-19 pandemic that deeply affected our daily lives as well as the business world in 2020. In the 3-month period following August, a serious acceleration started in exports to the extent that it surpassed the 2019 figures (US\$ 177,409*

*million, US\$ 281,551 million and US\$ 287,184 million, respectively), but in November, when the second wave of COVID-19 began to be felt, a significant decline in international sales was experienced again. However, an upward trend was achieved again in December and exports of defense and aerospace products increased by approximately 46% compared to the previous month (despite the decrease by 3,1% compared to December 2019).*

According to Turkish Exporters Assembly (TIM) data, the Turkish Defense and Aerospace Industry achieved exports totaling US\$ 279,512 million in December 2020 and US\$ 2,279.027 billion for the year based on data from 1 January 2020 - 31 December 2020. In the light of this data, a decline by 16,8% was recorded in defense and aerospace product exports in 2020 compared to 2019. I consider that the increase in exports achieved in December will continue in January 2021 as well. With the initiation of the

first payments under the contracts signed in the second half of 2020, export revenues are expected to increase further in 2021 and even exceed 2019, which closed at a record high. According to TIM data, the Turkish Defense and Aerospace Industry exported approximately US\$ 2,740.144 billion to 164 countries worldwide in 2019 (34,6% increase compared to 2018) and the export figure was expected to reach US\$ 3,2 billion in 2020. On the other hand, in the Presidential Annual



# COVID-19

Program of 2021 prepared by the Presidency of Strategy and Budget, the export volume was projected to be US\$ 6,2 billion and the overall turnover was forecasted at US\$ 19,7 billion for 2021.

On January 5, 2021, Minister of Trade Ruhsar PEKCAN announced Turkey's 2020 foreign trade figures, emphasizing that 2020 reached a record high in terms of exports. Even though Turkey's overall exports were US\$ 17,843.802 billion with an increase of 16% in December, compared to the same

month of 2019 (the highest monthly export figures of all time), it fell by 6,3% between January 1, 2020 and December 31, 2020. According to TIM data, Turkey's total exports amounted to US\$ 180,832.722 billion in 2019, while in 2020 exports amounted to US\$ 169,514.167 billion.

When we look at the monthly breakdown of total exports in 2020 for the Turkish Defense and Aerospace Industry worth US\$ 2,279,027 billion, it was US\$ 166,851 million in January, US\$ 173,864

million in February, US\$ 141,494 million in March, US\$ 160,660 million in April, US\$ 112.402 million in May, US\$ 167,259 million in June, US\$ 139,475 million in July, US\$ 177,409 million in August, US\$ 281,551 million in September, US\$ 287,184 million in October, US\$ 191,366 million in November and US\$ 279,512 million in December.

However, according to TIM data, while export revenues decreased, the total weight of exported products increased steadily. Accordingly, the

total weight of defense and aerospace products exported in October 2020 was 4,412 tons, while it was as 4,813 tons in November and 6,954 tons in December. The total weight of defense and aerospace products exported in December 2019 was announced as 4,713 tons. Accordingly, an increase of 47.5% was achieved in the total weight of the exported products in December compared to the previous year. As per TIM data, while a total of 43,873.000 kg of defense and aerospace products

were exported between January 1 and December 31, 2019, this was around 47,544.000 kg during the same period in 2020. Accordingly, an increase of 8.4% was recorded in the total weight of the exported products in 2020 compared to the previous year. In the light of such data, the kg/US\$ value of exports for 2019 was US\$ 62,46 (the export kg value of Aselsan, which realized US\$ 330 million in 2019, was announced as US\$ 1,500), while this value was recorded as nearly kg/US\$ 48 in 2020.

On the other hand, despite the COVID-19 pandemic, our defense and aerospace industry companies signed a series of export agreements in 2020 which will bring results as from 2021, and this signals a potential increase in the export of defense and aerospace products for the upcoming period. In this context, for example, the project contract worth US\$ 2,3 billion with a 9-year schedule for the construction of 5 Fleet Support Vessels (FSV) at 45,000 tons for the Indian Navy, to which TAIS Shipyard is also a party, was signed by Hindustan Shipyard Limited (HSL) in February 2020, after the necessary permits from the Indian Ministry of Defense. TAIS, with its local partner Hindustan Shipyard Limited (HSL) Shipyard, was the successful bidder in the international tender in May 2019, but the contract award was suspended

due to President ERDOĞAN's speaking out on the Kashmir problem repeatedly in the international arena. Katmerciler Company that exported US\$ 3,25 million worth of security vehicles to an undisclosed country in September 2020 is getting ready for the delivery of 118 HIZIR MRAPs to the Kenyan Defense Forces. In January, Kenya Defense Forces spokesman Colonel Zipporah Kioko declared that they planned to procure 118 HIZIR 4x4 MRAP vehicles from Katmerciler through the Export Credit Bank of Turkey (Turk Eximbank). "The Star", one of Kenya's national newspapers published the cost of the purchase to be around 7,7 billion Kenyan Shilling (nearly TRY 518 million and US\$ 73 million). Simsoft Company signed a contract with an undisclosed Far East country for the development of an air defense weapon system simulator in September 2020, while Otokar signed a contract with unnamed African countries for the sales of COBRA II, ARMA 8x8 ZMA and tactical wheeled armored vehicles in October 2020 for US\$ 110 million and at the beginning of November 2020, it signed two separate contracts worth US \$25 million. Aselsan, which increased the number of its users to 70 by exporting to 6 new countries in 2020, signed an export contract of

US\$118 million with an international customer on November 7, 2020, regarding the export of an unspecified defense system solution. In November, it also signed three sales contracts with an international customer for the export of Electro-Optics and Communication Systems with a total value of US\$ 38,822 million. It is noted that the deliveries under the contracts will be made in 2021-2022. Despite the COVID-19 restrictions, two contracts signed between FNSS and the Philippines Ministry of Defense in 2020 have officially become effective. In this context, FNSS will supply stabilized manned weapon tower systems to the Philippine Army until 2022 and provide the necessary logistic support services with AZMIM vehicles until 2023.

The financial volume of the export contracts, which was publicized in December 2020 (export value of defense and aerospace industry products was US\$ 279,512 million), reached several billion dollars. In this context, for example, President of Defense Industries İsmail DEMİR and the accompanying Turkish delegation officially visited Ukraine on December 14, 2020, and a series of agreements were signed between Ukraine and Turkey for the production and technology sharing

regarding ADA Class Corvettes and Baykar Company's Armed UAVs. The agreements, the financial value of which I estimate will reach US\$ 2 billion, are reported to cover the export of 12 Ground Control Stations and 48 Bayraktar TB2 Armed UAVs (the first agreement worth US\$ 69 million signed in January 2019 covered the sales of 6 Armed UAVs and 3 Ground Control Stations together with the necessary ammunition), and 4 ADA Class Corvettes (the financial size of the contract previously signed with Pakistan for the sales of 4 JINNAH Class Corvettes was announced as US\$ 1.5 billion). The corvettes (first in Turkey) and a portion of the Armed UAVs will be produced in Ukraine. In a report by Anadolu Agency on December 22, 2020, it was stated that ADA Class Corvettes will be built in the Ocean Shipyard (PJSC Mykolaiv Shipyard Ocean) in Nikolayev, Ukraine. President of Defense Industries İsmail DEMİR, with a post on his social media account on December 24, 2020, stated that the Turkish Defense and Aerospace Industry conducted substantial exports to Tunisia in the last days of 2020 and added, "Under the coordination of our Presidency, 5 of our companies have exported a total of US\$ 150 million." Regarding the contracts, President DEMİR announced that TUSAS' ANKA-S

Unmanned Aerial Vehicles, BMC's KIRPI and Nurol Makina's EJDER YALÇIN armored vehicles, Katmerciler's tank carriers and tankers and Aselsan's electro-optic systems will be in the service of Tunisian security forces. According to the news in the press, 100 KIRPIs, 9 VURANs, 71 EJDER YALÇINs and 6 ANKA UAVs were sold to Tunisia.

Aselsan, the flagship company of the Turkish Defense and Aerospace Industry, wrapped up 2020 with an export of defense and aerospace products. With a statement submitted to the Public Disclosure Platform (KAP) on December 31, 2020, Aselsan announced that it signed an international sales contract with an international customer regarding the export of command and control systems, Oanti-tank missile launch systems, inertial navigation systems and gunshot detection systems, with a total value of US\$ 38,266.780. Meanwhile, Aselsan Chairman of the Board and CEO Prof. Haluk GÖRGÜN stated that Aselsan achieved a turnover of approximately US\$ 2,3 billion and exports worth US\$ 331 million in 2019 at the "Independent Thoughts Meeting" held by the Bursa Branch of the Independent Industrialists and Businessmen Association (MUSIAD) on January 22, 2021. "We have exported

Country	December 1st 31st		January 1st - December 31st			
	2019	2020	Variation	2019	2020	Variation
USA	68,020.16	96,654.91	42.1%	816,511.55	784,227.29	-4.0%
Azerbaijan	52,672.83	5,189.16	-90.1%	88,675.98	260,839.32	194.1%
UAE	212.46	12,077.44	5584.6%	132,228.75	200,280.47	51.5%
Germany	14,929.10	13,181.03	-11.7%	256,868.13	157,685.97	-38.6%
India	20,52	12,79	-37.6%	40,628.63	127,266.91	213.2%
Oman	34,949.45	0,00	-100.0%	297,199.20	74,449.46	-74.9%
Pakistan	1,638.24	46,471.81	2736.7%	40,175.23	67,396.99	67.8%
Qatar	8,382.30	993,62	-88.1%	186,168.28	44,554.25	-76.1%
UK	6,584.71	3,379.78	-48.7%	60,603.79	41,405.07	-31.7%
Netherlands	2,391.45	1,414.74	-40.8%	75,125.41	40,776.05	-45.7%
Bahrain	12,439.25	4,235.27	-66.0%	40,812.57	29,738.08	-27.1%
Indonesia	0,00	15,90		377.16	27,606.27	7219.5%
Russian Federation	536,56	1,640.43	205.7%	8,499.59	26,979.54	217.4%
Ghana	0,66	24,477.99	37270390%	22,201.77	24,688.46	11.2%
Poland	572,89	1,303.30	127.5%	33,675.05	23,953.51	-28.9%

to 70 countries so far. Aselsan signed export contracts worth over US\$ 450 million in 2020 despite the COVID-19 pandemic. This figure will increase even more in the coming years with the start of normalization period. For companies like us, the level of export is not satisfactory."

Upon examination of the TIM export data the top 15 countries with the highest exports between January 1, 2020 and December 31, 2020 from the Turkish Defense and Aerospace Industry are as follows: USA (US\$ 784,227 million), Azerbaijan (US\$ 260,839 million), UAE (US\$ 200,280 million), Germany (US\$ 157,686 million), India (US\$ 127,267 million), Oman (US\$ 74,449 million), Pakistan (US\$ 67,397 million), Qatar (US\$ 44,554 million), United

Kingdom (US\$ 41,405 million), Netherlands (US\$ 40,776 million), Bahrain (US\$ 29,738 million), Indonesia (US\$ 27,606 million), Russian Federation (US\$ 26,980 million), Ghana (US\$ 24,688 million) and Poland (US\$ 23,954 million).

The top 8 countries with the highest exports between December 1-31, 2020 are the USA (US\$ 96,655 million), Pakistan (US\$ 46,471 million), Ghana (US\$ 24,478 million), Romania (US\$ 22,751 million), Germany (US\$ 13,181 million), UAE (US\$ 12,077 million), Mali (US\$ 6,305 million) and Azerbaijan (US\$ 5,189 million).

In TIM's export data of November 2020, no significant increase was observed in defense and aviation product exports to Pakistan despite the

JINNAH Class Corvette contract. While the volume of defense and aerospace product exports to Pakistan in November was only US\$ 719,91 thousand, monthly exports reached US\$ 46,471 million with a record increase in December. An interim payment made under the JINNAH Project may have had an effect on this increase. On the other hand, Aselsan exports HIZIR Torpedo Jamming and Deception System, ALPER LPI Radar, ARES-2N and ARES-2NCL Extended Ship and ARES-2SC/P Submarine Electronic Support System to Pakistan, mainly under the JINNAH and AGOSTA-90B Submarine Half-Life Modernization Projects. I consider that Otokar's Tactical Wheeled Armored Vehicle deliveries play an important role in

January 1st - December 31st			
Country Groupings	2019	2020	Variation
African Countries	75,960.87	82,981.35	9.2%
EU Countries	554,779.49	376,964.91	-32.1%
Commonwealth of Independent States	240,912.79	322,446.54	33.8%
Other American Countries	9,024.08	31,174.92	245.5%
Other Asian Countries	89,757.99	199,656.33	122.4%
Other European Countries	38,875.20	14,595.55	-62.5%
Other Countries	22,06	21,00	-4.8%
North American Free Trade Area	841,285.28	804,318.15	-4.4%
Oceania Countries	7,271.67	6,011.49	-17.3%
Middle East Countries	710,144.29	374,508.16	-47.3%
Free Trade Areas	123,225.71	3,336.15	-97.3%
Far East Countries	49,434.75	63,012.25	27.5%
<b>Total</b>	<b>2,740,694.17</b>	<b>2,279,026.80</b>	<b>-16.8%</b>

exports to Ghana. During the delivery ceremony in Ghana in March 2020 COBRA and COBRA II Tactical Wheeled Armored Vehicles were seen in a parade equipped with different weapons, radar and sensor systems. According to TIM data, exports to Romania were around US\$ 1,036 million in 2019. Again, according to TIM data, the export volume, which was only US\$ 20,12 thousand in November 2020, suddenly increased to US\$ 22,751 million in December. However, I do not have any information about any contract which leads to a peak in exports to this country in December. Despite the political tension between the two countries, defense and aerospace exports to this country increased by 51.5% in 2020 compared to

2019, reaching the level of US\$ 200,280 million. The volume of export made to this country only between December 1 and 31, 2020 was US\$ 12,077 million. The RABDAN 8x8 ACV Project, a product of Otokar, has an important share in increasing exports to the UAE. While the export volume to the Russian Federation was around US\$ 8.5 million in 2019, there was a significant increase of 217.4% compared to exports in 2020. Of the annual exports of approximately US\$ 26,980 million, US\$ 1,640 million was made in December and around US\$ 7,509 million in November. Sales to Azerbaijan, which made significant amounts of purchases from Turkish Defense and Aerospace Industry companies before and during the 44-day Operation One

Homeland that started on September 27th and ended on November 9, 2020, were in a downward trend since November. Sales to Azerbaijan, including Baykar Company's BAYRAKTAR TB2 Armed UAV Systems (over 20 air vehicles), Roketsan's mini smart ammunition MAM-L (including the INS/GPS version that can reach out to 14 km) and the TRLG-230 Guided Artillery Missile and STM's KARGU Kamikaze Drone, were at the level of US\$ 101,209 million in October 2020 (approximately 36% of total exports on a monthly basis), while this figure was around US\$ 31,415 million in November and only US\$ 5,189 million in December, according to TIM data.

When we look at the

breakdown of the exports of the Turkish Defense and Aerospace Industry worth US\$ 2,279.027 billion by country groups, we see the following figures: nearly US\$ 82,981 million to African Countries (9,2% increase compared to 2019), nearly US\$ 376,965 million to European Union (EU) Countries (32,1% decrease compared to 2019), approximately US\$ 322,447 million to Commonwealth of Independent States (33,8% increase compared to 2019), around US\$ 31,175 million to Other American Countries (245,5% increase compared to 2019), nearly US\$ 199,656 million to Other Asian Countries (122,4% increase compared to 2019), approximately US\$ 14,596 million to Other European Countries (62,5% decrease compared to 2019), nearly US\$ 21 thousand to Other Countries (4,8% decrease compared to 2019), US\$ 804,318 million to North American Free Trade Area (4,4% decrease compared to 2019), US\$ 6,011 million to Oceania Countries (17,3% decrease compared to 2019), US\$ 374,508 million to Middle East Countries (47,3% decrease compared to 2019), US\$ 63,012 million to Far East Countries (27,5% increase compared to 2019) and US\$ 3,336 million to Free Trade Areas (97.3% decrease compared to 2019) ■

# Our Technology Is Beyond the Sky

As the pioneering technology developer  
and innovation leader of Turkey since the year 1988,  
**our objective to achieve the best for Turkey continues.**



©ROKETSAN SPKİŞ.PT.0100.1990.21.035

# Major Contracts Signed by Turkish Defense

**February 2020**

TAIS and Hindustan Shipyard Limited (HSL) signed a contract for the construction of five 45,000-ton fleet support ships (FSS) for the Indian Navy after obtaining the necessary permits from the Ministry of Defense of India. The project has a 9-year schedule and a volume of US\$ 2.3 billion.

**February 18, 2020**

The Aselsan and HAVELSAN Business Partnership and the Main Contractor STM Savunma Teknolojileri Mühendislik ve Ticaret A.Ş. signed a contract regarding the MILGEM 5 Project (Combat Systems). Under the contract, Aselsan will be responsible for the supply of Navigation Systems, Communication Systems, Radar Systems, Weapon Systems, Underwater Systems, Electronic-Warfare Systems and Electro-Optical Systems, and its work share is approximately TRY 663,475 million. The deliveries under the contract will be accomplished in 2021-2023.

**March 30, 2020**

Aselsan and the Presidency of Defense Industries (SSB) signed a contract for the Gendarmerie Integrated Communication and Information System (JEMUS) 5 Cities Project with a total value of US\$ 50,715 million and approximately TRY 448,828 million. Within the scope of the contract, deliveries will be realized in 2020-2023

**April 27, 2020**

Aselsan made the following statement on the Public Disclosure Platform: "Aselsan and the SSB signed a contract regarding the Digital Communication Network (Adana and İzmir, DMR+LTE) Project (Public Safety and Emergency Communication System), with a total contract value of US\$ 22,154 million + TRY 178,977 million. The deliveries under the contract will be made in 2021-2023."

**November 7, 2020**

Aselsan signed an export contract worth US\$ 118 million with an international customer for the export of a defense system solution (the type remained undisclosed). Aselsan has increased the number of users using its solutions to 70 by exporting to 6 new countries in 2020.

**October 2020**

A Logistics Support Service contract for E-7T HIK Aircraft was signed between the SSB and Turkish Technic. Logistic support service will be provided to 4 aircraft in the inventory. The DSB of the aircraft will be conducted at Turkish Technic's facilities at Esenboğa Airport.

**October 2020**

OTOKAR, with exports of US\$ 48 million in 2020 Q1, signed separate contracts with two undisclosed African countries for the sale of COBRA II, ARMA 8x8 ACV and tactical wheeled armored vehicles, at an amount of US\$ 110 million and US \$25 million at the beginning of November 2020.

**September 2020**

SİMSOFT secured a contract from an undisclosed Far East country for the development of an air defense weapon system simulator.

**November 17, 2020**

Aselsan signed three sales contracts with an international customer for the export of Electro-Optic and Communication Systems, with a total contract value of US \$38,822 million. Deliveries under such contracts will be realized in 2021-2022.

**December 14, 2020**

President of Defense Industries Prof. İsmail DEMİR and the accompanying Turkish delegation officially visited Ukraine and a series of agreements were signed between Ukraine and Turkey for the production and technology sharing regarding ADA Class Corvettes and Baykar Company's Armed UAVs. The agreements, the financial value of which I estimate will reach US\$ 2 billion, cover the export of 12 Ground Control Stations and 48 Bayraktar TB2 Armed UAVs (the first agreement worth US\$ 69 million signed in January 2019 covered the sales of 6 BAYRAKTAR Armed UAVs and 3 Ground Control Stations together with the necessary ammunition), and 4 ADA Class Corvettes (the financial size of the contract previously signed with Pakistan for the sales of 4 JINNAH Class Corvettes was announced as US\$ 1.5 billion). The corvettes (first in Turkey) and a portion of the Armed UAVs will be produced in Ukraine.

**December 17, 2020**

A contract amendment was signed between Aselsan and the SSB with a total value of TRY 315 million and US\$ 18.9 million for the Electronic Warfare System Project. The related deliveries will be made in 2022-2024. (It could be considered a New Generation KORAL/KORAL-2 order).

**December 21, 2020**

It was reported that Turkish commercial and military vehicle manufacturer BMC secured a contract from Baku Transportation Agency for the delivery of 320 Compressed Natural Gas (CNG) buses. Under the deal, the buses are expected to be delivered in 2021. The contract was signed during Turkish President Recep Tayyip ERDOĞAN's visit to Azerbaijan.

**December 24, 2020**

Roketsan-SSB ORKA Project (324mm National Lightweight Torpedo) Protocol Signature Ceremony was held. The ORKA LWT is expected to be ready in 2025.

# & Aerospace Industry Companies in 2020

**May 2020**

Aselsan signed a new sales contract with Bahrain regarding the export of 25mm STOP Remote Controlled Naval Gun Systems (UKSS). Aselsan's remote controlled gun systems currently serve in 20 countries.

**June 10, 2020**

Aselsan made the following statement on the Public Disclosure Platform: "A production contract was signed between Aselsan and USHAŞ on June 9, 2020 regarding intensive care respirators. Within the scope of the contract, an order has been placed to Aselsan for a mid-level intensive care mechanical ventilator amounting to a total of US \$31,315 million." The statement also included that the deliveries under the contract would be completed in 2020."

**June 2020**

Otokar signed a contract with the Georgia Municipal Development Fund for 175 buses and their spare parts and relevant training, amounting to nearly EUR 18.7 million. Deliveries of the 117 SULTAN LF and 58 KENT LF buses will start in 2020. Spare parts supply and the related training will also be provided by Otokar.

**July 2020**

Meteksan Savunma signed a contract with the Republic of Korea for the second sale of the Damage Control Simulator. Meteksan Savunma previously included the Republic of Korea among the customers of this simulator with the contract signed in 2017. Following the first Damage Control Simulator, for which Meteksan Savunma worked with a company based in the Republic of Korea and completed in 2019, the second Damage Control Simulator project was initiated as part of the needs of the Korean Naval Forces. Meteksan Savunma signed a design and consultancy contract for the simulator, which will again be built in the Republic of Korea.

**September 2020**

KATMERCİLER exported US\$ 3.25 million in security vehicles to an undisclosed country

**August 31, 2020**

In the Turkish Type Fast Attack Craft Project, which was initiated by the Presidency of Defense Industries (SSB) in 2013, the Term-1 Agreement Design Contract was signed between the SSB and STM Savunma Teknolojileri Mühendislik ve Tic. A.Ş. The Term-1 Contract is just for the design process and a separate contract will be signed for the construction process.

**August 2020**

Within the scope of the contract signed between FNSS and the Philippine Department of National Defense, which officially entered into force. FNSS will provide the Philippine Army with the production, integration and logistical support services of stabilized manned gun towers. According to the statement made by FNSS, the towers are planned to be mounted on vehicles in October 2021 and training and logistic support services will be completed by December 2021, as per the contract effective officially in August 2020. In this context, FNSS will provide the Philippine Army with the necessary logistic support services with stabilized manned gun tower systems by 2022 and AZMIM vehicles by 2023.

**July 21, 2020**

An international sales contract totaling US\$ 93.263 million was signed between Aselsan and an international customer regarding the export of command-and-control systems, anti-tank missile launch systems, remote controlled weapon systems, radio link systems, inertial navigation systems and gunshot detection systems. Within the scope of the contract, deliveries will be realized in 2020-2021.

**December 24, 2020**

President of Defense Industries Prof. İsmail DEMİR, with a post on his social media account, stated that the Turkish Defense and Aerospace Industry made substantial exports to Tunisia in the last days of 2020 and added, "Under the coordination of our Presidency, 5 of our companies have conducted exports amounting to a total of US\$ 150 million." According to the news in the press, 100 KIRPIs, 9 VURANs, 71 EJDER YALÇINs and 6 ANKA UAVs were sold to Tunisia.

**December 31, 2020**

With a statement submitted to the Public Disclosure Platform, Aselsan announced that it signed an international sales contract with an international customer regarding the export of command- and-control systems, anti-tank missile launch systems, inertial navigation systems and gunshot detection systems, with a total value of US\$ 38,266,780.

**December 31, 2020**

A contract amendment for the City Security Management System and License Plate Recognition System Project was signed between Aselsan and the SSB, amounting to TRY 308,693 million. Within the scope of the contract amendment, deliveries will be completed by 2024.

Prof. Haluk GÖRGÜN, Chairman of the Board and CEO of Aselsan, the flagship company of the Turkish Defense and Aerospace Industry, said in a meeting on January 22, 2021 that Aselsan signed export contracts worth over US\$ 450 million in 2020 despite the COVID-19 pandemic. Aselsan received new orders worth US\$ 511 million in the first half of 2020 (the amount of new orders exceeded US\$ 320 million in the first quarter), 10% of which was from foreign customers. Aselsan's total backorders were US\$ 9.5 billion as of the end of 2020 Q1, and 94% of them were defense orders and 6% were non-defense orders.

# Turkish Defense & Aerospace Industry Closes First Two Months of 2021 with 17.5% Increase in Exports

**İbrahim SÜNNETÇİ**

*Having closed the year 2020 with a fall by 16.8% in the export of defense and aerospace products compared to 2019, the Turkish Defense and Aerospace Industry has succeeded in maintaining the upward trend in exports which began in December 2020, carrying this momentum into the first two months of 2021, despite the negative effects of the COVID-19 pandemic and closed the first two months of the year with an increase in exports.*

According to data released by the Turkish Exporters Assembly (TIM), the Turkish Defense & Aerospace Industry realized US\$ 166.997 million in defense and aerospace equipment exports in January (represents a 3.7% increase compared to the same period of the previous year) and US\$ 233.225 million in February 2021, represents a 34.1% increase compared to the same period of the previous year and around 40% increase compared to January 2021. According to export figures revealed by TIM, during January 1st - February 28th of 2021, the Turkish Defense & Aerospace Sector exported a total of US\$ 400.222 million, while the said figure came in at around US\$ 340.594 million level in the same period of last year (representing a 17.5% increase).



Even though the industry's January export data shows about a 62% decrease compared to December 2020 (US\$ 279.512 million), December exports are generally higher compared to other months due to the year-end closures, as many countries and domestic customers prefer to place their orders in December with the remaining money from their budgets. When we take a look at the export figures of the Turkish Defense and Aerospace Industry in January in the last three years, we observe that in January 2021, there is a 3.7% increase compared to January 2020 (US\$ 166.851 million), a decrease of approximately 0.9% compared to January 2019 (US\$ 174.498 million) and an increase of about 62% compared to January 2018 (US\$ 106.506 million).

On the other hand, according to data released by TIM, the total weight of products exported

by the Turkish Defense & Aerospace Industry in January 2021 was around 4.255kg and in February it is 5.513kg. So, the average price of Turkish Defense & Aerospace export products has reached US\$ 39.25 per kilogram in January 2021 and US\$ 42.30 per kilogram in February 2021. The total weight of products exported by the Turkish Defense & Aerospace Industry during the first two months of 2021 is around 9.768kg. It was 5,856kg during the same period of last year.

In the Presidential Annual Program of 2021, prepared by the Turkish Presidency, Presidency of Strategy and Budget and published in the official gazette on October 27, 2020, the export volume was projected as US\$ 6.2 billion and the turnover as US\$ 19.7 billion for 2021. With the initiation of first payments under the contracts signed with Turkish companies during the second half of

2020, export revenues are expected to increase further in 2021 and even to exceed the year 2019, which closed at a record high.

According to data released by TIM, the U.S. ranked first in defense and aerospace industry exports in January 2021. Exports to this country increased by 38.5% to US\$ 83.931 million. Azerbaijan followed the U.S. with an export volume of US\$ 39.717 million from US\$ 62.11 thousand. (It represents an increase of 63.848%, recorded as US\$ 101.209 million in October 2020, US\$ 31.415 million in November and US\$ 5.189 million in December, thus shifting from a sharp downward trend in the last two months to an upward trend.) Germany ranked third with a decline of 36.8% to US\$ 12.027 million. These countries were followed by Oman with US\$ 6.410 million, France with US\$ 3.239 million, the United Kingdom with US\$ 2.980

million, Netherlands with US\$ 1.848 million, Canada with US\$ 1.438 million, Italy with US\$ 1.319 million, Brazil with US\$ 1.289 million and Bulgaria with US\$ 1.178 million.

According to TIM's data as of March 1, 2021 the list of the top 15 countries that imported defense and aerospace products from Turkey during January 1 - February 28, 2021 is composed of the US, UAE, Azerbaijan, Germany, Uzbekistan, Ruanda, China, Oman, the UK, Netherlands, France, Qatar, Italy, Canada and Indonesia. As in previous periods, the US ranked first in defense and aerospace industry exports during first two months of 2021. Exports to this country increased by 31.9% to US\$ 172.891 million. The UAE followed the US with an export volume of

US\$ 44.356 million from US\$ 26.091 million realized in the same period of last year. Azerbaijan ranked third with around US\$ 40.870 million, representing 388.6% increase compared to the same period of last year. Germany ranked fourth with a fall by 25.8% to US\$ 28.375 million. Uzbekistan ranked fifth with around US\$ 20.284 Million, representing 2521.3% increase from US\$ 80.42 thousand during January-February 2020. These countries were followed by Rwanda, which imported US\$ 15.935 million worth of defense and aerospace products from Turkey during first two months of 2021 (which was at around US\$ 0.12 thousand level during the same period last year, rising 13169321.5% compared to the same period of 2020), China with US\$ 10.040 million, Oman

with US\$ 6.426 Million, UK with US\$ 6.257 million, the Netherlands with US\$ 4.949 million, France with US\$ 4.819 million, Qatar with US\$ 3.927 million, Italy with US\$ 2.814 million, Canada with US\$ 2.544 million and Indonesia with US\$ 2.167 million.

According to TIM's figures during January 1st - February 28th of 2021, the Turkish Defense & Aerospace Industry has exported US\$ 175.586 million (which was at the level of US\$ 134.947 million during the same period last year) in defense and aerospace equipment to North America/US, around US\$ 50.750 million (which was at US\$ 76.107 million during the same period last year) to EU Member Countries, around US\$ 8.546 million to other European countries, around

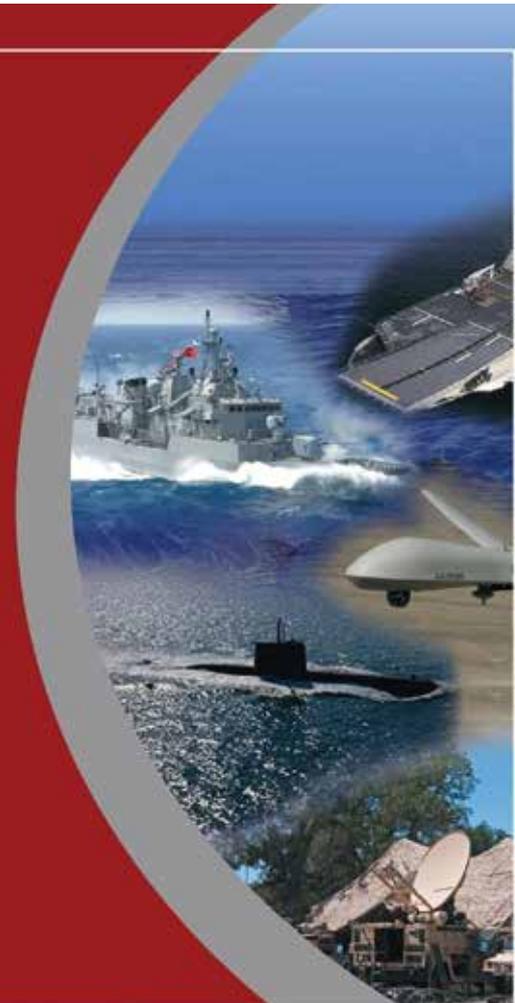
US\$ 56.446 million (which was at around US\$ 62.156 million during the same period last year, falling 9.2% compared to 2020) to the Middle East countries, around US\$ 64.664 million (which was at US\$ 12.254 million during the same period last year, representing a 427.7% increase) to the Commonwealth of Independent States (CIS), around US\$ 12.402 million (which was at the level of US\$ 27.864 million during the same period last year) to other Asian countries, around US\$ 19.573 million (which was at US\$ 1.764 million during the same period last year, representing a 1009.8% increase) to African countries and around US\$ 7.086 million (which was at around US\$ 7.6 million during the same period last year) to countries in the Far East.

# NOVA

POWER SOLUTIONS, INC.

## YOUR POWER PARTNER IN DEFENSE

WHEN POWER FAILURE IS NOT AN OPTION



# Turkish Defense & Aerospace Industry's Achievements in 2020 & Targets for 2021

Though it set new records in 2019 in terms of turnover and export figures, unfortunately the Turkish Defence and Aerospace Industry failed to achieve its targets in the export of defense and aerospace products due to the Covid-19 pandemic and a decrease by 16.8% compared to the figures of 2019 was recorded. However, a further increase in the export revenues and exceeding the record-shattering figures of 2019 are expected in 2021 with the start of the initial payments in line with the contracts signed in the final quarter of 2020 and the signing of new contracts. The export data on January and February 2021 seems to support such expectation.

Despite the certain level of decrease in export revenues, the number of Turkish Defense and Aerospace companies in the list of world's top 100 defense companies reached 7 with the inclusion of Havelsan and FNSS. Five more Turkish companies managed to enter this list in the last five years. Ranking 48th in the list with nearly US\$ 2.3 billion turnover (95% from the sales of defense industry products) in 2019, Aselsan had its title written in the list of top 50 companies, TUSAŞ (53rd), BMC (89th), Roketsan (91st), STM (92nd), FNSS (98th) and Havelsan (99th) achieved to rank among the top 100 companies.



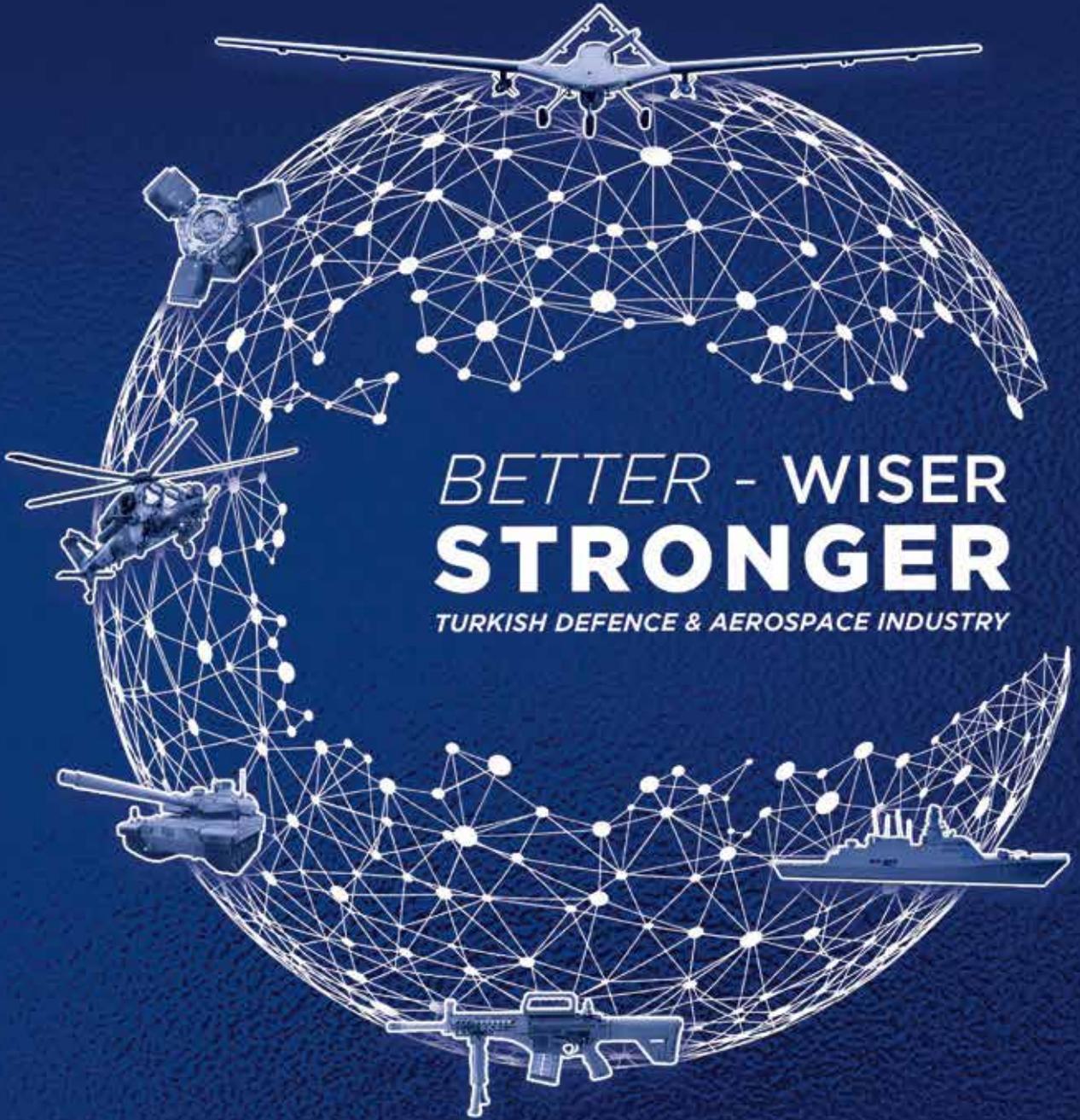
Turkish Defense and Aerospace Industry uninterruptedly continued its production activities in shifts (production process has been divided into shifts and the number of employees in each shift has been decreased) despite the Covid-19 pandemic, thanks to the measures adopted and special permissions and though certain products could not be delivered in planned amounts due to the delay in the procurement of some foreign sub-systems based on the explicit and implicit embargoes applied by the so-called friendly and allied nations, it pursued the delivery of the high-technology indigenous products demanded by the Turkish Armed Forces and Security Forces in 2020.

2020 has been the year where the first indigenous probe rocket SR-0.1 launched to space reaching an altitude of 136 km as part of the Micro Satellite Launcher System Project became the first Turkish vehicle to reach the space, where the first delivery of the New Generation Criminal Investigation Vehicle KIRAC to the Security General Directorate (SGD, Turkish

Police) took place, where KAMIKAZE Mini UAV KARGU-2 and first national armed drone system SONGAR was introduced to the Security Forces, where first P-72 Maritime Patrol Aircraft was delivered to Naval Forces Command (TNFC), where STM's DM-5 and DM-7 Portable Ammunition Systems that enable repeated firing to 5.56 mm and 7.62 mm machine guns were presented to the Security Forces for the first time and where the first indigenously designed helicopter engine TEI-TS-1400 was delivered to TUSAŞ. The year 2020 was a year full of achievements where the strategic developments in projects occurred: the first national and indigenous air defense system HİSAR A+'s final acceptance test was conducted and it was rendered available to be included in the inventory, the inventory acceptance process of our first national anti-ship guided missile ATMACA was launched as the missile's tests were finalized, the final stage before the inventory started for the SUNGUR Air Defense System, AKINCI Combat Unmanned Air Vehicle was rendered available for serial

production, AKSUNGUR A-UAV successfully completed its firing test with the INS/GPS + Laser Guided TEBER-82 munition and the serial production activities of the drone were launched. Deliveries continued uninterruptedly and many new projects were launched in 2020, as well. Along with the achievements in the projects, critical progress was made in exports with the contracts signed with the allied countries in Eastern Europe, Middle East, North Africa, Caucasia, Central Asia and South Asia.

Presidency of Defense Industries (SSB) gathered with the press members as part of the "Meeting for the Assessment of 2020 and Targets for 2021" held on January 11, 2021 at the SSB for informing the public on the activities conducted in 2020 and the targets identified for 2021. In light of the information shared in the meeting, following are the list of the prominent activities held in 2020 by the Turkish Defense Industry Companies under the guidance of the Presidency of Defense Industries and the critical activities planned to be executed in 2021.



*BETTER - WISER*  
**STRONGER**

*TURKISH DEFENCE & AEROSPACE INDUSTRY*



**Turkish**  
Defence &  
Aerospace

[turkishdefenceindustry.gov.tr](http://turkishdefenceindustry.gov.tr)  
[ssi.gov.tr](http://ssi.gov.tr)



# Turkish Defense Industry's Critical Activities in 2020



## Aerospace and Space

- AKINCI UCAV was rendered available for serial production. Maiden flight of the second prototype was conducted. Activities on the third prototype were launched.
- AKSUNGUR A-UAV's serial production activities were initiated.
- First indigenous probe rocket launched as part of the Micro Satellite Launcher System Project was the first Turkish vehicle to enter space through reaching an altitude of 136 kilometers.

- First P-72 Maritime Patrol Aircraft was delivered to the Naval Forces Command within the scope of Meltem-3 Project.
- Utilization of the Kamikaze Mini UAV KARGU-2 and Armed Mini/Micro UAV SONGAR started.
- Within the F-16 Structural Upgrade Project, the structural improvement activities of the first two F-16 Block-30 Aircraft were completed and the aircraft were delivered to the TurAF.
- Execution of the design activities and wind tunnel tests of the National Combat Aircraft (TF-X) continued. Sub-systems were selected.



## Air Defense, Weapons and Ammunition

- Final acceptance tests of Low Altitude Air Defense Missile System HİSAR-A+ were conducted successfully and the system became ready to be included in the inventory.
- Routine tests of the Medium Altitude Air Defense Missile System HİSAR-O+ were performed successfully.
- Activities for including the SUNGUR Air Defense System in the inventory reached the final stage. As a portable system, SUNGUR can be integrated to land, air and naval platforms.
- Ground tests of the short and medium/long range BOZDOĞAN and GÖKDOĞAN air-to-air missiles were completed successfully and the certification tests over the aircraft were initiated.

- Tests over the first indigenous anti-ship guided ATMACA missile reached the end and relevant activities for inclusion in the inventory started.
- TRLG-230 Missile System was developed through integrating a laser seeker into the TRG-230 Missile System to fire the targets identified by UAVs and A-UAVs from the ground.
- DM-7 and DM-5 Portable Ammunition Systems that enable continuous firing for 7.62mm and 5.56mm machine guns were put into the service of our Security Forces for the first time.
- Roketsan Explosive Raw Material Production Plant was launched to service. The facility will minimize the foreign dependency in raw material required by the missile and rocket warhead explosives.



## Naval Projects

- Launched to sea in May 2019, the Harbor Acceptance Tests (HAT) of the Multi-Purpose Amphibious Assault Ship (LHD) TCG Anadolu (L-400), which will be the largest battleship under the service of the Naval Forces Command (TNFC) with its length of 230.8, were initiated.
- Construction of the Test and Training Vessel TCG Ufuk (A-591) with intelligence capabilities (ELINT/SIGINT) was completed, the Sea Acceptance Tests (SAT) were launched.
- Two Emergency Dive Training Boats and the second New SAT Boat were delivered to the TNFC.



## Land Vehicle Projects

- Within the scope of the FIRAT M60T Project, the qualification of the PULAT Active Protection System was completed and the system's integration into the tanks started.
- Installation of the additional armor packages to the tanks was launched as part of the modernization of the Leopard 2A4 Main Battle Tanks.
- As a groundbreaking development in our country, the first KIRAÇ vehicles manufactured in line with the New Generation Criminal Investigation Vehicle Project were delivered to the Directorate General of Security.
- First assembly of the PARS 6x6 Mine-Resistant Armored Combat Vehicle with leading features in its class was conducted. The vehicle will be included in the Turkish Armed Forces (TAF) inventory for the first time.
- Modernization of the first prototype of the Armored Combat Vehicle was completed after intensive design and integration activities.



## Electronic Systems

- Indigenous Identification Friend or Foe System (IFF Mode-5/S) was to the F-16 aircraft within the Turkish Air Force (TurAF) inventory.
- Design activities of the IFF Mode-5/S Transponder device designed and manufactured by Aselsan were completed and the serial production of the device was launched. IFF Mode-5/S Transponder device's integration to the prototype F-16 Block 30TM Aircraft was accomplished and the first test flight was conducted successfully.
- CATS FLIR Electro-Optical Reconnaissance, Surveillance and Target Acquisition System's serial production started. CATS FLIR will be installed to and utilized by the Armed UAVs and Unmanned Combat Air Vehicles (UCAVs). Upgraded version of the UAV Reconnaissance, Surveillance and Target Acquisition System AseFLIR-F500C Project was launched.
- KARAKULAK High-Frequency Direction Finding & Interception System was included in the TAF inventory for the first time.
- New Generation KORAL (KORAL-II) Electronic Warfare System Project was inaugurated.
- Establishment of the Electronic Warfare Coordination Center (SEHKOM) was completed and the center launched its activities.
- The ROBOTIM Project, where the artificial intelligence (AI)-enabled unmanned air and land vehicles will be performing in swarm in a fully automated manner in circumstances without GPS, was initiated.
- The contract for the Indigenous Scanning System (MILTAR) Project, where the indigenous production of the X-ray devices and container scanning systems, was signed. These products are manufactured by merely seven countries in the world.
- Deliveries under the Electronic Concrete Monitoring System Project commenced under the guidance of the SSB for the Ministry of Environment and Urbanization were realized.

# Significant Defense Industry Activities Planned for 2021



## Aerospace and Space

- Initial deliveries of the AKINCI Unmanned Combat Air Vehicles (UCAVs) will be realized.
- Serial production of the AKSUNGUR Armed Unmanned Air Vehicles (A-UAV) will continue.
- Projects regarding the performance of swarm system tasks of the Mini, Tactical, Operative and Strategic Class UAVs and AUAVs will be launched.
- Initial delivery of the upgraded Phase-2 version of the T129 ATAK Helicopters will be started.
- Structural improvement of the F-16 Block 30 Aircraft within the TurAF's inventory will continue.
- Three Maritime Patrol Aircraft and Maritime Utility Aircraft as part of the MELTEM-3 Project will be delivered.
- Within the scope of the ERCIYES Project, two more C-130 A/B transport aircraft, the avionic modernization of which was completed, will be delivered.
- Design activities and wind tunnel tests of the National Combat Aircraft (MMU) will continue. Sub-system designs will start.



## Air Defense, Weapons and Ammunition

- Low Altitude Air Defense Missile System HİSAR-A+ will be included in the inventory and initial deliveries will be conducted.
- Medium Altitude Air Defense Missile System HİSAR-O+'s tests will be completed and the missile will be available to be included in the inventory.
- Detailed design of the system and sub-system components under the Long Range Air and Missile Defense System – SIPER Project will be completed under Aselsan-Roketsan-TÜBİTAK SAGE cooperation.
- First delivery within the scope of the first indigenous anti-ship cruise missile ATMACA will be realized (in the 2nd quarter of 2021).
- Initial delivery of the Indigenous and National Heavy Weight Torpedo AKYA will begin.
- First delivery of the KARAOK – the Man Portable Anti-Tank Missile will be realized.
- Firing tests of the short and medium/long range BOZDOĞAN and GÖKDOĞAN air-to-air missiles developed to be used by the combat aircraft within the TurAF's inventory will be completed.
- Delivery of the first indigenous 7.62 mm Machine Guns (PMT 7.62) developed for platforms will commence.
- Delivery of the systems developed to replace the Modular Gunpowder System procured from foreign countries will be launched.
- The first group of mortars modernized within the scope of the project launched for increasing the efficiency of mortars within the inventory will be delivered.
- The Laser Weapon System Project will be launched for the first time for the SGD.
- Production activities conducted at the Roketsan Explosive Raw Material Production Plant will be maintained. These activities will minimize foreign dependency on the explosives utilized in rocket and missile systems.



## Naval Projects

- The Multipurpose Amphibious Assault Ship (LHD) TCG Anadolu will be delivered.
- Test and Training Ship TCG UFUK will be delivered.
- The first Ship as part of the Logistic Support Ship – LDG Project will be delivered.
- The MILGEM Project's fifth ship, the I Class Frigate TCG Istanbul will be launched to sea.
- Within the scope of the New Type Submarine Project, the

first submarine TCG PiriReis (S-330) will be launched to sea and the second submarine TCG HızırReis (S-331) will be docked. The docking ceremony of the TCG PiriReis, which was the first of the REİS Class Type 214TN Submarines, was held on December 22, 2019. Following the completion of ongoing outfitting efforts, the TCG PiriReis submarine will undergo Factory Acceptance Tests (FAT), Harbor Acceptance Tests (HAT) and Sea Acceptance Tests (SAT) before its induction into the service of the TNFC in 2022.

- New projects on unmanned surface and underwater vehicles will be launched.



## Land Vehicle Projects

- Prototype production of the Heavy-Class Unmanned Land Vehicle (ULV) will be performed.
- First vehicles of the Second Level Medium-Class ULV will be delivered and a contract will be signed for the First Level.
- First products as part of the Third Level Light-Class ULV will be delivered.

- Initial delivery of the PARS 6x6 Mine-Resistant Vehicles will be conducted. The vehicles will be included in the Turkish Armed Forces (TAF) inventory for the first time.
- Contracts regarding the Battle Tank Transporter, Wheeled Container Transporter and Wheeled Rescue Vehicle Projects will be signed.



## Electronic Systems

- First delivery of the KTJ-3200 Turbojet Engine, which will be employed by SOM and ATMACA missiles, will be realized.
- First prototype of the BATU MBT engine developed for the ALTAY BMT will be operated (2021 April/May).
- First prototype of the UTKU engine and transmission developed for the New Generation Light-Weight Armored Vehicles will be run.
- First system as part of the High-Frequency Electronic Warfare (HF EW – MILKAR-4A2) Project will be delivered.

- First delivery of the Early Warning Radar System (EWRS) that will cover TurAF's early warning requirements indigenously instead of foreign systems will be conducted.
- Delivery of the first serial production Radar EW Systems within the scope of the Radar Electronic Support (ES)/Electronic Warfare (EW) Systems Project will be made.
- Serial production of the CATS Electro-Optical Reconnaissance, Surveillance and Target Acquisition System will continue. The design stage of the upgraded version the AseI FLIR-F500C Project will commence, and the Project will be launched



## HMS Queen Elizabeth Class Carriers

The fact Great Britain is an island nation necessitates maintaining a strong navy that can project power in distant parts of the World, and aircraft carriers are the backbone of any force projection capability.

When the HMS Queen Elizabeth Class was commissioned in 2017, the Royal Navy did not have an aircraft carrier in its inventory for 3 years and did not conduct aircraft operations from its carriers for 11 years. The arrival of the HMS Queen Elisabeth and the HMS Prince of Wales was a jubilant moment for the Royal Navy after a long period of designing, planning, re-designating and re-planning, and construction was finally over along with what seemed like an unending political tug-of-war.

HMS Queen Elizabeth class aircraft carriers are by far the largest ships ever constructed for the Royal Navy. The size truly matters as these warships are designed to meet nine key user requirements.

The class is expected to be able to operate with joint/combined forces to deliver medium-scale offensive air operations and integrate with all elements of this joint/combined force. The class will have high readiness for one unit for medium or small-scale carrier strike operations at all times while being able to deploy to core areas of interest. These ships are expected to conduct operations lasting up to 9 months away from port

facilities and support air operations up to 70 days with afloat support. The class is expected to be able to carry up to 40 aircrafts in surge operations and create 110 air sorties per day. The class is expected to survive and protect themselves against natural incidents as well as existing and future threats. Furthermore, these ships will be able to operate and support a full range of different rotary and fix winged aircraft



by Cem Devrim YAYLALI

and will be able to deploy agile mission groups.

The Queen Elizabeth class aircraft carriers have an empty displacement of 65,000 tons. Their waterline length is 263 meters increasing to 280 on the flight deck. The beam of these warships is 39 meters at the waterline increasing to 70 meters on the flight deck.



In front, F-35B STOVL Aircraft is seen after landing on board and next to it is another making a vertical landing on the carrier.

The flight deck is the heart of any aircraft carrier, and the total area of the Queen Elizabeth class flight deck spans 14,000 m<sup>2</sup>. Of this area 2,000 m<sup>2</sup> is treated with a thermal coating made from a combination of titanium and aluminum to withstand the enormous heat from the engines of F-35B Lightning II aircraft. The Queen Elizabeth class lacks the mechanical means to propel the aircraft into the air such as catapults. Therefore, there is a 61-meter ski jump with a 12.5-degree angle, which enables F-35B planes to launch with their full load.

Like their predecessors, the Invincible class, the new carriers lack an angled flight deck. Since F-35B planes can perform landings using both vertical thrust from the engine and lift from the wing the flight deck is large enough to recover the aircraft without the angled flight deck. This type of landing will be unique to Royal Navy as other naval F-35 operators have either arrestor cables (such as the US) or not enough flight deck space (such as Italy).

Immediately below the flight deck is the 168-meter-long hangar with a floor area of 4,800m<sup>2</sup>. The 29-meter wide and 7-meter-high hangar provides enough space for 22 F-35B sized aircraft. To move the aircraft from the hangar to the flight deck and vice versa are two large aircraft elevators. These are located aft of each island. Each aircraft elevator can lift 70 tons. They are large enough to carry a Chinook



*A Boeing AH-64 Apache from the British Army is landing onboard the HMS Queen Elizabeth Carrier*

sized helicopter with its blades unfolded.

An important design feature of Queen Elizabeth class ships is the high automation envisaged since the early conceptual designs of these ships.

Weapon handling, machinery, damage control, communication and even food preparation on board have been designed to work with a minimal crew. The result is these ships need 672 sailors to run without the aircrew. In contrast, the French aircraft carrier Charles de Gaulle has a core crew around 1,250. Both carriers carry an addition crew of around 600 strong to fly and maintain the aircraft on board.

The high degree of automation on board the Queen Elisabeth Class makes these ships more affordable to operate and they are more comfortable for the crew. The ships have space to house 250 extra troops such as Royal Marines or if needed, refugees.

In February 2021 the Queen Elizabeth Class

aircraft carriers have occupied a place in Turkish public opinion when there were rumors that one of these warships might have been bought by the Turkish Republic. It is nice to observe that this topic was only briefly discussed and quickly forgotten.

It is neither easy nor cheap to build, own and operate a dedicated aircraft carrier. There are a small number of navies operating aircraft carriers, few navies have such capability. Nevertheless, as the examples of Argentina and Brazil have demonstrated, it is an expensive elite club.

Aircraft carriers are very potent and mighty weapons, making them not only a military instrument but also instrument of foreign policy, thus a political tool. The existence of an aircraft carrier must be supported not only by economical means but by political means as well. Thailand is a good example of a country that owns an aircraft carrier without a political need and objective to have one, essentially that ship is mainly used as the King of Thailand's yacht.

To have an aircraft carrier is a symbol of technical, operational, and doctrinal maturity for a navy. An interesting and certainly worthy of being an alternative are large amphibious assault ships such as the Juan Carlos 1 or America-class warships. While these ships lack the airpower of a full-fledged aircraft carrier, these versatile ships can offer more options for their users including the ability to project power ashore by landing troops, armored vehicles, and other equipment.

A warship, like many ships, is a living system consisting of crew, equipment, systems, and subsystems on board. Learning the inner workings of an organism is best done when observing the intricacies of a living example and posting Turkish naval officers as liaisons on board aircraft carriers of our NATO partners is an effective way to learn about the multiple aspects of operations on board rather than dissecting the cadavers of decommissioned aircraft carriers send to break yards in Aliğa ■



# Initial Training For Combat Readiness

Turkish Air Force Pilot Training Program



by Cem DOĞUT

Well-trained personnel are an indispensable necessity for a strong Air Force as much as modern aircraft and munitions. The Turkish Air Force (TurAF) meets its personnel needs with the Pilot Training System, which is implemented according to NATO and U.S. Air Force standards. The first step of this system is the Air Force Academy (Hava Harp Okulu/HHO). During their education period, cadets of the Air Force Academy receive Applied Flight Training in addition to their academic and military lessons. With the help of this training, cadets improve their knowledge and skills about aviation. Flight Training, which is planned and controlled by the Wing Command, is conducted under the supervision of the 5th Squadron Command and it is executed via highly experienced instructor pilots who have served in different bases of the Turkish Air Force for many years. While acquiring the principles and dynamics of basic flight within the content of light training, cadets enhance their knowledge in real flying conditions in T- 41D planes of the 5th Squadron, and they increase their skill levels intended for piloting training. In parallel to the recurrent flight training in every academic year, cadets also receive meteorology, flight physiology, radio communication, GPS, flight planning, and cartography courses as part of the ground training. Additionally, the

Air Force Academy cadets are given glider courses by the flight instructors from the Turkish Aeronautical Association (THK) at Yalova airfield during the summer term.

Young Lieutenants who graduated from the Air Force Academy and Officers from different classes who meet the necessary conditions, to fill the need for pilots that emerged after July 15, receive flight training as Pilot Candidate Officers at the 2nd Main Jet Base in İzmir Çiğli. Training is given with five different aircraft/helicopter types at the 5th Squadron Command located in Çiğli and Kaklıç. Training is divided into two classes, which are ground training and flight training. Ground training has four main subjects: Aircraft Technical Training, Squadron Ground Training, Simulator Training, and Academic Training. Pilot candidates receive technical information about the aircraft they will fly at the Technical Training Center. Here, they are given information on the technical characteristics of SF-260D, KT-1T, T-38M, and CN-235 Cougar helicopters in the inventory of the 2nd Main Jet Base Command. The academic training is 174 hours in total, and pilot candidates receive the courses along with flight training. These academic courses consist of 44 hours of the Initial Flight Training phase, 112 hours of Basic Flight Training phase, and 18 hours of Advanced Flight Training phase.



Glider & T-41D Plane



SF-260D



KT-1T



T-38M

Pilot candidates receive "Basic Survival Training" and "Physiological Training" before flight training begins. During survival training, they are trained to use maps, first aid, communication, survival in water, and radios. With Physiological Training, pilot candidates are taught different ways to avoid physiological problems that arise from the performance of the aircraft during the flight to minimize accidents that may occur due to human factors.

After completing all these courses, the pilot candidates join the 123rd Squadron Command. After two weeks of ground courses, they begin to take Initial Flight Training with SF-260D aircraft. After taking Flight Ground Training lessons (Meteorology, Aerodynamics, Flight Planning, Flight Physiology, and Navigation) for the first two weeks of training, which lasts for 3-4 months in total depending on meteorological conditions, the pilot candidates who fly for approximately 20 hours



© Cem DOĞUT

*KT-1T awaiting its turn to take flight and next to it is a T-38M taking off.*

in 16 sorties complete Initial Flight Training by flying their last sorties alone.

Pilot candidates, who go to the 122nd Squadron Command to receive Basic Flight Training, take the Aircraft Egress Trainer (UTER) course before flying with the KT-1T trainer aircraft. Having learned to use the Martin-Baker Mk16 ejection seat used in KT-1T and T-38M aircraft, pilot candidates begin to take ground courses with the "Computer Based Training

System" before flight training. In single rooms, basic information about the KT-1T aircraft is interactively displayed on two computer screens, both audibly and visually, and the cadets start the training with the simulator. During simulator training, 2 KT-1T Aircraft Operational Flight Training (OFT) Simulators, 2 KT-1T Aircraft Instrument Flight Training (IFT) Simulators, and 2 Aircraft Training Devices (ATD) are used. After flying 35 sorties with the simulator, the pilot

candidates complete their Basic Flight Training by performing 69 sorties with the KT-1T trainer aircraft. At the end of this training, which lasts 6 to 9 months, pilot candidates must make a decision that will affect their future careers. They are divided into Jet, Transport, or Helicopter Pilots. The cadets who will be Transport and Helicopter Pilots are assigned to the 125th Training Squadron Command. After six months of training, which consists of 52 sorties with CN-235-100M aircraft and 18 sorties with the simulator, the successful Transport



© Cem DOĞUT

*T38M&KT-1T&SF-260D are seen in formation flight with CN-235M*



Pilots are divided into C-130B/E, C-160D, and CN-235-100M aircraft. C-160D and C-130B/E pilots are assigned to the 221st and 222nd Squadrons at the 12th Air Transportation Main Base Command in Kayseri for Combat Readiness Training, while the CN-235 pilots are assigned to the 212th Squadron at the Ankara 11th Air Transportation Main Base

Command to receive their Combat Readiness Training. Helicopter pilot candidates also fly 50 sorties during six months of training. Those who successfully complete the training continue their Combat Readiness Training at the 125th Training Squadron Command. Lastly, candidates selected as Jet Pilots start their Advanced Jet Training at the 121st Squadron Command.

Pilot candidates fly 69 sorties with T-38M aircraft for six months. Twelve of these sorties are solo flights (1 pre-solo flight sortie, 4 contact flight sorties, 4 basic formation flight sorties, 2 advanced formation flight sorties, and 1-night flight sortie.) The pilot candidates also fly 35 sorties in the simulator during this training period, and they can take

additional lessons with the simulator if needed. These simulation lessons are performed with 2 T-38M Aircraft Operational Flight Training (OFT) Simulators, which emulate visual flight conditions with a wide-angle display system and only the front cockpit layout, 2 T-38M Aircraft Instrument Flight Training (IFT) Simulators with a normal angle-of-view display





© TURAF

system and both front/rear cockpit layout, and 4 Debriefing Systems. The orientation period of the T-38M is more difficult. The cadets must be able to control and fly the high-speed (900 km/h and above) aircraft in the air and land the plane safely while approaching the runway at a speed of approximately 300 km/h per hour.

## **Air Force Academy, the 2nd Main Jet Base Training Center Command**

Pilot candidates are qualified to wear their badges after successfully completing their one and a half years of intense training. They are assigned as pilots to the F-4E/2020, F-16, E-7T, and KC-135R aircraft of the Turkish Air Force. Depending on the aircraft type, they are sent to different Squadrons to receive Transition to Combat Readiness Training. F-16 Combat Readiness Training is

given with T-38M trainers at the 121st Squadron. F-4E/2020 Combat Readiness Training is provided by the 111th Squadron at the 1st Main Jet Base. E-7T Combat Readiness Training is given with simulators at the 131st Squadron Command and the Turkish Airlines Training Center. KC-135R Combat Readiness Training is provided by the 101st Tanker Squadron at the 10th Tanker Base Command.

Pilots who started their flight careers at the Air Force Academy, continue their training with Combat Readiness Training after graduation. As can be seen, pilot training is a long and expensive process. Moreover, simulator training, which can also be considered synthetic flight, is gaining significance as it shortens this process and reduces overall cost. Compared to other countries, fortunately, Turkey can

design and manufacture these simulators domestically. Havelsan has become a world-renowned company in this field. Fighter aircraft used by the TurAF today or to be used in the future have become increasingly sophisticated. All the 5th generation fighter jets have been or will be produced as single-seat aircraft. Simulators have become even more critical in transitioning pilots to these aircraft. Additionally, new generation trainer aircraft are required for the 5th gen-fighters. The HürKuş and HürJet projects, which were initiated to meet these needs, are still ongoing. In its 110-year history, the Turkish Air Force, which has met its training needs primarily from foreign countries, has now turned into a Force that can provide and support the entire process from Initial Training to Combat Readiness Training. With its seasoned experience the TurAF can now provide training to other allied Air Forces worldwide ■



GELECEĐİNE  
**GÜÇ KAT**



**T129 ATAK**

*TAARRUZ VE TAKTİK  
KEŞİF HELİKOPTERİ*



© Defence Turkey

# HÜRJET New Generation AJT's CDR Phase Completed

İbrahim SÜNNETÇİ

The Critical Design Review (CDR) Phase of the HÜRJET, twin-seat, single-engine supersonic new generation Advanced Jet Trainer (AJT) and Light Combat Aircraft (LCA) was completed in early March 2021. According to original schedule the CDR Phase should have been completed in August 2020 (To+36 months).

Speaking at a ceremony organized at TUSAŞ facilities to celebrate the delivery of first T129B2 ATAK Helicopter to the Security General Directorate (Turkish Police) on February 26, 2021 TUSAŞ President & CEO Temel KOTİL disclosed that HÜRJET prototype will perform its maiden flight in December 2022, after the completion of the detailed design, prototype production and ground testing phases. While talking to TRT Radio 1 at the National and Domestic

Program on December 4, 2020 TUSAŞ President & CEO KOTİL had previously underlined that the first HÜRJET prototype would execute its maiden flight on March 18, 2023, when the 108th anniversary of the Çanakkale Naval Victory will be celebrated.

HÜRJET is being developed by TUSAŞ under a Protocol signed between TUSAŞ, the SSB and the TurAF on July 2, 2018. The initial studies for the "Advanced Jet Trainer & Light Attack Aircraft (HÜRJET) Project" were started in July 2017 and the Project was officially launched on 14 August 2017, as a company funded project (which was funded from TUSAŞ' own resources) after receiving a green light to go ahead from the TUSAŞ Board.

The Conceptual Design Phase (CDP) of the HÜRJET Project was completed in April 2018, according to original schedule the Preliminary Design Review (PDR) Phase activities

should have been completed in February 2019 (To+18 months), Critical Design Review (CDR) Phase should have been completed in August 2020 (To+36 months) and the Test Readiness Review (TRR) Phase should have been completed in August 2021 (To+48 months). However due to the internal and external reasons this schedule could not be kept. The PDR Phase could only be completed in July 2020. Within the scope of the PDR Phase, TUSAŞ engineers have carried out several wind tunnel tests including Static Wind Tunnel Tests, Air Intake Wind Tunnel Test and Low Speed Wind Tunnel Test with HÜRJET's 1/10 scaled model to confirm the existing configuration. The HÜRJET model that underwent the initial wind tunnel tests was configured in accordance with GE's F404-GE-102 turbofan engine.

Following the signing of a Letter of Intent (LoI) between TUSAŞ and Eurojet

Turbo GmbH for the delivery of EJ200 turbofan engines the design of the HÜRJET was modified (such as, the air intakes were revised and enlarged to accommodate the more powerful EJ200 engine) and further wind tunnel tests have been carried out to confirm revisions on the aircraft overall design. So currently HÜRJET has two separate designs in accordance with two different engine options. According to our sources the HÜRJET will be powered by the F404-GE-102 engine from GE. Under the project two prototypes will be manufactured. According to project schedule the 1st HÜRJET prototype would be rolled-out in December 2021 and to perform its maiden flight in February 2022 (To+60 months), the 2nd HÜRJET prototype, on the other hand, is planned to perform its maiden flight in August 2022 (To+64 months) but this schedule seems to could not be accomplished.

The HÜRJET Project is aimed at the development of an indigenous new generation Advanced Jet Trainer (AJT), capable of supersonic flight to replace the T-38M jet trainer fleet in the service of the TurAF in 2030s, and a Light Combat Aircraft (LCA) able to perform a Close Air Support (CAS) role to assist and release the load off the TurAF's F-16C/Ds shoulders. The indigenous jet trainer HÜRJET will be utilized to train and prepare pilots for the next generation MMU/TF aircraft in the 2030s, replacing the aging T-38M jet trainers in service with the TurAF. Currently the TurAF operates 68 T-38M Advanced Jet Trainers in Advanced Jet Training and Combat Readiness Transition Training at Çiğli Air Base (2nd Main Jet Base Command) in Izmir.

As a clean-sheet design the single-engine, twin-seat HÜRJET will be Turkey's first indigenous supersonic aircraft and one of the world's few supersonic trainers. The aircraft is 13m (42.6ft) in length, 4.2m (13.7ft) in height, has a 9.8m (32.1ft) wingspan and 24m<sup>2</sup> (258.33 sq ft) wing area. The figures related the predicted empty weight and maximum takeoff weight (MTOW) of the aircraft have not been publicized yet. HÜRJET prototypes will be powered by GE's 17,000lb thrust class F404-GE-102 turbofan engine. Also, a number of series productions of HÜRJET were also planned to be powered by F404 turbofans (supposed to be manufactured by TEI under license in Turkey). According HÜRJET's publicised Technical Specification, the maximum speed of the HÜRJET will be Mach 1.4; the service ceiling will be 13.716m (45,000ft) and the climb rate will be 39,000ft/minute. The HÜRJET will



be able to perform +8G/-3G maneuvers and will be capable of sustaining 5.5Gs at an altitude of 15,000ft and up to Mach 0.9 speed. The range of the aircraft will be 2,222km (1,200nm) and payload capacity will be 2.721kg (6,000lb).

As Turkey's first indigenously developed supersonic aircraft the HÜRJET will pave the way for the MMU/TF-X. TUSAŞ currently is aiming to complete the subsystem procurement of HÜRJET. When the subsystem, the engine, etc., is completed, it means most of the work is almost done, then the production stage will start. In early September 2020 TUSAŞ announced that they had established the HÜRJET Test and Evaluation Simulator dubbed HÜRJET 270. Equipped with artificial intelligence (AI) infrastructure, the HÜRJET 270 (with 270-degree field of view) engineering simulator is designed to collect feedback from test pilots to make the design of HÜRJET "better, more solid and more efficient." The simulator is also meant to detect design faults at the development stage. Comprising less costly parts of the original aircraft while still containing its latest technological developments, the

simulator will also be able to instantly detect errors encountered by pilots during test runs, a first for the defense industry. Thanks to its real-time software, size, and features, along with its wide viewing angle, existing risks will be identified and eliminated during the development phase. According to TUSAŞ the HÜRJET 270 simulator will feature "human eye-level resolution." It will also collect data for future training simulators. The integration of the simulator's avionics and flight control software, screens, cockpit components and communication equipment were completed by the TUSAŞ Prototyping Office. Speaking on the expected contributions from the HÜRJET 270 engineering simulator to the project, TUSAŞ Deputy General Manager Atilla DOĞAN said: "We have to develop the flight control algorithm and software and the avionics software before the plane is produced and assembled. The 270-degree engineering simulator we developed for HÜRJET provides us with a greater capability to make flight control algorithms, software and avionics software with the input of test pilots."

On September 16, 2020 Stirling Dynamics of the

UK announced that they secured a new contract from TUSAŞ to provide technical assistance in the areas of loads and aeroelastics for the HÜRJET aircraft program. This contract builds on previous support provided by Stirling Dynamics, which was initial consultancy to support TUSAŞ up to the HÜRJET's Preliminary Design Review (PDR). Under the new contract, Stirling Dynamics will support TUSAŞ' engineering team as they work towards Critical Design Review (CDR). Stirling Dynamics' engineers will provide support in several formats involving training and guidance, expert review, and off-site work packages. Technical areas of interest include flight and gust loads, buffet, flutter, and validation testing. Henry HACKFORD, Stirling's Aerospace Technical Services Business Unit Manager, commented: "We are delighted to have the opportunity to work with TUSAŞ again on their indigenous aircraft development program. The HÜRJET contract is the realization of a long-standing dialogue with TUSAŞ and provides an exceptional opportunity for us to demonstrate our key strengths" ■



# TUSAŞ Delivered first T129B2 ATAK Helicopter to Turkish National Police

by Saffet UYANIK

On February 25, 2021, an exclusive ceremony was held with the participation of distinguished guests at TUSAŞ facilities for the delivery of the General Directorate of Security's first T129B Phase-2 Tactical Reconnaissance and Attack Helicopter (in fact, this particular helicopter with the tail number "EM-102" was actually delivered to the Turkish National Police with limited participation and without any ceremony on February 17). The T129B Phase-2 ATAK Helicopter with the tail number "EM-101", which is planned to be delivered to the National Police in March 2021, was also exhibited at the ceremony. According to the delivery schedule, Turkish Aerospace (TUSAŞ) will manufacture 9 T129B ATAK helicopters all in Phase-2 configuration for the Turkish National Police

Head of the Committee of National Defense İsmet YILMAZ, Deputy Minister of National Defense Şuayip ALPAY, President of Defense Industries Prof. Dr. İsmail

DEMİR, President & CEO of TUSAŞ Prof. Dr. Temel KOTİL, General Director of National Police Mehmet AKTAŞ, Deputy Director Generals of National Police Selami HÜNER, İbrahim KULULAR, and Resul HOLOĞLU as well as Head of Turkish Police Aviation Department Uygur ELMATAŞ, attended the delivery ceremony.

In his speech at the ceremony held at Turkish Aerospace facilities, President of Defense Industries Prof. Dr. İsmail DEMİR stated that they were justifiably proud and thrilled to get together for the delivery of the first

ATAK helicopter that will further strengthen the police force. DEMİR noted that the T129 helicopters delivered to date have played an active role in the operations conducted by the security forces and became a force multiplier with the capabilities they provide. "Within the scope of the ATAK project, which is a significant milestone in establishing the helicopter industry infrastructure in our country, various national equipment, and weapons systems are produced domestically, including the central mission computer. ATAK helicopters are actively involved in the

operations today with their domestic smart munitions and firepower, and with the Phase-2 configuration, their electronic warfare (EW) and countermeasure capabilities reached their maximum level. The helicopter delivered to the police force is also in Phase-2 configuration." Emphasizing that their goal is not only to build platforms but also to develop their subsystems and especially critical components domestically and nationally, President DEMİR stated that the studies on the indigenous TS-1400 helicopter engine continue. DEMİR said, "Our next goal is to integrate the domestic engine with our helicopters so that they can fly freely in the sky."

Underlining that the Turkish defense industry is followed with great interest in the world thanks to the breakthroughs it has made, İsmail DEMİR said, "Turkey continues to take firm steps towards becoming a country that



Prof. İsmail DEMİR- President of the SSB

does not import technology but exports technology in the defense industry. Our nationally and domestically produced helicopters, UAVs, and UCAVs, as well as various weapon systems, munitions, and electronic capabilities integrated into them, have maximized the operational capabilities of our security forces. In doing so, this week, we have delivered two TUSAŞ product ANKA UCAVs with increased range to our naval forces."

In his speech at the ceremony, President & CEO of TUSAŞ Prof. Dr. Temel KOTİL stated that they are proud to deliver the ATAK helicopter, which serves in the Land Forces and Gendarmerie General Command, to the General Directorate of Security. Noting that the delivered ATAK Phase-2 helicopter is equipped with a Laser Warning Systems (LWS) and Radar Warning Receiver (RWR), KOTİL said, "It will perform very well in the field. ATAK has the best high-altitude performance in its class in the world. Its engine power is not impaired due to high temperature and altitude; therefore, it serves exceptionally in Turkey and its nearby geography."

Furthermore, KOTİL stated that they will deliver 2 more ATAK helicopters to the General Directorate of Security in March 2021. Providing additional information about the projects carried out by TUSAŞ, KOTİL stated that the 11-ton ATAK-2 helicopter would make its maiden flight in 2023 and the Hürjet at the end of 2022. KOTİL also noted that the National Combat

Aircraft (TF-X) would perform its first taxi test on March 18, 2023.

General Director of National Police Mehmet AKTAŞ: "Our helicopters will be assigned as a mobile fleet with headquarters in Ankara, primarily to serve in Diyarbakır, Van, Şırnak, and Hakkari."

Stating that the Police Aviation Department received its first tactical reconnaissance and attack helicopter under the T129 EGEMEN Project, General Director of National Police Mehmet AKTAŞ said, "We are constantly updating our aviation capabilities with new technologies and trying to provide a more advanced security service. With the increase in the number and quality of our aircraft, we can take more effective and rapid action not only in the fight against terrorism but also in all kinds of operational activities, especially narcotic crimes, organized crime, combatting human trafficking, and establishing traffic order. We received our first ATAK helicopter today and proudly add it to our Aviation Department fleet. Eight more helicopters will be delivered by the end of 2022. Our helicopters will be assigned as a mobile fleet with headquarters in Ankara, primarily to serve in Diyarbakır, Van, Şırnak, and Hakkari."

AKTAŞ also stated that a crypto protocol was signed with the Ministry of National Defense for the national encryption devices such as identification friend or foe (IFF) system and encrypted radios to be used and operated by the General Directorate of Security.



Following the ceremony, Turkish National Police T129 ATAK Helicopter with the tail number "EM-102" & T625 GÖKBEY "P3" helicopters made a demonstration flight to the participations. TUSAS were also displayed T625 GÖKBEY configuration that will be delivered the Turkish Gendarmerie as well T-70 General Utility Helicopter prototype,

HürJet Advanced New Generation Jet Trainer and Light Attack Aircraft, HürKuş New Generation Basic Trainer Aircraft, ANKA-S UAV, AKSUNGUR UCAV prototype on static display area. Unmanned fully electric T629 Helicopter Technology demonstrator was debut first time by TUSAS as well.



## From A to Z “T129 ATAK Program”

The first flight test of the T129B Phase-2 Tactical Reconnaissance and Attack Helicopter, equipped with additional Electronic Warfare Self Protection and communication systems, was successfully performed at Turkish Aerospace facilities on November 13, 2019. Within the scope of the T129 ATAK project carried out by the Presidency of Defense Industries, a total of 60 ATAK helicopters produced by TUSAŞ have been delivered to security forces. As of February 23, 2021, TUSAŞ delivered 53 ATAK helicopters (9 T129A EDH, 44 T129B) to the Turkish Land Forces, 6 ATAK helicopters (T129B Phase-1) to the Gendarmerie General Command, and 1 ATAK helicopter (T129B Phase-2) to the General Directorate of Security.

Under the ATAK Project carried out by the Presidency of Defense Industries, TUSAŞ will produce a total of 59 T129 Tactical Reconnaissance and Attack Helicopters (9 T129A EDH and 50 T129B in two different configurations, 29 Phase-1 and 21 Phase-2) for the

Turkish Land Forces, 24 T129B Helicopters (6 T129B Phase-1 and 18 T129B Phase-2) for the Gendarmerie General Command, and 9 T129B Helicopters for the General Directorate of Security (ordered in Phase-1 configuration but delivered in Phase-2 configuration).

Although Turkish Land Forces planned to switch to Phase-2 configuration starting from the 30th (actually the 39th T129 helicopter including the 9 T129A EDH//Early Delivery Helicopters previously delivered) T129B helicopter in 2018, this plan could not be achieved because of various reasons at that time and

the 13 T129Bs planned for Phase-2 were produced and delivered in Phase-1 configuration. Therefore, after the detailed tests and approval for serial production/assembly, Phase-2 configuration is expected to be applied retrospectively to the 13 T129B Phase-2 helicopters produced and delivered so far. As of February 2021, the Turkish Land Forces operates 9 T129A EDH, 41 T129B Phase-1 (one crashed during the Operation Olive Branch), and 2 T129B Phase-2 helicopters.

The main difference between the Phase-1 and Phase-2 helicopters is related to the Electronic Warfare (EW) systems.

In addition to the current Phase-1 configuration, the Phase-2 helicopters include 9681 V/UHF (Very High/Ultra High Frequency) Radio and EW systems such as digital RWR (Radar Warning Receiver, capable of detecting the radar signals in C-J bands using Pulsed and Continuous Wave/CW), I-J Band RFJ (Radio Frequency Jammer, incorporates various advanced technologies such as Active Electronic Scanning Antenna/AESA), solid-state Power Amplifier & Digital RF Memory (DRFM), and LWR (Laser Warning Receiver). Phase-2 is planned to reach the best stage in terms of self-protection systems and communication systems ■



T129 ATAK B2 Phase-II



DÜNYA ORDULARININ  
LİDER TEDARİKÇİSİ  
EUROPE'S LARGEST MANUFACTURER



**Askeri Üniformalar ve Tekstil Ürünleri**  
*Military Garments and Uniforms*

**Operasyonel Askeri Teçhizatlar**  
*Operational Military Equipment*

**Profesyonel Bot ve Ayakkabılar**  
*Professional Footwear*

**YDS TEXTILE FACTORY**



**YDS FOOTWEAR FACTORY**



**YDS TENT FACTORY**



**YAKUPOĞLU** A.S.

Havalimanı Yolu 20. Km. D6750  
Akyurt - Ankara / TÜRKİYE



[www.ydsboots.com](http://www.ydsboots.com)  
[www.ydsshop.com](http://www.ydsshop.com)



Ydsboots  
Ydsboots

FORNITE  
500

500  
IBC



## VICTA Will Start Sea Trials in August 2021!

Deploying Special Forces (SF) operators into their field of operations always has its challenges, but when it comes to covert operations in the open sea, safe insertion into and extraction out of the field takes on an even greater level of complexity and importance. Currently, SF use Long-Range Insertion Craft (LRIC) for surface-based fast transit and insertion operations at distance. Swimmer Delivery Vehicles (SDVs), often submarine-based, are used for sub-surface insertion. For subsea, VICTA brings a new concept, providing the combined capability to conduct long-range surface transit at speed before transitioning to Diver Delivery Unit (DDU) mode for sub-surface insertion.

Designed by the Subsea Craft company, a privately-funded SME Class (just has 22 personnel as of February 2021) advance maritime technology solutions provider focusing on delivering products and

services that meet specific client requirements based in Portland, UK, and unveiled for the first time at the 2019 Defense and Security Equipment International Exhibition (DSEI 2019) in London, VICTA is a revolutionary DDU, combining the characteristics (speed, range and capacity) of LRIC with those of a submersible SDVs.

As a new fictional hybrid craft that adds a unique new dimension to maritime operations VICTA DDU transits from surface to sub-surface just in 120 seconds. This transition, along with its performance in both domains is enabled

by an innovative fly-by-wire control system (there are around 250 subsea connectors all controlled by the fly-by-wire on-board system), which also enables designers to develop autonomous version of the craft. Fly-by-wire steering technology allows the same set of controls to be used both on the surface and underwater. A further 2 minutes sees the craft reach its maximum dived depth of 30m. VICTA can stay beneath the surface for up to 4 hours. Once submerged, the cockpit fills with water and the onboard life support system provides four

hours of air to all eight crew members, which means that passengers breathe from a common air breathing system (open-circuit air system) on board, thus the divers/SF operators do not deplete the air supply in their tanks. Upon reaching the diver-deployment target, VICTA stops, and the divers swim out through gull-wing doors on its sides.

As the world's most sophisticated DDU, VICTA's principal role is delivering specialist divers into high-risk/high-threat environments, including surveillance and reconnaissance



© VICTA



missions where landing discreetly into areas of conflict is prioritized. It's also well suited to counter-narcotics and coastal defense operations. Since the crew bay of VICTA is fully re-configurable and thus cargo capacity can be increased to enable its use in, for example, supporting the offshore energy industry. Likewise, a reduction in the range or speed could offset an increase in capacity or a reduction in size to meet a different requirement (i.e., the leisure sector). VICTA is focused primarily on the defense market but with utility beyond that in the research and leisure sectors. Although an exact figure of what VICTA will cost has not been given, according to open sources base price of VICTA will be circa US\$13.5 Million.

Designed around the operator, its 30+ knots cruise speed (the vessel can reach a top speed of 40 knots), 250 nm endurance and 2-minute transition between surface and sub-surface, enables delivery of 8 Special Forces operators (6 passengers and 2 crew, they must be equipped with diving suits, since once it submerges it can reach 30m below the surface) and their equipment to their objective 'mission-ready'

before recovering them – rapidly and covertly. On the surface, VICTA will use a SeaTek 725+ model diesel engine (has been fully sub-marinated to allow it to withstand pressure at the depth of 30m and complete immersion in salt water) generating 725hp and a Kongsberg Kamewa FF37 waterjet propulsion system, which will provide top speed of 40 kts. The seating is provided by patented Ullman Dynamics molded seats which comes with an advanced shock-absorbing system to provide a comfortable ride at high speeds on the surface. For submerged operations, two SubCtech Li-Ion Battery packs

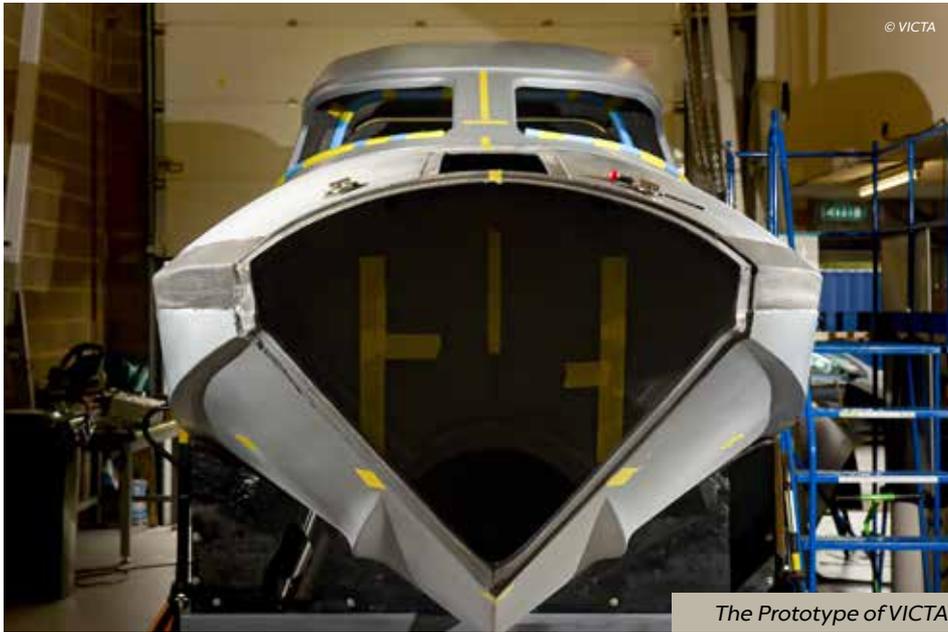
providing 140kW power twin 20kW electric thrusters to enable a cruising speed of 6 kts, and a maximum speed of 8kts. In submarine mode VICTA can travel up to a range of 25nm.

The design also features forward and aft hydroplanes - a vital part of the control system in maintaining stability when submerged, along with 4 vertically mounted Copenhagen thrusters that enhancing VICTA's low speed maneuverability. VICTA is fitted with Sonardyne's Vigilant Forward-Looking Sonar (FLS), described as VICTA's "eyes underwater". The Vigilant FLS will provide a

critical hazard avoidance capability for the crew and embarked divers when navigating on or below the surface. Using a compact and sophisticated bow-mounted transducer arrangement, Vigilant FLS displays water depth, sub-surface obstacles and features by creating an accurate 3D model of the underwater environment out to 600m and down to 100m, to alert crew to any possible objects or traps. VICTA also has a retractable mast (able to extend up to 4m and located just in front of the engine bay), which can be used for EO System, SIGINT System & Communication. VICTA does not feature



© VICTA



any ballistic protection, according to Subsea Craft thanks to its very low visual, radar and acoustic signature figures VICTA's main protection is its "stealthiness".

Providing truly formidable operational flexibility, VICTA is suited to deployment from platforms as diverse as a standard ISO shipping container through road-trailer and helicopter to surface vessel or air transport - without recourse to costly strategic assets. The VICTA can be carried by a Chinook Heavy Lift Helicopter to within 250nm of its target and then lowered into the sea. SubSea Craft is also partnering with IrvinGQ, to develop a parachute deployment option for the VICTA DDU. The IrvinGQ Maritime Craft Aerial Delivery System (MCADS) allows fast surface craft of various types to be air-dropped in concert with their crews and operators. Once married-up they can be underway in minutes. SubSea Craft

is working closely with its other partners, Ben Ainslie Racing (BAR) Technologies, SCISYS (CGI), and Diverse, alongside Sonardyne and IrvinGQ to explore how these systems could support VICTA for its marine customers in the future. According to information published on December 16, 2020, British company BAR Technologies, an innovative simulation-driven marine engineering consultancy, has announced that it has been chosen to support SubSea Craft Ltd, in the design and build of VICTA DDU. As the principal partner, BAR Technologies has been integral to the shape and form of VICTA - designing and optimizing the hull and control system to enable truly remarkable performance both on the surface and submerged. BAR Technologies and SubSea Craft began collaborating on the VICTA development in 2018.

The VICTA DDU is currently at the prototype stage (as of February 18, 2021 at Technology Readiness Level 5) and builds on

lessons learned (water proofing and significantly enhanced stability) from an earlier catamaran concept demonstrator (dubbed VICTA-01 or DDU-01) developed by the Subsea Craft. Established 6 years ago Subsea Craft started off with a catamaran design and following a 4-years effort covering extensive simulations, tank and wind tunnel testing, modelling, prototyping and sea trials at Subsea Craft's R&D facility in Portland, UK, DDU-01 (VICTA-01) technology demonstrator was launched in 2018. But at the end of 2018 company switched to monohull design constructed of lightweight carbon fiber and Diab foam core from catamaran concept. The catamaran design initial prototype (VICTA 01/DDU-01) allowed Subsea Craft to prove that their concept was viable. The development and testing of VICTA-01 was a hugely valuable experience and enabled the proving of many of the key design elements of VICTA-02, not least influencing the move to the monohull design.

The VICTA-02 prototype is near completion, currently at Subsea Craft's facility in Portsmouth where the fitting-out continues and will be in the water in mid-2021. The VICTA DDU will be undertaking sea trials in August/September 2021 at the company's Trials and Testing facility in Portland (in Southern UK) with the aim of having the craft operational late 2021. Rigorous Sea Trials are originally planned to start in March 2021 but since problems have experienced in the procurement of some components from different countries due to COVID-19, there was a delay of several months in the project schedule. Initially surface tests will be performed then subsurface tests to be carried out. Subsea Craft also planned to perform full capability demonstration with VICTA prototype by the end of 2021 by inviting people not only from UK but also from other countries to company's facility in Southern UK to follow/participate this event.

Subsea Craft sees Turkey as a key market for VICTA DDU as it opens up a whole new sphere of operational capability - across an array of mission profiles - while providing optimal value through a digitized system. This provides many advantages from improved, predictive maintenance, advanced synthetic training, and mission-rehearsal, whilst offering the potential to integrate seamlessly into contemporary and future mission systems.





**“We would welcome any opportunity to discuss the capability with officials from the Turkish Armed Forces.”**

Defence Turkey approached Tim CHICKEN, Chief Commercial Officer (CCO) at Subsea Craft to get first-hand information on the company, current status of VICTA DDU Program, short and medium-term objectives for the VICTA Program, market position of VICTA in the field of Diver Delivery Unit Systems and Subsea Craft’s approach to Turkey as a market for the sale of its products.

**Defence Turkey: Can you please briefly introduce your company Subsea Craft to our readers? When and why was it established and what has been accomplished so far?**

**Tim CHICKEN:** SubSea Craft was set up in 2015 when our founder (now Chairman) saw a leisure craft ploughing through waves in the sea and had an idea for a vessel that could operate both on and below the surface. He recognised the potential and decided to form a small team to explore the idea further. In two years, that team had taken the idea from the drawing board to sea-trials with a catamaran variant. However, although many lessons were learned, they decided to shift to a monohull design in 2018 and VICTA was born. The craft is now built and is completing the final stages of its fit-out. It will be launched later in 2021 and will conduct sea trials at our facility in Portland, Dorset, UK where we aim to prove the concept later in the summer.

**Defence Turkey: Can you elaborate on the structure and number of personnel working at Subsea Craft?**

**Tim CHICKEN:** We are a small company of 22 people, divided between Operations, Development (engineering), Commercial and Finance teams. We work in close co-operation with several other businesses.

**Defence Turkey: What can you tell us about Subsea Craft’s current technology, R&D, manufacturing capabilities and facilities?**

**Tim CHICKEN:** The craft was fabricated by a small specialist business in the South of England, AC Marine. Once completed, it moved to our facility in Havant to commence fitting-out. It is currently at our facility in Portsmouth where the fitting-out continues and where we will commence the build of production craft.

**Defence Turkey: What are Subsea Craft**

**competencies in the Diver Delivery Unit (DDU) sector? Can you please elaborate on the prospective vision of your company on Diver Delivery Unit technologies?**

**Tim CHICKEN:** The Subsea Craft team comprises of a mix of former military officers, specialist engineers and entrepreneurs. We work in partnership with a number of other companies, whose specialist skills allow us to develop this leading-edge capability. BAR-Technologies is a business specialising in high-performance yachts with significant experience in Computational Fluid Dynamics who designed the craft and the fly-by-wire control system.

**Defence Turkey: What could you tell us about the international presence and market position of Subsea Craft in the field of Diver Delivery Unit (DDU) Systems, and the international tenders**

**(if any) that you are currently following? What key geographical markets are you targeting?**

**Tim CHICKEN:** We believe that VICTA is a generation ahead of other, similar, vessels currently available. We have undertaken extensive market analysis and research and we believe that there are potential markets stretching from Asia Pacific, through the Middle East, Europe, and North America. We are in discussion with an array of potential clients.

**Defence Turkey: Can you please elaborate on the current status of the VICTA Program? When do you plan to perform live demonstration and sea trials with VICTA, which was first unveiled at the Defence and Security Equipment International (DSEI) exhibition held in London, in September 2019? Can we get information about your roadmap planned for 2021 within the scope of the VICTA Program?**



**Tim CHICKEN:** The craft is built and is completing the final stages of its fit-out. It will be launched later in 2021 and will conduct sea trials at our facility in Portland, Dorset, UK where we aim to prove the concept later in the summer. We anticipate attending DSEI London in September where we will display the craft with a series of capability demonstrations following in the subsequent months.

**Defence Turkey: Deploying Special Forces operators into their field of operations always has its challenges, but when it comes to covert operations in the open sea, safe insertion, and extraction to and from the field takes on an even greater level of complexity and importance. What leads Subsea Craft to introduce such an innovative even revolutionary vehicle/craft into the market?**

**Tim CHICKEN:** We have extensive experience in the conduct of maritime, joint, and special operations and we are familiar with the capabilities that

are currently fielded to conduct those operations. But the contemporary operating environment is very complex, with increasing threats to freedoms of action, access, and movement. This is exacerbated by the availability of low-cost technology, which can serve to further disrupt and impede free movement. Capabilities such as VICTA offer a means to restore freedom of action.

**Defence Turkey: Have you collaborated with the Royal Navy or any Navy during the design process of VICTA-02?**

**Tim CHICKEN:** We have engaged in extensive discussion with an array of actors from several states.

**Defence Turkey: What is your budget and how many years were needed to develop VICTA? What could you tell us about your partners that you cooperate with under VICTA Program?**

**Tim CHICKEN:** The project has lasted almost 3 years to date. Throughout that, we have worked closely

with the likes of BAR-Technologies, CGI, Avon, Sonardyne, SeaTek and Kongsberg (plus several others). Subsea Craft is funded by a single investor however, we are seeking further investment as we look to expand our offering.

**Defence Turkey: Are you able to deliver customized versions of VICTA to meet the specific requirements of your customers?**

**Tim CHICKEN:** We will work closely with customers to meet their needs and are happy to explore the possibilities of licensed production in the home state.

**Defence Turkey: Do you also have a plan to develop unmanned/autonomous version of VICTA?**

**Tim CHICKEN:** VICTA employs cutting-edge technology in its systems, including a fly-by-wire control system, removing the need for traditional rods, wires, and levers for the control. It replaces them with digital signals, which feed actuators

at the control surfaces in the same way that contemporary aircraft do. This means that autonomous operation for the craft is eminently feasible, replacing the pilot with a digital input. Whilst this is a highly desirable capability, it is not a priority for the moment however, we will explore it fully once the craft has completed its development.

**Defence Turkey: Do you also have a plan to develop a commercial version of VICTA for the commercial diving market?**

**Tim CHICKEN:** We have had some interest from the leisure sector, and we are exploring how VICTA might serve the commercial market. Coronavirus has prevented us from pursuing this at the moment, however, we will be examining it more closely in due course.

**Defence Turkey: What feedback have you received on VICTA since DSEI 2019 held in September 2019? For example, what was the interest of the Royal Navy's Special Boat Service, which according to open sources already operates 3 SEAL/Swimmer Delivery Vehicles in its inventory?**

**Tim CHICKEN:** We have enjoyed significant positive feedback from many different potential clients, including the UK MoD.

**Defence Turkey: Can you please elaborate on the major differences between existing western**



**SEAL/Swimmer Delivery Vehicles (SDVs) and VICTA? Can it be deployed from surface ships and submarines? Can it be launched from the shore? Is it air droppable by the C-130 Hercules or A400M Atlas transport aircraft or can it be carried by a heavy lift helicopter into an operational area as in the case with SDVs?**

**Tim CHICKEN:** VICTA combines many of the characteristics of a fast surface vessel (such as a Long-Range Insertion Craft (LRIC)) and a specialist submersible such as an SDV however, unlike the latter, VICTA is highly flexible and can be launched from any of a range of platforms - such as a road trailer or surface vessel (with the appropriate lift capacity), through to specialist amphibious shipping (LPD, LSD, LHD) and heavy-lift helicopters and transport aircraft. We have also undertaken feasibility work to confirm its compatibility with airdrop. It is not reliant

upon expensive strategic assets (submarine) for its deployment.

**Defence Turkey: Can you elaborate on the CONOPS (Concept of Operations) defined for VICTA?**

**Tim CHICKEN:** VICTA offers a customer the ability to undertake missions aligned with the traditional Special Operations portfolio: Surveillance and Reconnaissance, Offensive Action and Support and Influence tasks. These can be prosecuted as a part of force projection, national

defense or constabulary missions.

**Defence Turkey: Some SDVs, such as the Mark 9 of the US Navy, are capable of carrying two Mark Mk31 or Mark Mk 37 torpedoes for standoff attacks against ships or can be armed with sea mines. Does VICTA have external and/or internal weapon carriage capabilities?**

**Tim CHICKEN:** Weapons can be mounted on or carried within the craft, depending upon the user's need.

**Defence Turkey: How would you position VICTA in the Diver Delivery Unit market? How does it differ from its competitors? Why should potential customers prefer and order VICTA DDU from you?**

**Tim CHICKEN:** We believe that VICTA is a generation ahead of other, similar, vessels currently available. This stems from the employment of leading-edge technology within the craft and its digital core. A key facet of the



# THE **FUTURE** OF THE AEROSPACE INDUSTRY

 **DUBAI  
AIRSHOW**

**14-18 NOVEMBER 2021**  
DWC, DUBAI AIRSHOW SITE

[www.dubaiairshow.aero](http://www.dubaiairshow.aero)

Book your space today: [sales@dubai.aero](mailto:sales@dubai.aero)

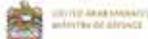
Helping drive recovery and future growth  
at the most anticipated point of convergence  
for the aviation industry in a live format

Follow us on: [f](#) | [in](#) | [@](#) | [t](#)

#DubaiAirshow

COMMERCIAL AVIATION | AIRCRAFT INTERIORS | MRO | BUSINESS AVIATION | AIR TRAFFIC MANAGEMENT  
SPACE | DEFENCE & MILITARY | AIR CARGO | EMERGING TECHNOLOGIES 

Supported by:



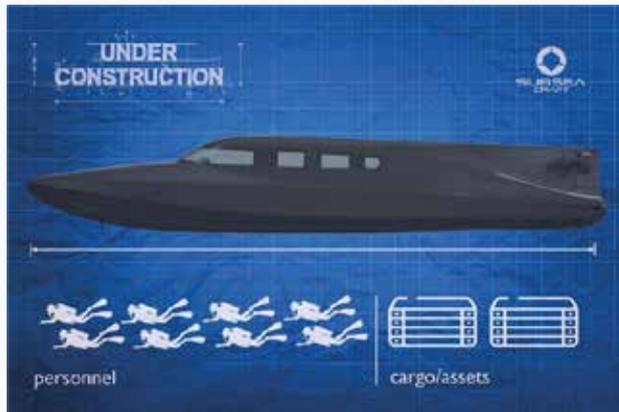
craft is its 'digital twin', created by harvesting and exploiting its digital thread. This allows for the most efficient maintenance and support, reducing planned maintenance and thus through-life costs whilst enabling simulation, tactical development, and mission rehearsal for its users. VICTA also employs an open-architecture command system, which allows additional capabilities to be added in a 'plug and play' fashion.

**Defence Turkey: Do you have a plan to develop a range of swimmer delivery vehicles based on VICTA-02? Can you elaborate on your short and medium-term objectives for the VICTA Program?**

**Tim CHICKEN:** Our short-term aim is to complete the development, trials and testing of the craft and enable a comprehensive capability demonstration for clients. Beyond that, we are keen to explore other variants - for example within the leisure sector - as well as examining the potential for an autonomous version and the possibility of an all-electric drive. But these are not yet confirmed and are all to be considered once the prototype has completed its development.

**Defence Turkey: What kind of new products and capabilities do you see a demand for in the coming years in the Diver Delivery Unit market?**

**Tim CHICKEN:** All electric drive must be a priority



as users increasingly will want to move away from carbon fuels.

**Defence Turkey: Have you received any orders so far? If yes, could you please share the order quantity with us? When will you start deliveries to global customers?**

**Tim CHICKEN:** We are in conversation with an array of potential clients, but I am not in a position to divulge details at the moment.

**Defence Turkey: Is VICTA an ITAR Free product?**

**Tim CHICKEN:** We don't anticipate ITAR being a major issue.

**Defence Turkey: Have you received any interest from the Turkish Navy in VICTA-02? Do you have any plans for a live demonstration of the Turkish Navy in 2021?**

**Tim CHICKEN:** There has been some interest from Turkey, but I am not at liberty to describe that here. At the moment there is no plan to demonstrate the craft in Turkey, but I anticipate significant interest when

we demonstrate the craft in the UK in due course.

**Defence Turkey: What can you tell us about Subsea Craft's approach to Turkey as a market for the sale of its products?**

**Tim CHICKEN:** Turkey is but one of many modern states that has the capacity to employ VICTA. We would welcome any opportunity to discuss the capability with officials from the Turkish Armed Forces.

**Defence Turkey: Would you like to add anything in the way of a message for our readers?**

**Tim CHICKEN:** We would welcome any opportunity to discuss the potential offered by VICTA with interested parties in Turkey.

**Defence Turkey: Tim, thank you for sharing your time with our readers** ■

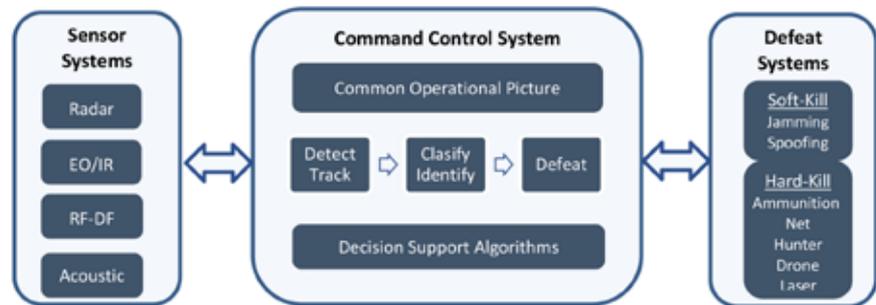




# Counter Drone Systems: Tailor-Made System Solutions Based on Open System Architecture

Mini-Micro Unmanned Aerial Vehicles (UAVs), commonly known as “Drones” are becoming widespread in many fields due to their autonomous capability, availability, and affordability. They are extensively used by security forces for reconnaissance, surveillance, and border security and in many other civil applications, especially in agriculture, construction, cinematography, and transportation. However, this proliferation and ease of use have also opened a gate for hostile usage of drones and turned them into weapons that are widely used as an asymmetrical warfare threat. The need for the protection of military and civilian critical facilities against this novel threat has been the main trigger of the development in Counter Drone System in recent years.

Counter Drone System is a bottom-layer air defense system and its architectural characteristic is similar to modular and multi-layer air defense systems. Although each air defense system is developed against a set of air threats, their kill-chain mainly consists of three complex sub-systems: Sensor Systems, Command Control System and Defeat Systems (**Figure-1**). With this characteristic, Counter Drone Systems are so-called Systems of Systems.



**Figure-1:** Counter Drone System Architecture

In a Counter Drone System, requirements, types and quantities of each subsystem may widely vary depending on the facility or the infrastructure to be protected, possible threat scenarios, the zone, and project budget. Hence, the solution set is not unique and the optimum solution must be achieved by customizing and adapting the system architecture as a tailor-made system solution for each application.

## Sensor Systems

Detecting, locating, tracking, classifying, and identifying the small size and low-speed drones in a wide-area to protect is a complicated problem to be solved effectively and it becomes even more challenging when autonomous drones and swarm attacks are considered. Therefore, sensors of Counter Drone Systems depend on different modalities. The four sensor types that are commonly used in sensing drones are Radar, passive RF-DF (Direction Finding),

Electro-Optical and Thermal (EO/IR) cameras, and Acoustic systems. A general comparison chart of key features between these technologies in terms of range, location accuracy, volume scanning, environmental conditions, tracking and classifying capability, autonomous, multi-target extension performances and cost are presented in **Figure-2**.

For detection and tracking, Radars are mostly used as the main sensor in Counter Drone Systems due to their precise localization, autonomous and multi-target detection performance besides sufficient range regardless of environmental conditions. These Anti-drone radars should be specially designed with effective radar signal processing algorithms to detect targets and extract intrinsic features from the processed signal for automatic detection and classification since low RCS, low speed drones share key characteristics with birds.

Retinal FAR-AD Drone Detection Radar (**Figure-3**)

is one of the field-proven high accuracy 3-dimensional Anti Drone Radar, which incorporates these special algorithms and waveforms to detect, track and classify drones. Retinal FAR-AD also provides 40-degree elevation angle for wide and effective area coverage and 30-rpm rotation speed for effective tracking on fast-moving and agile targets in addition to Micro-Doppler signature analysis capability for identification.

For a wider situational awareness zone passive RF-DF sensors with a high range of detection are used as early warning sensors. Some of those RF-DF sensors also support identification and classification by their preinstalled Drone communication frequencies library. But most precise classification is ensured by EO/IR systems. High-resolution cameras and thermal imaging techniques are used to capture UAVs in several backgrounds. These optical and thermal data received from EO/IR sensors are processed by customized AI-based algorithms to



# SHIELDAFRICA

## 7-10 June 2021



Abidjan  
Côte d'Ivoire



INTERNATIONAL  
EXHIBITION  
**SECURITY & DEFENCE**

**2021 THEME:**  
New security issues  
in African cities



République de Côte d'Ivoire  
Ministère de l'Intérieur  
et de la Sécurité

[www.shieldafrica.com](http://www.shieldafrica.com)  
#shieldafrica2021



obtain the best performs for the protected territory. On the other hand, although acoustic signatures of drones also provide adequate data for classification, acoustic sensors are a less common option in Counter Drone Systems with their limited effective range.

## Defeat Systems

Once the hostile drone was detected and identified it must be neutralized either hard-kill (kinetic) or soft-kill (non-kinetic) defeat system. Hard-kill solutions depend on physical damaging in short range due to the small, fast-moving and agile characteristics of drones. Besides, solutions like weapons create significant collateral damage and therefore they are not preferred in civil and heavily populated areas. Furthermore, kinetic solutions are one-to-one and need to be scaled linearly in swarm attacks which makes them non-cost-effective.

On the other hand, Soft-kill solutions jamming and spoofing are the most common methods used in Counter Drone Systems. Jammers defeat the drones by interfering with all radio communication channels and GNSS signals that drones rely on for control and navigation. Once drones lose the control and navigation signals they switch fail-safe modes (auto return-home or immediate landing modes) without achieving their mission. Main drawbacks of jammers are their ineffectiveness against autonomous drone attacks but those attacks usually do not succeed or have limited impact due to

accumulated navigation errors without GNSS. The other soft-kill solution spoofing, take control of or misdirect the hostile drone by generating counterfeit control and GNSS signals. However, the spoofing is hard to implement for the drones built with protected communication link.

Like sensor systems, no Defeat System is fully effective for every scenario and the configuration of the Defeat System should be chosen according to the region to be protected, the risk and impacts of collateral damages and budget.

## Command and Control System

Command and Control is the mastermind and decision-maker of Counter Drone System that manages all activities in the kill-chain. It receives the data from various types of sensors and generates a unique air picture by sensor fusion algorithms. On Common Operational Display, it shows the threat information like position, classification and identification together with the detection and defeat zones on digital maps to achieve situational awareness. Then it applies

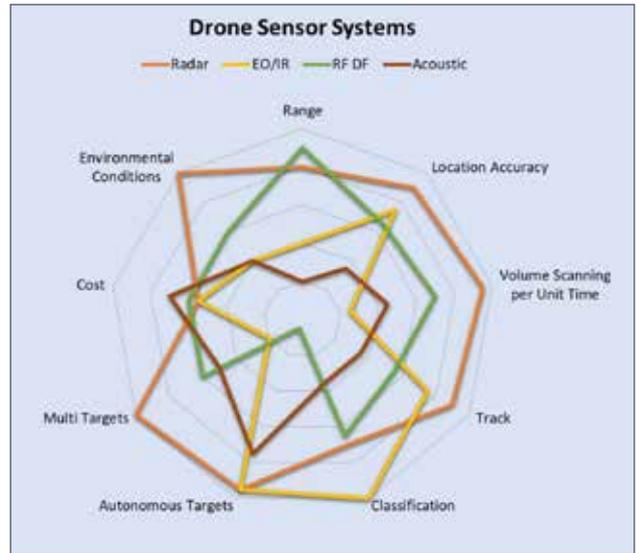


Figure-2: Comparison chart of key features between Drone Sensor Systems

the most appropriate countermeasure either automatically or manually depending on the chosen mode by using decision support algorithms like Threat Evaluation and Weapon Assignment. Depending on Sensor and Defeat Systems chosen, all AI-based decision support algorithms should be trained and optimized on real data collected from the installed area.

All in all, Counter Drone System requirements are not uniform and vary depending on the asset and the area to be protected. Therefore, Counter Drone Systems must have an open system architecture

and each solution must be customized by configuring, adapting, training and optimizing the subsystems.

Meteksan Defence KAPAN Anti-Drone System (Figure-4) is a good example of open architecture Counter Drone System, which allows cost efficiency with modularity and scalability. It fulfills all the customer-specific requirements by integrating the necessary sensor and defeat systems and providing superior drone detection, tracking, and neutralization performance under the management of command control system for border and critical infrastructure security.



Figure-3: Retinar FAR-AD Drone Detection Radar

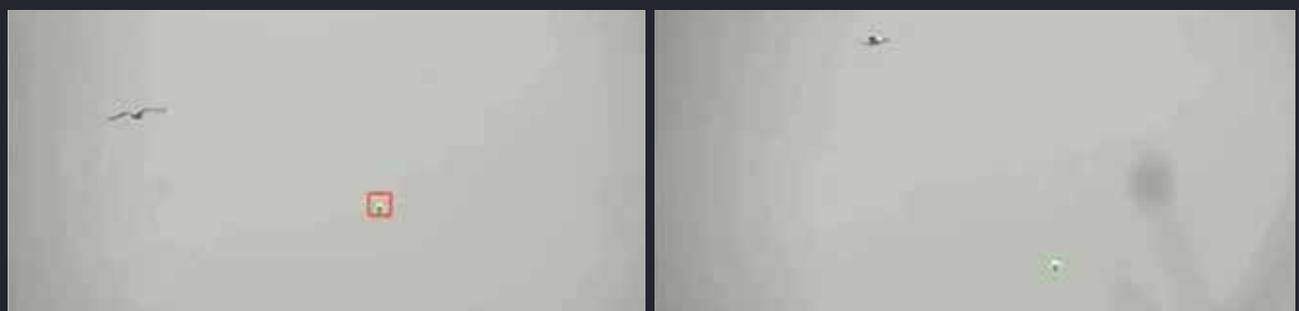
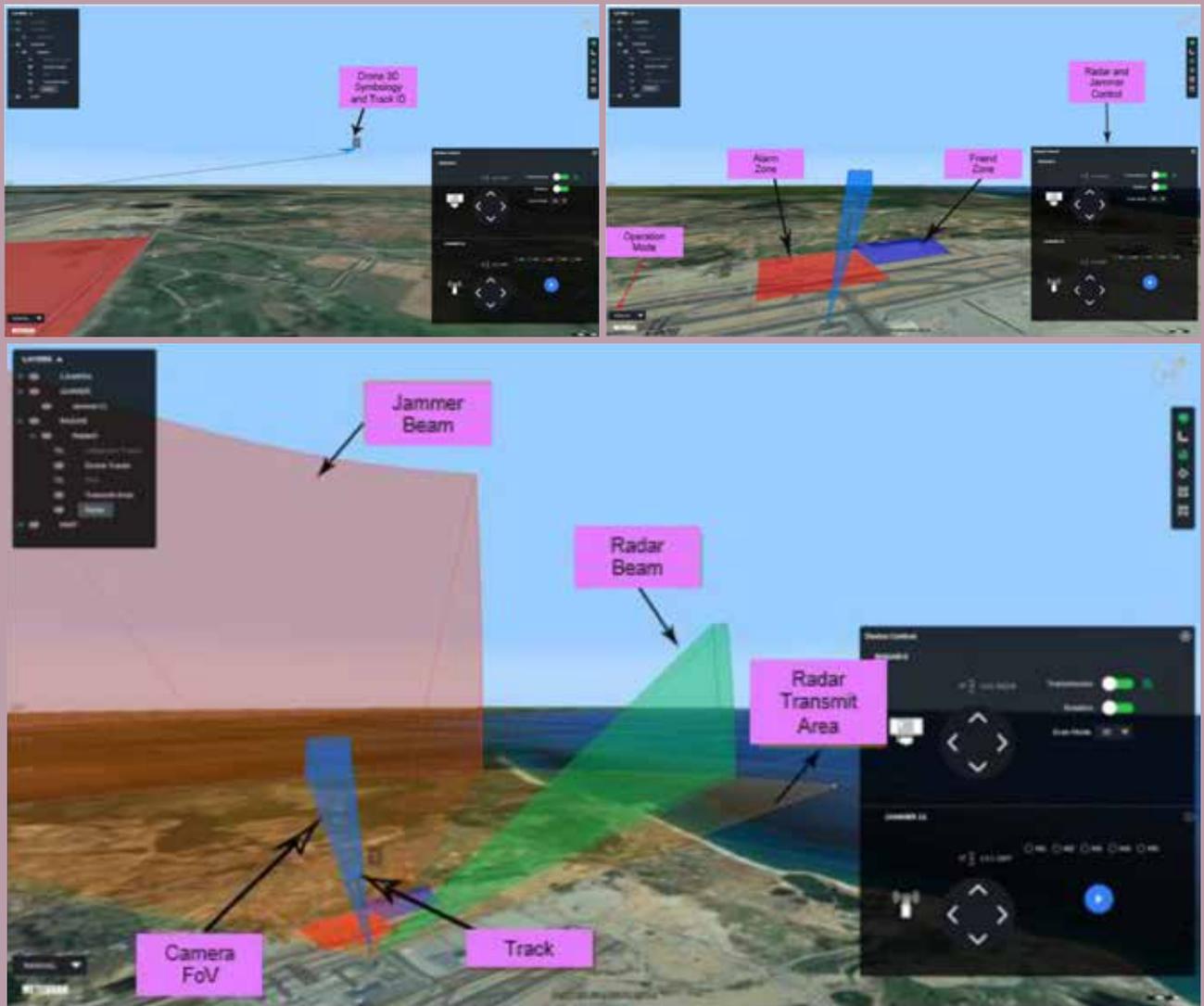


Figure-4: KAPAN Anti-Drone System



# SAHA Istanbul, Thrives in Continued Growth with Participation of New Companies

We had an exclusive interview with İlhami KELEŞ, Secretary General of SAHA Istanbul Defense and Aerospace Cluster Association, Turkey's largest and the fastest growing industrial cluster, about SAHA Istanbul's founding purpose, its services and support provided to member companies, activities carried out and/or supported in 2020, its 2021 targets and expectations, and the performance of SAHA Expo 2020 - Turkey's first virtual defense and aerospace exhibition - since its opening on November 9, 2020.

**Defence Turkey: Could you briefly summarize SAHA Istanbul's story of around 6 years since its establishment, the founding purpose and its accomplishments during this period?**

**İlhami KELEŞ:** SAHA Istanbul was established by initiatives of 27 founding members also from the Presidency of Defense Industries (SSB), Istanbul Chamber of Industry (ISO) and Istanbul Chamber of Commerce (ITO) on March 17, 2015, with the aim of

performing activities in the Northern Marmara corridor which covers 54% of Turkey's industrial production. After its foundation, in 2016 SAHA commercial enterprise was established, and the Yıldız Technopark Liaison Office was opened. Entitled to MKFED Membership, our cluster moved to its current office in Teknopark Istanbul in 2017. 2018 was quite hectic for SAHA Istanbul. As a member of the European Cluster Association, it set a target for itself of becoming Europe's second largest

defense industry cluster. In the same year, it carried out the SAHA EXPO 2018 Defense Industry Exhibition. This exhibition, unlike other Defense Industry fair organized in our country, brought together companies that contribute or wish to contribute to the defense industry as manufacturers/suppliers. One year after the exhibition, SAHA EXPO Inc. was established to carry out fair organization activities internally. In the same year, the first of our MBA programs was

initiated to train executives for the defense industry, started by SAHA Akademi Inc. In the first months of 2020, with the Covid-19 outbreak in December 2019, the whole world and our country felt the unprecedented impact of the pandemic. During the fight against the pandemic, we produced the products needed locally with our members. We shifted our networking activities to a digital platform and supported our members in learning new skills by organizing "Webinars". In addition,



the SAHA MBA Program, which we aim to make a global brand, continued in hybrid mode. With these activities, 2020 was fruitful in all aspects for SAHA Istanbul. Within the scope of the "Gaziantep Defense Industry Development" Cooperation Protocol signed between Gaziantep Chamber of Industry and SAHA Istanbul, the SAHA Istanbul Gaziantep Branch was opened.

With the National Aerospace Industry Committee (MİHENK) formed with the participation of Turkish aerospace industry giants under the leadership of SAHA Istanbul, Turkey has become the 13th country that has completed the European Aerospace Quality Group (EAQG) integration.

The COVID-19 pandemic has affected the traditional Defense Industry Fair concept. We had to postpone the SAHA EXPO 2020, that would normally be held physically, to November 10-13, 2021, within the scope of the measures adopted by our Ministry of Interior due to the pandemic. Afterwards, in this period when business relations moved to the virtual environment, we took pride in being proactive and opening the "World's First 3D Defense Industry Exhibition". The SAHA EXPO Virtual Exhibition

was not physically held in order not to endanger the health of the participants due to the pandemic and it will remain open until April 9, 2021. BİTES, a member of SAHA Istanbul and an Aselsan company, developed the virtual exhibition application XperExpo for the event. Offering all opportunities of physical fairs to participants, SAHA EXPO attracted attention both at home and abroad.

Turkey's largest Defense Industry Cluster SAHA Istanbul continues to grow with the participation of new companies. With membership approval granted to the company applications in the last board meeting held in January, the number of SAHA Istanbul member companies has increased to 588.

With an accomplished public-industry-university ecosystem, SAHA Istanbul plays an active role in the nationalization of the defense industry. SAHA Istanbul, with its industry leading members such as Aselsan, Roketsan, HAVELSAN, Baykur, BMC, Tümosan, MKEK, Turkish Technic, STM and ASFAT, positions itself as an NGO that provides the most effective support to Turkey's National Technological Move carried out in defense, aviation, and aerospace industries.

Despite being founded just 5 years ago, SAHA Istanbul has become Turkey's largest cluster and the European Aerospace Cluster Association's (EACP) second largest cluster. The cluster seeks to encourage domestic and national companies to produce in the defense industry, civil aviation and space sectors. To this end, a series of studies are also carried out, such as ensuring the synchronized operation of the industry with our universities, providing state support to projects, providing production capabilities that are not available, and providing collective support in the search for overseas markets.

**Defence Turkey: As SAHA Istanbul, what kind of services and supports do you provide to member companies at home and abroad?**

**İlhami KELEŞ:** SAHA Istanbul is a structure that exists with its members. There is no commercial activity as a cluster and in fact it provides support to the state and its public institutions in this context. It coordinates two UR-GE projects for its members to become advantageous in international competition and to increase their export capabilities. SAHA Istanbul closely monitors and coordinates the activities carried out within the scope of the

EYDEP project initiated by the Presidency of Defense Industries in order to identify the positions of the companies in the Defense Industry Supply Chain and to increase their competencies in this field.

With the MÜRĞEMER Project carried out with the contribution of Marmara University and Teknopark Istanbul, we also aim to support our companies in the supply of design and analysis software.

Our SAHA MBA program, on the other hand, paves the way to increase the management skills of member companies' employees with courses and lectures given by prominent sector figures, in addition to academicians from our country and countries across the world.

MİHENK (National Aerospace Industry Committee) conducted its internal inspection in January with the 9104-2 Form F document and shared the required documents with the EAQG OPMT. The internal inspection was accepted and it was audited by EAQG OPMT on January 27. Turkey will acquire a certification capability upon SAHA Istanbul's receiving this certificate. In this way, our companies' obligation to acquire the certificates from foreign countries and



our country's foreign dependency in terms of certification will be eliminated.

### **Defence Turkey: What comments would you like to say on the current status of the Turkish Defense and Aerospace Industry and Turkey's position in the Defense and Security Market?**

**İlhami KELEŞ:** In 2002-2019 Defense and Aerospace turnover increased by 10 times while the exports of these sectors increased by 12.4 times. As of 2019 Turkey's defense expenditure reached US\$ 20.4 billion, and this amount falls to 1% of the entire world's total defense expenditure which is US\$ 1.9 trillion. Total employment of the sector reached 73,771 people.

On the other hand, 7 Turkish companies remain in the list of top 100 defense industry companies in the world with the highest turnover levels. These companies and their turnover are as follows: Aselsan US\$ 2.2 billion, TUSAŞ US\$ 1.9 billion, BMC US\$ 533 million, Roketsan US\$ 515 million, STM US\$ 485 million, FNSS US\$ 374 million and Havelsan US\$ 295 million.

R&D expenditures increased by 34 times and the budget of R&D

projects reached TRY 3.5 billion. Within this scope, 230 people in 18 universities, 438 people at 13 Research Centers and Institutes, and 2,371 people in 60 companies are working as R&D project stakeholders. Decisions were made for 36 projects to be launched and R&D Wide Area Requests for Proposals (SAGA) were planned for 17 R&D projects. The total ongoing and completed projects stands at 104.

### **Defence Turkey: What would you like to say on the activities and studies that SAHA Istanbul either realized or supported in 2020?**

**İlhami KELEŞ:** We established SAHA AKADEMİ in cooperation with SAHA Istanbul and TÜBİTAK TÜSSİDE. We launched the SAHA Akademi MBA Program at three centers in Istanbul, Ankara and Gaziantep, each with classes of 25 students, and this program initiated for mid-level and senior level managers still continues. SAHA MBA's vision is to become one of the top ten education institutions as a global brand in the defense industry area. Free specific technical training which may qualify as on-the-job training is offered to our members within the body of the SAHA Akademi.

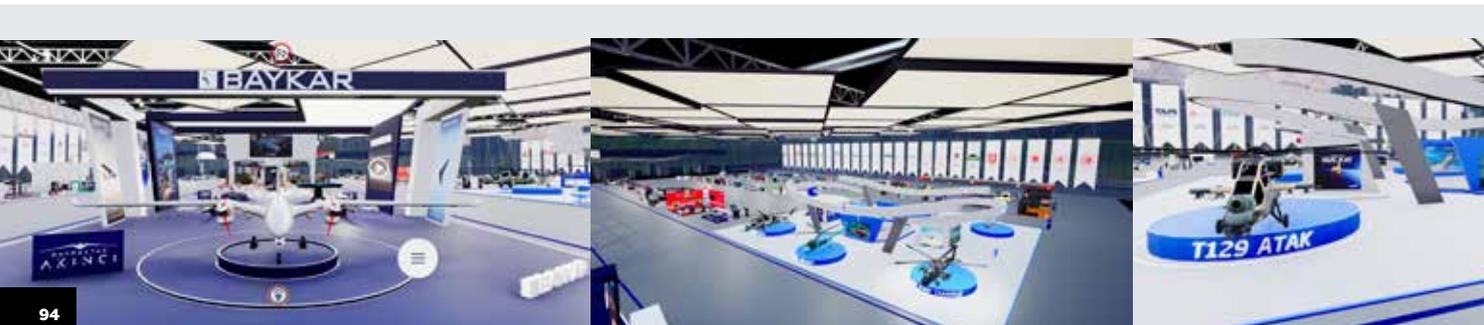
We accelerated our projects in 46 activity areas with our committees and members. Our Material and Material Forming Committee will continue to conduct research and indigenization activities into the infrastructure and requirements for manufacturing strategic material used in the defense industry, particularly steel, aluminum and titanium material from the mining process to the end-product stage with our member companies. Activities have been executed and will be carried out to acquire the capabilities we lack in technologies such as the forming process of the material when transforming it into end-products and heat treatment, layered manufacturing and precision machining. Activities for the development of material and sub-components required by epoxies have been executed as well. All the aforementioned activities will also continue in 2021.

Under the auspices of our Machine and Other Manufacturing Equipment Committee, the MİLTEKSAN A.Ş. Company was founded as a joint venture of our 11 companies and a production road map was drafted as part of

SAHA Istanbul's activities for building 5-Axis CNC Control Units. 3-axis CNC Control Units will be produced in 2022 by this company and production of 4-axis control boards will follow in 2023. Finally, in 2024, 5-axis, new generation CNC Control Units with a precision of >2 or below will be manufactured. Production of threaded rods and ring nuts is planned to meet the demands of the defense industry. The "spindle" and its driver are also aimed to be produced. Activities for building the capacity to locally produce components in which we have foreign dependency, such as high-precision redactors used in smart devices, sliding shaft, servo, "spindle" and spindle drivers are being maintained as well.

We already have launched 2 Product Development projects as part of this committee's activities and the requirement analysis studies of the projects are in progress.

Our Software, Automation and Digital Transformation Committee has been executing activities in cyber security for the protection production facilities and smart production equipment from cyberattacks as part of the software committee activities in coordination with the



SSB, universities and TÜBİTAK. Our committee's sub-workgroups are carrying out projects in an accelerated manner, and activities on artificial intelligence software and their utilization by defense and aerospace sectors are being carried out. Creating a software market for domestic software and including Academicians and SMEs in this market, gathering information on software from SAHA Istanbul member universities are a few of such activities. Also, the commercialization of the software inventory and our member companies' software that has not yet been commercialized and the Training Program for Developing Engineering Software (MÜYGEP) will be conducted.

Fulfilling the demands of defense industry stakeholders in particular and the indigenization of enterprise resource planning programs required by our country's industry are aims within the scope of a project launched by SAHA Istanbul in the first quarter of 2021. The first of a series of online meetings has been held and a consensus has been reached on the urgency of the matter and the necessity of building an open-source ecosystem. The studies to define a draft road map have been launched under the

guidance of the Ministry of Industry and Technology, TÜBİTAK TÜSSİDE and SAHA Istanbul and with the contributions of leading companies in our sector. The business plan will be launched upon the identification of the road map and the project is planned to be carried out with the government's support.

Activities to fulfill the industry's connector demands and relevant areas of expertise have been launched in our Electric and Electronics Committee. Activities on data recording systems, black boxes, 3D sound systems and pitot tubes are being conducted as part of the avionic activities.

Activities towards establishing a test, development and training center for unmanned systems are being conducted as an indigenous project by the Test and Certification Committee. Additionally, building an inventory of the companies active in the maritime sector and conducting activities by identifying the test, certification and training areas required by the naval platforms are aimed.

With MiHENK established within SAHA Istanbul's thriving body, Turkey has joined the league of Global Aerospace Quality builders. Thanks to MiHENK, Turkey

became the 13th country to be integrated into the International Aerospace Quality Group (IAQG). With this IAQG status, SAHA Istanbul has been qualified as the 11th National Aerospace Industrial Association (NAIA) in the Online Aerospace Supplier Information System's (OASIS) database.

Activities for achieving the license from the International Aerospace Quality Group for Turkish Accreditation Agency to accredit local companies are being carried out as part of MiHENK activities. This process is planned to be completed by early 2021. With another equivalent activity, one of our members, Turkish Lloyd will be able to grant AS9100s as the first national certification company.

Efforts for obtaining an ISO 9001 certificate are being exerted to accomplish SAHA Istanbul's institutionalization process. We have been working to improve our website and CRM infrastructure to achieve the digital transformation of SAHA Istanbul and provide better services to our members.

**Defence Turkey: Could you evaluate the year 2020 which was heavily influenced by the COVID-19 pandemic? What are your targets**

**and expectations in 2021? And on that note, would you like to comment on Turkey's Defense and Aerospace Industry's export performance in 2020?**

**İlhami KELEŞ:** Shadowed by the COVID-19 pandemic, the year 2020 resulted in recession, shrinking production capacity and disrupted supply chains.

According to Turkish Exporters Assembly's (TİM) data, total exports of Turkish Defense and Aerospace Industry in January 2020 was US\$ 166 million and 936 thousand. In January 2020, total defense and aerospace exports amounted to US\$ 181 million and 761 thousand. The exports conducted between January 1 and February 29, 2020 increased by 5% compared to the same period of the previous year and reached US\$ 348 million and 697 thousand.

However, this momentum started to slowdown in May 2020. The quarantine processes launched with the outbreak had an impact on the entire world resulting in decreases in export figures. According to the data provided by TİM, the Turkish Defense and Aerospace sector achieved exports of US\$ 1 billion 521 million and 396 thousand throughout the first 9 months of 2020. As similar worldwide, defense



exports experienced a decline in Turkey due to the COVID-19 pandemic, but revitalization occurred in September. In the sector, total exports increased by 80% September 2020 compared to the same period of the previous year and reached US\$ 281 million and 582 thousand.

As per the data of the first three quarters of 2020, the Turkish Defense and Aerospace Industry conducted the highest level of export activities to the following ten countries: USA, Germany, the UAE, India, the Netherlands, Qatar, Switzerland, the United Kingdom, Azerbaijan, and France. Pakistan and Ukraine may also be included in this list. The figures regarding the Defense and Aerospace Industry are declared each year in detail, however the figures that will demonstrate 2020's accomplishments have not yet been announced. A clearer picture will be illustrated as soon as the number are revealed.

Surely, the National Technology Move that has been maintained for nearly 20 years will be carried out in 2021 in an intense manner. We have been witnessing the concrete results of this movement as a country. Turkey's rate of domestic participation

in the defense industry increased to the level of 70% from 20%. In the following process, the transition into indigenous and national production will continue in more strategic products and systems that include high technology. The rate of domestic participation in defense industry is aimed to be increased to 71%, the defense and aerospace industry's foreign sale revenues are anticipated to US\$ 6.2 billion, the turnover target of this industry will be US\$ 19.7 billion and employment is aimed to reach 81,500 as a result of the activities to be held within the scope of the "Presidential Annual Plan for 2021." In this respect, as Turkish industry's frontrunner from past to present, the Defense Industry will continue to perform its duties in 2021 by increasing its success.

As SAHA Istanbul, we have an intensive work schedule in 2021. One of the most critical items on our agenda will be the world's first 3D virtual defense industry exhibition SAHA EXPO which we launched on November 9, 2020. The SAHA EXPO Virtual Exhibition will run until April 9, 2021. This virtual exhibition is open 24/7 visitors across the world and we will put forth our best efforts to render it a

global brand. We delayed the SAHA EXPO Exhibition to 2021, due to the pandemic and we will hold the event on November 10-13, 2021 physically at the Istanbul Expo Center in Halls 5, 6 and 7.

There are seven committees within SAHA Istanbul, and each committee has 15 members. In addition to participating in an integrated body within SAHA Istanbul, member companies with similar production capabilities serve in the committees built in accordance with areas of expertise. These committees hold regular meetings and conduct projects. The committees will continue their activities in 2021 and we will be witnessing concrete results in some of these projects.

We will have a General Assembly in 2021 and we will conduct B2B activities as part of Product Development in 2021. We are negotiating with foreign procurement delegations and business delegations according to the circumstances caused by the pandemic. Our activities will continue towards improving the exports of companies through the Product Development processes we built within each Committee.

We will be launching our new MBA Programs for the spring term. We will also continue our vocational training and training courses. European Aerospace Quality Group (EAQG) inspections will be executed as part of the National Aerospace Industry Platform (MIHENK).

We will be organizing events to gather main contractor companies, contractor companies, or conducting negotiations directly, based on projects with suppliers.

The activities we will be performing in line with our strategic plan are grouped as follows:

- Activities we will be performing with our member companies regarding business development
- Activities for improving SAHA Istanbul's corporate infrastructure
- Activities we will be conducting as part of SAHA EXPO, both in virtual and physical fair platforms
- Activities for fulfilling the country's demands through manufacturing by combining SAHA



Istanbul companies' capacities. In other words, the activities we will be conducting for producing what is not yet produced in Turkey.

- The studies on proposal and legislation development by our companies and universities to pave the way for decision-makers to make sound decisions,
- Training activities to be accomplished as part of SAHA Akademi,
- Participation in domestic and international fairs, activities that contribute to the promotion of our companies in such platforms.

**Defence Turkey: Organized by the SAHA Istanbul cluster and held virtually for the first time due to the COVID-19 pandemic, the SAHA EXPO 2020 Exhibition started online on November 9, 2020. Could you share with our readers the figures regarding the performance of SAHA EXPO since its opening? For example, the number of B2B meetings held by**

**the sector professionals from Turkey and around the world, the number of domestic and international visitors?**

**İlhami KELEŞ:** SAHA EXPO has been visited by a total of 85,348 visitors so far, 73,457 of which are locals and 11,891 are foreigners. At SAHA EXPO, which has a total number of 320 participants, including the Turkish Defense Industry's world-renowned companies Aselsan, TUSAŞ, Roketsan, Baykar, Havelsan, STM, MKEK, ASFAT, TAIS, FNSS and Kale Group, the participating companies and local-foreign delegations can conduct meetings in 744 virtual meeting rooms. The international visitors of the exhibition are mostly from countries such as Bangladesh, Pakistan, Malaysia, Ukraine, India, the United Kingdom, Nigeria, France, and Italy.

Within the scope of the virtual exhibition, 26,926 B2B meetings were held or planned, where significant cooperation opportunities were evaluated. The participants will be able to conduct B2B meetings until April 9, 2021 which is the last day of the Virtual Exhibition.

As the world's first Virtual Defense Industry Exhibition, SAHA EXPO

attracted the interest of foreign press as well. Many news and media outlets from Norway to Iran, and Japan to the US featured our Virtual Exhibition in their publications. The interest in the exhibition stimulated the participant companies. Where sixty companies displayed 3D products in the opening of the exhibition, this number rapidly reached 102. The number of 3D products demonstrated in the beginning was 355 and with the addition of new products this figure has increased to 536.

**Defence Turkey: What would you like to tell us about the SAHA EXPO 2021 Defense, Aerospace Industry Fair, which is announced to be held physically in Halls 5, 6 and 7 at the Istanbul Expo Center between 10-13 November 2021?**

**İlhami KELEŞ:** Organized with the support of the Presidency of Defense Industries (SSB), Ministry of National Defense and the Ministry of Interior, the SAHA EXPO Defense and Aerospace Industry Exhibition is an international platform that exhibits the increase in Turkey's domestic production potential and the independent production capacity. At SAHA EXPO where high-tech products are

exhibited, many products of strategic importance in the defense, aviation, maritime and space industries will be introduced for the first time.

SAHA EXPO brings together the defense industry's main contractors such as Aselsan, Baykar, TUSAŞ, TEI, Roketsan, BMC, Havelsan, STM, TÜBİTAK, FNSS, Sarsılmaz, ASFAT, Kale Group, MKEK and TAIS, with major global defense industry companies and suppliers of different sizes, and it also has a role in highlighting the support given to the Turkish defense industry to the National Technology Move.

Professional visitors and buyers from many regions including Europe, America, Africa, the Middle East, Ukraine, Russia, Malaysia, Indonesia, Bangladesh, and India will participate in SAHA EXPO. The Expo will be held in an area 5 times larger than SAHA EXPO 2018 and will be a gathering point where many international agreements will be made.

**Defence Turkey: Mr. Keleş thank you for your time on behalf of our readers and we wish you success in your future endeavors** ■



# One More Add-on to EJDER YALÇIN Configurations

February 09, 2021 Nurol Makina, which has delivered many EJDER YALÇIN vehicles in different configurations to both domestic and foreign users until today, is getting ready to introduce the mortar configuration to the end users. As per the statement made by the company, EJDER YALÇIN, with a new integrated 120 mm mortar system, will cater to operational requirements of our Turkish Armed Forces, Gendarmerie Forces, as well as the end users abroad.

Aselsan's ALKAR 120 mm mortar system was used on the 120 mm mortar vehicle, the new configuration of the EJDER YALÇIN armored vehicle family, which is one of the best vehicles in its class on account of its high protection capability, superior mobility and payload capacity. The qualification tests of EJDER YALÇIN Mortar vehicle were successfully completed.

EJDER YALÇIN Mortar Vehicle, which can provide fire support to Commando, Infantry, Motorized and Mechanized Infantry units in conventional and asymmetric operating environments, has a 120 mm mortar, semi-automatic ammunition loading system, ammunition storage system and fire control system. The high stability of the vehicle allows high precision hits. Thanks to its superior mobility in all kinds of terrain, the vehicle moves quickly and safely after firing and this makes it difficult for the vehicle to be detected by hostile units. In coordination with the EJDER YALÇIN Reconnaissance & Surveillance Vehicle, which is also capable of acting as a Forward Observer vehicle, detected targets



can be effectively fired upon with precision by the EJDER YALÇIN Mortar Vehicle.

EJDER YALÇIN, which has proven itself in the battlefield, has different configurations such as Air Defense Vehicle, Command-Control Vehicle, Combat Vehicle, Personnel Carrier, Mine/

IED Detection-Destruction Vehicle, Ambulance, Radar Vehicle, Jammer Vehicle, CBRN Vehicle, Anti-Tank Guided Missile Vehicle, Reconnaissance and Surveillance Vehicle, Border Surveillance and Security Vehicle. Nurol Makina has sold a large number of EJDER YALÇIN vehicles also to international buyers such as Tunisia, Qatar, Uzbekistan, Senegal and finally to Hungary, a NATO and a European Union member country, in addition to the Turkish Armed Forces and Security Forces up to date.



# Turkish Aerospace & TRMOTOR Signs Protocol for the Development of MMU's Power Units

Development activities of the National Combat Aircraft/FX (MMU) project carried out by the Presidency of Defense Industries (SSB) are in progress. Turkish Aerospace and TRMOTOR signed a new protocol for the development of domestic power units.

Turkish Aerospace, the main contractor of the project, had previously reached an agreement with local companies for investments such as a wind tunnel and lightning test center, and a framework contract was signed with TRMOTOR for the aircraft engine development. Within the scope of the project, to develop the domestic power units of the aircraft, another protocol was signed on February 14th with the participation of President of Defense Industries Prof. İsmail DEMİR, President and CEO of Turkish Aerospace Prof. Temel KOTİL & CEO of TRMOTOR Osman DUR.

Speaking at the signature ceremony, President of Defense Industries Prof. İsmail DEMİR said, "Developing subsystems for our National Combat Aircraft domestically is also really important in our



target of becoming fully independent in critical technologies. Our national industry will power the MMU, and our aircraft will fly independently in the sky. I wish success to Turkish Aerospace, TRMOTOR and all other companies involved in the project."

President and CEO of Turkish Aerospace Prof. Temel KOTİL said the following: "The National Combat Aircraft will not only meet our country's combat aircraft requirements but also bring in all the systems necessary for us to produce new generation aircraft and will have a catalyst role for the development of our aviation industry. The protocol we have signed with TRMOTOR will be an important step to turn a new leaf in Turkey's aviation history. We are

taking a new step for our domestic and national 5th generation fighter aircraft to reach domestic and indigenous power. Good luck to our nation and especially to our defense industry."

CEO of TRMOTOR Osman DUR: "Aircraft engines and power systems are very crucial technologies for our country in terms of technology and strategy. At the same time, it also requires critical knowhow and experience in material, design, production, as well as in human resources and technologies. TRMOTOR, which was founded to develop indigenous aircraft engines with such an awareness, has initiated APU and ATSS development projects, while continuing its efforts for the indigenous MMU engine. Turkey has the power to acquire

such technologies with its qualified human resources, engineering and consulting companies, universities as well as international collaborations. With the National Space Program announced this week, activities in the field of aviation, satellite and space will also accelerate the development of these technologies. It is certain that we will have fully independent, domestic and national engines in aircraft as we do in satellites, space and land platforms."

The APU (Auxiliary Power Unit) and ATSS (Air Turbine Start System) solutions to be required in the National Combat Aircraft, which is planned to be rolled out in 2023, will be achieved with this agreement and a critical milestone in the MMU project will be accomplished.

# Katmerciler Armored Vehicle Export Worth €40 Million

Katmerciler made sales of various armored vehicles to an undisclosed country under a package agreement of €39.450 million. According to the agreement, the deliveries will be made in batches and completed within the next year. In addition to HIZIR, ATEŞ - the border security configuration of Hızır is also included in the package. The armored personnel carrier KHAN will also be included in the inventory of an allied country's army for the first time.

In September of 2020 Katmerciler exported security vehicles to an undisclosed country worth US\$ 3.25 million and by the end of 2020 completed deliveries of armored vehicles worth € 20 million which were ordered from an African country in 2019. The company substantially increased its international sales in the last two years and has demonstrated a strong start in 2021 with important sales activity. According to the statement made by the company, an agreement was signed with an allied country for € 39.450 million, covering the sales of HIZIR, ATEŞ and KHAN Tactical Wheeled Armored Vehicles, Border Security and Personnel Carrier Armored Vehicles.

In the written statement by the company, it was stated that the agreement was made with another



Furkan KATMERCİ - Deputy Chairman of Katmerciler Executive Committee

allied country, not with the African country as appeared in the news in January 2021, and that it was a package agreement, covering various armored vehicles, not a single product. In January 2021, news was shared with the national and international press that Katmerciler Company was preparing for the delivery of 118 HIZIR MRAPs to the Kenyan Army and Kenya Defense Forces spokesman Colonel Zipporah Kioko declared that they would procure 118 HIZIR 4x4 MRAP vehicles from Katmerciler through the Export Credit Bank of Turkey (Turk Eximbank). "The Star", one of the national newspapers of Kenya, published the cost of the purchase as around 7.7 billion Kenyan Shilling (nearly TRY 518 million and US\$ 73 million).

Deliveries regarding the package, officially announced as €40 million, are expected to begin in 2021. Deliveries are planned

to be made in batches and expected to be completed in 2022.

FURKAN KATMERCİ: "We have Exceeded our 2020 Revenue, Export and Profitability Targets."

Furkan KATMERCİ, Deputy Chairman of Katmerciler Executive Committee, made a statement after the signing of the armored vehicles export agreement and said, "Our efforts to export our defense industry products, each of which has distinguished features in its own category, continue to yield results. With the contribution of the Turkish defense industry's growing reputation on an international scale, the fact that we have signed an agreement worth around €40 million is very pleasing for our country, for our industry and our company. Within the scope

of the agreement there are several armored vehicles in different segments, not a single product, and this is also an indication of the trust in Katmerciler's quality work as well as the Turkish defense industry."

Stating that the deliveries under the agreement will be made in batches, KATMERCİ added, "This success will pave the way for Turkish armored vehicles to be included in the inventories of friendly countries and it will also contribute to Katmerciler's export growth and increase its export revenues. We have exceeded our 2020 targets for revenue, export, and profitability. As a public company, we are happy to share good news to our investors and shareholders. This new agreement will make a significant contribution to the export targets of the next two years. We keep moving forward confidently in line with the targets that

we have set. Our export activities to allied countries from different parts of the world, especially to Africa, continue. We believe we will continue to share good news. Our major goals are to grow our exports in the field of defense, to increase our total revenues and profitability.”

## **ATEŞ Border Security Vehicles on Duty at Edirne-Kırklareli Border Region**

As a payload on ATEŞ Armored Vehicles, designed as Border Security Configuration of HIZIR 4X4 Vehicles, Aselsan’s ACAR Ground Surveillance Radar, ŞAHİNGÖZÜ-OD Electro-optic Sensor System, 9661 V/UHF Ground Radio System and SEDA Gunshot Detection



ATEŞ Border Security Vehicle

System are available. Additionally, the SECANS Security Management Software is designed and developed by Aselsan and all sensors are controlled through this software. Thanks to the on-vehicle sensors, short/medium/long range troop mobile surveillance requirements are met during day/night and under adverse weather conditions, while

a target detected by radar or a sharpshooter firing detected by a gunshot detection system can be determined on the digital map with coordinates and monitored in real time by thermal cameras.

For use by border troops serving in Edirne and Kırklareli provinces in order to detect irregular migrants and traffickers as well as ensure Turkey-

EU border security, a project for the “Supply of Mobile Surveillance Units for Increasing Border Surveillance Capacity of Borders between Turkey and EU” was launched, the tender of which was conducted by the Central Finance and Contracts Unit of the Ministry of Treasury and Finance. The Ministry of Interior’s Provincial Administration General Directorate was the beneficiary and the project was supported 75% by the EU and 25% by Turkey. HIZIR 4x4 vehicles were selected with Aselsan’s solution in the tender. The contract covering a total of 57 vehicles was signed in 2017, and the deliveries of the package, including a total of 57 Armored Vehicles, were completed in 2020 and were included in the Turkish Armed Forces inventory ■



© Katmerciler

HIZIR 4X4



## Lighter Version of the National Infantry Rifle MPT-76 Ready for Duty



The lightened version of the MPT-76 National Infantry Rifle, which continues to be developed with Turkish Armed Forces feedback, is now ready for use by security forces.

February 07, 2021, President of Defense Industries İsmail DEMİR announced on his official social media account that the qualification of the lighter version of the National Infantry Rifle, MPT-76-MH, has been completed. "We continue our efforts to ensure that our security forces use their equipment more effectively in the field. Designed by MKEK, the qualification of the lighter

National Infantry Rifle MPT-76-MH has been completed." Demir said in his statement.

Serial production of the MPT-76, which was developed entirely by Turkish engineers within the scope of the Modern Infantry Rifle project carried out under the coordination of the Presidency of Defense Industries (SSB) to meet the modern assault rifle needs of the Turkish Armed Forces, started in 2016. Today, more than 40 thousand rifles, produced and delivered by the Mechanical and Chemical Industry Corporation (MKEK), Sarsılmaz, and

Kale, are actively used by security forces.

While the deliveries are ongoing, development efforts continued in line with the feedback from the field. Initially, the MPT-76 weighed 4.2 kilograms; however, MKEK made further improvements on the rifle and reduced its weight by more than 400 grams. Thus, the new MPT-76-MH became approximately 3 kilograms and 750 grams. Following the completion of its qualification process, the lighter National Infantry Rifle MPT-76-MH is expected to be used by security forces in the coming period.

The National Infantry Rifle (MPT-76), which was produced completely using national resources and without technical support from abroad, passed 42 different environmental tests such as cold and hot air, sand, rain, and mud, all prepared according to NATO standards. The rifle can operate at -40°C and 65°C under pressurized water and mud without malfunctioning. The MPT-76 uses 7.62x51 mm NATO bullets, has an effective range of up to 600 meters, a barrel life of up to 12 thousand shots, and has a firing rate of 650 shots per minute.

**INTERNATIONAL  
DEFENCE  
AND SECURITY  
EXHIBITION**



# Dual technologies for the future of Europe

NOVEMBER, 3-5th  
2021

PAVILION 8 & 10  
IFEMA

MADRID  
SPAIN

GLOBAL PARTNER



ECOSYSTEM PARTNERS



INDUSTRY PARTNERS



TECHNOLOGY PARTNERS



ORGANIZED BY



MANAGEMENT AND DEVELOPMENT



# Turkish Naval Forces Commissions 10,000 Tons Floating Dock

The 10,000-ton floating dock, which has the largest docking capacity on the Mediterranean and Aegean coasts of Turkey, has entered service with a ceremony attended by the Minister of National Defense Hulusi AKAR.

Commissioning Ceremony of the Floating Dock "Dock-14" with a lifting capacity of 10.000 tons, which was constructed by HAT-SAN Shipyard in cooperation with General Directorate of Shipyards (TGM) under the main contractor Military Factory and Shipyard Management Inc. (ASFAT), was held at the İzmir Naval Shipyard Command with the participation of Minister AKAR, Chief of General Staff Gen. Yaşar GÜLER, Turkish Armed Forces Commanders, and Deputy Minister Muhsin DERE.

In his speech at the ceremony, Minister of National Defense Hulusi AKAR stated that considering the recent developments, the importance of the domestic and national defense industry has become even more evident. Emphasizing that the Turkish defense industry's shipbuilding capacity has improved further with the commissioning of the 10,000 tons floating dock with the largest docking capacity



© MoD

on the Mediterranean and Aegean coasts of Turkey, Minister AKAR expressed that the "Dock-14" will make significant contributions to the operational capabilities of the Turkish Naval Forces. Stating that all these achievements have been accomplished through the dedication, sincerity, dialogue, and coordination of the public, private sector, and universities, Minister AKAR said, "The floating dock is a beautiful and successful example of public-private partnership."

Emphasizing his confidence in Turkey's human resources, potential,

and defense industry companies, Minister AKAR said, "Our businessmen, industrialists, engineers, and workers, who worked day and night, have a significant share in the successful operations carried out by the Turkish Armed Forces on land, sea, air, inside and beyond Turkey's border as in various geographies of the world." Congratulating those who contributed to the successful execution of these projects that strengthen the effective, deterrent, and honorable Turkish Armed Forces, Minister AKAR expressed his gratitude to ASFAT and HAT-SAN shipyard employees.

## HAT-SAN 10,000 Tons Floating Dock

The contract of 10,000 tons of Floating Dock Project, which was initiated to meet the requirements of the General Directorate of Shipyards, was signed on August 2, 2018. The Keel Laying Ceremony of the floating dock, which was constructed by HAT-SAN Shipbuilding Maintenance Repair Inc, was carried out on February 6, 2019.

The floating dock, which will serve the naval platforms that the Turkish Naval Forces will operate in the future, has a lifting capacity of 10,000 tons. The overall length of the floating dock is 175,60 meters, and the inner width is 35,54 meters. The floating dock can dive or floats within 1 hour. The dock has two electro-hydraulic-type mobile cranes. Cranes can carry 10 tons of load 10 mt/min.



# DIMDEX 2022

Doha International Maritime Defence Exhibition & Conference | معرض ومؤتمر الدوحة الدولي للدفاع البحري  
21 - 23 MARCH www.dimdex.com ٢١ - ٢٣ مارس

## DUNYANIN DENIZ SAVUNMA VE GÜVENLİK SANAYISINI BIR ARAYA GETIRIYORUZ

CONNECTING THE WORLD'S MARITIME DEFENCE & SECURITY COMMUNITY

٢١ - ٢٣ مارس ٢٠٢٢  
21 - 23 MARCH 2022

    
@DIMDEXQatar

Hosted & Organized by



القوات المسلحة القطرية  
QATAR ARMED FORCES

Strategic Partner



بوزان القابضة  
BARZAN HOLDINGS

Diamond Sponsor



Gold Sponsor



Official Show Guide Producer



Media Partners

































# Koç Savunma Makes a New Deal for its Underwater Telephone

The Underwater Telephone, a communication system that enables communication between submarines and vessels through underwater acoustic waves and indigenously developed by Koç Bilgi ve Savunma, receives orders from abroad.

In the written statement made by the company, it was shared that following the contract award for its use on a foreign naval ship in 2020, at the beginning of 2021, another sales contract was signed for the Underwater Telephone with an English-language menu to be used on a ship in the inventory of another country.

Koç Savunma Engineering Manager Hakan ÖKTEM recently shared a general evaluation of the year 2020 and discussed his views on the sales activity and stated that Koç Savunma accomplished all the deliveries of the year 2020 within the framework of its commitments and on time. ÖKTEM: "As Koç Savunma, we focused on R&D and innovation activities as a domestic and national defense company amid the pandemic, despite the challenging conditions caused by the pandemic all over the world and in our country.

In this context, we received considerable orders at home and abroad and have signed foreign representation agreements with many companies. Thus, we are proud to close the year 2020 as a solution partner preferred by defense companies both at home and abroad. We fully believe that this fruitful period will keep on in the upcoming period."

Stating that their strategic road map will take them into new sectors and growing in foreign markets, ÖKTEM said, "Koç Savunma evaluated 2020 as a fruitful year in terms of both domestic activities and export opportunities. During this period, we successfully launched activities to promote our products and generate solutions with various ministries and institutions."

The Company introduced its indigenous defense industry products, such as Echorium Diver Detection Sonar, Underwater Detection and Positioning System, Scoring System (MTS), Acoustic Tracking System (AIYS), Underwater Environment Model (SORTAM) and Underwater Telephone, for the first time at the IDEF fair held on April 30 - May 3, 2019.

# A Production Milestone in ATOM 35mm Air Burst Mmunition Electronics



Within the scope of the 35 mm Air Defense System Modernization (HSSM) and Particle Ammunition Supply (PMT) Contract conducted by Aselsan under the guidance of the Presidency of Defense Industries, 100 thousand ATOM 35 mm Air Burst Mmunition electronics were manufactured at Aselsan facilities.

ATOM 35mm Air Burst Ammunition provides high hit probability against various types of air and land targets, with the ability of precise time counting and the capability of being programmed during firing by taking the muzzle velocity into consideration. Thus, barreled systems can be used as effective air defense weapons. Modernized Towed Guns and KORKUT Systems, when used with ATOM 35 mm Air Burst Ammunition, become effective against traditional air targets such as fighter jets and helicopters, as well as modern air threats such as air-to-ground missiles, cruise missiles and unmanned aerial vehicles. ATOM 35 mm Air Burst Ammunition was developed by Aselsan as the main contractor and by subcontractors MKEK and TÜBİTAK SAGE and has become an important element in layered air defense.



# SUNGUR Low-Altitude Air Defense System Successfully Hits Target

Turkey's first Mobile Low-Altitude Short-Range Air Defense System SUNGUR, which was indigenously developed by Roketsan, successfully destroyed the target drone at maximum range and altitude during the latest firing test.

President of Defense Industries Prof. İsmail DEMİR announced the firing test, which was conducted against a Banshee Target Drone System (fitted with the Hot Nose, a black-body infra-red enhancement system that provides a proven infra-red (IR) source for IR tracked, guided or fused weapons), on his official Twitter account on February 26, 2021, and said: "SUNGUR solidified its role in layered air defense with this successful test against an aerial target at maximum range and altitude. Developed by Roketsan, the SUNGUR Air Defense System can be integrated into land, air, and naval platforms with its portable feature."

Turkey's first Mobile Low-Altitude Short-Range Air Defense System SUNGUR was indigenously developed by Roketsan under the contract signed between the Ministry of National Defense and Roketsan on September 10, 2013, to meet the Turkish Land Forces Command's Man-Portable Air-Defense System (PHSFS/ MANPADS) requirements. The system is expected to replace the Stinger POST (FIM-92B) and Stinger RMP (FIM-

92C) MANPADS in the inventory of the Turkish Armed Forces (TAF). The Project was later handed over to the Presidency of Defense Industries (SSB) on November 28, 2016.

Armed with the PORSAV missile, the SUNGUR Mobile Low-Altitude Short-Range Air Defense System provides short-range air defense protection for ground units against cruise missiles, unmanned aerial vehicles, low-flying fixed-wing aircraft, and helicopters.

Dubbed as PORSAV, the National MANPADS is a fully autonomous "fire and forget" missile equipped with a two-stage (booster and sustainer) solid-propellant rocket motor and features Aselsan's cooled Imaging Infrared (IIR) seeker.

Under the PHSFS/ MANPADS Project, the first firing tests with the Ballistic Test Missile, Controlled Test Missile, and unarmed Seeker-Guided Test Missiles took place in 2018 and 2019 at the Sinop Missile Test Range. The guided firing tests with armed Seeker-Guided Test Missiles (with a live warhead) took place during the second half of June 2020.



# MAM-L Developed by Roketsan Ahead of Its Rivals with Technology and Combat Experience



Among the world's top 100 defense industry companies, Roketsan continues to be noteworthy with new generation products that meet the needs of friendly and allied countries, especially the Turkish Armed Forces, with the technologies it has developed in line with the battle needs of today and the future. The Smart Micro Munition MAM-L changes the course of the battle and provides superiority on strike capabilities and is actively used in many unmanned aerial vehicles (UAV) platforms, especially in TB2.

Roketsan was established in 1988 as per the Defense Industry Executive Committee's decree for Turkey to have a leading institution in rocket and missile design, development, and production. The company creates value for its stakeholders and employees with its national defense solutions, in line with the country's target to become a global power. Roketsan, with its vision of "Becoming a leader in indigenous, reliable and cutting-

edge rocket and missile solutions for the future of Turkey" is a leader in the defense industry with the game changing technologies it develops.

MAM-L, a member of the Smart Micro Munition product family, developed in line with the battle needs of today and the future,

performs satisfactorily in the battlefield as it promises. Integrated into the BAYRAKTAR TB2 Tactical UAVs and ANKA MALE UAVs that are in the inventory of the Turkish Armed Forces, Gendarmerie General Command and General Directorate of Security, MAM-L has been effectively used in

operations since 2016. MAM-L munition is quickly gaining traction ahead of its rivals with its technology and combat experience.

Weighing nearly 22 kg, MAM-L stands out as a cost-effective solution for use in light attack aircraft as well as UAVs. The range of the MAM-L, which provides precise guidance with the Inertial Navigation System (INS) and engages to its laser-illuminated target with the Laser Seeker at the terminal phase, can be expanded up to 14 kilometers depending on the shooting conditions.

With the anti-tank and thermobaric warhead options, the ammunition can be effective against a variety of targets. Roketsan continues its R&D projects to expand the MAM Family and increase its capabilities in order to meet the needs of friendly and allied countries, in particular the Turkish Armed Forces, and to develop superior products together with all companies in its ecosystem.



MAM-L Technical Specifications	
Diameter	160 mm
Length	1 m
Weight	22 kg
Range	8 km (14 km depending on shooting conditions)
Seeker	Semi-Active Laser Seeker
Platforms	UAVs Light Attack Aircraft

# AKYA National HWT Torpedo being Integrated into the MÜREN PREVEZE Project



Turkey's growing defense industry, with significant contributions of TÜBİTAK BİLGEM, continues to produce indigenous and domestic solutions for the defense of our seas.

In order to eliminate our foreign dependency in underwater combat management systems, our four PREVEZE Class Submarines in the inventory of Naval Forces are modernized with the "MÜREN PREVEZE Combat Management System (CMS)" developed

by TÜBİTAK BİLGEM. Within the scope of the MÜREN PREVEZE CMS project signed on August 1, 2017, various capabilities such as integration with 20 different sensors and navigation systems, sonar signal processing, target movement analysis, ship navigation and modern heavyweight class torpedo launching are being developed by TÜBİTAK BİLGEM engineers with the cooperation of ARMERKOM and contribution of the Presidency of Defense Industries.

## National Underwater Management System to Acquire National Heavyweight Torpedo Launch Capability with AKYA

The MÜREN PREVEZE CMS AKYA National HWT Integration Project was signed on March 8, 2021 between Istanbul Naval Supply Group Command and TÜBİTAK BİLGEM to add new features to the acquired ones. With this project, AKYA, the first domestic and national

heavyweight torpedo developed by ROKETSAN, will be integrated into the MÜREN PREVEZE CMS, and our national combat management system will acquire national torpedo launch capability.

The factory acceptance tests of the MÜREN CMS for the first Preveze Class Submarine have been completed and its deployment on the ship continues. Following the completion of the sea acceptance tests for the first ship this year, the gains achieved with the MÜREN CMS will also constitute the basis for the National Submarine development efforts.



# The SSB Steps up to the Challenge with New R&D Projects

A signing ceremony was held for 6 new R&D projects initiated by the Presidency Defense Industries (SSB) in 2020.

February 18, 2021, President of Defense Industries Prof. İsmail DEMİR, President of TÜBİTAK Prof. Hasan MANDAL, representatives of the Ministry of National Defense and companies involved in the projects attended the signing ceremony which was held with a limited number of participants at the SSB premises.

Prof. DEMİR: “R&D expenditures reached US\$ 1.7 billion dollars in 2019.”

In his speech at the ceremony, SSB President Prof. İsmail DEMİR stated that TRY 3.5 billion has been spent on 104 R&D projects completed and ongoing up to date, and that they are carrying out these projects together with universities, companies, research institutes and institutions. DEMİR: “Defense industry R&D expenditures, which were only US\$ 49 million in 2002, increased by 34 times in 2019 to approximately US\$ 1.7 billion. This figure corresponds to around 15% of the total industry turnover. Such increase rates achieved and to be achieved are an indication of the contribution of our industry to indigenous product and technology development. “We are aware that the Global



Vision of Turkey is anchored in R&D and technology. The key to full independence in the defense industry is to achieve full indigenouslyness in critical and strategic areas.”

## R&D Projects Initiated in 2020

A total of 6 new R&D projects were initiated in 2020.

- Innovative Software Competition (Y3) and “Veri Kovani” Data Labeling Platform Project
- Artificial Intelligence Enabled Vulnerability Detection and Prevention in Software Defined Networks (MILAS) Project
- Global Vulnerability Analysis (KEŞİF) Project
- Thin and Lightweight Bullet Resistant Glass System (KEHRİBAR) Project
- Aviation Engine Materials Development Program PHASE-1 (CEVHER) Project

- Development of Lightweight and Resistant Armor Materials Reinforced with Graphene (GRAKOR) Project

A total of 10 contractors/subcontractors are involved in such projects, which are developed through models based on the cooperation of companies/institutions/organizations.

- Within the scope of the Aviation Engine Materials Development Program PHASE-1 “CEVHER” Project, the development of aviation gas turbine engine materials currently procured from abroad and the development of an encapsulation system for turbine disc production with powder metallurgy will be made. Turkish Aerospace (TUSAŞ) will be the main contractor and TÜBİTAK-MAM and Meta Nikel Kobalt Madencilik Company will take part as subcontractors in the project.

• With the Thin and Lightweight Bullet Resistant Glass System “KEHRİBAR” Project, the aim is to develop a domestic and national ballistic resistant reinforced thin and lightweight laminated glass system that can be used on air and naval platforms, especially on armored land platforms in the defense industry, which does not endanger the life of the personnel and the safety of defense equipment, does not affect the speed and mobility as well as visual angle of the vehicle. The project will be realized by TÜBİTAK-MAM, the main contractor and by ŞİŞECAM, the subcontractor.

• With the GRAKOR Project, graphene-added nanocomposites will be combined with fiber fabrics, and the graphene-reinforced and fiber-reinforced polymer composite armor material for personnel protection



# TUSAŞ to Export Satellite to Argentina

February 12, 2021 Turkish Aerospace (TUSAŞ), owned by the Presidency of Defense Industries (SSB) and Turkish Armed Forces Foundation (TSKGV), has taken an important step in terms of exports in space and satellite projects. GSATCOM, the subsidiary of TUSAŞ in the space field, will export technologies on “HTS Communications Satellite with High Output Power” to ARSAT S.A., Argentina’s national telecommunication company.

GSATCOM Space Technologies Inc. was established by Turkish Aerospace Industries (TUSAŞ) in partnership with Argentina-based INVAP S.E. at Ankara ODTÜ Teknokent and started their new generation communication satellite development program activities in 2019. These sales abroad to Argentina are a first for Turkey in next generation communication technology the area of intellectual and industrial property rights.

Within the scope of the project, TUSAŞ will be fulfilling the first export of our country in the field of space by selling various satellite subsystems, equipment and engineering services.

With the GSATCOM license, the ARSAT-SG1 Communication Satellite is planned to be developed by TUSAŞ, GSATCOM and INVAP engineers within three years and the production will be completed in 2024. The satellite that will serve in Geosynchronous Orbit will have strategic superiorities involving many technological innovations.

The new generation ARSAT-SG1 Satellite, which will be used for civilian data transfer and has a fully electric propulsion system, is expected to achieve a technologically important position among its peers throughout the world with its output capacity exceeding 50 Gbps in Ka-band.

will be developed. The project will be carried out by the NANOGRAPHY Company.

- With the Global Vulnerability Analysis “KEŞİF” Project, the aim is to detect cyber vulnerabilities in IT infrastructures in advance with the support of artificial intelligence. Within this framework, a search engine for devices connected to the internet will be developed. Within the scope of the project, the objective is to collect intelligence data that will contribute to the national cyber security of our country and to produce effective outputs for decision makers. The project will be carried out by Intelprobe Information Technologies Company.

- Within the scope of the Artificial Intelligence Enabled Vulnerability Detection and Prevention in Software Defined Networks “MİLAS” Project, the aim is to develop an artificial intelligence enabled vulnerability detection and prevention system in order to ensure end-to-end business continuity and data protection in the entire network by developing an autonomous cyber security layer for critical communication infrastructures. The project will be realized by ULAK A.Ş., the main contractor and by STM, the subcontractor.

- With the Innovative Software Competition (Y3) and the "Veri Kovani" Data Labeling Platform Project, the competitions conducted under the Y3

competition program aim to transform the "Veri Kovanı" Platform, which was established to label the data needed under the Y3 competition program and in artificial intelligence studies, into a sustainable program management. The project will be carried out by SSTEK Savunma Sanayi Teknolojileri A.Ş.

With the ongoing and new R&D Projects, substantial contributions will be made in meeting the needs of the Turkish Armed Forces and security forces, minimizing foreign dependency, achieving indigenous, domestic and national solutions, and increasing the R&D and technology competence of our country.

With the SSB R&D Panels established by the SSB in order to initiate R&D projects with more rapid and dynamic manner, decisions are made for the launch of projects that are needed by the security forces' systems and platforms or in new technology areas for the future. Furthermore, in the SSB R&D Panels, a decision has been made to call for projects regarding technology demonstration which do not involve final product delivery.

The first meeting of the SSB R&D Panel was held on December 22, 2016. During the last four years, six meetings have been held and decisions were made to initiate 36 projects and to call for projects in 17 fields.



# Turkey`s First Indigenous Armed Unmanned Surface Vehicle "ULAQ AUSV" Launched

**ARES Shipyard and Meteksan Defence, which had initiated Turkey's first indigenous Armed Unmanned Surface Vehicle (AUSV) program in October 2020, announced that the prototype vessel, ULAQ AUSV, has been launched and sea trials have started.**

February 12th ,2021, In 2018 ARES Shipyard and Meteksan Defence teamed up to manufacture Turkey's first unique Unmanned Surface Vehicle and the ULAQ AUSV project was officially initiated by the parties in the same year. The research and concept studies were published between 2018-2019. In 2019, the

prototype production process was started with national capabilities, and prototype design activities were completed in the first quarter of 2020. The production of the first prototype started in June 2020 and the design studies of the prototype boat were finalized in August. Eventually, the first prototype vessel was launched in February 2021.

In the joint press release issued by the two companies, Utku ALANÇ, Chief Executive Officer of ARES Shipyard, and Selçuk K. ALPARSLAN, General Manager of Meteksan Defence, stated: "In the field of Unmanned Surface Vehicles (USVs); we would like to proudly announce that we have launched the first Armed Unmanned

Surface Vehicle of ULAQ series, and have initiated the intensive sea trials period. From now on, our next short-term target is to complete the sea trials successfully and carry out the guided-missile firing tests. Since the very first announcement of ULAQ Unmanned Systems, we have encountered

significant interest from our country and our allies. This interest and support have given us great incentive to design and build unique, state-of-the-art solutions. On this occasion, we would like to express our sincere gratitude to the Turkish Ministry of National Defense, The Presidency



of Defense Industries and Turkish Naval Forces and all our citizens who have provided full support since the very first launch of the ULAQ program."

The design, construction, and outfitting activities of ULAQ are carried out by ARES Shipyard, the integration of remote command, autonomous, datalink and data transfer systems are performed by Meteksan Defence, and weapon systems are provided by Roketsan.

ULAQ, which has a length of 11 meters, a payload capacity of up to 2 tons, a maximum cruising range of 400 km, and 65 km/h (35 knots) top speed, is equipped with a day/night Electro-Optical (E/O) system, encrypted communication infrastructure, and an Anti-jamming GNSS infrastructure. Manufactured from advanced composite materials, ULAQ is equipped with passive and active stabilization systems, a damage-control system with self-righting capability, a telescopic mast, and an antenna system to increase detection & identification capabilities, a navigation and surveillance radar system to track surface targets, as well as a laser and IR-guided weapon systems.

The UCSV can be operated from mobile ground control stations, military headquarters, and command centers or naval platforms such as aircraft carriers and frigates to carry out different missions such



as Reconnaissance, Surveillance & Intelligence, Anti-Surface Warfare (ASuW), Asymmetric Warfare, Armed Escort & Force Protection, and Strategic Facility Security. The AUSV will be able to carry out joint operations with complementary forces such as UAV's, AUAV's and TUAV's. Furthermore, the AUSV is not only a remotely controlled vehicle but also,

and more importantly, an autonomous vehicle that hosts artificial intelligence.

The prototype AUSV's missile systems include CİRİT 4 cells and 2 of L-UMTAS, supplied by Turkish missile systems provider Roketsan. Simultaneously during the sea trials, the firing tests are expected to be planned at the end of Q1-2021.

ARES Shipyard and Meteksan Defence have announced that after the first prototype vessel they will be ready to manufacture other USVs for operations like surveillance and intelligence, mine countermeasures, anti-submarine warfare, firefighting, search and rescue missions ■



# Aselsan Scores the Highest Revenue and Profitability of All Time

**Aselsan has recently announced 2020 year-end financial results. The company's revenues grew by 24% in 2020 compared to the previous year and exceeded 16 Billion TL. The company's net profits reached 4.5 Billion TL with an increase of 33% compared to the previous year. Aselsan increased its receivable collections significantly with the revenues from exports and successfully completed the year with a strong cash position.**

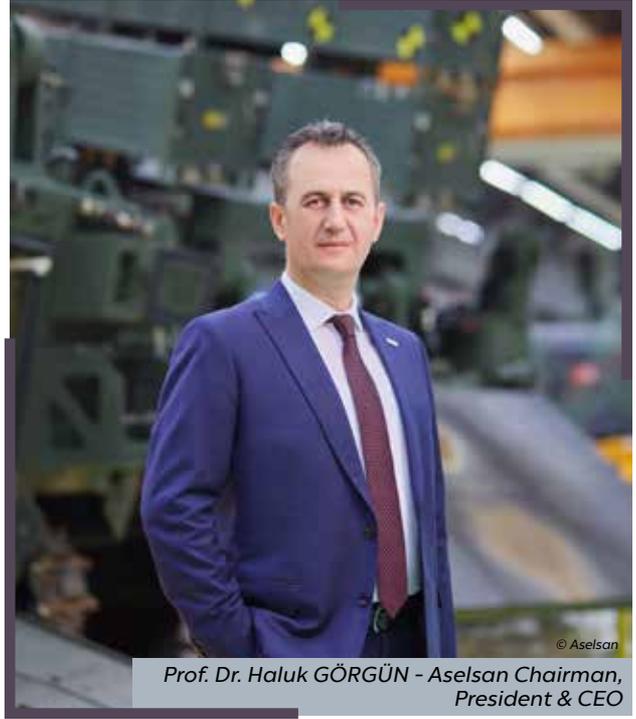
Aselsan, the world's 48th largest defense company (Defense News Top 100 Defense List 2020) with its sales and production network spanning over 12 countries in 3 continents, completed 2020 with record results. The company's consolidated net sales increased by 24% compared to the previous year and exceeded 16 Billion TL. The company's Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA) increased by 38% to its all-time high of 4 Billion TL. The EBITDA margin exceeded expectations and reached its highest level in the history of the company with 24.4%.

## **\$1 Billion Export Backlog Threshold Exceeded**

Aselsan's acceleration in exports continued in 2020, when the mobility between countries stopped completely due to the pandemic. In 2020, the company signed contracts with 6 new countries for a total amount of US\$ 446 Million and contributed to the export volume of our country. With the contribution of new orders received from abroad, the export backlog reached its historical peak by exceeding the US \$1 Billion threshold. The total backlog is US \$9.5 Billion.

## **The Pandemic did not Affect Acceleration**

Aselsan Chairman, President & CEO Prof. Dr. Haluk GÖRGÜN said the following in his evaluation of the 2020 year-end financial results: "Being aware of the responsibility we bear for our country, in 2020, when the negative effects of the pandemic were felt in every field, our motto was "Aselsan does not stop,



*Prof. Dr. Haluk GÖRGÜN - Aselsan Chairman, President & CEO*

cannot stop!" and we did not stop our activities for a single day. We implemented an effective decision mechanism within Aselsan when the first effects of the pandemic began to appear. While observing the needs and expectations of our government on the one hand, we also tried to take all kinds of precautions for the health of our employees. In 2020 Aselsan continued its activities in the field of technology and R&D with R&D expenditures of 3.3

Billion TL. We mobilized all our financial and operational resources to ensure that more than 4 thousand suppliers, who provide products and services to Aselsan, are not adversely affected by the pandemic. Our high revenue and profitability figures by the end of 2020 are the result of the management strategies that we have implemented with the awareness of being a family.



*© Aselsan*

## Aselsan Is Growing Rapidly, Globally

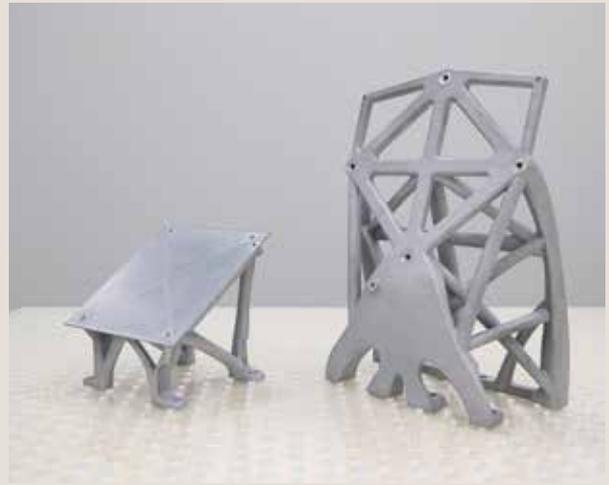
The year 2020 has been a very productive year for Aselsan resulting in the highest collections of export receivables, with the most export orders received, and the number of export countries also increased to 70. As part of its ambitious strategy the company opened offices and branches in 3 countries last year. With these breakthroughs, the total number of offices and branches at home and abroad reached 28. An estimated 1,500 new employees joined Aselsan in 2020 as well.

## Cash Management Approach Covering the Whole Ecosystem Adopted

Prof. Dr. Haluk GÖRGÜN stated that in 2020 they worked with an understanding that prioritized the financial needs of not only Aselsan and its affiliates, but also more than 4 thousand suppliers. Prof. Dr. GÖRGÜN said that they had reduced the liquidity pressure caused by the pandemic in the ecosystem by paying out more than 12 Billion TL to their business partners last year. The share of local companies in Aselsan's total procurement increased to 73% in 2020. 9 out of every 10 orders placed were forwarded to SMEs. While Aselsan completed the year with a record level of cash collection, the company closed the year with a net cash position thanks to the successful working capital management throughout the year. The Company's cash level by the year end stood at 4 Billion TL.

Aselsan Chairman, President and CEO Prof. Dr. Haluk GÖRGÜN concluded his statements with the following words. "From defense electronics to health, from communication systems to financial Technologies, from energy and transportation systems to space technologies; we proudly observe the benefits that our products and services bring our nation in every field that we operate. In a period when pandemic conditions were getting worse, our ventilators are an example of one of these products we offered to our nation for use. Aselsan, in cooperation with the members of the consortium, produced more than 20,000 ventilators in a very short time and provided very important support to our health community in the fight against COVID-19. Our ventilators were made available to our friend and brother countries under the coordination of the Turkish Government.

As Aselsan, our goal is to reduce our country's dependence on imports by producing high-standard technological products and services in all areas we operate. With experience spanning more than 45 years, with high engineering skills and financial strength, Aselsan is capable of achieving these goals. We will continue to work diligently to carry Aselsan, which is of crucial importance to the Turkish nation and entrusted to us, beyond these successful results. I would like to thank all of our stakeholders, especially our employees, for their trust in us and for always being with us, and I hope that our success will continue to increase. "



## Turkish Aerospace Opens a New Chapter in Space

February 21, 2021, Turkish Aerospace (TUSAŞ) broke new ground in the national aerospace ecosystem. The design, analysis, production and qualification of satellite structural components have for the first time been conducted in Turkey with 3D printers based on Additive Manufacturing Technology.

TUSAŞ produces mission-critical space structural components with the Additive Manufacturing Method to develop three-dimensional components by melting metal, ceramic and polymer composites as layers, in contrast to machining. With this new technology a 30% reduction in weight has been achieved with advanced structural optimization software in the developed components. The components are to be used in high-tech communication satellites, and the space

qualification tests were successfully completed at the Space Systems Integration and Test Center (USET) within TUSAŞ.

At the Additive Manufacturing Technology Center established by TUSAŞ is envisaged to be a national center of excellence, where strategic large sized aviation and space components made up of titanium and aluminum alloys will be produced starting from the raw material stage. With this capability acquisition, the aim is to develop two different 3D printers indigenously and domestically and to acquire high technology production capabilities with the projects carried out in partnership with the Presidency of Defense Industries (SSB) and the Production Technologies Center of Excellence (ÜRTEMM A.Ş.).

# Critical Acquisition from TEI & TÜBİTAK-MAM in Material Technologies

Within the scope of the KRİSTAL Project, which was supported by the R&D and Technology Management Department of the Presidency of Defense Industries and initiated with the cooperation of TEI and TÜBİTAK-MAM in 2016, and which covers the "single crystal blade casting" activities considered as a critical technology stage in turbine engines, the production of cooled and uncooled turbine blades to be used in TEI-TS1400's high pressure turbine was completed and delivered to TEI.

Stating that TÜBİTAK-MAM and TEI will achieve a critical acquisition in material technology with the production of single crystal turbine blades, TÜBİTAK President Hasan MANDAL said, "In addition to such production, I also think that the competence and talent as well as the material technologies we have acquired here are important for the development and sustainability of our country, especially in the defense industry."

MANDAL stated that together with TEI they developed delivered the first set of the turbine blades, which work under extreme conditions and he noted that sometimes these blades are impractical to import, he said "As TÜBİTAK-MAM, we are able to manufacture turbine blades, which are the most difficult component of our



country's first domestic and national turboshaft engine. This is a critical technology owned by a very limited number of countries in the world. It is a very complex and difficult design, and it is not easy to manufacture and we have achieved it. TÜBİTAK Materials Institute and TEI will now be able to produce nickel-based superalloys for these and similar applications, starting from raw material, with the Aviation Engine Materials Development Project - Cevher Project - the contract of which was signed yesterday."

TEI President and CEO Prof. Mahmut F. AKŞİT expressed that he was also a Board Member of EÜAŞ (Electricity Generation Company) when he was a faculty member at Sabancı University and said that they took similar steps for blades required by industrial gas turbines at that time and that they brought this type of infrastructure to TÜBİTAK MAM.

AKŞİT pointed out that even if they sell the turbine blade, which is one of the most important parts of aviation engines, they do not share the technology and how it is produced,

and he stated that they decided to develop the blade technology at TÜBİTAK-MAM because they knew the infrastructure there.

AKŞİT stated that the blades received today were not the first turbine blades manufactured by TÜBİTAK, they were previously delivered to TUSAŞ and that these blades were also used in the TEI-TS1400 engine, but they could not organize a ceremony at that time.

Stating that they received delivery of the previous turbine blades in stages



as they were completed, AKŞİT said, “What you see here is a complete set for an engine. They are the first-stage single crystal blades, not having internal cooling, which is much more difficult to manufacture, and second-stage single crystal blades having internal cooling. We plan to use this on our TS5 engine. These blades were also used in the engines we previously supplied to TUSAŞ. This is the full set for our TS5 engine. It was the first time we see them all together as a full set.”

Stating that they produced the TS4 engine and that the related tests are continuing, AKŞİT said, “We delivered our first national helicopter engine, the TEI-TS1400 on December 2, 2020. These blades will be mounted on our TEI-TS1400 engine (TS5) and they will work on the GÖKBEY helicopter.”

AKŞİT pointed out that the first-stage blades come first when the most critical parts in an engine are listed and said, “Perhaps the combustion chamber comes second, followed by the second-stage blades in terms of temperature and technological complexity. The compressor side is also rather complex, but the most complicated parts are in the first-stage single crystal blades. If you can't do this, you can't generate power, you can't achieve at high temperature.”

AKŞİT said the following regarding the function of single crystal turbine blades in engines: “All jet engines, like other fossil fuel engines, operate with the expansion of hot air. How do we heat air? We put fuel in it and ignite it so that the air gets



heated and expands. To do this, we have to compress the air from the compressor. If we do not compress the air, the combustion will be very slow and we get much lower power from the same engine. The power we obtain per unit time decreases. That's why we reach high pressure; if it burns more efficiently, we get more output from the engine per unit time. As such, instead of using the gas that ejected from the back in direct impulse, we convert part of the energy there into rotational motion by having it hit these hot blades, which supports the compression by absorbing the air in the compressor.

Without these blades, the engine is not able to run. In other words, these blades run the compressor by using considerable power.”

The single crystal casting blades produced by TÜBİTAK-MAM under the highest quality standards will first be used in the TS5 engine to be used in ground tests of the TEI-TS1400 engine. In subsequent stages of the project, it will be used in the certification processes, which are very critical for aviation industry, and later in the final engines.

Turbine blades, one of the most critical components of aviation engines, are exposed to high

temperatures, versatile power sources and harsh environmental conditions, and as a result they need to protect the integrity of parts and the engine. They are produced from nickel-based superalloys with single crystal structure by a precision casting method and are suitable for working at temperatures up to 1400°C with their extremely sensitive cooling channel designs. Thanks to the single crystal casting, subsequent heat treatments and simultaneous development of non-destructive test methods, an important step will be taken in the acquisition of high technology ■



# National Test Bed Center for Critical Infrastructures

## University-Industry Contribution for the Cyber Security of Electricity Distribution, Water Management and Health Services

The “National Test Bed Center”, which will host studies to ensure the security of electricity distribution and water management infrastructures, was inaugurated with the cooperation of STM and Sakarya University.

The opening ceremony of the Critical Infrastructures National Test Bed Center was held on February 2nd. The related work to establish the center was initiated with the protocol signed between STM and SAU on October 31, 2019, within the framework of University-Industry cooperation. Deputy Minister of Transport and Infrastructure Dr. Ömer Fatih SAYAN, Deputy Governor of Sakarya Murat KARASU, Sakarya Metropolitan Municipality Mayor Ekrem YÜCE, Sakarya University Rector Prof. Fatih SAVAŞAN, STM General Manager Özgür GÜLERYÜZ, STM executives and university administration and academicians attended the ceremony which was held at the Faculty of Computer and Information Sciences of Sakarya University.

SAYAN: “We must be ready for cyberattacks against critical infrastructures.”

In his speech at the ceremony, Deputy Minister Dr. Ömer Fatih SAYAN mentioned that the problems that may arise in critical infrastructures can cause great harm to the security of the state and society, as well as to the economy, and the health



and welfare of society and said that the information and communication infrastructure has a particular importance due to its connection with all other infrastructures. Stating that sectors with critical infrastructures are often targeted by cybercriminals, SAYAN noted that cyberattacks have the potential to disrupt the daily life of cities and the overall country and cause irreversible losses.

Deputy Minister SAYAN pointed out that the catastrophe scenarios built in the field of information technologies throughout the world have started to be applied more frequently and countries are trying to defeat each other through cyberattacks. “For this reason, taking the necessary precautions to protect critical infrastructures and sectors is as vital as maintaining 24-hour monitoring at the border

as well as airspace with radar systems. For this, first of all, the communication infrastructure must be secure and the protection must start here. The Center for Intervention to National Cyber Incidents (USOM), within the Information and Communication Technologies Authority (BTK), protects the digital borders of our country 24/7 like a defensive wall, with the support of our Ministry. We also observe the impact of our work in the field of cyber security from international indicators. According to the report of the International Telecommunication Union's Global Cyber Security Index published in 2019, our country has risen 23 places to 20th in the world compared to the previous year, and to 11th in Europe. Protection of critical infrastructures should not be considered just a national issue. We have witnessed that the developments that started with the capture of a small control system in cyber incidents in the recent past could affect the whole country. In recent years, centers in Georgia, Estonia,



Dr. Ömer Fatih SAYAN - Deputy Minister of Transport and Infrastructure

Iran and the US have experienced cyberattacks and thousands of people have been left without electricity. Attacks on energy centers could harm many countries. The consequences of the attacks towards the health system, especially during the COVID-19 pandemic, will probably be irreparable. We, as the Ministry, consider the development of a sustainable domestic and national ecosystem in the field of information and communication technologies as a strategic goal in line with the National Technology Move initiated by our President, and we place importance on the activities performed in this field. Within this scope, the 5G project was developed. The interaction of 5G with vertical sectors hosting critical infrastructures becomes even more critical in ensuring the security of such infrastructures. In the field of R&D, the relationship between industry and universities should be developed, and these two should understand each other's needs and expectations, and the theoretical infrastructure of the academia and the innovation capabilities of companies should be aligned around a common goal.

The National Test Bed Center, established in cooperation with Sakarya University and STM, is a good example to this end. The capacity development for the security of critical infrastructures, academic studies becoming domestic and national concrete projects with university-industry cooperation, and contribution to increase the resilience of critical infrastructures regarding cyber security make us happy. It is exciting that the center will also

turn out to be an R&D center. By modeling the academic studies in the real environment, the center will also increase the initiatives for domestic and national production in line with the 2023 goals. I wish the center to be beneficial and we congratulate those who contributed."

**SAVAŞAN:** "We offer high value-added services to the sector."

Expressing his satisfaction with the conclusion of the project which they have worked on for more than a year, Sakarya University Rector SAVAŞAN said, "I would like to thank those who contributed, especially Professor İbrahim ÖZÇELİK. One of the most important functions of universities has once again been realized at our university. This test bed is a first in Turkey and I believe it will meet the important need of the sector in terms of ensuring the security of critical infrastructure. By cooperating with STM, one of the leading defense industry companies, we had the opportunity to offer high value-added services to the sector."

Stating that Sakarya University not only manages transformation in education with its innovative management culture, but also guides it, Rector SAVAŞAN added, "I would like to proudly say that Sakarya University is the inventor and the first practitioner of many innovations in the field of education. The +1 application has spread to the Turkish higher education system from this university. As a new SAU brand in 2018, we started industry courses and realized many innovations such as the Practice of Interest Areas, Student R&D Compliance project."



**GÜLERYÜZ:** "A concrete example of university-industry cooperation"

In the opening speech, STM General Manager Özgür GÜLERYÜZ stated that they have expanded their cyber security capabilities also for critical civilian areas and said, "Cyber security emerges as an important area also for the critical civil infrastructures to continue to function. We hereby launch our National Test Bed Center for the first time in our country, which will provide a test environment in order to make sure that services that may affect the social order and the flow of life are not interrupted in case of disruptions in electricity networks and water management and to ensure the cyber security of these infrastructures. By gaining this center to our country, which will allow both academic and sectoral studies, in cooperation with Sakarya University, we are proud to offer concrete University-Industry Cooperation and to fill an

important gap. Our wish is to diversify our test bed centers by expanding this capability in our country to communication, transportation and power plants and to prepare and lay the groundwork also for the development of competitive products in this field."

Following the opening speeches, the guests toured the National Test Bed Center.

## Indigenization is at the Forefront

At the Test Bed Center, energy and water management systems are modeled at the initial stage. With the modeling of academic studies in a real environment, the aim is to expand the knowhow of the country and to increase initiatives in domestic and national production in parallel with the 2023 targets. The project is planned to focus on critical infrastructures which are very important within the scope of cyber security, the indigenization of the control systems, and the capability to maintain the security of these systems with national means ■

## Long-Term Cooperation Between Aselsan and TrTest

Aselsan will take advantage of the services of Trtest for the testing and verification activities of the components used in its indigenously developed systems. The protocol regarding the cooperation was signed by Aselsan Chairman of the Board and CEO Prof. Haluk GÖRGÜN and Trtest General Manager Bilal AKTAŞ.

The scope of cooperation between Aselsan and Trtest:

- Test procedures will be established by Trtest for the products specified by

Aselsan, in accordance with the related requirements.

- Test activities will be performed and reported by TrTest in line with the test procedures prepared by Trtest and approved by Aselsan.
- Review, evaluation, control and/or verification will be provided by TrTest for the reports of the previous tests on products that were conducted by Aselsan and/or third parties.
- A Certificate of Conformity will be issued by TrTest for the products, the tests of which are validated.



## Akkuyu Nuclear Power Plant's Fire Fighting Training Simulator Complex to be Constructed by Meteksan Defence

Meteksan Defence was selected as the successful bidder for the construction of the training simulator complex of the Akkuyu Nuclear Power Plant (NPP), Turkey's first NPP.

The Fire Training Simulator will be located the Akkuyu NPP training simulation complex and will be developed with the aim of training on firefighting methods, the use of equipment, as well as the training for firefighters under extreme conditions and environments. The container-based system will include a command control system, fire compartments, ventilation and heat monitoring, gas detection and extinguishing infrastructure. In the simulator, vehicle fires will be simulated as well as fire compartments where possible fires that can occur in daily life will be simulated, including living spaces, electrical panels and cable channels.

Key features of the Akkuyu NPP training simulator complex:

- Realistic modeling of the environment and conditions to occur during a fire
- Training of firefighting personnel without causing environmental pollution, considering occupational safety
- Simulation of places affected by smoke, and the rescue of people under harsh conditions and who are exposed to a fire
- Implementation of coordinated and most effective techniques, and use of intervention tools/apparatus during firefighting and rescue training in an environment where it is hard to breathe
- Development of skills, knowledge, and practical skills in the use of appropriate firefighting clothing, equipment and other tools/apparatus to be used
- Command-control, continuous monitoring and recording of the training by the operator

## New Era at Koç Information and Defence Technologies



Technology and Engineering Management Group Manager Mehmet Hakan ÖKTEM is appointed as the company's Defense Technologies Managing Director. With this appointment, Mehmet Hakan ÖKTEM assumed all management processes of KoçSavunma as of March 1, 2021. ÖKTEM took over the task from Yaşar Hakan BAŞARAN who was the Managing Director of Defense Technologies since 2007. BAŞARAN will continue to work as a Consultant to the Chairman of the Board of Directors of Koç Information and Defense Technologies as of March 1, 2021.

Mehmet Hakan ÖKTEM started to work at Koç

Information and Defense Technologies in 2009. He completed his undergraduate and postgraduate education in Electrical and Electronics Engineering at Hacettepe University. He started his career as a System Integration and Test Engineer in Roketsan in 1999 and later worked at the American aerospace company Boeing between 2003-2008. ÖKTEM returned to Turkey in 2008 and worked as Group Leader in Havelsan between 2008-2009. Since 2009, ÖKTEM has worked as Project Manager, System Engineering Senior Specialist, Sonar Systems Unit Manager, and Technology and Engineering Group Manager at KoçSavunma, respectively.



# AVIATION TURKEY

BEYOND THE HORIZON  
[aviationturkey.com](http://aviationturkey.com)





# INTERNATIONAL FUTURE SOLDIER CONFERENCE

07-08 SEPTEMBER 2021  
Sheraton-Ankara

Within the scope of the planned conference program, panels, presentations, and discussions will be held in the following related technology fields:

- Combat Clothing, Individual Equipment & Ballistic Protection
- Weapons, Sensors, Non Lethal Weapons, Ammunition
- Power Solutions
- Soft Target Protection
- Soldier Physical, Mental and Cognitive Performance
- Robotics and Autonomous Systems
- Medical
- C4I/STAR Systems
- Exoskeleton Technology
- CBRN
- Logistics Capability



[ifscturkey.com](http://ifscturkey.com)

supported by



supported by



supported by



organised by



in cooperation with

**TSSK**

Teknokent Savunma Sanayi Kümelenmesi  
Teknokent Defence Industry Cluster

**ODTU-TEKNOKENT**