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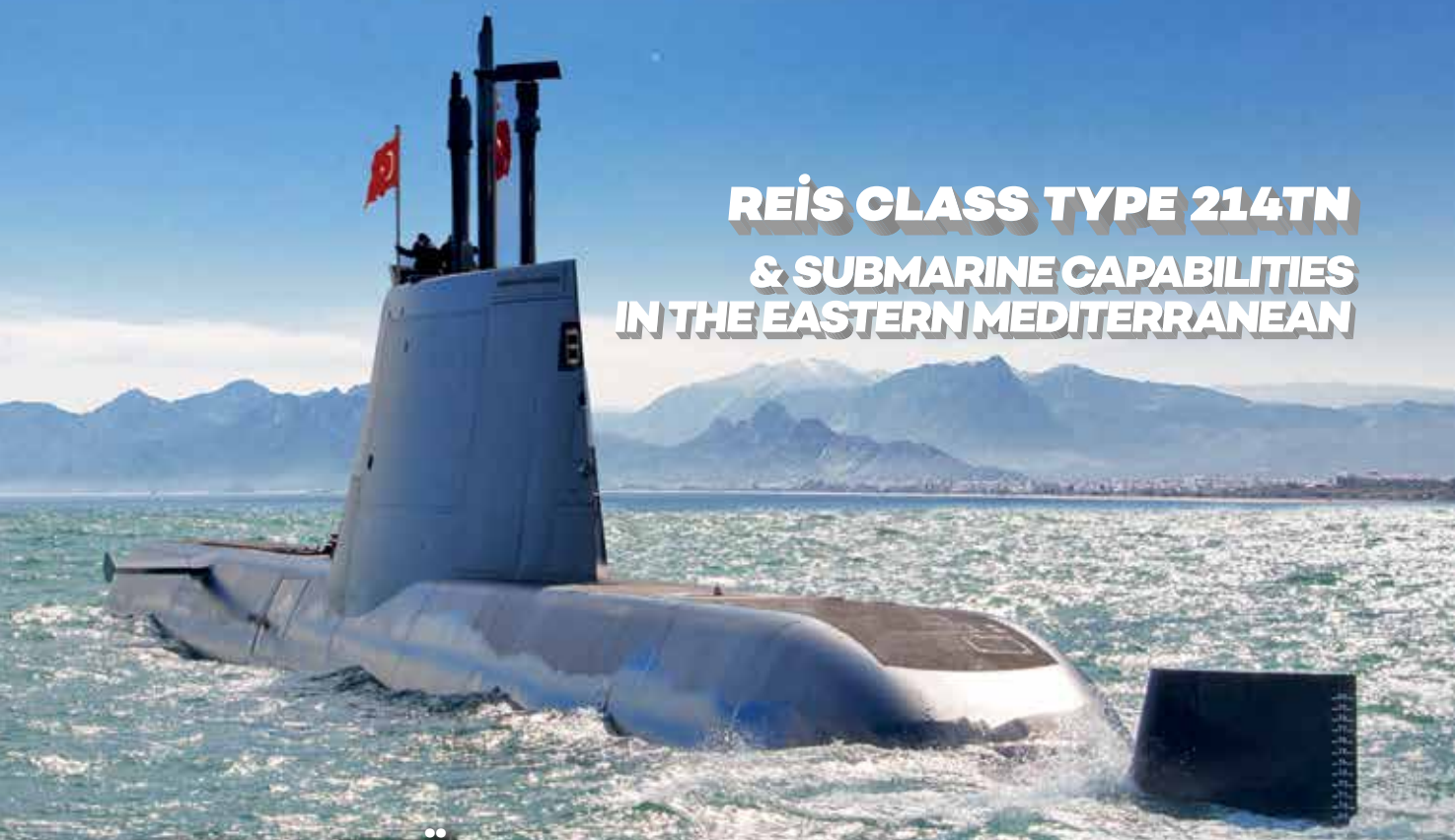
DEFENCE TURKEY



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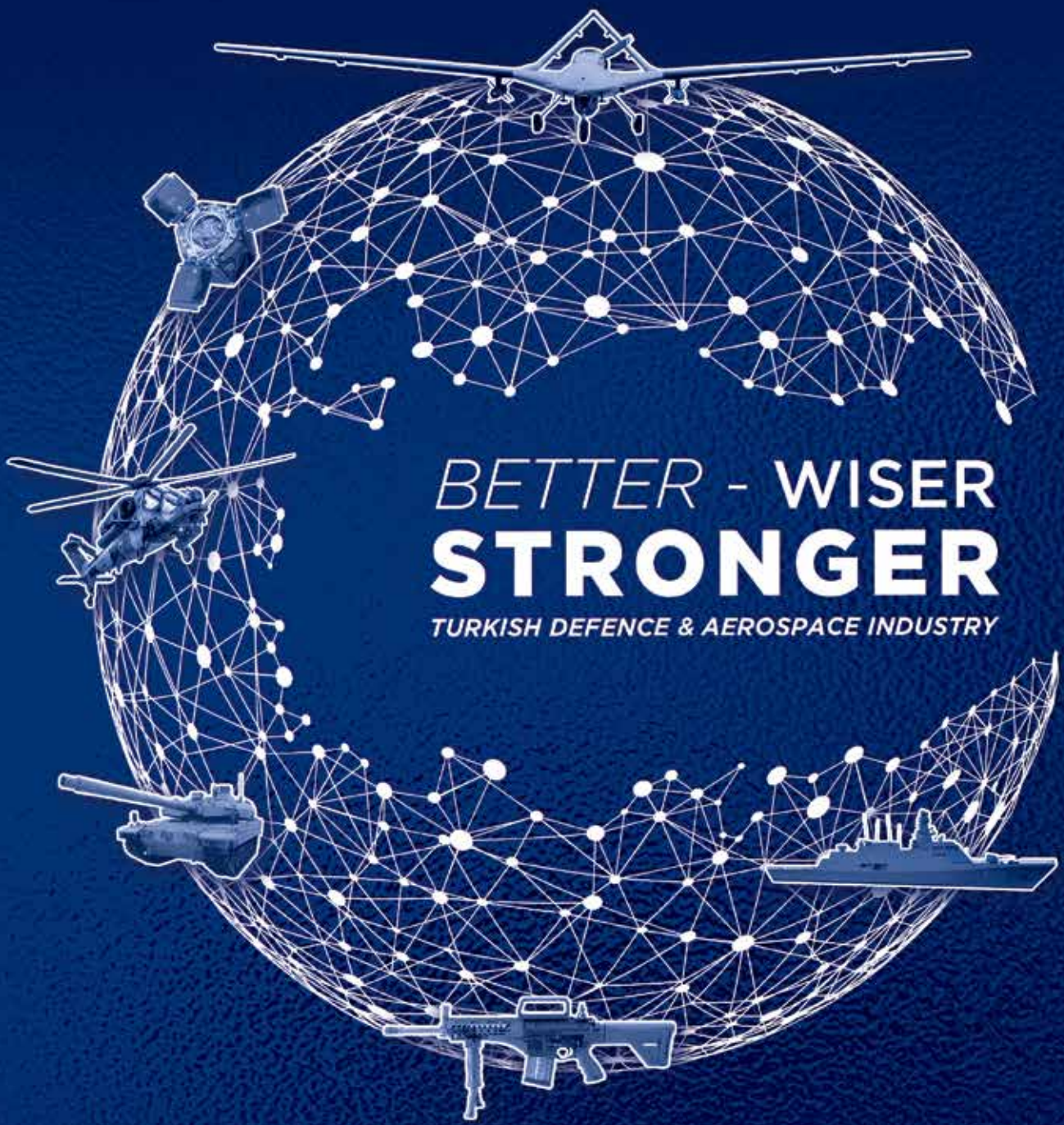

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Publisher
Hatice Ayşe EVERS

Editor in Chief
Ayşe AKALIN
a.akalin@defence-turkey.com

Managing Editor
Cem AKALIN
cem.akalin@defence-turkey.com

International Relations Director
Şebnem AKALIN
sebnem.akalin@defence-turkey.com

Editor
İbrahim SÜNNETÇİ
ibrahim.sunnetci@defence-turkey.com

Administrative Coordinator
Yeşim BİLGİNOĞLU YÖRÜK
y.bilginoglu@defence-turkey.com

Correspondent
Saffet UYANIK
saffet.uyanik@defence-turkey.com

Translation
Tanyel AKMAN
info@defence-turkey.com

Editing
Mona Melleberg YÜKSELTÜRK

Graphics & Design
Gülsemin BOLAT
Görkem ELMAS
info@defence-turkey.com

Photographer
Sinan Niyazi KUTSAL

Advisory Board
(R) Major General Fahir ALTAN
(R) Navy Captain Zafer BETONER
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Zeynep KAREL

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

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

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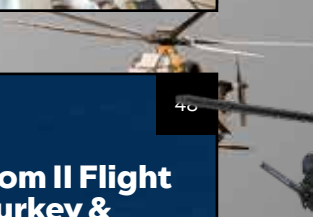

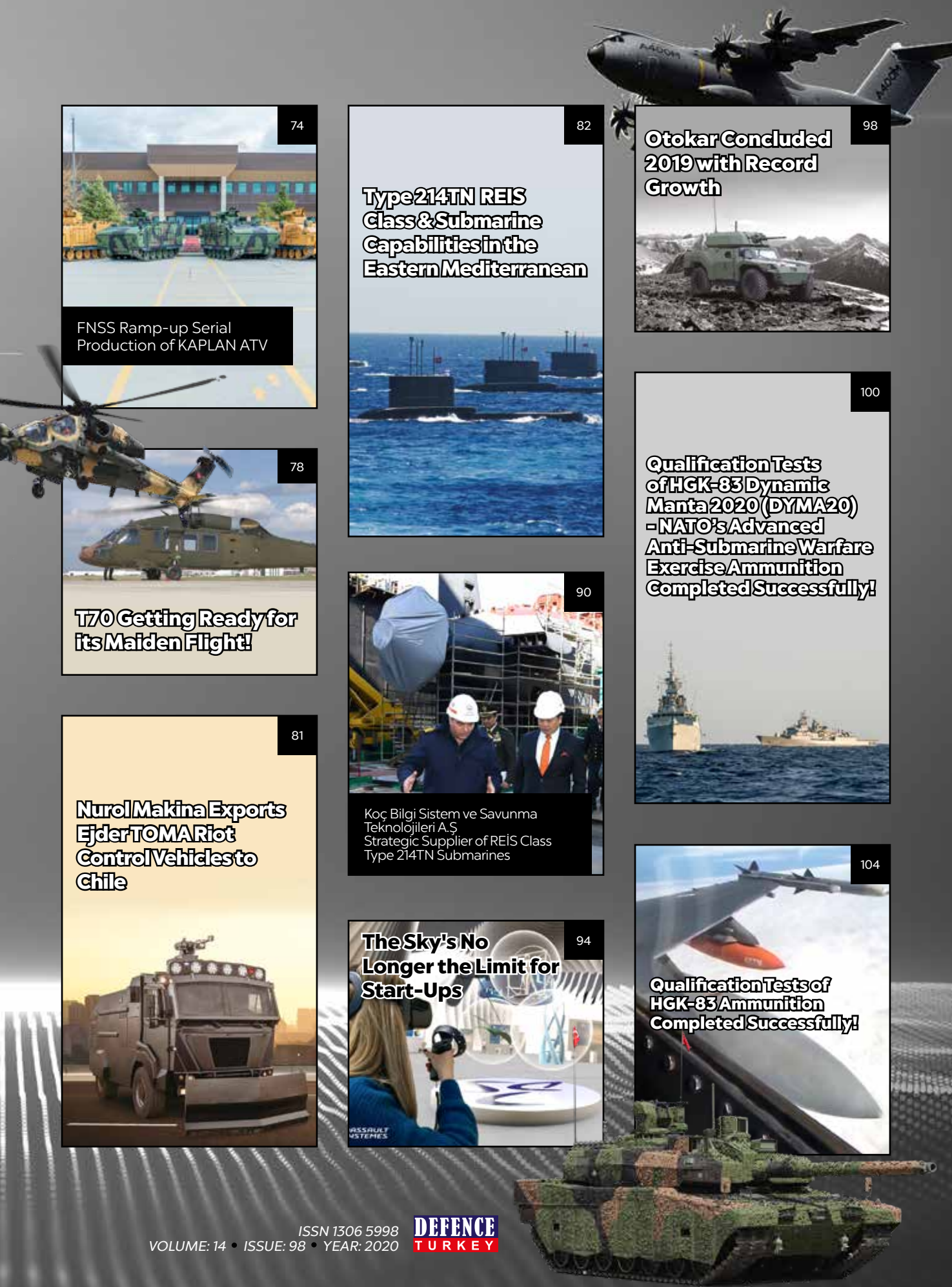

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DEFENCE TURKEY

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How COVID-19 will Impact the Defense Industry?

Ayşe AKALIN
Publisher & Editor in Chief

The impact of the COVID-19 pandemic has brought forth an unprecedented state of uncertainty for all business circles as well as the defense industry. Executives and officials are struggling to understand the new situation with new challenges to tackle.

Most global and Turkish defense companies are taking some actions to protect staff from the COVID-19 outbreak. I believe that the most comprehensive scenario-based analyses on how to survive and achieve stability should be conducted by defense organizations and defense authorities to protect local industries with a re-evaluation of business strategies.

The major concerns that have arisen in the defense industry with the spread of COVID-19, are as follows:

- How will manufacturing facilities and the supply chain be affected?
- What new challenges will marketing and business development face?
- What are the new market scenarios that we need to be aware of in order to implement realistic changes in our strategies?
- What approaches can be considered to effectively reposition businesses for stability and growth?
- What are the government's policies and the steps taken to help local defense companies to mitigate the effects of the unprecedented challenges caused by the outbreak?

Overall, when compared to consumer-based sectors, the defense industry will most likely see less of an impact thanks to its long-term program protected by budgeted government expenses. However, many companies in the supply chain are financially vulnerable and it may impact the procurement of the material and equipment.

While it is too early to predict whether the industry will be stable, of if it will take a major or minor dip, it is significant that defense companies define what the major impact points are and to assess their potential to reposition and adjust future plans.

Moreover, I personally believe that the whole world is facing many of the same problems during this calamitous time. It is as if the pause button of the whole world was pressed in an instant. Events, fairs, the visits of official delegations, and meetings have come to a full stop. Business travelers who once could not catch their breath between daily, weekly and monthly travel for meetings, are now thinking and pondering life from the balcony of their home, perhaps taking that much needed breath of fresh air. What did human beings miss out on while they were focused on corporate goals, contracts, new markets, competition, ambition of success, and making more money? Now, it is as if an environment was created for everyone to slow down, a time for introspection, to think about... who I am, what do I want from life, what do I love and what is really important to me? The only thing we cannot earn more of, to gain, no matter how hard we try, is time. During this unusual time I too hope to quiet my mind. Our personal lives extend to our business lives with the full of energy of our intent and we can all use this important time to calmly reflect, learn new skills and to look at life with a different perspective...

Enjoy this issue...

A Message from the President of Defense Industries Prof. İsmail DEMİR on the Measures Taken Against COVID-19 in Turkey

As the Turkish defense industry sector, we continue to perform our activities while complying with the measures taken against Coronavirus (Covid-19) nationwide. While the activities in critical projects continue, work-from-home practices are also being implemented. In such cases, there may be a certain slowdown in every sector, but in the defense industry, we continue our activities without affecting our critical projects. While doing this, we take our precautions believing that human health comes first. The knowhow in the sector and the competence of personnel are important to us. In order to protect their health and ensure their maximum efficiency, we carry on our activities with measures to guarantee their maximum compliance with health guidelines.

In certain projects where force majeure cases arise, we examine the related applications, and if we really consider them as force majeure cases, we take the necessary precautions. Even now, we are exerting all efforts to make sure such force majeure does not occur, and we highlight that we should keep the ball rolling and the system should continue to work on the basis of the subcontractor. In this struggle, we, as the defense industry, both follow the measures taken under the leadership of our President Recep Tayyip ERDOĞAN and strain to continue critical defense industry production as well as R&D and technology development activities without any interruption.

Defense is a holistic concept; therefore, the defense of a country cannot be accomplished only through military and armed elements. In addition to the armed forces, areas such as intelligence, transportation, health, communication, information technology, cyber security, energy and agriculture are also crucial in the defense vision. For the security of a country and society, the defense concept needs be tackled with a holistic perspective. Our Turkish defense industry is ready to provide all kinds of support including the knowhow and achievements to the healthcare field. We can make use of our existing knowhow and experience on electronic devices, circuits, imaging and image processing devices, microelectromechanical systems, control systems, materials and material technologies that can be used in medical devices, and chemicals, biology and radiation technologies, also in the healthcare industry.

The multiple utilization of the defense industry's existing capabilities was previously brought forward. We own such technologies and we think that they can be easily applied to other fields. The awareness raised will be an opportunity to trigger a national technology movement in the healthcare industry. For the hot topic of ventilation devices for example, defense industry companies have opened their doors and are offering all their capabilities to meet the sub-components of the devices or specific technology needs, and the use of their existing infrastructure, test infrastructure and facilities.

Indigenous and national health technologies are one of the most important elements of the move toward national technology in the long term. Our defense industry sector is ready to support our country's healthcare industry with all its knowhow, capabilities and infrastructures achieved by means of the R&D activities carried out in TUBITAK and its institutes under the Ministry of Industry and Technology for the purpose of establishing this technology. Our industry will be the supporter of all relevant institutions, especially our Ministry of Health, to this end.

As the Presidency, we believe in the dynamism and enthusiasm of the private sector, and we encourage them through various endeavors. We support companies demonstrating diligence, dynamism and a certain technological infrastructure in times when they need extra backing or long-term planning. When needed, we issue projects and orders in furtherance of a future-focused vision. In some cases, we perform activities aiming at developing multi-utilization technologies. We will have full support here as well, with an approach of supporting various capabilities, backing them, and partnering if necessary, rather than a policy such as maximum involvement of defense industry companies in the healthcare sector. Here, what is important is to determine the level of support specifically for which technology, which company and for which need. We have opened all the cards on the table. For

the sake of our country, we are ready to provide any support for the success of the 'National Technology Move'. This can be achieved through our Presidency as well as our defense industry companies. Instead of establishing a healthcare company under the title of a defense industry company, we believe that it will be more effectual to gather with diligent companies in the healthcare industry and work with them.

The public sector especially needs to examine, in particular, domestic capabilities in all kinds of products supplied directly from abroad. It is important also for other sectors to proceed by considering the domestic capabilities here after exploring the opportunities available in different areas. It is important to introduce the products into the market but making it with national and domestic opportunities is even more important for the future of our country. Perhaps we may not achieve the full functionality of the products in the first stage, we may wait a little. In the long term, it is necessary to place great importance to the concept of indigenousness for our future. It is essential for the sectors to communicate with each other, to have a commonly known map of our industry and technology ecosystem, and to take maximum advantage of it in purchases and acquisitions. The Presidency of Defense Industries has achieved this previously on various occasions, and we consider that this model can be an example in other sectors as well.

President of Defense Industries Prof. İsmail DEMİR

The Invisible Enemy – How Defense Industry Companies are Coping with the Global Pandemic

by Saffet UYANIK

Following its declaration as a pandemic, the Novel Coronavirus (COVID-19), pushed countries to take strict measures and raised many questions regarding both the economy and the continuity of production activities.

COVID-19 (Coronavirus Disease 2019) is currently affecting 203 countries and territories around the world and has brought businesses and entire economies to a halt. Numerous countries are in the midst of implementing either mitigation measures or curfews that are taking a toll on both people and industry. While most of the attention has been focused on the impact on health services and the economy, the spread of the virus is beginning to affect defense industry companies that were involved in large scale military projects. Many companies have already urged their employees to work from home or have placed them on administrative leave.

However, most of the workforce is still reporting for work and the bulk of the production is still ongoing thanks to enhanced disinfection efforts and shift changes that have reduced the number of people working at one time. Although defense companies try to continue their business without disruption, both domestic and foreign disturbances have caused a slowdown in the industry as the main contractors and procurement processes in the industry are affected by the unexpected emergence of the COVID-19 outbreak.

On the other hand, defense industry companies have significant infrastructure and capability in technology development and production. This extensive know-how and R&D offers a real opportunity to contribute to the studies being carried out in other sectors, such as healthcare especially in providing electronic equipment, circuits, imaging and image processing devices, Microelectromechanical systems (MEMS), control systems, materials and material technologies that can be used in medical devices.

In light of the recent developments, with the emergence of the Novel Coronavirus (COVID-19), President of Defense Industries İsmail DEMİR made a statement about the contributions that can be made to the health care sector by defense industry companies. The President of Defense Industries İsmail DEMİR evaluated the measures taken due to the Novel Coronavirus (COVID-19) pandemic and the contributions of defense industry companies to meet the needs arising in the health sector. Emphasizing that the Turkish Defense Industry is ready to provide all kinds of support for health services with its knowledge and capabilities, DEMİR stated that they are keeping personnel in charge of necessary tasks in companies and are ensuring that the required measures are taken during the work.

Stating that their main goal is to protect the health of employees without disrupting critical operations, DEMİR emphasized that they have taken several measures to maintain their activities and to ensure maximum compliance with health rules to guarantee the health of personnel. Emphasizing that the concept of defense is a matter of understanding and not only to meet the needs and equipment of the Armed Forces or Security Forces, İsmail DEMİR drew attention to the transfer and use of the experience of the defense sector to other sectors.

Pointing out that existing capabilities of the defense industry can be easily applied to other fields, DEMİR affirmed that the awareness raised is a beginning for the national

COMMER

technology movement to be implemented in the field of healthcare. DEMİR also added that they are ready to use all capabilities, existing infrastructure, and the facilities of defense industry companies to provide the sub-components of much-needed equipment such as ventilators. DEMİR stated that the defense industry is ready to operate in the health sector with all its capabilities and infrastructure. R&D studies have been carried out by institutes within the Ministry of Industry and Technology and TÜBİTAK to build domestic and national healthcare technologies. Indicating that we should attach great importance to the concept of nationalization and localization for our future in the long term, DEMİR emphasized that everyone should use a shared map of the industry and technology ecosystem to maximum potential.

Under the directives of the Minister of National Defense Hulusi AKAR , the **COVID-19 Fighting Center (COMMER)** was established within the Ministry of National Defense to combat the COVID-19 pandemic, to take necessary measures and supervise all processes. Employing other personnel from the General Directorate of Primary Health Care Services, COMMER aims to establish essential protection against the pandemic in the units, headquarters, and institutions of the Ministry of National Defense. The center closely follows the developments in both Turkey and all over the world and carries out planning, management, follow-up, and monitoring activities. COMMER monitors the implementation of the measures taken in the Turkish Armed Forces as part of the fight against the COVID-19 outbreak and develops actions and medical plans to be implemented to address possible cases.

Additionally, within the scope of the battle against the COVID-19 pandemic, all Military Academies, Institutes, and Higher Education Schools under the National Defense University were closed until April 13, 2020. Activities such as ceremonies, conferences, short-term meetings, courses, fairs, and seminars were also canceled until further notice. To protect the border units from the Novel Coronavirus, new ways to minimize contact with individuals caught during illegal crossings were determined, and troops were equipped with protective clothing, gloves, and masks. Upon the instructions given by the Minister of National Defense Hulusi Akar to produce masks that are in high demand because of the COVID-19 outbreak, **MKE Machinery and Gas Mask Factory (MAKSAM)** has accelerated its production. MKE MAKSAM facilities produce chemical, biological, radiological, and nuclear (CBRN) gas masks, as well as rubber-based masks developed against viral hazards. As part of the measures taken against the COVID-19 outbreak, workers continue to produce disposable face masks. Production lines are regularly disinfected, and the body temperature of employees are measured and recorded at the entrance and exit of the factory. The daily production of disposable face masks at the MKE facilities was also increased to 400-500 thousand.

When we look at the 2018 figures of the Turkish Defense Industry published by the Defense and Aerospace Industry Manufacturers Association (SaSaD), the total turnover rate increased by 30.90% despite all the adversities experienced in 2018 and reached US$8,761 billion, while the number of employees reached 67,239 with a 50.29% increase compared to last year. While the defense industry is currently not affected as much as many other industries, maintaining all assembly lines and an active workforce in the face of a global pandemic is a challenging situation that defense companies could face.

As part of the fight against the virus, **Aselsan** has announced that it has initiated an R&D study on diagnosing the COVID-19 infection with a sensitive optical biosensor method in the Aselsan Research Centre Biodefence Department, which had previously been successful in detecting the Hepatitis-B virus. Implementing contact-reducing measures in line with the social distancing guidelines determined by the Ministry of Health and the Coronavirus Scientific Committee, Aselsan stated that the company temporarily stopped using biometric palm scanners at the entrances and exits of its facilities as of February 26, 2020. Additionally, as of March 20, 2020, the company allowed only 4,965 of its 8,100 employees to continue their duties to reduce density in its premises. Furthermore, the

company made changes to its working environment due to COVID-19 and placed pregnant personnel and vulnerable employees on administrative leave as of March 16, 2020. Aselsan closed all the cafeterias on its campuses until further notice as of March 19, 2020 and stated that it would provide packed meals for each employee. The company also reported that it launched an aid campaign to meet the material and equipment needs of health care workers through the Aselsan Social Innovation Leaders (ASIL) Program.

Ensuring that the necessary measures are carried out with its "Coronary Virus Outbreak Emergency" team **FNSS**, announced that, based on their field of work, certain employees have started to work from home to reduce the density in line with social distancing measures. Within the scope of these measures, the company announced that pregnant and disadvantaged personnel, employees with chronic illnesses and previous critical operations, and workers who are over the age of 60, will be placed on administrative leave for a period not less than the legal regulations. The company also stated that it would conduct all meeting with partners and customers via teleconference or video conference.

Stating that it has conducted the necessary disinfection & sterilization measures at its facilities, **Nurol Makina** announced that it continues production. The company placed its managers & employees who returned from aboard on administrative leave for 14 days and allowed them to continue their work from home. Nurol also

implemented necessary social distancing measures at its facilities in line with the guidelines of the Ministry of Health.

Since the defense industry is of critical importance for Turkey, Meteksan stated that it would continue to work with all necessary precautions, as long as the company does not receive a contrary notification from the Ministry of Health and that the risk level can be kept under control. In coordination with the Ministry of Health, Meteksan Defense stated that certain employees started to work from home according to their work qualifications to reduce the intensity in the working environment. Meteksan Defense also announced that all international travel had been canceled until further notice, and all employees returning from abroad would be placed on administrative leave for self-quarantine 14 days.

Otokar made an announcement via the Public Disclosure Platform (PDP) about the company's Partial or Complete Suspension or Impossibility of Operations and stated that within the framework of measures taken to reduce the effects of Coronavirus affecting the whole world, Otokar decided to suspend production activities for 14 days, starting from March 25, 2020, due to the disruptions in the procurement and delivery processes from European countries. Otokar also noted that activities related to non-production operations would continue within the framework of the company's Business Continuity Plan and measures for the health of its employees.

Telescopic Lifting Systems (Mast) manufacturer **MILMAST** stated that due to COVID-19 Pandemic countermeasures, the company would continue its activities to meet the needs of the defense industry effectively. Emphasizing that the safety of their employees, families, and customers are MILMAST's primary concern, the company announced that it disinfects all facilities periodically, adheres to the social distancing rules, and applies all related precautions. MILMAST also allowed its administrative staff to continue to work remotely while all other employees work in minimum numbers according to their fields of activity.

SDT (Space and Defense Technology) has announced that it will continue its activities with a rotating shift system as of March 30, 2020, onwards to protect all its employees and business partners from COVID-19.

Havelsan General Manager Ahmet Hamdi Atalay provided information regarding measures taken by Havelsan for the COVID-19 outbreak within the scope of social distancing guidelines and stressed the importance of staying at home to combat the Novel Coronavirus (COVID-19) pandemic. He called upon young people to spend this period engaging in online training to learn to code. Atalay called for young people to learn artificial intelligence technologies and stated that there are numerous online and free courses on the internet about machine learning, deep learning, and artificial intelligence applications. Announcing that they stopped public education and activities for a while due to the COVID-19 outbreak, Atalay stated that they started to work from home and underlined that Havelsan would continue to improve to meet the needs of its customers by creating the necessary infrastructures.

Underlining that they produce critical weapon systems for the Turkish Armed Forces, Roketsan reported that it would not stop its production due to the COVID-19 pandemic because and stated that the company is ready to fulfill its duties to provide medical equipment. In this context, **Roketsan** announced that the company aims

to share its technological know-how and production infrastructure to provide the much-needed medical equipment to support the fight against the virus outbreak. Roketsan also stated that Turkey will succeed in this struggle with its trained workforce, scientific infrastructure, and solidarity as a nation and offered its gratitude to all healthcare professionals working with great devotion in the fight against COVID-19.

As part of the fight against the outbreak, various defense industry companies supported the medical ventilator production campaign initiated by CTO of Baykar, Selçuk BAYRAKTAR on March 22 and the production of 5,000 devices has started. To combat the Novel Coronavirus (COVID-19), the ventilators (artificial respiration apparatus) are as crucial as the coronavirus test kits. In most countries where there are numerous critical patients in intensive care units due to coronavirus, the number of ventilators is insufficient. Although there aren't any ventilator shortages in Turkey, domestic companies continue to manufacture ventilators in case of increased demand.

The company **Biosys** which operates at Bilkent Teknopark is one of these companies. Aselsan cooperated with Biosys in 2018 and aimed to make Turkey one of the six countries that can manufacture medical ventilators. In this context, **Baykar Defense, Aselsan, Havelsan, Tarnet, Turkish Aerospace, and Roketsan** provided technical support for ventilator production using their experience and


© Selçuk BAYRAKTAR

infrastructure in the defense industry, and Arçelik opened its facilities for serial production. Stating that Baykar ordered 250 devices from Biosys to boost the production of ventilators, Selçuk BAYRAKTAR, in his statement from his twitter account, expressed his gratitude to the relevant companies and announced that 1,000 medical ventilators were donated. He also added that 5,000 respiratory equipment would be produced for the needs of the Ministry of Health in total.

Following the announcement of the pandemic, international defense industry companies started to take measures to continue their production amidst a global outbreak and to protect the health of their employees.

The US defense giant **Lockheed Martin** has been forced to stop the production of F-35 parts at two facilities in Italy and Japan due to the coronavirus. In response to this crisis, Lockheed Martin made an announcement and stated that the company would be guided by and will operate with three clear priorities. First, LM will continue to protect the health and safety of its employees on the job and their families. Second, LM will continue to perform and deliver for its customers, and third, LM will do its part to use the know-how, resources, and leadership as a company to assist its communities during this period of national crisis.

As an initial contribution to the COVID-19 relief and recovery effort, Lockheed Martin announced that it would advance more than US$50 million to small and medium-sized business partners in its supply chain to ensure they have the financial means to continue to operate, sustain jobs, and support the economy. LM has also activated a US$6.5 million employee disaster relief fund to assist Lockheed Martin employees and retirees impacted by COVID-19. Additionally, LM donated the use of its corporate aircraft and vehicle fleet for COVID-19 relief logistical support and medical supply delivery and indicated that the company would also donate the use of its facilities for crisis-related activities including critical medical supply storage, distribution, and COVID-19 testing, where needed and practical.

Regarding the Coronavirus (COVID-19), Boeing stated that the safety of its employees, their dependents, and visitors to their sites remains a top priority. To protect its employees, Boeing increased the cleaning of high-touch areas and impacted sites and asked all employees who can effectively do their jobs from home to telecommute. It offered its Dreamlifter to transport urgently needed supplies to healthcare professionals and utilized 3D printing capabilities to manufacture face shields, shipping masks, gloves, and other equipment for its employees in impacted areas and for hospitals in need. The company also encouraged virtual meetings whenever possible and social distancing of 6 feet (1.82m) or more when face-to-face meetings are critical.

In its most recent statement about COVID-19, **BAE Systems** is focusing on safeguarding the health and wellbeing of its more than 35,000 employees, their families, and local communities. As BAE Systems carry out their mission-essential work in support of national security and the critical transportation infrastructure of the US, the company monitors guidance from governmental and health authorities and updates their procedures accordingly. To support social distancing, BAE has asked employees who can work remotely to do so. Given the essential nature of its business, the company stated that not all of the work could be done from home, so BAE has put in place measures recommended by the Centers for Disease Control and Prevention, including enhanced cleaning procedures and various forms of social distancing

Canceled or Postponed Defense Industry Fairs, Air Shows, Conferences and Events Due to the COVID-19 Outbreak

Within the framework of the measures adopted against the novel coronavirus pandemic COVID-19, the fairs, EXPOs, congresses, conferences and company events planned to be organized in the first half of 2020 on a national and international scale were either canceled or postponed to the second half of the year. Which fairs were canceled and which were postponed during this period of uncertainty? We've kept up with the process for you.

Within the framework of the measures taken due to the coronavirus epidemic that started in China in January 2019 and later became a pandemic, the **DIMDEX 2020** fair, was planned to be held on March 16-18, 2020. This is a fair that Turkish Defense Industry companies have been attending for years and it was canceled on March 3, due to the state of emergency declared in the country.

SOFEX 2020, which will be held in Jordan, was postponed to a later date, not because of the coronavirus outbreak, but because of the damage caused to the venue due to heavy rain at the end of January.

The **FIDAE** fair, scheduled for March 31, 2020 in Chile, was postponed until further notice.

The **DSA Malaysia** fair, which was planned to be held on April 20-23, was postponed to August 24-27, 2020 with the statement made by the DSA organization on March 16th.

The **International Eurasia Air Show**, which would have been held for the second time on April 22-26, 2020 in Antalya, was postponed to June 24-28, 2020.

The **UDT (Undersea Defense Technology)** fair, which was planned to take place in Rotterdam on May 26-28, was postponed to December 08-10, 2020.

The **KADEX 2020**, which was planned to be held in Kazakhstan on May 26-28, was postponed to June 10-13, 2021.

The **Berlin ILA** fair, which is sponsored by Defence Turkey Magazine as a media sponsor and was scheduled to take place in Berlin on May 13-17, 2020, was canceled with the written statement made by the organization. The statement made by the ILA organizing committee states that "events with an anticipated attendance of at least 1,000 persons and above are forbidden, in accordance with the measures taken by the German government due to the coronavirus outbreak". With the announcement, it was disclosed to the public that the event has been canceled and will not be held this year.

The **Farnborough International Airshow**, which was planned to be held in Farnborough, UK on July 20-24, 2020, was also canceled within the framework of the measures taken by the UK government.

The **International Eurosatory 2020** fair, which was scheduled to take place in Paris on June 08-12 this year, was canceled on March 26th with the announcement made by GICAT within the framework of the measures taken by the French government. In the statement made by GICAT, it was noted that the preparations (transportation of necessary equipment, travel arrangements of participants and hotel planning, health measures, etc.) are no longer possible and therefore the organization will not take place this year. The next edition of the organization will take place on June 13-17, 2022.

Conferences and Fairs in Turkey also postponed

The **SAHA EXPO 2020**, one of the defense industry events in Turkey that would have taken place on March 25-28, was postponed to November 4-7, 2020 with the decision taken by the Board of SAHA Istanbul.

The **International Future Soldier** Conference, organized by SaSaD and Defence Turkey Magazine with the support of the MoD, General Staff and Presidency of Defense Industries and which was planned to be held on March 23-24 this year, was postponed to September 29-30, 2020 as per the decision of the Conference Executive Committee.

The **9th Air and Avionics Seminar** that would have taken place in Ankara on April 28-29 was postponed to September 3-4, 2020.

SEDEC Conference that was scheduled to be held on June 2-4, 2020 was postponed to September 15-17, 2020.

Regarding the **10th Defense Technologies Congress (SAVTEK)**, there has not been a notice of postponement or cancellation about the event which is scheduled to be held on June 24-26, 2020 and the schedule of the event remains unchanged on the official website.

It is observed that the events planned to be held in the first seven months of the year have been affected by pandemic measures and there have been no changes in the schedule of national and international events that are due to take place in the last quarter of the year, with the expectation that the outbreak will be brought under control in the summer.

Middle East Technical University & ODTÜ TEKNOKENT

Turkey's Pioneer in University-Industry Cooperation

METU has proudly completed hundreds of projects within the scope of cooperation with defense industry companies. In this exclusive interview with Prof. Mustafa Verşan KÖK - METU Rector & Chairman of ODTÜ TEKNOKENT discusses the impressive and innovative projects that have been launched, and the success of the establishment of the Defense Industry Research and Technology Development Sub-Region (SATGEB) at ODTÜ TEKNOKENT in 2006. R&D departments of major contractors of the industry such as Aselsan, Havelsan and Turkish Aerospace are located at ODTÜ TEKNOKENT where new entrepreneurs, scientists, researchers cultivate collaboration, building upon Turkey's strengths and future vision.

Defence Turkey: Presently, nearly 5000 METU graduates are working as engineers, researchers and executives at defense industry companies such as Aselsan, Roketsan, Turkish Aerospace, FNSS and Havelsan. Could you by briefly inform our readers on METU's cooperation as a university with the defense industry?

Mustafa Versan KÖK: Middle East Technical University has always been a prominent pioneer not only in terms of education but also with respect to industrial cooperation. Various engineering departments and branches in our university enabled us considerably in contributing to various industrial collaborations, and in particular to the defense industry.

METU's academic past with the defense industry goes back to the 1970s. The departments focused mostly on increasing their academic richness until that date and then they started to build industrial cooperation with the establishment of companies such as Aselsan, Havelsan and Turkish Aerospace. These companies attach great importance to R&D studies, thus enabling our academicians to take part in projects as consultants or researchers.

After the establishment of Defense Industry Research and Technology Development Sub-Region (SATGEB) at ODTÜ TEKNOKENT in 2006 as a result of the emerging needs that arose due to the momentum reached in R&D studies and

fueled by the increase in collaborations, R&D departments of major main contractors of the industry such as Aselsan, Havelsan and Turkish Aerospace started to establish locations at ODTÜ TEKNOKENT.

As of 2010, companies active in the defense industry started to gather under the Teknokent Defense Industry Cluster (TSSK). TSSK has been providing various R&D and engineering services related to areas such as manned and unmanned air vehicles, advanced material, man-machine interactions, cryptography, coding and encryption, electronic intelligence systems, simulation systems, sensors and electronic systems and datalink technologies. Presently about 3 thousand defense industry R&D personnel are employed at ODTÜ TEKNOKENT.

Meanwhile in 2011, in order to maintain the cooperation between university and the defense industry, the Researcher Training Program for the Defense Industry (SAYP) was launched by the Presidency of Defense Industries (SSB) and METU, Aselsan, Roketsan, Turkish Aerospace, FNSS, Milsoft and Havelsan for the employees in the defense industry, for postgraduate students and prospective postgraduate students of Middle East Technical University.

Over 1000 R&D projects related to the defense industry have either been conducted or are being executed at our university.

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Defence Turkey: What would you like to say on the operations conducted in 2019 under the cooperation built with the Turkish Defense Industry companies within the scope of the University-Industry cooperation model? Presently, with how many defense industry companies does METU collaborate? Could you please mention a few of the projects that stand out in the defense industry field?

Mustafa Versan KÖK: METU has been carrying out intensive cooperation with Turkish Defense Industry companies for many years. These activities increasingly continued in 2019 as well. In 2019, R&D projects were launched as part of state-funded projects or projects funded through their own resources with over 50 defense industry companies.

A prominent example of a project that was launched in 2019, I would like to draw attention to the Development of Unique Sensor Networks and Identification System against Nuclear Radiation Threats (RADAT) Project. This project is funded by the Presidency of Defense Industries (SSB) and will be conducted with METU and the Nanomagnetic Instruments Company at ODTÜ TEKNOKENT. This project aims to develop a detection system capable of identifying the isotope that is a source of radiation and that could measure radioactivity to detect microGray level dose values. On account of this project, the CdZnTe (cadmium zinc tellurium) crystal capable of detecting beta, gamma and x ray emissions will be developed for the first time in Turkey. The CdZnTe crystal and detector that is the main component of the radiation detection systems could not be produced in our country. The number of countries with this product in the world is extremely limited. Therefore, we decided to support the RADAT project as part of the R&D program launched by the Presidency of Defense Industries.

Another project that I would like to highlight is the Project on the Development of an Infrared Detector Set (NAR) that focuses on the unique development and production of infrared detector sets that are the most critical sub-component of infrared camera systems. The main contractor of the project launched by SSB, is Aselsan and the related support will be received from METU Quantum Devices Nano Devices Laboratory and Crystal Growth Laboratory. The first product manufactured within the scope of the project will be delivered in 2 years and delivery of all products will be completed within 6 years. Accordingly, METU intensely continues its efforts in the development of unique products and technologies integrated with defense industry institutions.

Finally, I would also like to mention one of the critical projects. The "Innovative Software Competition (Y3)" project funded by SSB and conducted by METU Center for Image Analysis (METU OGAM) aims to conduct precise measurement of capabilities and know-how existing in our country in automatic target acquisition and identification through images. To this end, the main target of the project is to build the hardware and software infrastructure capable of

Very-Light Aircraft (VLA) Concept Design

measuring the automatic identification performance of the different algorithms for visual data types and varying target types. A total of 147 individual applications have been submitted by university students, institutions, SMEs and university employees to the competition held as part of this project and the winners of the competition were awarded by the SSB with a TL 100,000 prize.

A contract was signed for the execution of the 2nd phase of the project in 2020.

Defence Turkey: On December 14, 2017, a contract was signed at Turkish Aerospace facilities within the scope of the "Development of an Independent Research and Development Project for the Development of Very-Light Aircraft (VLA)". According to the project, METU students will be designing the aircraft and Turkish Aerospace will be in-charge of production, integration and test activities. What kind of activities have been accomplished so far as part of the project? Could you please enlighten our readers on the latest status of the project?

Mustafa Versan KÖK: Together with Turkish Aerospace, Turkey's technology center in the development, modernization, production, system integration and life cycle support processes regarding aerospace systems, activities are being carried out uninterruptedly. This cooperation aims to contribute to the development of Very-Light Aircraft while enabling METU students studying in various disciplines to experience the complete air vehicle design process with an interdisciplinary approach under the guidance of experienced Turkish Aerospace staff and thus become more experienced when they graduate from the university as the project renders the participant students to have more know-how and experience than their rivals across the world.

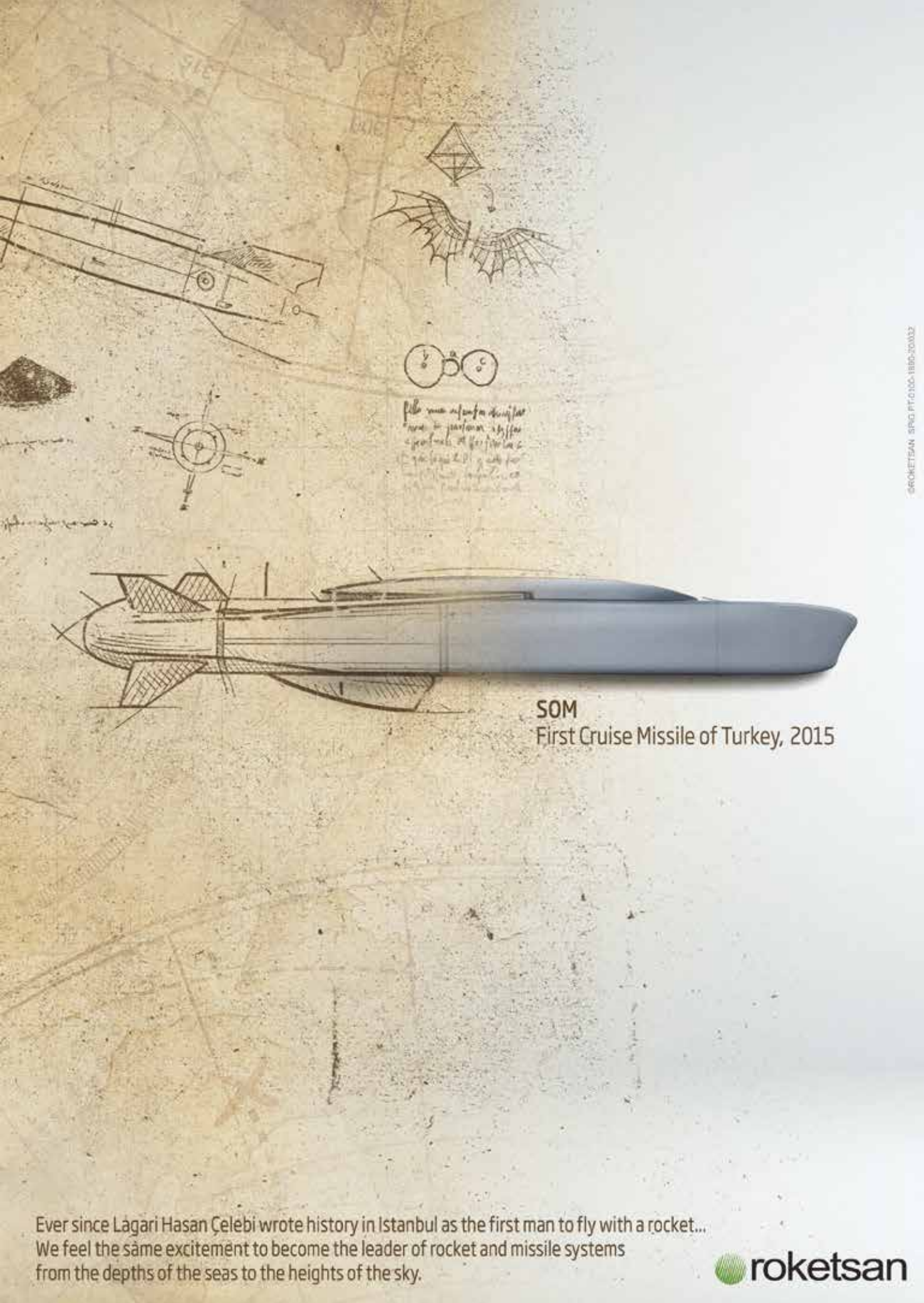
11 METU academicians from Aerospace Engineering, Mechanical Engineering, Electrical and Electronics Engineering Departments and 83 students from Aerospace Engineering, Mechanical Engineering, Electrical and Electronics Engineering, Industrial Engineering and Industrial Design Departments of METU are taking part in the aforementioned project that was launched on March 1, 2018. By the end of 2018, the predesign phase of the activities identified for the design of the prototype aircraft in the VLE category was completed. The second phase of the project started in 2019 and production, assembly and test activities were conducted through Turkish Aerospace resources. The SRR, PDR and preliminary CDR phases were accomplished. Design activities on the end product aircraft continue as the design is aimed to be completed by the end of February 2020.

With this project, METU was deemed worthy of the University - Cooperation Award as part of the Excellence Award granted in 2019 by the Council of Higher Education.

Defence Turkey: There are many projects conducted in the departments of aerospace engineering, mechanical engineering, computer, electrical and electronics engineering, metallurgical and materials engineering, chemistry and physics engineering departments and research centers of METU. These projects contribute greatly to the Turkish Defense Industry through Faculty of Engineering, Institute of Science and Technopark. Could you please inform us on the total number and financial size of the ongoing projects in the defense industry?

Mustafa Versan KÖK: Our research and application centers are the critical research infrastructures in our university. Presently, one third of our 29 centers are conducting activities in the field of defense. At this point, I would especially like to mention the Research and Application Center for Space and Accelerator Technologies (İVME-R) which was established with the financial support of the SSB. The Center became an application and research center in 2019 and is presently under assessment to be granted a legal entity within the scope of Law No. 6550. Additionally, the Robotic Technologies Research and Development Training Center that the call for proposal has been issued by SSB two year ago, is included in the scope of support program. With this project, critical infrastructure will be established in our campus within 2020 in the area of robotics. This infrastructure will contribute significantly to the defense field in our country will be transformed into a research center before long.

Moreover, to date, hundreds of projects either have been conducted or are being executed



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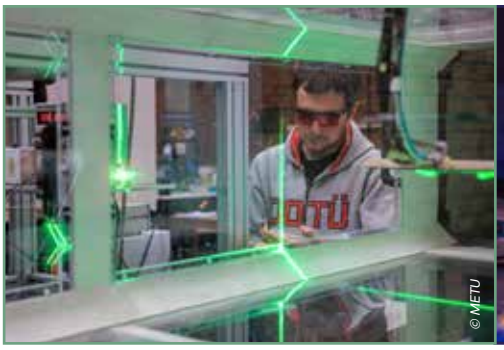
within the scope of the cooperation between METU and defense industry companies. 86 projects have been launched in this area in just 2019 alone with a project budget of TL 25 million.

Defence Turkey: Teknokent Defense Industry Cluster (TSSK) companies have major contributions in many projects launched in the Turkish Defense Industry in recent years. How many companies are there under the auspices of ODTÜ TEKNOKENT that are actively involved in R&D studies and how many of them are working in the defense industry field?

Mustafa Versan KÖK: The Teknokent Defense Industry Cluster launched its activities in 2010 with the participation of ODTÜ TEKNOKENT companies. Today, this Cluster conducts its activities not merely with the companies of ODTÜ TEKNOKENT but also with the participation of defense industry companies active in other technoparks. TSSK companies made their mark on successful projects in the defense and security projects of our country with their superior know-how and capabilities. Currently, over 400 technology companies are active under the auspices of ODTÜ TEKNOKENT and nearly one third of these companies are working in defense and security fields.

Defence Turkey: ODTÜ TEKNOKENT gathers companies with vertical competence and develops new products and services in defense, aerospace and security fields. Additionally, many research centers and laboratories within METU joined together these companies active in the defense industry under the Teknokent Defense Industry Cluster (TSSK) in 2010. Could you inform us on the number of R&D personnel working at ODTÜ TEKNOKENT, the number of staff employed by projects related to the defense industry, the number of executed R&D projects in the defense industry and the export volume conducted until the end of the of 2019?



Mustafa Versan KÖK: ODTÜ TEKNOKENT, with its three campuses, one at METU, the METU MET campus on the Eskişehir Highway and the Ostim Center, hosts a considerable sized workforce. Over 8,500 research personnel are employed by over 400 technology companies and 90% of this staff have either graduate or post-graduate degrees. Nearly 3,000 of the aforementioned staff are employed by our companies that are active in the defense industry. It is hard to mention an exact figure as the project cycles of ODTÜ TEKNOKENT companies with dynamic structures advance quite rapidly, yet it is possible to note that over 600 R&D projects in the defense industry are being conducted actively. Though it is quite hard to take part in the global market, particularly in the areas of defense and security with its severe competitors in exports, our companies accomplished a prominent achievement by reaching an export figure of nearly US$ 120 million.

Defence Turkey: What are your thoughts on the project incentives METU received from TÜBİTAK on the Scientific and Technological Research Projects Funding Program (1001), Career Development Program (3501) and National New Ideas and Products Funding Program (1005) and how do you evaluate the rate of success in these projects?

Mustafa Versan KÖK: Encouraging the studies of our scientists, increasing the competitiveness of our country, developing projects towards applied and/or experimental research and generating new competence have always been our priority. Within this scope, our university plays a key role in the research ecosystem of our country. For instance, considering the latest results of March 2019 regarding the TÜBİTAK ARDEB Scientific and Technological Research Projects Funding Program (1001), our university has been the one that received the greatest project support. Moreover, our average success rate in 2014-2018 in concern with the TÜBİTAK ARDEB 1001 program is 32%. Within the scope of the "National New Ideas and Products Funding Program (1005)" and "Career Development Program (3501)", the average success rate of our university reached 50%. Regarding the total calls for proposal supported by ARDEB during the same period (2014-2018), our university became the one with the highest number of supported projects with 377 projects and a total budget of TL 181.7 million. Moreover, the overall success rate of our university during aforementioned years reached 29.8%, above the overall support rate of ARDEB which is 14.5%.

Our university also made its mark on many achievements in the new programs in recent years in addition to TÜBİTAK's fundamental programs. For instance, our university's "Center for Solar Energy Research and Applications (GUNAM)" and "Microelectromechanical Systems Research and Application Center (MEMS)" have applied to the TÜBİTAK ARDEB's Center of Excellence Support Program

(1004), where research universities and research infrastructures are qualified by Law No.6550 and they entered the list of 17 projects supported across the country.

As part of another new program of the TÜBİTAK, SAYEM - Industrial Innovation Network Mechanism, our university was entitled to receive support for two out of the three applications. These two applications were under the partnership of the companies ARÇELİK and BİYOMOD.

Similarly, 11 out of our university's12 applications to the call for BİDEB 2244 - Industrial Doctorate Program made for the first time by TÜBİTAK were accepted. Thus, 47 of 517 PhD students to be trained by the industrial partnership of our country will be trained at our university under the partnership of 8 industrial enterprises.

Our university used effective methods for creating awareness for the BİDEB programs. Accordingly, 20 applications were made on behalf of our university for "BİDEB 2232 - International Fellowship for Outstanding Researchers Program" and 14 of them were entitled to receive support. Arriving in our country within the scope of this program, 2 researchers decided to conduct their research at our university, and a total of 16 outstanding researchers, 5 of which are foreigners will be launching their studies at our university as of 2020. With the help of these effective promotions, 12 applications made for the BİDEB 2236 - Co-Funded Brain Circulation Program in 2018 reached 25 in 2019.

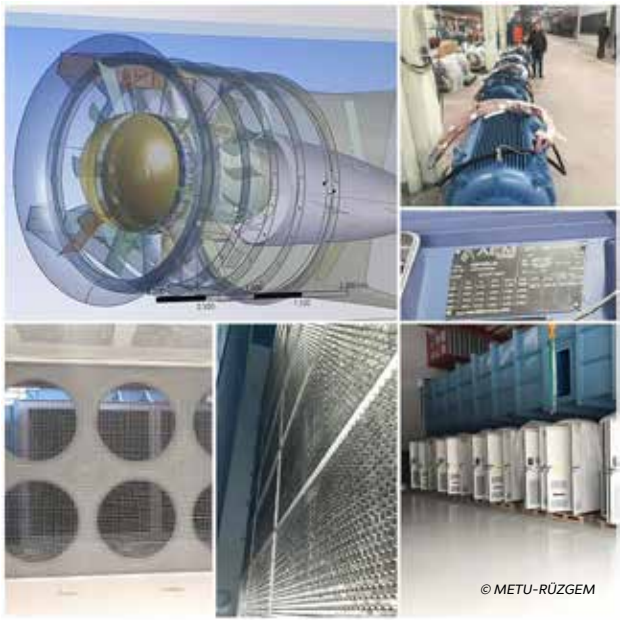
Defence Turkey: The Researcher Training Program for the Defense Industry (SAYP) was launched with the cooperation protocols signed with METU and the SSB, Aselsan, Roketsan and Turkish Aerospace in October 2011 and started to be implemented in 2012. Could you please inform us on the activities conducted within the scope of SAYP in the past 7 years? How many researchers graduated from METU under the program and how many of them are still involved in the program?

Mustafa Versan KÖK: As you also mentioned, SAYP is a program launched with the initiative of METU and it was then extended to all our universities by the SSB. The country-wide popularity of the programs we launched is our source of pride.

To date, 37 projects have been conducted as part of SAYP. 20 out of these projects were accomplished successfully and 20 students graduated. I would like to mention with pleasure that one of our projects that is about to be completed bears a patented product.

Defence Turkey: We would like to hear more about the test infrastructure and capabilities owned by METU? Within this frame, what would you like to say about the METU RÜZGEM Large Scale Wind Tunnel Construction that was completed in the beginning of last June? At this location aerodynamic, isolation and wind tests of all vehicles capable of gearing up to the speed of 360km/h can be conducted. Can you also touch on the Open Field Acoustic Test Field at the METU Yalıncak Pond?

Mustafa Versan KÖK: METU-RÜZGEM Large Scale Wind Tunnel is presently Turkey's largest wind tunnel and it is also the highest speed wind tunnel in its category, and it is among the few wind tunnels in Europe in terms of size and areas of application. Installed with the research infrastructure support of the Presidential Strategy and Budget Office, it is planned to be fully activated in spring 2020.



The Steel Honeycomb, Engine of Tunnel annd Tunnel fans were produced by local companies

On account of its modular structure capable of moving over air cushions, this tunnel will be capable to provide services both for civil sector requirements such as wind power, construction and automotive sectors and will also host tests required as part of the defense industry, specifically for the aerospace industry, for instance UAV scaled model tests, certain tests of various ongoing aircraft projects (HürJet, National Combat Aircraft, etc.) and some tests related to helicopter projects. Mostly local resources were utilized during the construction of the tunnel, the construction was realized by a local company and all the technical monitoring and controls during the construction were conducted by the relevant departments of our university.

Considering that the steel honeycomb units regulating the flow in the wind tunnel were manufactured in Turkey, that the engines of the tunnel were procured from domestic companies, the tunnel fans were designed at RÜZGEM and manufactured by domestic companies, the tunnel's automation and control system was developed by RÜZGEM, the fact that the model support system to

be utilized in aerodynamic tests were designed by domestic companies, and that the studies over the external balance system to be used when measuring the power was conducted at METU, the Large Scale Wind Tunnel project plays a crucial role both in terms of the utilization of national resources and the indigenization of know-how and capability in this area.

Defence Turkey: Could you please inform our readers on the METU Design Factory where academicians and students specializing in various areas gather and design projects addressing many different issues presented by major industrialists such as the automotive industry, defense industry, white goods, aviation, aerospace industry, energy companies, SMEs, non-governmental organizations, hospitals or any other stakeholder wishing to create a difference in its line of business and also on the Factory's activities in 2019?

Mustafa Versan KÖK: Ever since its establishment, the METU Design Research and Innovation Center has become a brand-new interface for our university, aiming to become a 4th generation university, where university and non-university stakeholders are gathered, in addition to the multi-disciplinary collaboration of various disciplines.

Within this context, with the help of the interdisciplinary studio launched every semester, the METU Design Factory has continued to conduct projects gathering students, academicians and non-METU stakeholders, training on "Design Oriented Thinking" and research projects in 2019 as well. In addition to research and training activities, the factory supported the establishment of similar centers by hosting representatives from many regional development agencies, governmental and industrial organizations at various scales and educational institutions.

METU Design Factory

Collaborations in different areas were realized during the last year. For instance, within the scope of a project executed in our university, measurement and modelling activities have been accomplished for the identification of problems that emerged around the head of cancer patients, before and after their treatment. Test samples were designed for a research project being conducted at a different university. A cooperation protocol was signed as part of the project on unmanned air vehicles developed under the partnership of BAE and Nurol. The Mine Marking Project, which is among the projects conducted with the UNDP, was deemed worthy of an entrepreneurship award. The smart toy and smart playground project focused on the rapidly ageing population with Autodesk, the inner campus smart transport project with Willdan Group, the inner campus activity optimization software project with UTARIT group were accomplished during the past year. Similarly, the factory worked jointly with Turkish Airlines on the development of an automated cargo packaging and tracking system. In the same period, four projects were realized with the energy sector, either directly or indirectly. Reinforcement of aging wooden utility poles with Enerjisa, optimization of wind turbines and improvement of their life cycles and a project on an alternative wind power solution system with GAMA Enerji were realized, while a project on achieving energy savings in refrigerators was conducted with Anadolu Holding.

Research projects in various sectors are currently being conducted, while the number of collaborations and the projects to which the Design Factory provides consultancy increase day by day.

Defence Turkey: Could you make an assessment on the defense industry activities that METU plans to conduct in 2020 and on your targets and expectations regarding the future?

Mustafa Versan KÖK: Middle East Technical University aims to increase our collaboration with the major companies of our country in the defense field through maintaining our cooperation in the defense industry in 2020 as well. Development of joint R&D projects and enabling our students to take part in defense industry projects will continue to be our priorities, while we continue to support the activities conducted under the auspices of our engineering departments, research institutes, ODTÜ TEKNOKENT and the TSSK with full effort.

Defence Turkey: Dear Rector, would you like to convey any message to our readers?

Mustafa Versan KÖK: First of all, I would like to thank you for this interview. As METU and ODTÜ TEKNOKENT, the defense industry is amongst our priorities.

In addition to its achievements in education, METU has always been a pioneer in our country in terms of cooperation with the defense industry and being aware of this we will continue our endeavors in the future

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The State of Qatar and Qatar Armed Forces

by İbrahim SÜNNETÇİ

The State of Qatar is a peninsula located amid the western coast of the Arabian Gulf. The peninsula is approximately 100 km across and extends 200 km into the Gulf. Qatar adopted its first written constitution in April 1970 and became fully independent from the United Kingdom on September 1, 1971. The State of Qatar is a sovereign and independent Arab state that has been ruled by the Thani Family since Jassim Bin Mohammad Al-THANI signed a treaty with the UK in 1868 that recognized its separate status.

Having emerged as one of the world's most important producers of oil and gas and is the richest country on earth, the State of Qatar has been governed by HH Sheikh Tamim Bin Hamad Bin Khalifa Al-THANI since June 2013. As one of the smallest nations by size and area in the world the State of Qatar has a total land area of 11,610 km2 (4,483 sq. miles). According to United Nations (UN) estimations, dated August 2019, the State of Qatar's total population is 2,839 million. With some 340,000 people, Qataris are considered a 'minority' in their own nation amounting to only 12% of the population. Foreign workers amount to around 88% of the population, with Indians being the largest community numbering around 700,000.

Nowadays, the State of Qatar is one of the safest countries in the world with the seventh-lowest crime rate, according to the World Economic Forum.

Military Service

Since April 2015, when the National Service Law entered into force, Qatar has made it mandatory for Qatari citizens to be conscripted in the Army. Until April 2018, Qatari men between the ages of 18 and 35 years old must train in the military for at least three months if they are college graduates, and four months if they have high school diplomas or have dropped out of school.

In April 2018, amid the ongoing Gulf Crisis, Qatar allowed female Qatari citizens to join the Army and extended compulsory military service to one year. With this step the State of Qatar has sought to increase its limited manpower (citizen-soldiers) for the Armed Forces. According to Law No. 5 of 2018 on compulsory national service program issued by the Emir Sheikh Tamim Bin Hamad Al-THANI on April 4, 2018 Wednesday, those who refuse to participate in military service without an excuse can face imprisonment of one month to a year or a fine between US$13,700 to US$82,400.

Under the current legislation the Ministry of Interior and the Ministry of Public Health and other bodies concerned are required to provide the National Services Academy during the first half of each year the

Soldiers at Military Parade on Qatar National Day in December 2018

names of males who will be turning 18 years of age in the following year. The Qatari male must present himself to the National Services Academy within 60 days from the date of attaining the age of 18 or obtaining the high school certificate or the equivalent, whichever is earlier. The national service for females of the age of 18 is voluntary.

Foreign Contract Soldiers

Excluding Iraq and Saudi Arabia, the Arab states of the Persian Gulf (namely Bahrain, Kuwait, Iraq, Oman, Qatar, Saudi Arabia and the United Arab Emirates) have small citizen populations that limit their ability to strengthen their Armed Forces with the available pool of citizens.

Therefore, thanks to their rich financial wealth most of the Arab states that border the Persian Gulf (Arabian Gulf), prefer to recruit large numbers of contracted soldiers from other countries, including Jordan, Pakistan, Sudan and Indonesia to strengthen their Armies' manpower. The foreign contract soldiers (mostly non-native Sunni Muslims and do not speak the local dialect or do not speak Arabic at all) generally have no political interests to pursue and seldom participate in attempts to overthrow the regime. They also have no social links to the native population, so in case of domestic social unrests the state can deploy them with confidence against its citizens. Relatively cheaper than citizen-soldiers, foreign contract soldiers can also be dismissed with no political liability.

Qatari Emiri Air Force troops on parade

According to open sources experiencing a struggle of limited manpower for its Armed Forces, Qatar is not only extending its compulsory national service program from 3 to 4 months to 12 months and allowing volunteer females to join the Army, but also recruits large numbers of foreign contract soldiers to overcome manpower limitations. As a wealthy oil and gas power, Qatar is one of the three Persian Gulf states that the highest proportion of foreign contract soldiers serve. Reports indicate that up to 85% of the Qatar Armed Forces' manpower consist of foreign contract soldiers. In October 2017 'Somali Garowe Online' revealed that in 2016 Qatar recruited 6,000 Somali soldiers to increase its defense force in addition to at least 360 Sudanese mercenaries to defend and protect Qatar's Head of State. The growing imbalance between citizens and non-native personnel recruited from other countries in the Qatari Armed Forces has turned into an urgent concern since 2017.

In early June 2017 the Gulf Crisis broke out when a handful of Arab states led by Saudi Arabia (the de facto leader of the GCC) abruptly severed diplomatic relations with the State of Qatar and imposed a blockade on the State of Qatar. In response to threats from Saudi Arabia, Bahrain, the UAE and Egypt, Qatar launched a massive multi-billion dollar military power buildup. This massive re-equipment program however has raised a series of questions about the country's ability to incorporate the ordered sophisticated weapon systems and platforms

The "Al Zubarah" Corvette, first of four Doha Class air defense corvettes

(including 24 x Eurofighter Typhoon, 36 x Rafale and 36 x F-15QA fighter jets as well as Doha Class air defense corvettes, OPV/FACM type ships, cadet training ships and an air defense LPD) into its military amid a crisis faced with the above mentioned Gulf nations. Considering the availability of citizen-soldiers/staff officers, Qatar is believed to be recruiting further foreign contract soldiers/staff officers to operate acquired sophisticated weaponry and to compensate for existing staffing shortage. Proving this expectation according to Aviation International News, the first batch of pilots trained for the Qatari Emiri Air Force in France in November 2017 were Pakistani exchange officers. In February 2018 the Express Tribune, a Pakistani publication, reported that 627 Pakistani personnel, including 165 from the Pakistan Army and 462 from the Pakistan Navy and Air Force, were deployed in Qatar. The report added nearly 300 additional personnel could be deployed to Qatar for "training and advisory" roles.

Foreign Troops

Most of the Arab states of the Persian Gulf consider the presence of foreign troops in their territories essential to fend off internal coups and foreign invasions. The method of joint military building, which is less expensive, more flexible and responsive to variables, is usually adopted when the state is unable to achieve a balance of power with its adversary on its own.

Dassault - Rafale

Due to the geopolitical power imbalance with its neighbors the State of Qatar has adopted the method of joint military building, since 1996. Through the construction of military bases for foreign troops in its territories the State of Qatar has aimed to bring in foreign troops to safeguard Qatari defense.

The presence of the Qatar Armed Forces and foreign troops operating together could aid in the formation of steadfast alliances to deter a potential foreign assault or an internal coup. While continuing implementation of the method of joint military building with an increased trend, after the Gulf Crisis the State of Qatar has realized that this method could not be adopted as a single option like before, but rather, as a parallel option to self-building. Qatar currently hosts some 13,000 US troops at Al Udeid Air Base and at As Sayliyah Army Base as well as some 2,000 Turkish soldiers (including Turkish Army, Navy and Special Forces personnel) at the Tariq Bin Ziyad and Khalid Bin Walid military barracks outside Doha. Turkey has been a major supporter of the State of Qatar since June 2017, when Saudi Arabia, Bahrain, the United Arab Emirates (UAE) and Egypt severed diplomatic and trade relations with the country.

Historically, Qatar has been a major defense partner to the United States, starting most notably after Operation Desert Storm in 1991, when the US-Qatar Defense Cooperation Agreement (DCA) was signed. Located at 35km southwest of Doha, the Al Udeid Air Base is home to over 11,000 US troops and is considered the largest US military base in the Middle East. Constructed in 1996 at the cost of more than US$1 Billion the base also houses Qatari Emiri Air Force and US-

GÖKTÜRK - 2

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Patriot PAC-3 launcher on Qatar's National Day Parade

led anti-ISIL coalition forces and over 100 operational aircraft. The Al Udeid Air Base serves as the headquarters for the US Central Command (officially called the Combined Air and Space Operations Center), US Air Force Central Command and the Forward Command Center for US Special Operations. The base has key strategic importance in the US air campaign against the Islamic State (ISIL) in Syria and Iraq with 80% of aerial refueling in the region took place there. In January 2019, a memorandum of understanding (MoU) was signed between the US Department of Defense (DoD) and the State of Qatar to coordinate efforts on the expansion of Al Udeid Air Base, which would help to increase operational capabilities of US forces. In July 2019 after his meeting with US President Donald TRUMP, Head of the State of Qatar Tamim Bin Hamad Al-THANI said Qatar would pay for the expansion of the air base. The expansion project valued at US$1.8 Billion also covers the construction of additional and improved quarters along with new schools, a sophisticated medical center, more recreational facilities and family compounds, 200 villas in total, aiming to improve the living conditions of US Air Force personnel stationed there. In early June 2017, the Pentagon said that the diplomatic tensions between Qatar and some of its Arab neighbors would not affect US operations at the Air Base. In April 2018, the then Saudi Foreign Minister Adel Al-UBEIR said if the US withdraws the military base and the protection that its presence provides to Qatar, the regime in Doha "would fall there in less than a week."

Located in Al Sailiya, a suburb outside Doha, Qatar the As Sayliyah Army Base was established in 2000. As the largest US Army prepositioning site in the world the base stores prepositioned equipment for CENTCOM, most of which is on reserves for use in Iraq and Afghanistan.

Turkey and Qatar's defense ties have strengthened in recent years, in line with the countries' political alliance. In order to resist the Saudi Arabia (the de facto leader of the GCC) led pressures within the Gulf Cooperation Council (GCC/an alliance of six Gulf monarchies; Saudi Arabia, Kuwait, Qatar, United Arab Emirates, Bahrain, and Oman that came into existence with an aim to create regional security system), the State of Qatar chose Turkey as an ally and allowed the country to open a military base in its territories. Turkey's military involvement in Doha dates back to December 19, 2014, when the two countries inked a military cooperation agreement that allows the deployment of the Turkish Armed Forces (TAF) in the State of Qatar. The agreement was ratified by the Turkish Parliament (TBMM) on March 19, 2015. The first group of Turkish troops arrived in the capital city of Doha on October 4, 2015, and four days later the Turkish flag was hoisted at Turkey's new permanent military base that was set up at the Tariq Bin Ziyad military barracks under an agreement signed in December 2014. The establishment of Turkey's permanent military base (which was named the Qatar-Turkey Combined Joint Force Command in December 2017) in Doha at the Tariq Bin Ziyad military barracks was completed in April 2016. According to reports the base has a capacity to accommodate up to 5,000 troops and Turkey plans to gradually increase the number of its forces in Qatar to

© Turkish MoND

A T-155 Fırtına SPH is being disembarked from a Qatari Air Force C-17 in Qatar

3,000 in accordance with the agreement between the two countries and keep a brigade in the Gulf country. With the establishment of a permanent military base in Doha, which represents Turkey's first overseas military installation in the Middle East, Turkey has become a counterbalancing power in the region concerning Iran and Saudi Arabia.

The Qatar-Turkey Combined Joint Force Command, of which headquarters is overlooking the Strait of Hormuz in the Persian Gulf, has been active since October 2015 at the Tariq Bin Ziyad military barracks, and until August 2019 was comprised of commando platoons, military engineering unit indirect fire support teams, and air force and naval liaison teams in what is basically a mechanized battalion battle group involving some 300 Turkish soldiers (as of July 2017 there were just 230 troops and 38 vehicles at the base).

Cooperation between Turkish and Qatar Armed Forces has notably intensified since the Gulf Crisis broke out in June 2017. One of the 13 demands that were presented by Saudi-led Arab states to Qatar on June 22, 2017 was the calling for the immediate closure of Turkey's permanent military base in Qatar and the termination of military cooperation with Turkey inside Qatar. However, pointing out that it was open to negotiations without endangering its sovereignty, the State of Qatar has refused to meet these demands and agreed with Turkey to increase the size of the Turkish military contingent in the country and to expand the Qatar-Turkey Combined Joint Force Command in Doha with naval and aerial components. As part of this agreement, Turkey immediately sent additional troops and armored vehicles (including Self Propelled Howitzers) to its permanent base at the Tariq Bin Ziyad military barracks and conducted joint exercises with Qatar in August 2017.

Accompanied by Turkish MoND Hulusi AKAR, Qatar Defence Minister Khalid Al-ATTIYAH salutes Turkish Soldiers at Khalid Bin Walid military barracks

Shortly after the eruption of the Gulf Crisis on June 7, 2017 the Turkish Parliament (TBMM) ratified two deals on deploying troops in Qatar and training its gendarmerie forces. As part of the expansion plan construction of a new base near the Tariq Bin Ziyad military barracks was launched and completed in August 2019. The Qatar-Turkey Combined Joined Force Command's new Headquarters was officially opened with a ceremony held on December 14, 2019 with the participation of Turkish MoND Hulusi AKAR, Chief of Turkish General Staff General Yaşar GÜLER and Qatar Deputy Prime Minister and Minister of State for Defense Affairs Dr. Khalid Bin Mohamed Al-ATTIYAH. The new base was named after Khalid Bin Walid - a well-known commander in early years of Islam. According to Turkey's President Recep Tayyip ERDOĞAN the Qatar-Turkey Combined Joined Force Command would serve the stability and peace of not only Qatar but also the Gulf region and described the new military base as "the symbol of brotherhood, friendship, solidarity and sincerity."

Qatar Armed Forces

The Ministry of Defense of Qatar is responsible for defending the homeland. It leads fighting and support units including the Qatari Emiri Land Force, the Qatari Emiri Air Force and the Qatar Emiri Navy.

Founded in 1971 after the country gained independence from the United Kingdom, the Qatar Armed Forces became the military forces of the State of Qatar. According to reports as of early 2016, an estimated 12,000 personnel - 8,500 Land Forces, 1,800 Naval Forces, and 1,500 Air Forces served in the Qatar Armed Forces, the second smallest in the region after Bahrain. However, soon after the diplomatic crisis (Gulf Crisis) broke out, Qatar sought out to improve its military capabilities and to expand its Armed Forces. In this context, while on the one hand the State has been purchasing advanced military equipment from various manufacturers and signing various agreements for training and enhancing its human resources, on the other hand Qatar has extended its compulsory national service program with an aim to increase its limited manpower (citizen-soldiers) for the Armed Forces to support its self-reliance strategy.

As a result of ongoing expansion efforts, according to open sources, as of 2019 the Qatar Armed Forces' personnel strength has been estimated to have increased to over 20,000 personnel - some 15,000 Land Forces, 3,000 Naval Forces (with Naval Police), and over 2,500 Air Forces. In order to support its self-reliance strategy, the personnel strength of the Qatar Armed Forces is expected to be increased further in the coming years. In this context, for example the Qatari Emiri Navy that launched the construction of the new major naval base in early 2019 is reportedly planning to raise the number of its personnel from 3,000 to more than 7,000 by 2025. Being constructed at Hamad Port, a commercial port inaugurated in 2017 and located at south of Doha in Al Wakra, the new Qatar Emiri Naval Base will include a quay wall and basin revetments, infrastructure, utility buildings, security facilities, a helicopter airfield, and an access bridge. The boundary is secured with bulletproof-glass buildings, detention facilities, and security gates; the base will have special defense and surveillance towers too. The base is expected to house about 6,000 troops with 200 buildings and to host some of Qatar's newest expensive military purchases.

As a small state, Qatar's defense policy is mostly focused on self-defense and in order to achieve this strategy the State has been allocating a considerable amount of money to improve its military capabilities and to equip its Armed Forces with state-of-the art weapon and platform systems. According to some sources the State has allocated at least US$6.5 Billion in defense expenditures for 2019. According to Stockholm International Peace Research Institute (SIPRI) figures Qatari arms imports rose by 245% between 2007 and 2011, by 225% between 2009-2013 and 2014-2018 and ranked as the ninth biggest arms importer country in the world in 2018. According to SIPRI data Qatar's arms imports increased by more than 22% in 2018 compared to 2017 due to rearmament efforts and the diplomatic crisis (Gulf Crisis) with neighboring countries.

A Qatari Emiri Land Force Leopard 2A7 MBT seen here during a live fire exercise

In the 1980s and 1990s France provided some 80% of the country's military requirements as Qatar's main arms supplier. Since 2009 Qatar has been relying heavily on US defense companies to purchase defense equipment. According to SIPRI data the US was responsible for 65% of Qatari arms imports during 2014-2018, while the remaining imports came from countries such as Germany, France, Italy, China, Russia and Turkey.

During last decade the State of Qatar has used its vast oil wealth to rebuild its Armed Forces and has spent tens of billions of US dollars buying some of the world's most advanced military weapons. Since the start of the Gulf Crisis, the State of Qatar has purchased three different types of fighters, including 36 x US-made F-15QAs, 12 x French-made Rafale fighters (under the agreement signed in May 2015 Qatar has ordered 24 Rafales and with a US$1.3 Billion valued follow-on order agreement awarded in December 2017 country exercised option for the purchase of 12 additional Rafales thus the total number of Rafales has been increased to 36) and 24 Eurofighter Typhoons as well as 4 Doha Class air defense corvettes, 2 OPV/FACM type ships, 1 air defense LPD and 2 cadet training ships).

Force Structure of the Qatar Armed Forces

The Qatar Armed Forces are organized into three branches: the Qatari Emiri Land Force, the Qatari Emiri Navy, and the Qatari Emiri Air Force. The following information on the equipment of three branches of the Qatar Armed Forces have been compiled from various open sources.

Military Age: Between the ages of 18-35 years (Regular), with a reserve commitment of 10 years (up to age 40)

Conscription: 12 Months

Total Active Personnel: Over 20,000

Para-Military Forces: Royal Guard Brigade (the Amiri Guard under the Ministry of Defence and part of the Qatari Emiri Land Force) and Police Department. There are also 3 Special Force-type Units each with company strength under Army command: Oil Well Guard Units (located in the Dukhan and Umm Bab areas and charged with securing pipelines), Border Guards Regiment and a Static Guard Regiment ■


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Qatari Emiri Air Force (QEAF)

As the air arm of the Qatar Armed Forces, the Qatari Emiri Air Force was formed in 1974, three years after achieving independence from Great Britain in September 1971.

Personnel: Over 2.500

Main Air Bases: Al-Udeid Air Base and Doha International Air Base (also known as Camp Snoopy, was a former US military installation located at the Doha International Airport) in Doha. In August 2018, Qatar announced the construction of a new air base near Dukhan. Named after Emir Tamim Bin Hamad Al-THANI, the Dukhan/Tamim Air Base is the country's third and newest air base. The Dukhan/Tamim Air Base received five of the Qatari Emiri Air Force's order of 36 Dassault Rafale fighter jets in June 2019, though it was not completely operational at the time. As of February 26, 2020 Qatar, Emiri Air Force took the delivery of 23 Rafale fighter jets from France.

Al-Udeid Air Base

- 3rd Rotary Wing
  - 20th Squadron – 39 x AW139
- Transport Wing
  - Transport Squadron – 8 x C-17 Globemaster and 4 x C-130J-30
  - Al Zaeem Mohamed Bin Abdullah Al-ATTIYAH Air College - 8 x MFI-395 Super Mushshak, 24 x Pilatus PC-21, 14 x SA342 Gazelle (to be replaced with 16 x H125)

Doha International Air Base

Rafale F3R of the Qatari Emiri Air Force

- 1st Fighter Wing
  - 7th Air Superiority Squadron – 9 x Mirage 2000-5EDA, 3 x Mirage 2000-5DDA
  - 11th Close Support Squadron – 6 x Alpha Jet
- 2nd Rotary Wing
  - 6th Close Support Squadron – 24 x AH-64E (the first of 24 helicopters for the Qatari Emiri Air Force was handed over during a formal delivery ceremony at Boeing's Mesa production plant in Arizona on March 14, 2019. Deliveries are scheduled to be completed by the end of May 2020)
  - 8th Anti Surface Vessel Squadron – 8 x Westland Commando Mk.3/ Sea King (wired for AM-39 Exocet ASM and to be replaced with 12 x NH90 in naval [NFH] variant)
  - 9th Multi-Role Squadron – 1 x S-92 VVIP and 4 x Westland Commando Mk 2 (to be replaced with 16 x NH90 in tactical transport [TTH] variant)

Dukhan/Tamim Air Base

- U/I Fighter Wing
  - Al Adiyat Fighter Squadron – 23 x Rafale (deliveries being completed and will eventually reach to 36)

Equipment:

Combat: 6 x Alpha Jets, 9 x Mirage 2000-5EDA/DDAs, 36 x Rafales (deliveries ongoing), 36 x F-15QAs (on order) and 24 x Eurofighter Typhoons (on order)

Training: 24 x L-39 and L-29 (in store), 10 x MFI-395 Super Mushshak (on order and under delivery process)

Mirage 2000-5EDA

Transport: 8 x C-17 Globemaster and 4 x C-130J-30

Tanker Aircraft: In early 2014 Airbus Defense and Space had been selected by Qatar to supply two A330 MRTT (KC-30) new generation air-to-air refuelling aircraft for the Qatari Emiri Air Force

Helicopters: 24 x AH-64E, 39 x AW139, 8 x Westland Commando Mk.3/Sea King, 1 x S-92 VVIP, 4 x Westland Commando Mk 2 and 14 x SA342 Gazelle

UAVs: 3 x BAYRAKTAR TB2-S Armed UAV Systems with six aircraft, FLIR payloads, 3 x Ground Control Stations and a UAV Training Simulator are in the service of QEAF Reconnaissance and Surveillance Centre Command

SAMs: 1 x Rapier Battery with 18 x launchers and 250 missiles, 9 x Roland 2 (3 self-propelled Roland 2 systems on the AMX-30R chassis and 6 shelter-mounted) and 1 MIM-23B I-HAWK Battery and NASAMS/SL-AMRAAM.

Ballistic Missile Defense (BMD) Systems: In order to enhance its missile defense capability against Iran's missile arsenal Qatar has purchased various BMD systems during last decade. In 2012, Qatar purchased 10 x Patriot Configuration 3 (PAC-3) Firing Units (with 40 launchers) and missiles at an estimated value of nearly US$10 Billion. Also that year, the US agreed to sell 2 x Terminal High Altitude Area Air Defense (THAAD) System Firing Units (with 12 launchers and 150 missiles), the most sophisticated ground-based missile defense system the US had made available for sale, but Qatari budgetary and operational concerns have delayed or derailed that purchase. In February 2017, Raytheon concluded an agreement to sell Qatar an early warning radar system to improve the capabilities of its existing missile defense systems, with an estimated value of US$1.1 Billion. In December 2017, the US Defense Department awarded Raytheon a US$150 Million contract to provide Qatar with services and support for its PAC-3 System, and the Ministry of Defense of Qatar has committed to acquire additional Patriot systems, with an estimated value of about US$2 Billion.

NB: In March 2018 during tbe DIMDEX 2018 Fair, Qatar signed a contract for the purchase of 28 NH90 military helicopters. The agreement includes 16 x NH90s in tactical transport (TTH) configuration and 12 x NH90s in naval (NFH) configuration. As part of its ongoing military helicopter fleet modernization plan, Qatar will also receive 16 x H125 light single-engine helicopters in training configuration for operation by the Al Zaeem Mohamed Bin Abdullah Al-ATTIYAH Air College. In April 2018 it was reported that the Ministry of Defense of Qatar signed a US$2.5 Billion contract with Qatar for the delivery of National Advanced Surface-to-Air Missile Systems (NASAM) to Qatar. On November 27, 2018, the US Defense Security Cooperation Agency (DSCA) notified Congress of a State Department approval of a commercial sale by Raytheon of 40 x AIM 120C-7 Advanced Medium-Range Air-to-Air Missiles (AMRAAM) missiles, 8 x AMRAAM Captive Air Training Missile (CATM-120C), 1 x spare AMRAAM guidance section, 1 x spare control section and missile containers along with classified software for the Raytheon-made AN/MPQ-64F1 Sentinel Short Range Air Defense (SHORAD) radar, spare and repair parts, cryptographic and communication security devices, precision navigation equipment, training, and other related program support at an estimated value of US$215 Million. On December 18, 2018 single SL-AMRAAM launcher (fitted with AIM-120B missile mock-ups) on Humvee tactical vehicle took part during the National Day Parade of Qatar Armed Forces, held in Doha, Qatar. On July 10, 2019, Raytheon announced that Qatar would be the first country to purchases its Advanced Medium Range Air-to-Air Missile - Extended Range (AMRAAM-ER) weapon. In May 2019 the US State Department approved the sale of 24 x AH-64E Apache Guardian attack helicopters to Qatar at an estimated cost of US$3 Billion. The proposed sale will supplement the QEAF's previous procurement of 24 x AH-64Es. Qatar signed a contract for 24 x AH-64E aircraft in June 2016 and the ongoing deliveries will be completed by the end of May 2020

Qatari Air Force AH-64E attack helicopter

On December 18, 2018 single SL-AMRAAM launcher on Humvee tactical vehicle took part during the National Day Parade of Qatari Armed Forces

Qatari Emiri Land Force

The Qatari Emiri Land Force is the largest branch of the Qatar Armed Forces

Personnel: Some 15,000

Major Units:

Royal Guard Brigade with 3 Infantry Battalions

Qatari Army with 1 Special Forces Battalion, 4 Mechanised Infantry Battalion and 1 Artillery Battalion

Armored Brigade with a Mortar Company, Tank Battalion, Mechanised Infantry Battalion and an Anti-Tank Battalion

Equipment:

MBTs: 62 x Leopard 2A7+ and 30-44 AMX-30 (being withdrawn and replaced by Leopard 2A7+ MBTs)

AIFV and APCs: KF-41 Lynx, Dingo Heavy Duty (4x4) APCs (including Armoured Ambulance version), RG-41 MRAP, Marauder 4x4, 32 x Fennek 4x4 light armoured reconnaissance vehicles, 6 x Wisent 2 Support Vhecles, 36 x MOWAG Piranha Mk-II 8x8 CCTS-90mm turret, 4x MOWAG Piranha ARVs, 40 x AMX-10P IFVs, 158 Renault Trucks VAB 6x6 APC, 4 x Renault Trucks VAB/VPM-81 4x4 Mortar Carrier with 81mm mortar, 24 x Renault Trucks VAB 4x4/6x6 VCAC "Mephisto" with a pair of HOT ATGM launchers, 27 x Renault Sherpa 2 light tactical vehicles, 12 x Nexter Systems AMQ-10RC 105mm 6x6 ARVs, 8 x Cadillac LAV V150 Commando 4x4 APC, 16 x VBL 4x4 APC, 32 x EE-9 Cascavel 90mm 6x6 ARVs, 342 x EJDER YALÇIN 4x4 MRAPs, 214 x NMS/YÖRÜK APCs/IFVs (150 of them are fitted with Aselsan's SERDAR ATGM Launching System that able to launch Russian Kornet-E and the Ukrainian Skiff ATGMs), 90 x KİRPİ 4x4 MRAPs and 35 x AMAZON APCs

Nurol Makina's EJDER YALCIN WAVs with Aselsan SERDAR Anti-Tank Missile Launching System

Artillery: 22 x AMX-F3 155mm SPHs (being withdrawn and replaced by PzH 2000 SPHs), 24 x PzH 2000 SPHs and 12 x G5 155mm Towed Howitzerz (being withdrawn and replaced by PzH 2000 SPHs)

Mortars: 15 x Brandt 120mm heavy mortars, and 30 x 81mm mortars

MLRS: 4 x Astros II MLRS and 7 x M142 HIMARS MLRS (with 60 M57 MGM-140 ATACMS Block 1A T2K TBFs with unitary warhead and 360 M31A1 GMLRS guided artillery rockets with unitary warhead)

ATGMs: 48 x MBDA HOT ATGM launchers with 1,000 missiles, 100 x MBDA MILAN ATGM launchers with 630 missiles and 50 FGM-148 Javelin ATGM launchers with 500 missiles

SAMs: Some 20 x SA-7s, 10 x Blowpipe (with 50 missiles), 24 x Mistral (with 500 missiles) and 12 x Stinger (with 60 missiles)

SRBMs: At its national day parade held in Doha 0n December 17, 2017, Qatar displayed two of its newly purchased SY 400/BP-12A Short Range Ballistic Missile (SRBM) launchers accompanied with two loaders. The Chinese SY-400 is typically mounted on an 8x8 Transporter-Erector-Launcher (TEL), like the one which was shown in the parade, is capable of carrying both BP-12A and SY-400 missiles. The BP-12A can carry a 480 kg conventional payload over a 280 km range, while the SY-400 can carry a 200 kg conventional payload over a 200 km range. The Qatari SY-400 launchers are appeared to be modified to carry two larger caliber BP-12A canisters instead of eight SY-400 canisters. The display of SY-400 launchers at the parade apparently represented an effort to demonstrate to the Saudi-UAE led bloc Qatar's capabilities to resist pressure.

NB: In December 2017, the Qatari Minister of State for Defense Affairs signed a letter of intent (LoI) with Nexter for the procurement of up to 490 VBCI IFVs with a value of €2 Billion. But due to the crisis between Paris and Doha the decision on the procurement was frozen in November 2019. On December 18, 2018 a brand new KF-41 Lynx AIFV took part during the National Day Parade of Qatar Armed Forces, held in Doha, Qatar. It is believed that Rheinmetall sold unknown amount of KF-41 Lynx AIFVs to Qatar, with this sale Qatar becomes the first operator of the vehicle. On February 5, 2019 Turkish MoND Hulusi AKAR, formerly Chief of the Turkish General Staff, disclosed that Turkey has recently signed a contract with Qatar for the sale of FIRTINA Self Propelled Howitzers (SPHs). MoND AKAR did not share any figures about the number of FIRTINA SPHs (20 estimated) to be delivered to the Qatar Armed Forces. It is believed that the contract is covering the New Generation FIRTINA (also dubbed FIRTINA-II) SPHs, which are under production at the 1st Main Maintenance Factory Directorate located in the Sakarya province of northwest Turkey.

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Qatari Emiri Navy

The Qatari Emiri Navy (QEN), also called the Qatari Emiri Naval Forces (QENF), is the naval branch of the Qatar Armed Forces.

Personnel: Over 4,000 together with Coast Guard, Marine Police and Coastal Artillery

Base Locations: QEN's headquarters is at Doha. Major Naval Bases are located at Al-Daayen Naval Base (operated by Coast Guard, located in Semaisima, 30 kilometers (18 miles) from Doha), Halul Island (one of the main bases for the Qatari Navy is located in Halul Island) and Ras Abu Aboud. The new naval base of the Qatari Emiri Navy is under construction at Hamad Port (a commercial port inaugurated in 2017 and is located south of Doha in Al Wakra)

Fleet:

FPBs: 4 x Barzan Class (56m Vita type) FPBs, 3 x DAMASH Class (Combattante III type) FPBs, 3 x MRTP 34 (That Assuary Class) FPBs, 4 x MRTP24/U Special Operation Craft (SOCs) and 4 x MRTP24/U Fast Missile Craft

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MRTP34 Class Fast Intervention Boat of Qatari Emiri Navy

Patrol Crafts (PCs): 3 x MRTP16 and 10 x MRTP 20 Fast Intervention Boats (FIBs, deliveries ongoing), 26 Hercules FPBs (at Coast Guard service, deliveries will be completed by the end of 2020), 4 x Vosper patrol boats, 6 x Vosper 110 ft. Class PCs, 6 x Damen Polycat 1450 Cass PCs, 2 x Keith Nelson type 44 ft. Class PCs, 2 x Fairey Marine Interceptor class PCs, 4 x MV-45 class PCs, 25 x Fairy Marine Spear Class PCs, 5 x P-1500 Class PCs, 4 x DV-15 Class FIBs and 3 x Helmatic M-160 class PCs

Landing Ships: 1 x Robha Class LCT and 4 x LCUs

NB: On March 31, 2014, Nakilat Damen Shipyards Qatar (NDSQ, a joint venture between Damen and Qatar's Nakilat) and QEN signed two Letter of Intents (LoIs) for the construction of seven vessels at Qatar's premier shipyard with a value of US$851 Million. The MoUs cover six 50 m (164 ft)-long axe-bow high-speed patrol boats and one 52 m (171 ft)-long diving support vessel. The 6 x Damen 5009 Class patrol boats are currently under construction at NDSQ and are scheduled to be delivered in 2024. In June 2016, Fincantieri of Italy signed a €4 Billion contract with the Qatari Minister of State for Defense Affairs for the construction of seven surface vessels that are currently under construction in Italy at Muggiano (Las Spezia) Shipyard. The contract included the construction of 4 x Doha Class air defense corvettes (the first of the Doha Class corvette was launched on February 27, 2020), 2 x OPV/FACM type ships and 1 x air defense LPD. During DIMDEX 2018 Exhibition the Qatar Emiri Naval Forces has placed an order for two Cadet Training Ships (CTS) to Turkish private shipbuilder Anadolu Shipyards.

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ARES 150 HERCULES FPB during sea trials

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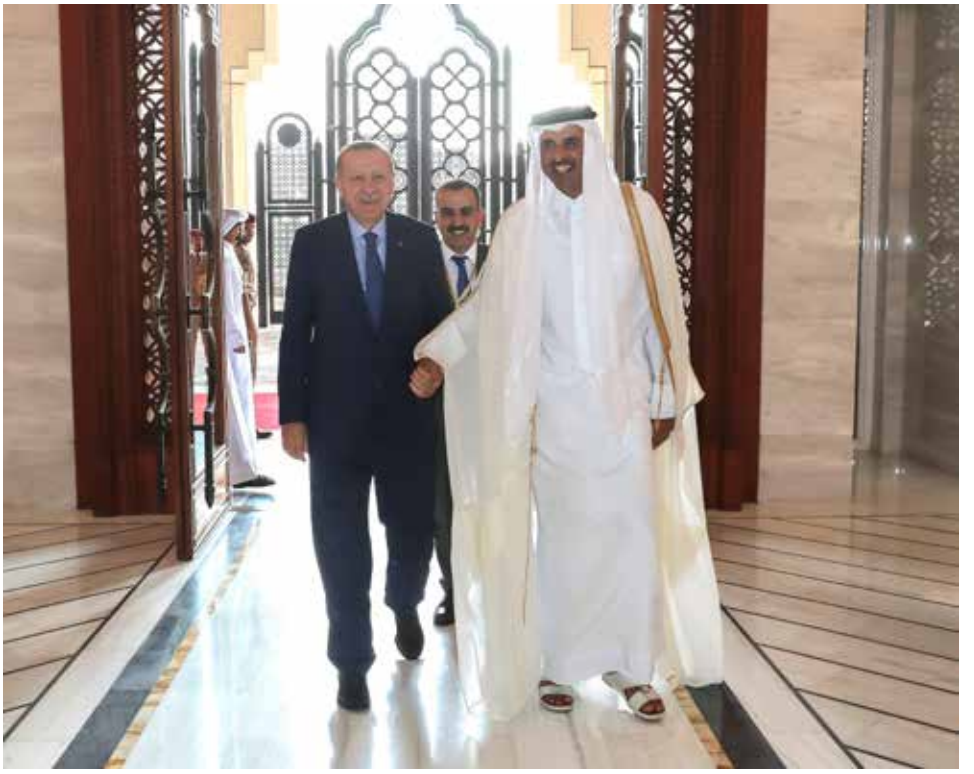
Turkey & Qatar Foul-Weather Friends!

by İbrahim SÜNNETCİ

The Republic of Turkey has constantly sought out good relations with the Arab world and has paid great attention to not intervening in Arab affairs. However, this reservist attitude toward the Arab world started to change in the 1980s during which time Turkey had started to consider the Arab world as a lucrative market for Turkish made products and foreign capital under the then Prime Minister of Turgut ÖZAL's leadership. Turkey's relations with the Arab world gained significant momentum when the Justice and Development Party (AKP) came to power in Ankara in November 2002. The AKP has viewed the Arabs as natural allies. Believing that stronger ties between Turkey and the Arab world could solve most of the problems in the region, Recep Tayyip ERDOĞAN, Turkey's President and the Chairman of the ruling Justice and Development Party, have made tremendous efforts during last 18 years to improve and expand both economic and political relations between Turkey and the Arab world.



During the first decade of the 2000s, as an active partner of the Arab states, Turkey developed economic, political and defense related relations with the Gulf Cooperation Council (GCC/an alliance of six Gulf monarchies; Saudi Arabia, Kuwait, Qatar, United Arab Emirates, Bahrain, and Oman that had signed a defense pact to consider an attack on one of them as an attack on all). Turkey's institutional relations with the GCC commenced with the "Framework Agreement for Economic Cooperation between Turkey and the Cooperation Council for the Arab States of the Gulf (GCC)" signed on May 30, 2005 in Manama, Bahrain. Thanks to the high level of economic and political relations on September 2, 2008 Turkey became a strategic partner of the GCC with the signing of a Memorandum of Understanding (MoU) establishing a Strategic Dialogue Mechanism between Turkey and the GCC in Jeddah, Saudi Arabia. With this MoU Turkey became the first non-Gulf state able to attain the status of GCC's strategic partner. Trade volume between Turkey and the GCC have grown from US$$1.5 Billion in 1999 to US$16 Billion in 2014. Turkish Government has previously declared a target of US$100 Billion trade with GCC countries by 2023.

However, Turkey's relations with the GCC began to deteriorate rapidly soon after the July 2013 military coup in Egypt against Mohamed MORSI, the leader of the Muslim Brotherhood who had been elected President of Egypt. While Saudi Arabia, and the UAE, asserted that the Muslim Brotherhood was a recruiting vehicle for Sunni terrorist groups in the region, Turkey and Qatar claimed that it was a moderate political Islamist movement that could foster regional stability through participation in the legitimate political process, so they provided region-wide support to the Muslim Brotherhood. Turkey also insisted that MORSI should be returned to power. So as a result of differences over the Muslim Brotherhood issue and the new military government of Egypt, Turkey's relations with the GCC was strained and tensions led the to the creation of Saudis-Emiratis and Turkish-Qataris blocks.

Due to political dispute

over the Muslim Brotherhood and other issues the differences between Saudis-Emiratis and Turkish-Qataris blocks widened and by accusing Qatar of supporting "terrorism", Saudi Arabia, the UAE, and Bahrain withdrew their ambassadors from Doha in March 2014. In November 2014, the UAE, Bahrain, and Saudi Arabia made the decision to return their ambassadors to Doha, Qatar after an agreement was reached to resolve an 8 month-long dispute between the GCC states. In response to Saudi Arabia, Bahrain, the UAE and Egypt's threats, Qatar chose Turkey as an ally and allowed the country to open a military base in its territories. On December 19, 2014, the two countries inked a military cooperation agreement that allows the deployment of the Turkish Armed Forces (TAF) in the State of Qatar. The agreement was ratified by the Turkish Parliament (TBMM) on March 19, 2015 and the first group of Turkish troops arrived in the capital city of Doha on October 4, 2015. As a result of these developments and diplomatic tensions Turkey's economic ties with GCC countries have suffered a setback.

Impact of the Gulf Crisis and Turkey-Qatar Relations

Though the history of bilateral relations between the State of Qatar and the Republic of Turkey go back 1972, it is a fact that their relations have gained significant momentum after the Gulf Crisis, during which time Turkey stood firmly with the State of Qatar.

The differences between Qatar and other member states of the GCC erupted again following the May 20-22, 2017, visit of US President Donald TRUMP to Saudi Arabia, during which he expressed substantial support for Saudi leaders. And on June 5, 2017 the Gulf Crisis broke out when a handful of Arab states led by Saudi Arabia (the de facto leader of the GCC) abruptly severed diplomatic relations with the State of Qatar, expelled Qatar's diplomats, recalled their ambassadors, and imposed a blockade on the country, despite Qatar being a fellow member of the GCC. It is clear that the Gulf Crisis revealed the fragility of the GCC and created a negative impact on existing diplomatic, economic and military relations between Turkey and the GCC.

The Gulf Crisis also shed light on the emerging defense relations between Turkey and Qatar and proved to Qatar how valuable its relationship with Turkey was. Turkey helped its ally to cope with the Saudi-led blockade and prevented a military escalation of the crisis, as both Riyadh and the UAE reportedly had plans to invade Qatar. On June 22, 2017, the Saudi-led group presented Qatar with 13 demands, including severing relations with the Muslim Brotherhood, scaling back relations with Iran, closure of Turkey's permanent military base in Qatar, termination of military cooperation with Turkey inside Qatar, and paying reparations for its actions.

However, the State of Qatar refused to meet these demands and agreed with Turkey to increase the size of the Turkish military contingent in the country and to expand the Qatar-Turkey Combined Joint Force Command in Doha with naval and aerial components. On June 7, 2017 the Turkish Parliament (TBMM) ratified two deals on deploying troops in Qatar and training its gendarmerie forces. As part of the expansion plan construction of a new base near the Tariq Bin Ziyad military barracks was launched and completed in August 2019. Turkey also increased food exports to Qatar to replace those previously provided by Saudi Arabia. Qatar, as a small peninsular Gulf state, has struggled to maintain food supplies because of the imposed embargo on the country. According to reports soon after the imposition of the blockade, Turkey dispatched airlift (on June 22, 2017 the then Economy Minister Nihat ZEYBEKÇİ disclosed that 105 cargo planes from Turkey carried aid to Qatar) and naval expeditions and supplied Doha with approximately thousands of tons of food supplies. The sea route had been opened because air transport was insufficient to meet the needs of the population of the State of Qatar.

Turkey-Qatar Economic and Trade Relations

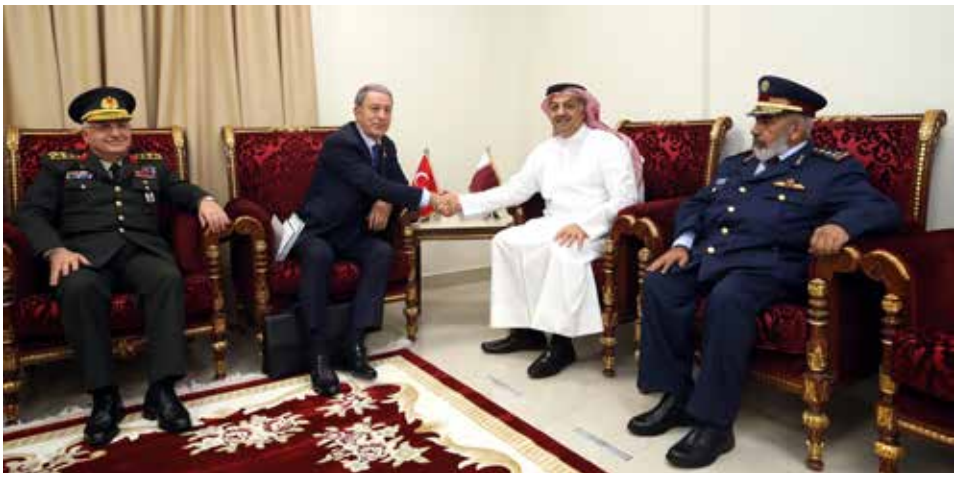
Economic relations between Turkey and Qatar witnessed substantial development in the 21st century. In line with Turkey's deepening relations with Qatar, Turkey has become an important destination for Qatari tourists. The volume of Qatari capital investments in Turkey increasing steadily during last two decades. In the 2000s, the total trade volume between the two countries was just US$38 Million. By 2014, this figure had increased to US$739 Million and by the end of 2018, trade volume between the two countries increased by 57%, compared to 2017, and reached a level of US$1.4 Billion. According to Qatar Minister of Commerce and Industry Ali Bin Ahmed Al-KUWARI, the level of trade exchange between the two countries, which doubled by 78.8% to reach about QR 8.7 Billion in 2018, compared to QR 4.8 Billion in 2017, while Qatari exports to Turkey recorded growth of about 99% between 2017 and 2018, and Qatari imports from Turkey grew by about 64.9% during the same period. Qatar ranks first among the Gulf countries in terms of the number of projects undertaken by Turkish contractors.

Speaking to media in January 2020 Deputy Minister of Foreign Affairs of Turkey, Yavuz Selim KIRAN disclosed that standing at US$6.4 Billion Qatar's foreign direct investment in Turkey between 2005 and 2019 represents the 1.2% of Turkey's cumulative foreign direct investment. Deputy Minister KIRAN also stressed that as of 2019

there were 170 companies with Qatar capital operating in Turkey. "Qatar is the 7th country where Turkish Contracting Industry companies undertake the most projects abroad. The total value of projects undertaken by Turkish companies in Qatar has reached US$18.3 Billion (many of them related to the 2022 FIFA World Cup soccer tournament). With the project price of US$1.2 Billion received in 2019, Qatar became the 2nd country with the highest number of jobs after Russia, with a share of 6.6%. Qatar expects to see many more Turkish companies setting up production facilities in Doha.

Speaking at the Qatari-Turkish Economic Forum held in November 2019 in Ankara, Qatar Minister of Commerce and Industry Al-KUWARI underlined that Turkish companies operating in Qatar play an important role in supporting the national economy, where more than 499 Qatari-Turkish joint ventures operate in the fields of trade, contracting and information technology, while the number of companies wholly owned by the Turkish side is 37, which are leading companies working in the fields of construction, and industry.

The volume of exports from Turkey to the State of Qatar has also been increasing steadily since 2002. According to Turkish Exporters' Assembly (TIM) figures, in 2019 Turkish exports to the State of Qatar rose to US$1.101 Billion from US$1.018,265 Billion (representing an 8.11% increase) in 2018. The volume of Turkey's exports to Qatar was US$15 Million in 2002.



Military Cooperation Between Qatar & Turkey

The State of Qatar and Turkey currently maintain strong military ties. Several military cooperation agreements have been signed between the two countries during last decade, and Turkey steadily increase its military equipment exports to the State of Qatar. Turkey's military involvement in Doha dates back to December 2014, when Head of the State of Qatar Tamim Bin Hamad Al-THANI paid an official visit to Turkey. During the visit on December 19, 2014 the two countries signed a comprehensive military cooperation agreement that allows for the deployment of the Turkish Armed Forces (TAF) in the State of Qatar and agreed to set up a bilateral cooperation and consultation group called the Turkey-Qatar High Strategic Committee, headed by the Qatari emir and Turkish President.

Since then the Committee has convened five times – in December 2015, December 2016, November 2017, November 2018, and November 2019 sometimes in Qatar and sometimes in Turkey – to sign framework agreements and memorandums of understanding in different spheres, including the military sphere, with the aim of deepening the collaboration and strengthening the ties between the countries. At the fourth meeting of the High Strategic Committee, held in Istanbul on November 26, 2018 and attended by the Turkish president and Qatari emir, the two countries signed, inter alia, memorandums of understanding on cooperation in the cyber field and the exchange of military delegations, alongside agreements on culture, economy, and trade. The Committee's fifth meeting was held in Doha on November 25, 2019 under the co-chairmanship of the Amir Sheikh Tamim Bin Hamad Al-THANI and Turkish President Recep Tayyip ERDOĞAN and witnessed the signature of 7 agreements in various fields including economy, urbanization, trade, industry, technology, and standardization to boost bilateral relations.

Under an agreement signed on December 19, 2014 Turkey set up its first permanent military base at Tariq Bin Ziyad military barracks. The establishment of Turkey's first permanent military base, which was named the Qatar-Turkey Combined Joint Force Command in December 2017, in Doha at Tariq Bin Ziyad military barracks, was completed in April 2016. Construction of Turkey's second permanent base near the Tariq Bin Ziyad military barracks was completed in August 2019. The Qatar-Turkey Combined Joined Force Command's new Headquarters was officially opened with a ceremony held on December 14, 2019 with the participation of Turkish Minister of National Defense (MoND) Hulusi AKAR, Chief of Turkish General Staff (TGS) General Yaşar GÜLER and Qatar Deputy Prime Minister and Minister of State for Defense Affairs Dr. Khalid Bin Mohamed Al-ATTIYAH. The new base was named after Khalid Bin Walid. The inauguration of the second Turkish permanent military base in Qatar further

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fortified the bilateral military and defense cooperation between the two nations. The new military base in Doha also reflects Turkey's increasing involvement in the security of the State of Qatar and the Gulf region in general. However, Turkey's increasing military presence in the region has created considerable discomfort among Qatar's neighbors.

Since the eruption of Gulf Crisis in June 2017, cooperation between the Turkish and Qatari militaries has notably intensified through a number of high-level visits, joint training and war games. On June 19, 2017 Turkey-Qatar joint military exercise was carried out at the Tariq Bin Ziyad military barracks. On July 31, 2017, Turkish Gabya Class frigate TCG Gökova, carrying 214 sailors, arrived in Hamad Port for two days of naval exercises with the Qatari Navy. Conducted during August 1-8, 2017 as part of military cooperation agreements between Turkey and Qatar the joint naval exercise, codenamed "Iron Shield" included combat maritime maneuvers. In March 2018, Turkish forces participated in the Qatari Army's "Lion's Den Exercise"; in April 2018 forces from both countries participated the "Sahin 20" joint military exercise in the Gulf; in December 2018 they held the "Al-Khandaq" joint exercise in Turkey, and in February 2019 the Qatari forces participated in the Winter-2019 Exercise, an annual exercise held in the city of Kars in northeastern Turkey. In late April 2019 Qatar's Border Guard held a joint exercise with the Turkish forces in Qatar. Furthermore, in the same month the Turkish Air Force (TurAF) participated in the "FALCON-21 Exercise" with the Qatari Air Force. In June 2019, the Qatari Air Force participated in the 15-day Anatolian Eagle Exercise in Turkey. On March 8, 2020 the Turkish Ministry of National Defense announced that the Qatar-Turkey Joint Military Exercise "Invincible Sentry 2020 (Al-Hares Al-Mane 2020)" hosted by Qatar has been kicked off with the participation of Turkish troops. According to a MoND announcement Turkey participates in the Exercise with two Commando Teams from the Qatar-Turkey Combined Joint Force Command, one Special Forces Team from Turkish Special Forces Command and one SAT (Underwater Offence) Team personnel from Turkish Naval Forces Command. Turkish troops also participate in the "Impregnable Guard 2020" military drill, which is organized by the Qatari Joint Special Forces in partnership with the Ministry of Interior, the Internal Security Force (Lekhwiya), and the Amiri Guard. The "Impregnable Guard 2020" exercise commenced on March 8th and run through March 27, 2020 along with Jordan, Morocco, Pakistan, the Sultanate of Oman and the US. The drill aims to prepare and train the participants to respond to any cross-border security threat.

In order to strengthen the existing cooperation and collaboration between the two-Armed Forces, frequent meetings took place over the years between the Defense Ministers and the Chiefs-of-Staff of the two countries since beginning of the Gulf Crisis. For instance, on November 4, 2017, Qatar Defense Minister Khalid Al-ATTIYAH met with his Turkish counterpart at the time, Nurettin CANİKLİ, to discuss strengthening of military and defense cooperation between the countries as well as the situation in the Gulf. On March 25, 2019 the Chief of Staff of Qatar Armed Forces Lieutenant General (Pilot) Ghanem Bin Shaheen Al-GHANIM met with the Chief of TGS General Yaşar GÜLER in Ankara, Turkey. During the meeting a number of issues of mutual interest were discussed, including means of enhancing and developing bilateral relations and cooperation in defense and military fields. General Al-GHANIM also met Turkish MoND Hulusi AKAR in the presence of General GÜLER and Qatari Ambassador to Turkey, Salem Bin Mubarak Al-SHAFI. During his stay in Ankara, Al-GHANIM also paid a visit to Commander of the Turkish Special Forces. In May 2019, Qatar Defense Minister Al-ATTIYAH met in Qatar with his Turkish counterpart Hulusi AKAR, and the two met again in August 2019, this time in Turkey. In September 2019 Qatari Defense Minister Al-ATTIYAH and the Chief of Staff of Qatar Armed Forces Lt. Gen. (Pilot) Al-GHANIM met with the Chief of TGS General Yaşar GÜLER to discuss the military relationship between Turkey and Qatar. On November 6, 2019 at the Turkish Ministry of Defense the Chief of Staff of Qatar Armed Forces Lt. Gen. (Pilot) Al-GHANIM met separately with Turkish MoND AKAR and Chief of TGS General GÜLER. During the meetings, they discussed aspects of joint military co-operation between the two sides. On November 29, 2019 the Chief of Staff of Qatar Armed Forces Lt. Gen. Al-GHANIM met with the Commander of Turkish Special Forces, Major General Ömer Ertuğrul ERBAKAN, and his accompanying delegation in Doha, Qatar. The meeting discussed military topics of mutual interest. On December 13, 2019 accompanied by Chief of TGS General GÜLER, Turkish MoND AKAR visited Qatar. During the visit he met with the Libyan Government head to discuss the recent maritime deal between Turkey and Libya. He also attended the inauguration ceremony of the Qatar-Turkey Combined Joined Force Command's new Headquarters in Doha. On December 23, 2019 a Qatari Navy delegation paid a visit to Turkish Naval Forces Command's Yıldızlar Surface Training Center Command to get firsthand information on the Fire and Damage Control Training Simulator and the Bridge Combat Information Center Simulator Systems. On February 4, 2020 the Chief of Staff of Qatar Armed Forces Lt. Gen. Al-GHANIM met with Commander of the Turkish Naval Forces (TNFC) Admiral Adnan ÖZBAL in Doha, Qatar. During the meeting, they reviewed the military relations between the two countries and means of enhancing and developing

Chief of TGS General GÜLER and the Chief of Staff of Qatar Armed Forces Lieutenant General (Pilot) Al-GHANIM met at TGS Headquarters in Ankara on Februrary 19, 2020

them. A number of senior officers of the Armed Forces also attended the meeting. On February 13, 2020 Commander of the Qatari Emiri Navy Major-General (Navy) Abdullah Bin Hassan Al-SULAITI received Commander of the TNFC Admiral Adnan ÖZBAL.

On February 19, 2020 the second Qatari-Turkish High-Level Military Dialogue Meeting concluded in Ankara. The delegation of the State of Qatar to the meeting was chaired by the Chief of Staff of Qatar Armed Forces Lt. Gen. Al-GHANIM, while the Turkish side was chaired by Chief of TGS General GÜLER according to reports the meeting discussed a number of issues related to the military cooperation between the two countries and ways of promoting and enhancing them. On the sidelines of the meeting, Lt. Gen. Al-GHANIM also met with Turkish MoND AKAR. During the meeting, the two sides are said to have reviewed a number of issues related to military cooperation between the two brotherly countries and means of developing them.

Turkish Defense & Aerospace Industry Export Figures

Starting in 2010 in an effort to increase defense cooperation with Islamic countries, Turkey turned its attention to the Middle East and North Africa (MENA) to export fast intervention boats, rockets/missiles, ammunition and armored vehicles. During recent years, leading Turkish companies such as Anadolu Shipyard, Aselsan, ARES Shipyard, Baykar Makina, BMC, FNSS, Havelsan, Meteksan Defense, Nurol Makina Sanayi (NMS), Otokar, Roketsan, TUSAS, TEI, Vestel Savunma and Yonca-Onuk JV have been quite active particularly in the Middle East and Gulf countries. Acting as partners not suppliers towards the Middle East and Gulf countries, Turkish defense sector companies have dramatically increased their exports and have started to sign high-value export contracts, thanks to the proactive foreign policy, aggressive marketing efforts and state-of-the-art, NATO-standard compliant and cost-effective products.

Emerging as a new arms exporter that can provide more efficient, low cost, combat proven, and less problematic products for arms buyers, the Turkish Defense & Aerospace Industry has managed to put 5 firms (Aselsan [52nd], TUSAŞ [69th], STM [85th], BMC [85th] and Roketsan [89th]) on the list of the world's 100 largest defense companies in 2019. According to export figures revealed by the Defense and Aerospace Exporters' Association (SSI) and the Turkish Exporters' Assembly (TIM), the Turkish Defense and Aerospace Sector has increased exports by 34.6% during 2019 compared to 2018. According to figures Turkey has realized US$2,741 Billion worth of defense and aerospace exports to 164 countries around the globe in 2019. According to data released by TIM, the total weight of products exported by the Turkish Defense & Aerospace Industry during January 1st – December 31st of 2019 was around 44,315 tons. The annual turnover of the Turkish Defense & Aerospace Industry also rose to US$9 Billion in 2019. The exports of Turkish Defense and Aerospace Industry are expected to exceed US$3 Billion by the end of 2020.

According to data collected by the Stockholm International Peace Research Institute (SIPRI), during 2015-2019 with a share of 0.8% Turkey ranked 14th on the list of the 25 largest major arms exporters of the world. Turkey was the 25th largest exporter in 2011. Turkey notably increased its arms exports (specifically armored vehicles and naval vessels/boats) to the Middle East and Gulf countries, which are among the major markets for Turkish Defense & Aerospace Sector sales, during 2013 - 2019 and this trend is expected to last also in 2020. According to TIM's figures during January 1st – December 31st of 2019, the Turkish Defense & Aerospace Industry has exported around US$710,145 Million (which was at around US$311,187 Million in 2018 and US$131,52 Million in 2017) worth of military equipment to the Middle East and Gulf countries. According to TIM's data as of December 31st, 2019 the list of the top 15 countries that imported defense and aerospace products from Turkey is composed of; the US (US$816,623 Million), Oman (US$ 297,199 Million), Germany (US$256,868 Million), Qatar (US$186,168 Million), UAE (US$132,229 Million), Ukraine (US$119,237 Million), Azerbaijan (US$88,676 Million), the Netherlands (US$75,125 Million), the

UK (US$60,604 Million), Bahrain (US$40,813 Million), India (US$40,630 Million), Pakistan (US$40,175 Million), Poland (US$33,675 Million), France (US$31,884 Million) and Italy (US$24,720 Million).

According to TIM figures, the total arms exports carried out by the Turkish Defense & Aerospace Industry soared by 5% during the first two months of 2020 and reached US$348,697 Million. With a total of US$62,187 Million in purchases the Middle East countries took a 17.8% share in Turkey's arms exports during January 1 – February 29, 2020.

Exporting its defense products to 164 countries around the world Turkey is targeting to become a top six country in the world in terms of defense and aerospace exports. On December 4, 2019 the Presidency of Defense Industries (SSB), the procurement authority under the Turkish Presidency, issued the "Strategic Plan 2019-2023," document, which states that the Turkish Defense and Aerospace Sector's annual turnover will rise to US$26,9 Billion in 2023, from US$8,761 Billion in 2018. According to the "Strategic Plan 2019-2023," document Turkey plans to boost its defense and aerospace (both military and commercial) exports to US$10.2 Billion by 2023, from US$2,188 Billion in 2018 and by 2023, the local content rate in defense and aerospace projects will reach to 75% up from 65% in 2018, according to the plan.

Turkish Defense & Aerospace Industry Exports to Qatar

Apart from close political and personal ties between Qatari and Turkish leadership, the defense sector has been one of the key areas to bolster cooperation and partnership between these two brotherly countries. Despite a strong presence in Qatar by the US and France, Turkey also plays an active role in Qatar's private and defense sectors. Qatar is interested in diversifying its defense and security procurement and has appreciated Turkey's approach for joint production, research and development, and easy technology transfer. Qatar has started to sign large-scale contracts with Turkish suppliers for the procurement of state-of-the-art, NATO-standard compliant and cost-effective defense and aerospace equipment for the Qatar Armed Forces.

The first formal agreement between the Turkish MoND and the Qatar Ministry of Defense for the procurement of defense and aerospace equipment from Turkey was signed during the IDEF '11 Fair. The Memorandum of Understanding (MoU) formed in May 2011 covered the direct procurement of US$120 Million worth of military equipment in the span of a year from Turkish companies. Under this agreement the Kale/Baykar partnership was awarded a contract in 2011 for the supply of 10 x Bayraktar GÖZCÜ Mini UAV Systems (each has 4 air vehicles) valued at US$2,5 Million. The acceptance tests of GÖZCÜ Mini UAVs were completed in February 2012 in Qatar. These Mini UAVs, which are Turkey's first exported Unmanned Air Vehicles, were manufactured in accordance with Qatar's desert climate. Having an operational range of 15-25 km, the GÖZCÜ Mini UAV is capable of reaching a maximum of 12,000 feet. Within the scope of the MoU valued at US$120 Million, Qatar also placed an order for 3 x MRTP 34 and 3 x MRTP 16 Fast Intervention Boats to Yonca-Onuk JV Shipyard (with a disclosed value of Euro52 Million) and for an AW139 Helicopter Simulator Training Center to Havelsan with a value of around US$50 Million. Under the MoU Qatar also procured an undisclosed number of vehicle-based RF Jammer systems from Turkish firm Atel Telecommunication in 2012. As part of the MoU, a free SSB Office, acting as liaison offices, arranging contracts between local authorities and Turkish companies was allocated within the Qatari Emiri Navy Command's premises in Doha.

Turkey's arms sales to Qatar increased steadily during 2014 – 2019. According to export figures revealed by TIM and SSI, Qatar is also progressing on the list of the top 15 countries that import defense and aerospace products from Turkey. While it was the 8th largest importer/recipient of the Turkish Defense and Aerospace industry products in 2014, Qatar ranked 4th both in 2018 and in 2019. According to data collected by TIM, Qatar imported US$52,783 Million worth of military equipment from Turkey in 2014, US$10,375 Million in 2015, US$52,277 Million in 2016, US$24,484 Million in 2017 (ranked 12th in the list), US$83,455 Million (this represents a 240.85% increase compared to 2017) in 2018 and US$186,168 Million (represents a 123.08% increase compared to 2018) in 2019. According to SSI data as of 2019, 15 Turkish Defense and Aerospace Sector companies have been exporting its products to Qatar. According to reports since the Gulf Crises, that erupted in June 2017, Qatar has spent more than US$25 Billion on military procurements and according to TIM's data the total value of Turkish defense exports to Qatar realized during 2017-2019 merely amounted to US$295 Million. Turkey aspires to have a bigger share in Qatar's defense and security procurements in the coming years.

Speaking at Aselsan Union of Forces Summit held on February 5, 2019 at ATO Congresium Center in Ankara, Turkey, Turkish MoND Hulusi AKAR, disclosed that Turkey has recently signed a contract with Qatar for the sale of FIRTINA Self Propelled Howitzers (SPHs). MoND AKAR did not share any figure about the number of FIRTINA

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The New Generation FIRTINA-II SPH was displayed at MoND's Booth at IDEF'19

SPHs to be delivered to Qatar Armed Forces. It is believed that the contract covers New Generation FIRTINA (also dubbed FIRTINA-II) SPHs, which are under production at 1st Main Maintenance Factory Directorate located in the Sakarya province of northwest Turkey. On December 14, 2018 Aselsan secured a contract valued at US$194,6 Million to deliver Fire Control Systems for the 140 FIRTINA-II SPHs ordered for the Turkish Land Forces Command.

With a Presidential Decree (Decree No: 481) signed by President ERDOĞAN on December 10, 2018 and issued in the Official Gazette on December 21, 2018 as part of the ALTAY MBT Serial Production Project the 1st Main Maintenance Factory Directorate, Turkey's top Main Battle Tank maintenance and modernization factory was transferred to BMC, a joint Turkish-Qatari venture that manufactures armored vehicles. The Qatari Government owns 49.9% of BMC. Under the deal, which represents another landmark in Turkish-Qatari defense cooperation, BMC will make an initial investment of US$40 to US$50 Million to modernize the MBT assembly and production unit. BMC plans to convert the military factory into a mass production unit for the ALTAY MBT, Turkey's first indigenous, new-generation MBT. The plant will be under lease to BMC for a period of 25 years, according to the deal. However, the Turkish Government's decision to privatize and lease of the 1st Main Maintenance Factory Directorate operated under the MoND-controlled General Directorate of Military Factories (AFGM) to the private company BMC drew strong criticism in Turkish public opinion and in the end it was decided to transfer the 1st Main Maintenance Factory Directorate to ASFAT Inc. According to Turkish media the transfer procedure took place during the second half of 2019. It is stated that ASFAT, which undertook the transfer, either directly rented the factory to BMC or let BMC to run it within certain conditions, periods, and restrictions. Since its purchase by Turkish and Qatari (Barzan Holdings) partners for US$360 Million following a tender held in an early 2014, BMC has been working as part of the strategic partnership between Turkey and Qatar.

In October 2018 it was reported that after receiving assurance that there would be no export restrictions, state-owned Machines and Chemical Industries Board (MKEK) signed a contract to procure 20 powerpacks (including 5TDFMA-1 engines) from UkrOboronProm (Ukrainian Government's Defense Industry Enterprise) for the FIRTINA-II SPHs. These 20 powerpacks were supposed to be installed in the Qatari Emiri Land Force's FIRTINA-II SPHs. However, according to recent reports Turkey find a new European engine provider for FIRTINA-II SPHs and series production would start soon during the first half of 2020.

Activities of Turkish Defense and Aerospace Industry Companies in Qatar

In order to strengthen the existing cooperation and collaboration in the defense industry between Turkey and the Middle East and Gulf countries MUSIAD (Independent Industrialists' Businessmen's Organization) and the SSB decided to organize country specific exhibitions in selected countries. In this context the Turkish Defense & Aerospace Sector's first event aimed at one specific country, High-Tech Port by MUSIAD Qatar, a high level, advanced and strategic technology exhibition, was organized during October 6-8th, 2015 in Doha under the auspices of Turkish President Recep Tayyip ERDOĞAN and the Head of State of Qatar Sheikh Tamim Bin Hamad Al-THANI. 67 Turkish and Qatari companies showcased their latest innovations in the defense industry at the High-Tech Port by MUSIAD Qatar.

In order to create awareness in the Middle East and Gulf countries of the Turkish Defense and Aerospace Industry capabilities, the Presidency for Defense Industries (SSB) has been supporting national participation in defense exhibitions in this region. In this context, Turkey participates in important defense and aerospace exhibitions organized

in the Middle East and Gulf region such as IDEX/ NAVDEX (UAE), DIMDEX (Qatar), SOFEX (Jordan) and Bahrain International Air Show (BIAS) and key players from the Turkish defense sector are brought together in a national pavilion.

Offering great export opportunities for the Turkish Defense and Aerospace Industry products, Turkey has been participating in the DIMDEX Exhibition, which has been held every two years since 2008, at a "National Level" with the support and coordination of the SSB since 2010. Turkey has been steadily expanding its participation and stand area at the Doha International Maritime Defense Exhibition and Conference (DIMDEX) reaching 33 companies occupying 2,413 square meters of the fairground in 2018. Turkey attended DIMDEX 2016 with 24 firms and 1,295 square meters of the fairground under the coordination of the SSB. At DIMDEX 2018, which was held during 12-14 March 2018, Turkey's leading defense & aerospace companies won contracts worth US$800 Million, of which around US$500 Million went to Turkish private shipyards. Meanwhile in March 2018 it was revealed that Qatar signed an agreement with Turkey to build a training center for Qatar's marine special forces. Under the contract awarded within the scope of DIMDEX 2018, Turkish firm MDS Defense Technologies and Construction Inc. would establish "BUROQ Special Marine Operations" Training in the Zekreet Zone. The contract was signed by the Commander of the Joint Special Forces, Major General Hamad Bin Abdullah Al-Fetais AL-MARRI, MDS Chairman İlyas AYVACI and Board Member İzzet ÖZGÜMÜŞ. With new training center the training needs of 200 military personnel would be met seamlessly and completely. It was to be established on approximately 130 acres of land. The aim of the new Naval Special Forces Training Center is to train elite units such as SAS (Underwater Defense) and SAT (Underwater Offence). The new Naval Special Forces Training Center will house various buildings and equipment such as an administration building, a 50-meter indoor shooting range and simulation center, a multipurpose training center and a parachute training area, a training area for urbanized terrain, a bomb training area, a cargo ship prepared for anti-terror and fire training, a pentathlon training area, a port for zodiac boats, a 200-person sleeping quarters for soldiers, a 50-person sleeping quarters for officers, a dining hall, and weapons and ammunition warehouses. Meanwhile during DIMDEX 2018, Piri Reis University, a maritime institution, also signed an agreement to establish an academy for the Qatari Emiri Navy.

DIMDEX 2018

The 7th edition of DIMDEX Exhibition was scheduled to be held during March 16-18, 2020 in Doha, however on March 3, the organizing committee announced that after consulting with public health officials and the Government of the State of Qatar regarding the status of the event, it was decided upon to cancel the event due to spreading corona virus. "Though the risk to the general public in Qatar remains low, our primary concern remains the health and welfare of all residents and visitors to Qatar and for this reason the event will no longer be held," as stated in the press release issued by the organizing committee.

Anadolu Shipyard

During DIMDEX 2018 the Qatari Emiri Navy placed an order for two Cadet Training Ships (CTS) to Turkish private shipbuilder Anadolu Shipyard. According to Anadolu Shipyard, the 90-meter vessels will displace 1,950 tons and will feature a helipad for a medium-size helicopter. The vessels, which will have the capacity to provide training for up to 72 naval cadets and are scheduled to be delivered in 36 months, are also set to be capable of performing offshore patrol duties.

Aselsan

Established in 1975 as a communication electronics company, Aselsan has grown into the largest defense electronics company in Turkey, one of the 100 largest defense companies (52nd in 2019) in the world. Aselsan already completed the delivery of three 12.7mm STAMP and three 30mm STOP/MUHAFIZ Remote Controlled Stabilized Naval Weapon Systems to the Qatari Emiri Navy and they were integrated on Yonca-Onuk JV's MRTP16 and MRTP34 Class Fast Intervention Boats. Aselsan also delivered a further six 12.7mm STAMP Systems to Qatar and they were integrated on six MRTP20 boats ordered during DIMDEX 2016. During the DIMDEX 2018 Exhibition, Yonca-Onuk JV secured a contract from the Qatari Emiri Navy to deliver four MRTP24/U Special Operation Craft (SOCs) and four MRTP24/U Fast Missile Craft (FACs). Construction of the MRTP24/U SOCs, which would be the Qatari version of the Turkish Navy's new SAT Boat design, started in 2019. The MRTP24/U SOCs will be armed with one of Aselsan's 12.7mm STAMP Remote Controlled Stabilized Naval Weapon System. Whereas the MRTP24/U FACs will be fitted with a pair of STAMP Remote Controlled Stabilized Naval Weapon Systems as well as Aselsan's remotely controlled BORA Low Altitude/Short Range Naval Air Defense System to be armed with MBDA's Mistral missile. At the end of 2018, MBDA successfully demonstrated the use of the Mistral missile against fast boats such as FIACs (Fast Inshore Attack Craft).

Aselsan's IGLA SAM Launcher System Mounted NMS YÖRÜK 4x4 was inw National Day Parade in Qatar, Doha

Aselsan's 12.7mm STAMP and 30mm STOP/MUHAFIZ Systems are also being integrated on a total of 26 HERCULES Fast Patrol Boats (11 x 24m ARES 80, 10 x 34,5m ARES 110 and 5 x 48,5m ARES 150) ordered in March 2014 and March 2018 by the Qatari Coasts and Borders Security Department from ARES Shipyard. An agreement regarding the procurement of 12.7mm STAMP and 30mm STOP/MUHAFIZ Remote Controlled Weapon Systems for the needs of the Qatar Coast Guard Command was signed between Aselsan and ARES Shipyard on December 28, 2016. Under the €20 Million contract awarded in January 2018 for the first batch of 17 boats covered the deliveries of 29 x 12.7mm STAMP and 12 x 30mm STOP/MUHAFIZ Remote Controlled Weapon Systems. Having established an office (Aselsan-Qatar Project Office) in Doha, Qatar Aselsan also exported an undisclosed number of STAMP-2 and SARP RCWSs to Qatar and some of the SARP RCWSs were already integrated on Renault VAB 4x4 Wheeled Armored Vehicles in Qatar Armed Forces service. The Qatar Armed Forces also utilize the DargonEye Integrated Electro-Optic (EO) Sensor System of Aselsan. It incorporates basically: Thermal Imaging Sensor, Laser Range Finder, Color Day Camera, GPS and DMC. According to the Aselsan 2019 Activity Report, the company completed delivery of around 200 DragonEye EO Sensor Systems to Qatar and Turkish Armed Forces in 2019.

On June 8, 2018 Aselsan secured a contract valued around US$150 Million from Nurol Makina to deliver an undisclosed number of SARP RCWSs (including SARP-Dual and SARP-ZAFER), SERDAR Anti-Tank Missile Launching Systems and IGLA SAM Launcher Systems to equip Qatar Emiri Special Forces' NMS/YORUK 4x4 Wheeled Armored Vehicles (WAVs). Deliveries will take place in 2020.

Meanwhile under a contract awarded by the Qatar MoD on October 11, 2017 Aselsan completed the delivery of the Integrated Mobile Border Security System to the Qatar Armed Forces on March 12, 2018. The System includes a tactical vehicle based on Mercedes Benz fitted with the ACAR Land Surveillance Radar, ARYA E/O Sensor Systems, SECANS Security Management Software and İŞBİR's Tactical Silent Cabinet Generator system. Also at DIMDEX 2018, Aselsan signed a technology transfer deal with Qatari military technology firm Barzan Holdings (which owns 49% of BMC), covering the establishment of a joint venture 'BARQ' (Arabic for "lightning") in Qatar for the local production of Aselsan's stabilized remote weapon systems and electro-optical reconnaissance and surveillance systems for the Qatar Armed Forces.

ARES Shipyard

Following tough competition with 18 international shipyards ARES Shipyard secured a US$55 Million contract on March 26, 2014, to deliver a total of 17 HERCULES Fast Patrol Boats from advanced composites in three configurations (five 24m ARES 80, 10 34.5m ARES 110 and two 48.5m ARES 150) to the Qatari Coasts and Borders Security Department. Deliveries started in October 2016 and ARES Shipyard managed to complete the delivery of the boats in late 2018 (20 months before the date specified in the contract). In December 2017, the handover ceremony for the ARES 150 HERCULES (QC901) Offshore Patrol Vessel, which is 48.5m meters in length and the ARES 110 HERCULES (QC812) Fast Patrol Boat (FPB), which is 34.5 meters in length, was held with the participation of officials from the Qatari Coasts and Borders Security Department and the Ministry of Interior in Antalya.

During DIMDEX 2018, ARES Shipyard received a follow-on contract to deliver three 48.5m ARES 150 Offshore Patrol Vessels and six 24m ARES 80 Special Operation Boats, to be armed with Aselsan's 12.7mm STAMP and 30mm STOP/MUHAFIZ Remote Controlled Stabilized Naval Weapon Systems. With this order while the total number of ARES Shipyard boats to enter the Qatari Coasts and Borders Security Department by the end of 2020 has been increased to 26 and the total value of company's business volume in Qatar has reached US$500 Million. ARES Shipyard also conducted negotiations with the Qatari Emiri Navy for the sale of two 27m long (+2 options) boats with an aluminum body. Within the scope of the contract, the boat personnel would be trained in Qatar, and the Qatari Emiri Navy will receive maintenance support for 6 years. ARES Shipyard also secured a contract from a Qatar state tourism company for the construction of 18 (8+10) ARES 17 CF luxury passenger ferries. The first two boats were delivered in April 2014 and deliveries of the first batch of 8 ferries were completed in January 2015.


© Baykar Makina

Baykar Makina

As pointed out above Baykar Makina entered the Qatar market in March 2012 with the delivery of 10 x Bayraktar GÖZCÜ Mini UAV Systems (each has 4 air vehicles) that were ordered in 2011 under a US$2.5 Million contract. During DIMDEX 2018, Baykar Makina secured a contract for the delivery of three BAYRAKTAR TB2-S Armed UAV Systems with six aircraft, FLIR payloads, three Ground Control Stations and a UAV Training Simulator to the Qatari Emiri Air Force Reconnaissance and Surveillance Centre Command, within a one-year schedule. Having entered Qatar Emiri Air Force service during the first half of 2019, the BAYRAKTAR TB2-S Armed UAVs are armed with Roketsan's MAM-L and MAM-C smart munitions. Under the contract Baykar Makina also set up a UAV Operation Center and network-based data tracing and archiving software for the Qatari Emiri Air Force. Baykar Makina provided a 4-month long training activity in Edirne, Turkey to 55 Qatari Emiri Air Force personnel including UAV Pilot, Payload (probably CMX-15) Operator and Maintenance crew, who operate and fly BAYRAKTAR TB2-S Armed UAVs. The company also provides 2-year logistic support to the Qatari Emiri Air Force for the operation of BAYRAKTAR TB2-S Armed UAVs.

BMC

BMC, a Turkish-Qatari joint venture that manufactures armored vehicles, previously delivered 40 KIRPI MRAPS equipped with a Dodaam RCWS to Qatar. During Doha International Maritime Defense Exhibition and Conference (DIMDEX 2018), which was held at the Qatar National Convention Center in Qatar's capital Doha on March 12-14, 2018, BMC secured a new contract to deliver 50 KIRPI-II MRAPs and 35 AMAZON 4x4 Multipurpose WAVs to Qatar. Deliveries of the vehicles that were fitted with Aselsan's SARP RCWS were completed in 2018.

On March 12, 2019 Vice Chairman of the Justice and Development Party (AKP) Ali İhsan YAVUZ disclosed that in accordance with the agreement Qatar will buy up to 100 ALTAY MBTs from Turkey and 40 of them would be delivered to the Gulf country in the first phase. However, Defense Turkey spoke to a BMC official during the IDEF '19 Fair and the official disclosed that there was no formal contract for the purchase at that time.

Havelsan

The cockpit view of Havelsan's AW136 Full Flight Simulator

In December 2012 Havelsan secured a contract valued around US$49 Million for the establishment of an AW139 Helicopter Simulator Training Center in Qatar for the Qatari Emiri Air Force. Under the contract Havelsan designed, developed and delivered one AW139 Full Mission Simulator (FMS), one Flight and Navigation Procedures Trainer, one Cabin Crew Trainer Simulator, a Debriefing System and a Tactical Control Center for AW139 Helicopters. The all-weather AW139 FMS provides high-resolution satellite imagery of Qatar's 11,000km2 land and medium-resolution imagery for the entire Gulf area (100,000km2). In addition to this AW139 Simulator Training Center (TCC), operated by Havelsan, also included were Computer Based Training Classes, Debriefing Rooms and Infrastructure Facilities. As part of the AW139 Simulator Training Center Project, which aimed to meet the training requirements of the Qatari Emiri Air Force AW139 Helicopter pilots, the first delivery took place in June 2015. The TCC was among the first product delivered to Qatar by Havelsan. It was followed by the Flight and Navigation Procedures Trainer and the Cabin Crew Trainer Simulator. Production and Factory Acceptance Tests (FAT) of the AW139 FMS had already been completed in 2015 but since the construction of the AW139 Simulator Training Center was not completed at that time it was decided upon to provide training service to the Qatari Emiri Air Force AW139 Helicopter pilots at Havelsan facilities with the AW139 FMS. Chief of Staff of Qatar Armed Forces Lt. Gen. Al-GHANIM paid a visit to Havelsan facilities in August 2016 and performed a flight in thee AW139 FMS. During his visit Lt. Gen. Al-GHANIM also met and talked with Qatari Emir Air Force pilots and trainers who had received Simulator Orientation Training at Havelsan facilities. 50 pilots from the Qatari Emiri Air Force were trained at Havelsan facilities for a total of 600 flight hours. Havelsan shipped the 47-ton AW139 FMS (manufactured with a local content rate of 70%) to Qatar on December 22, 2016. The official inauguration ceremony for the AW139 Helicopter Simulator Training Center took place on November 5, 2017. The Site Acceptance Tests (SATs) of the AW139 Simulator Training Center were completed in mid-2018. According to Havelsan, at least a thousand pilots can be trained with the AW139 Helicopter Simulator Training Center annually.

Considering Qatar as one of its strategic partners, Havelsan opened its first Middle East office in Doha, Qatar in August 2017. On August 21, 2017 Havelsan secured a contract from the Qatar MoD for the establishment of a Joint Warfare Training Center, which would serve all units of the Qatar Armed Forces and would be able to provide C4I services. In the Joint Warfare Training Center (JWTC), under development by Havelsan, wargame, Computer Assisted Exercise (CAX), planning and simulation-based procurement activities shall be carried out. The Joint Warfare and Training Center (JWTC) consists of the following software and systems: Havelsan ETE3 Software (H.ETE3), Havelsan Social Media Simulation Software (H.SMS), a Television Studio and Newspaper Printing Center, a Data Center, a Simulation Software and Joint Operations Center. Computer assisted exercise and war-game systems serve to improve the capabilities of command staff and headquarters in a cost-effective manner. Systems and software that allow the commander, headquarters and leader personnel to imagine and decide on any situation they may encounter during a real operation, enable planning and execution of maneuver, fire support, air defense, command-control etc. processes in battlefield function areas under realistic conditions. The JWTC, a force multiplier at the strategic level for the Armed Forces, is planned to be completed and put into service within the year 2020.

In 2019 Havelsan established a new company in Qatar, named 'Havelsan Qatar'. In 2019 Havelsan signed a contract to establish a Data Center for the Qatar Armed Forces. The high-tech Qatar Data Center Project that includes end-to-end engineering,

procurement, installation and commissioning of the Qatar Armed Forces Data Center in Doha/Qatar, will strengthen the company's presence in Qatar. In June 2019 Havelsan also signed a cooperation agreement with Jaidah Group, one of the leading international companies of Qatar in the fields of energy, telecommunication, automotive and security, cyber security solutions. With the agreement signed in Doha, the Qatar-based Jaidah Group will benefit from Havelsan's experience in cyber security and will improve its cyber security capabilities by taking advantage of Havelsan's products and solutions. Within the scope of the agreement, Havelsan will establish a Cyber Security Center for the Jaidah Group in Qatar and will make its cyber security platform available to Jaidah Group. Under the agreement Havelsan will cooperate with Qatar universities for the localization of Havelsan's solutions. In line with the agreement Havelsan will transfer its technologies in the field of cyber security to Jaidah Group. Qatar has been a victim of cyber security breaches in the past and has thus worked to strengthen its cyberspace and relating data. In May of 2017, for example, Qatar News Agency suffered a major security breach. This breach published false articles and released private emails to the public and caused diplomatic tensions and an economic embargo between Qatar and other GCC countries.

MRTP 20

Nurol Makina

In 2017 Nurol Makina (NMS) secured a contract from Qatar for the delivery of 342 EJDER YALÇIN 4x4 tactical wheeled armored vehicles (WAVs). Nurol Makina started its EJDER JALÇIN deliveries during the second half of 2017 and in December 2017, Qatar displayed for the first time it's EJDER YALÇIN 4x4 WAVs at the Qatar National Day Parade in Doha. The displayed vehicle was fitted with Aselsan's SARP-Dual RCWs. At the National Day Parade in December 2017 Qatar also revealed the two prototypes of NMS 4x4 WAVs that were equipped with Aselsan's SERDAR Anti-Tank Missile Launching Systems and IGLA SAM Launcher Systems. During DIMDEX 2018, Nurol Makina signed a Memorandum of Understanding (MOU) regarding the purchase of 214 NMS 4x4 Wheeled Light Armored Vehicles with Barzan Holdings. The MoU was signed by Major General Hamad Bin Abdullah Al-FETAIS Al-MARRI, Commander of the Qatari Joint Special Forces; Dr. Anıl KAREL, Deputy General Manager of Nurol Makina; and Mohammed Jaber LABDA, Programs Director of Barzan Holdings, at a ceremony held on the second day of the Exhibition. The NMS 4x4x Wheeled Light Armored Vehicles of the Qatar Emiri Special Forces were fitted with Aselsan's SARP RCWSs, SERDAR Anti-Tank Missile Launching Systems and IGLA SAM Launcher Systems. Nurol Makina started series production of NMS 4x4 WAVs in June 2018.

Roketsan

Roketsan delivered an unspecified amount of MAM-L and MAM-C smart micro munitions to Qatar for use on BAYRAKTAR TB2-S Armed UAVs.

Yonca-Onuk Shipyard

During the DIMDEX 2018 Exhibition, Yonca-Onuk secured a contract from the Qatari Emiri Navy to deliver four MRTP24/U Special Operation Craft (SOCs) and four MRTP24/U Fast Missile Craft (FACs). The construction of MRTP24/U SOCs, which would be the Qatari version of Turkish Navy's new SAT Boat design, started in 2019. The MRTP24/U SOCs are being armed with one Aselsan's 12.7mm STAMP Remote Controlled Stabilized Naval Weapon System. Whereas the MRTP24/U FACs will be fitted with a pair of STAMP Remote Controlled Stabilized Naval Weapon Systems as well as Aselsan's remotely controlled BORA Low Altitude/Short Range Naval Air Defense System to be armed with MBDA's Mistral missile. At the end of 2018, MBDA successfully demonstrated the use of the Mistral missile against fast boats such as FIACs (Fast Inshore Attack Craft).

Yonca-Onuk JV Shipyard had previously delivered three MRTP16 Class, three MRTP34 Class (Qatar was the first customer for this class) and 4 MRTP20 Class Fast Intervention Boats (FIBs, ordered in 2015 under a US$44 Million contract) to the Qatar Emiri Naval Forces. Meanwhile construction and delivery phase for the additional six MRTP20 FIBs that were ordered during DIMDEX 2016 under a €41 Million contract was completed in 2019. The boats were armed with Aselsan's 12.7mm STAMP and 30mm STOP/MUHAFIZ Remote Controlled Stabilized Naval Weapon Systems

F-4 phantom II

FLIGHT ROUTE IN TURKEY AND WORLD

by Cem DOĞUT

Phantom's story began in 1952 when David S. Lewis was appointed as the preliminary design manager of McDonnell Douglas (MDD). With the team he established, he started working on the new aircraft model requested by the U.S. Navy. The aircraft would be a supersonic fighter jet. MDD started the "Super Demon" project based on the existing F3H Demon model. MDD's rivals the Grumman XF9F-9 and the Vought XF8U-1 Crusader were already meeting the supersonic fighter requirements. In response, they started to work on the more advanced YAH-1 project in 1954. The planned design criteria were a single-seat fighter/bomber that could operate in any weather conditions (all-weather). The project was launched with these needs, but on May 29, 1955, new requirements were sent to the company by the Navy. Everything had changed suddenly. Now, the Navy wanted a tandem-seat fighter jet that could fly CAP (Combat Air Patrol) missions at 300 miles for 2 hours with the capability to detect and engage hostile aircraft at extended ranges.

The YAH-1 project was later revised. A second crewman was added to operate the radar, the internally mounted cannon was removed, the fuselage was modified to carry four semi-active homing missiles, and the General Electric J79-GE-8 engine was selected to power the aircraft. The J79 was also used on the McDonnell Douglas F-101 Voodoo aircraft, and as in Voodoo, the engines sat low in the fuselage to maximize internal fuel capacity and ingested air through fixed geometry intakes. With all these changes, the first XF4H-1 prototype was finished and became ready for new trials. On July 25, 1955, the Navy ordered two XF4H-1 test aircraft and five YF4H-1 pre-production examples. The first test aircraft made its maiden flight on May 27, 1958, with test pilot Robert C. Little at the controls. The plane was officially named Phantom II on July 3, 1959, at the 20th anniversary of the factory to honor FH-1 Phantom, the first jet aircraft produced by McDonnell Douglas. The F4H-1 first entered service in 1960 with the U.S. Navy. In the meantime, the United States Air Force also requested a new plane. Secretary of Defense Robert McNamara wanted the same aircraft to be used in all aviation branches (Air Force, Navy, Marines) of the military. The Navy wanted the Phantom as an interceptor, while the Air Force wanted it for its fighter-bomber missions. The new Phantoms produced for the Navy are considered more successful than the Convair F-106 aircraft used by the Air Force and was selected by the USAF as well. The plane was initially designated F4H (later F-4A) by the United States

Navy, while the original designation by the USAF was the F-110A Spectre (later F-4C). The F-4 designation came about in 1962 when the designation systems for all branches of the U.S. military were unified by order of U.S. Defense Secretary Robert McNamara. The first Air Force F-4C Phantom flew on May 27, 1963, exceeding Mach 2 on its maiden flight.

The first Phantom model used by the Navy in real terms was the F-4B. In 1961 both the Navy and Marine Corps began to add F-4Bs to their inventories. The aircraft is equipped with J79-GE-8 axial-flow turbojet engines, AN/APQ-72 radar, AAA-4 infrared search & track (IRST) system, and AN/AJB-3 bombing computer. A total of 649 F-4Bs were produced. In the following years, this model began to be replaced with the F-4J, and between 1966 and 1972, 552 F-4J aircraft were delivered in total. The 288 F-4B aircraft were upgraded to the F-4N standard.

The F-4B Phantom II aircraft went to Vietnam on August 5, 1964, to conduct bomber escort missions. On April 9, 1965, the Phantom II won its first air victory. During the war, U.S. Navy F-4 Phantom squadrons participated in 84 combat tours with F-4Bs, F-4Js, and F-4Ns. The Navy claimed 40 air-to-air victories at the cost of 73 Phantoms lost in combat (7 to enemy aircraft, 13 to SAMs, and 53 to AAA). In 1987 the last Phantoms were retired from deployable USN squadrons. Phantoms continued to serve as target drones (QF-4) at the Naval Air Warfare Center until their subsequent retirement in 2004.

The Air Force F-4Cs arrived in Vietnam in December 1964. On July 10, 1965, F-4Cs of the 45th Tactical Fighter Squadron scored the USAF's first victories against North Vietnamese MiG-17s using AIM-9 Sidewinder air-to-air missiles. In 1962, the U.S. Air Force wanted to replace its RF-101 reconnaissance aircraft and started the RF-4C development program. The prototypes were concerted from the existing F-4C airframes, and the production aircraft made its initial flight in May 1964. The nose section was redesigned and extended by 33 inches, and the AN/APQ-116 terrain-following radar (TFR) was installed on the aircraft. For photography, the plane was equipped with a KS-87 forward oblique camera, two KS-87 side-looking cameras, and a KS-56 panoramic camera pointing straight down. The aircraft's sensor suite was also upgraded with the AN/APQ-102 side-looking radar and the AN/AAS-18A infrared reconnaissance system for easier navigation in adverse weather conditions and night missions. In 1971, the RF-4E was produced by combining the RF-4C nose and the F-4E airframe for the German Air Force. The RF-4E was the unarmed export version offered to allied air forces. It was designed strictly for export and never served with the USAF.

The F-4D model was put into service in 1967. Although the F-4C was virtually identical to the Navy/Marine Corps F-4B in performance, the F-4Ds were explicitly tailored for the needs of the USAF. The D models were later upgraded using the experience gained in Vietnam. They were integrated with a new optical sight and lead-computing gunsight. The aircraft could carry 20mm SUU-16/A and SUU-23/A external gun pods. Also, they started to use laser-guided munition for the first time with the AN/AVQ-10 Pave Knife targeting pod.

In the late 50s and early 60s, the U.S. Air Force thought that the era of close-range dog fights with aircraft guns was over. This because the USAF believed that newly introduced radars and air-to-air missiles would replace the cannons, and the hostile aircraft would be engaged at 10-15 miles without getting closer to the enemy. Phantom II was built on this theory. Unfortunately, this theory soon found to be a mistake, and USAF learned the hard way in the Vietnam War. The relatively new heat-seeking and radar-guided missiles at the time were frequently reported as unreliable, so the cannon was still needed for close engagements. To overcome this problem, USAF F-4Cs began carrying external gun pods; however, the desired hit rate could not be achieved as the aircraft was not equipped with lead-computing gunsights. The lack of a cannon was addressed by adding an internally mounted 20 mm M61A1 Vulcan on the F-4E using the extended nose section of the RF-4C. The combined weight of the gun and ammunition shifted the center of gravity of the plane forward. To fix this, a seventh fuel cell was added to the rear, the radar was replaced with the new AN/APQ-120, and the existing J79-GE-8 engines were replaced with the more powerful J79-GE-17 engines (each can generate 17900 lbs. of thrust) to compensate the increased weight. Also, F-4E Block 48 models were fitted with leading-edge slats to increase the aircraft maneuverability. The United States Air Force retired the F-4s from active duty in 1996, and just like the Navy continued to use the planes as target drones until January 1, 2017.

International F/RF-4 Phantom II Users


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Germany

In the 1960s, the F-104G Starfighter became the standard aircraft of NATO and Luftwaffe (German Air Force). By the early 70s, the F-104G was struggling to meet the needs of users. Luftwaffe wanted a high performance, reliable and fast aircraft that could fly in any weather condition. Due to the high losses with the F-104Gs, they sought for a twin-engine plane. Germany first ordered 88 RF-4Es in 1969 and then ordered another 175 F-4F Phantom II on June 24, 1971. Under this agreement, Messerschmitt-Bölkow-Blohm (MBB) would manufacture parts for F-4Fs, and MTU would produce 448 J79-GE/MTU-17A engines. Although the F-4Fs produced specifically for Luftwaffe were a version of the F-4E, there were some significant differences between them. These changes include the replacement of the internal fuel cell number 7 with an APU (Auxiliary Power Unit) for the hydraulic pressure system, the non-slotted version of the horizontal stabilizer, and APQ-120 [V5] radar which did not support AIM-7 Sparrow missiles.

In the early 90s, Germany decided to modernize 113 F-4Fs and launched the ICE (Improved Combat Efficiency) program. Under the ICE program, Hughes AN/APG-65Y digital multi-mode radar, AIM-120 AMRAAM missile firing capability, Honeywell H-423 laser gyro inertial navigation system (INS), the GEC Avionics CPU-143/A digital central air data computer, and MFD (Multi-Function Display) screens were added to the aircraft. Germany retired her F-4Fs in 2013.

Australia

In the 1960s, McDonnell Douglas offered a special F-4C model for the Royal Australian Air Force (RAAF). Instead of the General Electric (GE) J79 engine, F-4C would be powered by the French SNECMA Atar 9 turbojet engine. The Atar 9 was also the engine of the Dassault Mirage III planes used by the RAAF at the time. The Royal Australian Air Force (RAAF) did not accept this offer and instead decided to buy General Dynamics F-111C. Because of the problems and delays encountered in the development process of the variable-sweep wing F-111C aircraft, in May 1970, it became evident that the delivery of the first plane could not be completed before 1974. Therefore the Royal Australian Air Force agreed to lease F-4E from the United States Air Force (USAF) to replace the age Canberra B.20 bombers in the RAAF fleet until the F-111C was received.24 aircraft produced for USAF were leased to RAAF for two years at a total cost of $US41,554 million under the "Peace Reef" program which was signed on June 22, 1970. All 24 aircraft were delivered to Australia between September and October.

In 1972, the delivery of the F-111Cs started earlier than expected. Therefore, the F-4Es were sent back to the US gradually, and the last RAAF F-4E returned to the USAF on June 21, 1973. During the three-year service of the planes, only a single aircraft was lost due to an accident. Phantom A69-7203 crashed on June 16, 1971, during a night bombing sortie on the Evans Head range. Twenty-one of the returned planes were converted to F-4G and used for the Suppression of Enemy Air Defences (SEAD) missions.

South Korea

The Republic of Korea Air Force purchased 18 secondhand F-4Ds in 1968 under the Peace Spectator program and acquired a total of 92 F-4Ds in the following period. The ROKAF also ordered 37 new-built F-4Es and started receiving these aircraft in 1978. They received 23 RF-4Cs from the USAF in 1990. The RF-4Cs are officially retired, and a small number of F-4Es are still active.

United Kingdom

In July 1964, the Royal Navy ordered two F-4K (FG.1) prototypes for use on aircraft carriers. They decided to install Royce Spey turbofan engines, which are powerful than the J79, on the prototypes developed based on the F-4J model. These provided extra thrust for operation from smaller British aircraft carriers. Compared to the J97 turbojets, Spey engines would reduce fuel consumption and increase take-off performance. The introduction of new engines into the Phantom required significant structural changes. The air intake area was increased by twenty percent, and the aft fuselage under the engines had to be redesigned. Since these changes caused more drag, they could not provide the expected increase in performance. Besides the

Navy, the Royal Air Force (RAF) also asked for the Phantom. They initially wanted to buy the F-4C, but the government disagreed and decided to buy the F-4M (FGR.2), the Spey-powered version of the F-4C. A total of 170 (52 K and 118 M) Phantoms were acquired. The need for new aircraft emerged after the Falkland war, and consequently, 15 F-4Js were purchased from the US Navy in 1984. The United Kingdom officially retired the Phantoms in October 1992 and replaced them with Panavia Tornadoes.

Iran

Iran received 32 F-4D, 177 F-4E, and 16 RF-4E between 1968 and 1979. On February 28, 1979, the United States imposed sanctions on Iran after the Islamic revolution and the exile of Reza Shah Pahlavi, the Shah of Iran. As a result of the arms embargo, the Imperial Iranian Air Force (IIAF) could not receive 31 F-4E and 11 RF-4E. Phantoms played an active role in the Iran - Iraq war that started on September 22, 1980. Although few, the Islamic Republic of Iran Air Force continues to use the F/RF-4s actively despite the embargo.

Israel

Israel is the largest foreign operator of Phantom with the 240 F-4E and RF-4E it bought between 1969 and 1976. Israel declared its intention to buy Phantom for the first time in 1965, but the United States did not accept this request. However, as a result of Israel's losses after the Six-day war in 1967, the arms embargo imposed by France and Soviet arms sales to Arab countries changed the opinion of the U.S. government. Under the "Peace Echo I" program, Israel purchased 44 F-4E and 6 RF-4E aircraft in September 1969. In the War of Attrition that took place between Egypt and Israel between 1969 and 1971, the Israeli Air Force (IAF) used the Phantoms for the first time during its attack on the Egyptian air defence units located west of the Suez Canal on October 22, 1969. The Israeli F-4Es scored their first air victory on November 11, 1969, by downing an Egyptian Mig-21. The F-4E Phantoms, which are relatively weaker when compared to the Israeli F-15, F-16, and the other aircraft used by the Air Forces of the Arab states, were upgraded in 1987 under the Kurnass 2000 modernization project. Phantoms refitted to Kurnass 2000 standard underwent many changes, including new radar, HUD (Head-Up Display), mission computer, MFD (Multi-Function Display), HOTAS (hands-on-throttle-and-stick), radio, avionics, and structural strengthening. Israeli Phantoms saw extensive combat during Arab–Israeli conflicts. Between 1969-1982, Israeli F-4Es shot down 116 hostile aircraft in these battles, whereas 55 Phantoms were lost to the enemy fire. The last Israeli F-4s were retired in 2004.

IDFAF's 201st Squadron F-4E Kurnass 2000

Spain

The Spanish Air Force acquired 36 ex-USAF F-4C Phantoms between October 1971 and September 1972 under the "Peace Alfa" program. Later, Spain purchased 4 F-4C and 4 RF-4C under the "Peace Alfa II" program in 1978 and an additional 8 RF-4C in 1989. In 1995, Spain received another 6 RF-4Cs to replace the first RF-4Cs. The last Spanish Phantoms were retired in 2002.

Japan

From 1968, the Japan Air Self-Defence Force (JASDF) imported 14 unarmed reconnaissance RF-4E and purchased a total of 140 F-4EJ

RF-4EJ's that had been modernized by KAI project, were the part of the 501st Tactical Reconnaissance Squadron in JASDF

Phantoms without aerial refueling, AGM-12 Bullpup missile system, AN/AJB-7 bombing system, nuclear control system or ground attack capabilities. The first two F-4EJs were produced by McDonnell Douglas, while the remaining 138 aircraft were manufactured under license in Japan by Mitsubishi Heavy Industries. These are the only Phantoms built outside the United States. One of the planes (17-8440) was the very last of the 5,195 F-4 Phantoms manufactured in the world. Mitsubishi delivered it on May 20, 1981. In the late 80s, 110 out of 125 aircraft in service were planned to be modernized, but this number was later reduced to 96 because of budget constraints. Under the "Kai" modernization program AN-APG-66J pulse-doppler radar, new mission computer, Kaiser Heads-Up Display, AN/APZ-79 IFF, LN-39 INS and J/APR-6 RWR systems were installed on the F-4EJ aircraft. 11 RF-4Es were included in this program and upgraded to the RF-4E Kai standard and equipped with new AN/APQ-172 radar, J/APR-5 RWR, and LN-39 INS. 17 F-4EJs were converted into reconnaissance aircraft and designated as RF-4EJ after receiving a similar upgrade. RF-4EJs can carry LOROP (Long Range Oblique Photography - KS-146B camera), TAC (Tactical Camera Pod - KS-135A, and KS-95B cameras or D-500UR IR camera) and TACER (Tactical Electronic Reconnaissance - ELINT) under-fuselage pods for reconnaissance missions.

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RF-4E was the part of 348th Tactical Reconnaissance Squadron in the Hellenic Air Force

Japan will retire its Phantoms this year and replaced them with F-35A Lightning II.

Egypt

Egypt started to receive economic aid from the US after the Camp David agreement signed with Israel in 1978. Before the agreement, the Egyptian Air Force (EAF) was using Russian aircraft. In 1979, the Egyptian Air Force purchased 35 former USAF F-4Es from the United States as part of the "Peace Pharaoh" program. In exchange for the Phantoms, the US decided to buy some Mig-21 and Mig-23 aircraft from Egypt to give a chance to examine these planes firsthand. Egypt began receiving the aircraft in September 1979; however, as the Egyptian Air Force used to fly Russian planes, they had a hard time keeping the Phantoms ready for combat missions. Egypt even thought to sell these planes to Turkey in 1982. Later, with the new training programs and the support of the US, the number of active aircraft increased in 1985. By 2020, all the EAF Phantoms are retired.

Greece

The Hellenic Air Force ordered 121 F/RF-4E Phantoms in total with deliveries starting in March 1974. In 1997, Greece upgraded a total of 39 F-4E aircraft under the "Peace Icarus 2000" (29 Peace Icarus I and 10 Peace Icarus II) modernization program. As part of the modernization, AN APG-65 radar, GEC-Marconi HUD, GPS/INS, and MFDs were installed on the aircraft. The modernized planes were later designated as F-4E AUP (Avionics Upgrade Program). The Hellenic Air Force officially retired the RF-4E Phantoms on May 5, 2017, while around 20 F-4E AUPs are still active.


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TÜRKSAT
T.C. ULAŞTIRMA VE ALTYAPI BAKANLIĞI
TÜRKSAT 3A
TÜRKSAT 4A
TÜRKSAT 4B
TÜRKSAT 5A
TÜRKSAT 5B
TÜRKSAT 6A
Operasyonel durumdaki uydularımız Türksat 3A, Türksat 4A ve Türksat 4B'nin yanı sıra yapımı devam eden Türksat 5A, Türksat 5B ve Milli Haberleşme Uydumuz Türksat 6A'nın devreye alınmasıyla birlikte ülkemiz, 2022 yılında 6 uydudan oluşan bir filoya sahip olacak.
Türkiye uzayda daha güçlü.

F/RF-4E phantom II
IN THE TURKISH AIR FORCE

The needs of the Turkish Air Force Command (TurAF) were mostly met by the United States Military Assistance Program (MAP) under the Marshall Plan, which started in 1948. When Turkey became a member of the North Atlantic Treaty Organization (NATO) in 1952, large amounts of aircraft were acquired with the help of other NATO countries, primarily the United States (USA). By the 1960s, the striking power of the Turkish Air Force was formed by the F-84 Thunderstreak and F-100 Super Saber aircraft, which were acquired through the assistance program. In addition to these, TurAF was also operating a small number of F-5 Freedom Fighter and F-104 Starfighter aircraft. Due to the problems that started in Cyprus in 1960 and the crisis that escalated with Greece after the intervention on the island in 1964, the need for a new multi-role fighter plane emerged in the early 1970s.

111th Squadron

The acquisition of 36 F-4E Phantom II by Greece under the Peace Icarus Project in 1971, highlighted the necessity of meeting the modern and powerful aircraft need of the Turkish Air Force. Contract negotiations with the USA started in February 1972 and were completed in a short time, and the Peace Diamond project was launched within the same year. A total of 40 F-4E Phantom II aircraft were ordered, and the project was financed from the national budget. Within the scope of the order, the necessary supply, spare parts, and facility support needs of the Eskişehir and Erhaç/Malatya Jet Air Bases, as well as the personnel selection and training programs, were also planned.

With the arrival of two F-4E Phantom II (73-1016 and 73-1017) aircraft to the 1st Main Jet Base Command with US pilots on August 30, 1974, the Phantom page was officially opened in the history of Turkish aviation, and the incoming Phantoms entered service with the 113th "Tayfun" ("Typhoon") Squadron, established the same year at Eskişehir. F-4Es were taken to the Turkish skies for the first time by Tayfun Squadron Commander Major Ergin Celasin and Captain Ziya Alemdar with the Phantom 73-1016 on September 2, 1974. Squadron personnel became combat-ready in mid-1975. With the introduction of F-4E Phantom IIs, the Weapon Systems Officer (WSO) class, which was not exist in the Turkish Air Force, was introduced and "Şimşek" ("Lightning") Air Wing, which was established under the Squadron in 1976, began the combat readiness training of the F-4E Phantom II weapon system officers. 8 F-4E Phantoms, delivered in 1974, were assigned to the 113th Squadron. Of the 32 planes that delivered in 1975, 12 were assigned to the 113th Squadron, and the remaining 20 were assigned to the 112th "Şeytan" ("Devil") Squadron. As part of the Peace Diamond II Project, 32 F-4E Phantom II and 8 RF-4E Phantom II aircraft were ordered in total. An interesting feature of the Peace Diamond II Project is that the 5000th serial production F-4E was delivered to the Turkish Air Force with the tail number 77-0290 within the scope of this project. The 172nd "Şahin" ("Falcon") Squadron and the 111th "Panter" ("Panther") Squadron were modernized with the aircraft that had been purchased since April 1978 under the Peace Diamond II Project. The 113th Squadron, the first F-4 Squadron established in 1974, disbanded on July 3, 1979. Instead, the 114th Squadron, which was established for the second time in 1977, was named as the 113th Squadron in 1979, and 8 RF-4E Phantom II planes, which were delivered under the Peace Diamon II between 1978-79, were assigned to the "new" 113th Squadron. The "Tayfun" call sign, which was used when flying with the F-4E in 1974, was changed to "Işık" ("Light") with the introduction of RF-4E aircraft to the Turkish Air Force.

With the delivery of F-4E Phantom II aircraft, modern munitions such as TV-guided AGM-65A/B Maverick air-to-ground missiles (AGM), AN/AVQ-23 Pave Spike laser targeting pods, laser-guided 500 and 2000 lb GBU-10/12 Paveway I/II and electro-optical guided 2000-pound GBU-8 HOBOS bombs were also entered to the TurAF inventory. In this way, the Turkish Air Force gained the precision strike capability against air-ground targets for the first time in its history. In addition to these modern munitions, medium-range semi-active radar homing AIM-7E Sparrow and short-range infrared heat-seeking AIM-9B/P Sidewinder missiles were started to be used for air-to-air missions. Furthermore, one of the

F-4E/2020 preparing for flight as part of a counterterrorism operation with four Mk-83 GP bombs

most effective electronic countermeasures (ECM) system, ALQ-119 pods were also introduced to increase the electronic warfare capability and protect the aircraft against radar-guided surface-to-air (SAM) missiles. Thanks to the APQ-120 radar, which is considered to be the advanced technology system of its time, the F4E Phantom II can carry out interceptions day and night, in all weather conditions. Thus, the 112th and 172nd Squadrons were assigned as an all-weather fighter-interceptor squadron with Sparrow and Sidewinder missiles.

As part of the Peace Diamond III Project, 15 F-4E Phantom II aircraft were supplied from the Aircraft Maintenance and Regeneration Center (AMARC) in the USA from July 1981 to April 1984. These planes, which were purchased under the Peace Diamond III project, were assigned to the 173rd Squadron after painted in Southeast Asia (SEA) camouflage.

Within the scope of the Peace Diamond IV Project, 15 ex-USAF F-4E aircraft were purchased between 1984 and 1985 to replace the losses of the four Phantom squadrons.

Within the scope of the Peace Diamond IV Project, 15 ex-USAF F-4E aircraft were purchased between 1984 and 1985 to replace the losses of the four Phantom squadrons. These planes were followed by 40 ex-USAF Aircraft F-4E Phantom II aircraft with Peace Diamond V Project in 1987. These aircraft were first modernized in the 131st "Ejder" ("Dragon") Squadron and later in the 132nd "Hançer" ("Dagger") Squadron at 3rd Main Jet Base Command in Konya.

In 1991, military aid was received from the USA and its allies as a result of the support given to Operation Desert Storm, launched by the US-led coalition to remove Iraq from Kuwait. In this context, as part of the Peace Diamond VI Project, 40 ex-U.S. Air National Guard Aircraft F-4E aircraft were received between 1991-1992.

Under the Kaan project, Turkey purchased a total of 46 ex-Luftwaffe RF-4E aircraft, which became surplus after the unification of East and West Germany in 1990 and the end of the Cold War. While 12 of the planes were purchased as spare parts, 34 RF-4Es were undergone an extensive upgrade by


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Messerschmitt-Bölkow-Blohm (MBB) before delivery. Within the scope of modernization, the aircraft's AN/APQ-99 radars were replaced with the AN/APG-172 radar system, which was also used in the USAF RF-4Cs that recently modernized by the US Air Force. The deliveries began in 1992 and were completed in 1994, and the planes were assigned to the 113th and 173rd Squadrons. In 1994, the Bora Air Wing was established in Eskişehir, and RF-4E training was started to transform the 173rd Squadron in Malatya into a reconnaissance role.

F-4E/2020 "Terminator" Modernization

Making its maiden flight in 1958, the Phantoms represents the technology of the 1960s. Thanks to their standard APQ-120 radar system, the Phantoms successfully carried out air-to-air missions until the mid-80s. However, by the 90s, the existing F-4E Phantom II aircraft in the Turkish Air Force inventory reached high values in terms of both airframe life and flight hour rates. Eventually, they have become outdated and could not respond to current needs and threats. Turkey had two alternatives to maintain its strong military position in the region and to increase its deterrence. In line with this need, Turkey would either replace the old Phantom aircraft with a new twin-engine fighter-bomber or upgrade some of the existing F-4E Phantom II aircraft with a comprehensive modernization project to increase their service life for at least 20 more years. Turkey favored the modernization option for economic reasons. Turkey's 30 years of experience in training, equipment, materials, repair, maintenance, and logistic support capability were also played a significant role in this decision.

German DASA and Israeli IAI companies submitted their proposals to the project, which was launched for the structural and avionics modernization of F-4E aircraft. The German offer included the replacement of the AN/APQ-120 fire control radar of the F-4E with the AN/APG-65 radar used in the F/A-18 Hornet, next-generation avionic displays, mission computer, flight control system, a new navigation system, and the capability to launch AIM-120 Advanced Medium-Range Air-to-Air Missiles (AMRAAM) with the MIL-STD-1553B data bus. On the other hand, the IAI solution based on the Kurnass 2000 developed for the Israeli Air Force included the replacement of the existing radar with ELTA product EL/M-2032 and the integration of AN/ALQ-178[V]3 electronic countermeasure system, MXF-484 VHF/UHF radio, HOTAS flight control system, heads-up display (HUD), integrated INS/GPS navigation system, airborne videotape


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recorder (AVTR), full-color multi-function displays (MFD), a new mission computer and MIL-STD-1553B data bus. Furthermore, the aircraft would gain the ability to ability to fire Popeye-I air-to-surface guided missiles (ASM) and carry ELTA EL/L-8225 electronic warfare pod.

The EL/M-2032 radar provided a cost advantage as well as a political advantage in technology transfer as there is no need to obtain permission from the USA. Turkey examined the technological and operational capabilities of the radar and stated that it is at least as successful as AN/APG-76 in terms of performance. Turkey accepted the IAI's offer and chose the ELTA product EL/M-2032 radar for the modernization of the Turkish Phantoms.

After evaluating the offers, Turkey reached an agreement with IAI and signed a contract worth US$632,5 million with the company in 1997. Within the scope of the project called Terminator, all wiring equipment of the planes to be modernized would be changed, and their airframes would be strengthened. According to the agreement, 26 of the 54 F-4E Phantom aircraft were to be modernized in Israel, and the remaining 28 were to be upgraded in the 1st Air Supply and Maintenance Center of the Turkish Air Force located in Eskişehir. According to the agreement, Israel would provide the necessary structural and avionic modernization kits for the 28 planes to be modernized in Turkey, train Turkish engineers for avionic integration, establish a System Integration Laboratory (SIL), and transfer this laboratory to Eskişehir. Thanks to this technology transfer provided by Israel within the scope of the project, the 1st Air Supply and Maintenance Center was planned to acquire the capability to carry out the desired structural and avionic changes on the aircraft by improving the technological infrastructure of the center. The first two F-4E/2020 (73-1032 and 68-0498) were delivered to the Turkish Air Force with a ceremony held on January 27, 2000. The two aircraft received were transferred to the 111th Squadron. The first F-4E/2020 was delivered to the 171st Squadron on December 21, 2001.

If we look at the post-modernization capabilities of the F-4E/2020 aircraft;

Produced by the Israeli ELTA company, the EL/M-2035 is an X band Pulse-Doppler multi-mode radar with SAR/GMTI (Synthetic Aperture Radar/Ground Target Moving Indicator) capability. Thanks to the SAR/GMTI function, the EL/M-2035 radar can display tanks, armored vehicles, howitzers, missile batteries, aircraft (on the ground), land-based radars, and other mobile-stationary or land-surface targets with a resolution close to photographic quality. The range and coordinates of the ground targets can be determined from the pictures collected with the SAR/GMTI mode.

It is possible to summarize the Mil-STD 1553 system as a computer program that enables the avionics and weapons systems on the aircraft to communicate with each other. Thanks to the system, which consists of both software and hardware, all modern weapons can be easily certified and integrated into the aircraft.

The Heads-up Display (HUD) is a system that shows the critical flight and tactical data of the aircraft at eye level by projecting it onto a

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transparent glass behind the front canopy. Thus, pilots can access this vital information without requiring looking away from their usual viewpoints and concentrate on flying the aircraft.

The hands-on throttle-and-stick (HOTAS) is the concept of placing buttons and switches on the throttle lever and flight control stick in an aircraft's cockpit, allowing pilots to access vital cockpit functions and fly the plane without having to remove their hands from the controls. The system gives the pilots the ability to manipulate all the essential radar functions without moving their hands away from the stick or throttle. Other features include weapon release, radio communications switch, chaff & flare countermeasure activation, speed brake controls, nose wheel steering, and aerial refueling disconnect.

RF-4E/TM Reconnaissance Aircraft, 173rd Squadron

A total of three Multi-function Displays (MFD) were added to the cockpit of the F-4E/2020 Terminators, one in the front seat and two in the rear seat. All the radar, navigation, equipment, and other flight information can be checked and, if necessary, changed from these displays. Sitting in the back, the Weapon Systems Officer (WSO) can control different systems such as radar and weapons from two displays on the rear seat instrument panel.

Thanks to the INS/GPS navigation system added to the aircraft, the Terminators can navigate from one point to another point precisely, and the absolute position of the plane can be determined. The system, in principle, calculates the latitude and longitude information very accurately and transmits its navigation coordinates to the flight control computer. Position data of the flight zone or the designated targets can be uploaded to the INS/GPS, which is calibrated and programmed on the ground before take-off. Therefore, pilots can locate their targets easily and engage with high precision.

Thanks to these Have-Quick compatible MXF-484 VHF/UHF band radios integrated into the aircraft, air-to-air and air-to-ground communication can be done without being jammed and intercepted. These radios use the NATO radio communication standard Have-Quick protocol to minimize jamming and interception risk. The antenna of these new radios is a large black

antenna placed on the aircraft fuselage. This antenna creates the most significant visual difference that distinguishes F-4E/2020 aircraft from other F-4Es.

Mikes ALQ-178[V]3 modules were selected for F-4E/2020 aircraft as the radar warning receiver (RWR), which is the standard equipment of every modern fighter jet. The same system was also chosen for the first package of the Turkish F-16 (Block 30/40) aircraft under the Peace Onyx I project. The EL/L-8225 jamming pods produced by Israeli ELTA were purchased as part of the project to provide active electronic countermeasure (ECM) solutions. Together with ELTA, Havelsan provides software control of the system. Passive protection systems integrated into F-4E/2020 aircraft include chaff and flare dispensers for deceiving hostile radar and infrared missiles.

The most significant improvement that increases the strike capability of the Terminators is that the F-4E/2020 aircraft can fire Popeye missiles. The Popeye is a solid-rocket powered stand-off missile weighing 1,360 kg (3,000 lb) with a 340 kg (750 lb) blast fragmentation or 360 kg (800 lb) I-800 penetrating warhead and imaging infrared or TV guidance. It has a reported range of 100 km, depending on its launch altitude. The missile can also be controlled directly through the data link.

"Işık (Light) Project" Turkey's first National Aircraft Modernization

F-4E/2020 modernization was followed by the "Işık (Light) Project." In line with the operational needs of the Turkish Air Force, the Işık (Light) Project, which was the first national aircraft modernization project of Turkey, was initiated to provide 18 RF-4E Phantom II aircraft with the ability and capability to navigate accurately in all weather conditions and to successfully conduct day and night reconnaissance missions under electronic warfare protection.

With the project, 7 RF-4E purchased from the US, and 11 RF-4E aircraft transferred from the German Air Force (Luftwaffe) were modernized. The RF-4E aircraft from the US and Germany had notable equipment and structural differences. The US origin RF-4Es had leading-edge slats like other F-4Es in TurAF inventory, while the Luftwaffe RF-4Es had leading-edge flaps and Boundary Layer Control (BLC). Other structural differences were that the US planes had rounded camera bays, while the German ones had angled camera bays. With the Prototype Phase that started on January 29, 2004, one US and one German RF-4E aircraft were modernized. The

111th and 112th Squadrons

first aircraft, which was upgraded under the Prototype Phase, made its first flight on December 19, 2008, and the second aircraft on January 19, 2009, and the test flights completed on April 16, 2009. The serial Production Phase, which started on August 31, 2007, and covered 16 aircraft, was completed in 2010.

Turkey's first national fighter aircraft modernization project, Işık (Light) Project, was accomplished by the main contractor 1st Air Supply and Maintenance Center (HİBM) Command with its technical/technological knowledge and infrastructure gained from the F-4E/2020 and F-5 2000 Modernization Projects which were also realized with the participation of the 1st HİBM Command. The command carried out various studies including design and final modernization configuration selection, installing and operating the system in a laboratory environment, prototype application on two aircraft, structural modernization, installation and analysis of the avionics, ground and flight tests, and serial modernization. The production of navigation, flight control, and communication equipment of aircraft and their integration using a digital data bus were carried out by Aselsan while MİKES performed the modernization of the Electronic Warfare system.

With the Işık (Light) Project, which was carried out entirely by Turkish engineers, technicians, and pilots, both flight and mission planning systems were made autonomous in RF-4E aircraft, and it was ensured that the planes could find their positions with high precision in all weather conditions.

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Phantom preparing flight with SUU-20 practice bomb dispenser

The aircraft is also equipped with a system capable of effective, uninterrupted, and secure communication thanks to the new generation digital remote communication systems that are resistant to electronic warfare.

To ensure that RF-4Es can operate safely without any structural failures until the 2020s, 16 critical parts on the aircraft were replaced/reinforced to extend the service life of the jets without disrupting the structural integrity of the planes.

As part of the avionics modernization process, the cockpits of the aircraft were redesigned, including the newly installed instruments and control panels. Moreover, the Avionic Relay Panel was redesigned and manufactured, front and rear seat instrument panels, pedestal panel,


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and left and right consoles were also redesigned. In this way, the cockpits of German and US origin aircraft were standardized. New wirings were also produced and installed for the updated avionic system. Within the scope of modernization, the CDU-900Z Control Display Unit, which is the primary interface between the pilot and Flight Control System and the Radar Warning Receiver (RWR) display of the AN/ALQ-173[V]3R passive electronic warfare system were installed to the front seat instrument panel. The CDU-900Z Control Display Unit acts as the center of the flight control system and the primary interface between pilots and the main avionics. RWR Interface Control Unit (ICU), Weapon Control Panel, Avionic Activation Panel (AAP), and Reconnaissance Panel were installed by redesigning the right and left consoles in the front cockpit. Located on the rear seat instrument panel, the RWR interface control unit its display instantaneously provides threat environment information in full color. CDU-900, AAP, and MILSEC-III crypto units were installed by redesigning the rear seat right and left consoles, and some modifications were made on existing panels. The LN-12 Inertial Navigation System (INS) on the RF-4E aircraft was replaced with the LN-100GT Embedded INS/GPS (EGI) system which reduces the nautical miles per hour position error-rate from 3.6nm to 0.8nm when INS is active, and to 10 meters when INS/GPS is used together providing the aircraft with a highly accurate navigation capability. The Pilot and the Weapon Systems Officer (WSO), receive and control the navigation information from the LN-100GT EGI system via the CDU-900Z Control Display Unit. Communication between the upgraded avionics with digital interfaces such as the LN-100GT system and the and the original analog display systems maintained on the aircraft is provided through the SBU-100 Synchro-to-digital Converter Unit which specially designed by Aselsan for this project. The AN/APN-159 radar altimeter system on the plane was replaced with the AN/APN-232 CARA (Combined Altitude Radar Altimeter) system. The communication system of RF-4E reconnaissance aircraft also received an extensive upgrade. The existing RT-793A/ASQ UHF and RT-792/ARC-105 HF radio sets were replaced with two encrypted and Link 11 compatible MXF-484 UHF/VHF Have Quick radio sets delivered by Aselsan. Additionally, 1 ARC-190 HF radio, Avionic Activation Panel, and Throttle Lever PTT (push to talk) Switch were integrated into aircraft. Within the scope of the EW system modernization, the AN/ALR-46 RWR system was replaced with the AN/ALQ-178[V]3R Passive Electronic Warfare System. While the E/J Band antennas of the EW system on Luftwaffe aircraft are located on the right and left side of the front KS-87B camera bay, the


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antennas on the US origin RF-4E planes are located at the wingtips. Also, 5 Luftwaffe RF-4E aircraft were upgraded to utilize the KS-146B Long Range Oblique Photography (LOROP) reconnaissance pods with the Işık (Light) Project, raising the total number of RF-4E/TM reconnaissance aircraft to 12. As part of the KS-146B reconnaissance pod system, the Reconnaissance Pod, Control Panel, Power Distribution Unit, and Two-position Side Oblique Optics were installed on the aircraft. The SBU-100 Converter act as a data interface for the INS information provided by the LN-100GT navigation system to the KS-146B reconnaissance pod system. LOROP was designed to take high-resolution photographs at high altitudes and long distances. The system includes the KS-146 cameras featuring a seven-element, 1676-mm (66-inch) focal length f/5.6 lens, a two-axis gyro-stabilized scan head, a passive isolation system, and a self-contained thermal system. Depending on the altitude of the aircraft, the system can provide maximum resolution at a distance of 65 to 100 km from the target.

"Şimşek (Lightning)" Modernization Program

Modernization activities continued with the "Lightning (Şimşek) Project." The Second Package of the F-4E Lightning Modernization Project was started in 2006 to strengthen the airframe structure and improve the avionics of the 16 F-4E Phantom II Fighter-Bomber planes in the Turkish Air Force inventory. In this context, the F-4E/TM (classified as such after modernization) aircraft 68-0403, which performed its first official test flight on December 24, 2009, after its modernization, was delivered to the 1st Main Jet Base Command with a ceremony held at the 1st Air Supply and Maintenance Center (HİBM) on March 2, 2010, and the project was completed in 2010.F-4E /TM planes were undergone a similar avionic modernization to RF-4E/M reconnaissance aircraft (except the MIKES product AN/ALQ-178[V]3R passive EW suite). Within this framework, the navigation system of the plane was upgraded with the LN-100G Embedded INS/GPS produced under license by Aselsan. Plus, the Flight Controls of the aircraft was improved with the CDU-900 Control Display Unit and the Operational Flight Software developed by Aselsan engineers. With the encrypted and Link-11 compatible MXF-484 radio system that enables communication in UHF and VHF bands, F-4E/TM aircraft were provided with an efficient and secure communication capability. Similar to the Işık (Light) Project, communication between the upgraded avionics with digital interfaces such as the LN-100GT system and the and the original analog display systems maintained on the aircraft is provided through the SBU-100 Synchro-to-digital Converter Unit designed by Aselsan. Therefore, analog systems were guaranteed to work together with modern digital systems without making any changes to the existing displays that the pilots are accustomed to. Before the flight test, the new avionic systems to be integrated into the aircraft were first ground tested in the System Integration Laboratory (SEL), which was established under the 1st HİBM Command as a functional example of aircraft avionics architecture in a laboratory environment. Within the scope of the project, to measure more than 120 parameters on the F-4E/TM aircraft, Flight Test Measurement studies on the plane were carried out at the Flight Test Measurement Center under the 1st HİBM Command. This center formes the core of the 401st Test Squadron.

Conclusion

During its 46-year adventure in Turkey, which started on August 30, 1974, Phantoms served in nine different squadrons (111,112,113,131,132,171,172,173, and 401) and introduced the Turkish Air Force to modern radar, ECM and ammunition. In addition to working with advanced weapon systems, Phantoms had another significant contribution; thanks to the Terminator, Işık (Light) and Şimşek (Lightning) modernization projects, the Turkish Air Force and Turkish Defence Industry gained unprecedented experience in system integration, product development, and their testing procedures. When the project first started, Phantoms were planned to be retired in 2020 with the arrival of the first F-35 to Turkey and the reactivation of the 172nd Squadron. However, it's all water under the bridge now; the F-35s did not arrive, and the F-4E/2020s will continue to protect Anatolian skies in the future...

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by Saffet UYANIK

TSSK's 7th Project Market and Cooperation Summit Held in Ankara

The 7th Project Market Summit organized by Teknokent Defense Industry Cluster (TSSK) was held with the main theme of "Sectoral Cooperation and Qualified Workforce"

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The TSSK Project Market and Cooperation Summit was organized for the 7th time this year by Teknokent Defense Industry Cluster and was held with the participation of Prof. İsmail DEMİR, the President of Defense Industries, on January 5, 2020 in Ankara at the METU Culture and Congress Center. The Summit, with main theme of "Sectoral Cooperation and Qualified Workforce", was held by the Teknokent Defense Industry Cluster, METU and ODTÜ TEKNOKENT under the auspices of the Ministry of National Defense and the Presidency of Defense Industries (SSB), with the cooperation of the Ministry of Trade, TÜBİTAK, ASO and SaSaD.

Speaking at the opening ceremony of the event, TSSK Chairman of the Board Zeynep ÖKTEM said that the objective of this event is to bring together the procurement authorities, main contractors and cluster members to cultivate cooperation. Pointing out the importance of collaboration within this context, ÖKTEM said, "Last year, we aimed to increase awareness about our cluster and improve our collaborations by conducting talks and visits. When we look at the domain expertise of the companies within our cluster, the number of which has increased by 10% compared to the previous year, we see that they carry out a large spectrum of activities and develop products that use critical technology, in particular. Cooperation with the main contractors and institutions within the sector needs to be achieved in order to use the R&D project outputs, with a technology readiness level of 5-6, as domestic and national products on the platforms, by increasing their technology readiness levels. While establishing cooperation, we wish that it will be in the form of strategic partnerships that protect our relatively small companies developing products with indigenous designs, ensure their sustainability, enable them to become intensified in technology, without hindering the competition, and realize long-term and order-guarantee supply processes. For healthy and sustainable collaborations, we also expect that relevant mechanisms are established to protect the intellectual property rights on technologies developed especially by subsystem companies."

Underlining the importance of having a qualified workforce, ÖKTEM added comments on another issue that the cluster pays special attention to "When we look at the workforce of our member companies, approximately 3,000 qualified employees, we see that the majority of them have MSc and PhD degrees with a solid background in basic sciences, engineering and design. One of the major problems of our companies is that they do not encounter any problems in attaining a qualified workforce, but they do have difficulty in retaining them for a long time. Unfortunately, our SME level companies

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Zeynep ÖKTEM - TSSK Chairman of the Board

could not offer our young colleagues the opportunity for a sustainable and promising career. As a result, there are transitions from big companies to small companies in the sector, in some cases such employees quit working in the sector and even prefer to go abroad. In this context, incentives and policies should be established that keep the trained workforce within the sector, especially making the SMEs in our cluster a center of attraction. Another point is that the relevant work shares of the projects carried out should be assigned to our companies as sub-projects, rather than contracting them with the SMEs on a man/hour or man/day basis."

METU Rector Prof. Mustafa Versan KÖK: "Joint R&D activities executed with more than 50 Defense Industry Companies in 2019"

METU Rector Prof. Mustafa Versan KÖK stated in his speech that creating the necessary environment for defense industry companies performing R&D activities in order to develop national and innovative products for the country's defense is among the main objectives of ODTÜ Teknokent. He noted "As you know in 2006, the Defense Industry Research and Technology Development Subzone was established at ODTÜ Teknokent, as a result of the need arising from the acceleration of R&D studies in the field of the defense industry and due to the increasing number of collaborations. As a consequence, R&D divisions of main contractors such as Aselsan, Havelsan and Turkish Aerospace were located at ODTÜ Teknokent. The Teknokent Defense Industry Cluster began its activities with the participation of ODTÜ Teknokent companies as of 2010 and continues its activities today with the participation of not only ODTÜ Teknokent companies but also defense industry companies operating in other technocities. Approximately one third of over 400 technology companies currently performing within ODTÜ Teknokent are companies operating in the field of defense and security."

Salim ATAY - President of the Presidential Human Resources Office

Prof. Mustafa Verşan KÖK- METU Rector

Referring to the activities carried out within ODTÜ Teknokent, KÖK also stated that they contributed to the defense sector and accomplished significant collaborations through the research centers and Technology Transfer Office (TTO) within Middle East Technical University. KÖK: "METU faculty members and undergraduates, particularly from electrical and electronics, computer, aerospace, metallurgy and mechanical engineering departments, execute defense industry projects in 29 research centers that are currently conducting research. In 2019, joint R&D activities were carried out with more than 50 defense industry companies in projects supported by state funds or through our own resources. Within this framework, our independent R&D project for the development of Very Light Aircraft, which we carried out with Turkish Aerospace, was also entitled for the University-Sector Cooperation Award within the scope of the Outstanding Achievement Awards given to our university in 2019."

President of the Presidential Human Resources Office Salim ATAY: "We are preparing the human resources inventory of the Republic of Turkey"

President of the Presidential Human Resources Office Assoc. Prof. Salim ATAY highlighted the issue of how university graduates are utilized by the private sector. He provided information about the activities performed in this regard. "We, as the Presidential Human Resources Office, provide data to policy makers and decision makers of our country having 32 million employees and give support to decision-making processes based on accurate data. For this purpose, in order to respond the question that has been discussed for years about which university is more successful, we conducted a study on how university graduates are utilized on the basis of

department, faculty and university by mapping the graduate data we obtained from the Council of Higher Education and the employment data obtained from the Social Security Institution. We have put this study into use, and we informed our rectors about the results of the study regarding their universities. Now everybody knows where their graduates are working, what they are doing, how much money they earn, who is unemployed and how long it took for them to find a job. More critically, we have also conducted a study according to OECD norms, for the determination of whether or not they are employed for the job suitable for their skillsets (under or overqualified). We did this and we will continue to do it regularly every year."

Providing information about the survey they conducted for university graduates working in the public sector, ATAY said, "This study was about how the markets valued the university; we also carried out a study called KAMU-VERİ (public-data) on how the employees valued the public sector. 862,000 employees working in the public sector participated in this study. It was a questionnaire consisting of 89 to 130 questions. We are now able to measure the productivity of all our institutions based on employee feedback. We analyzed this data and shared the outcome with all our institutions. Of course, when we were conducting this KAMU-VERİ study, we also involved the universities and asked academicians and administrative staff working at universities to share their opinions with us about the university administration. We also shared the results with our university rectors."

ATAY also shared information about their studies on talent migration, called Talent Mobility. "As for Talent Mobility, it is clear that a talented person goes wherever there is an opportunity; you cannot block them, you cannot build barriers, you cannot build custom walls. A talented person is the one who sees the opportunity better than anyone, so they prefer global opportunities. At that moment, as the Presidential Human Resources Office, we defined our policy to try to not prevent these people from leaving, but to raise awareness that this is the best country to return to eventually, if our people choose to go to another country. In this regard, we first started the "Talent is Everywhere" events in which 130 universities participated, under the coordination of 10 different universities from Erzurum to Edirne. Last year 70,000 students attended, and 300,000 students will attend this year. This is our plan and we started applying it regularly. In order to achieve this, we established Career Centers in 181 universities. Unfortunately, there were no career centers previously, except for just a few universities in Turkey. This is a problem the U.S. solved in the 1930s and 1950s. We did not have career centers before, but now we perform all our activities through them.

President of the Presidential Human Resources Office, Salim ATAY: "92% of defense industry employees are engineers, the average salary of newly recruited engineers is TL 5,700 and with a grade point average of 3.11."

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resources inventory of the Republic of Turkey, ATAY added, "The human resources inventory study, which maps data such as primary, secondary, high school, higher education, health, and security over 86 million individual data, is being carried out. Soon, we will release this study to all relevant institutions and organizations within the context of macro data so that they will be able to carry out their own human resources planning with this information. This data will give us clues in many areas such as how many people we have in which city and village, in which areas we have a skill shortage, and we will exert our best efforts to make policies in parallel with these specific data. I would also like to share several data with you. 28% of employees in the defense industry in Turkey are from METU, 11% from Bilkent University, 9% from Hacettepe University and 9% from ITU. The number of people starting to work in the defense industry has increased 4 times in the last 5 years, 74% of which are male and unfortunately 26% are female. 92% of defense industry employees are engineers; 30% of them are electrical and electronic engineers, 24% are mechanical engineers and 15% are computer engineers. 75% of our graduates are from state universities, while 25% from private universities. Here, we understand that the private university project implemented in Turkey is fruitful. Their grade point average is 3.11, which means that the best educated people prefer the defense industry, and their recruitment process takes 5.4 months and the average salary of newly employed engineers is TL 5,696. Consequently, the defense industry is the leading industry in Turkey, and Middle East Technical University is the driving force of this locomotive. According to the public data survey, which we have not shared with the public before, we observed that the employees having the highest level of satisfaction and sense of belonging are those working in the defense industry."

President of Defense Industries Prof. İsmail DEMİR: "Sustainability would be unachievable in a structure in which merely the Defense Industry is constantly ahead, and other industries remain behind."

Underlining that the defense industry attracts great attention as a driving force in Turkey in which significant industrial and technological activities are performed, President of Defense Industries Prof. İsmail DEMİR said, "I'd like to say once again that sustainability would be unachievable in a structure in which merely the Defense Industry is constantly ahead and other industries remain behind. It is a matter of ecosystem, technology

Prof. İsmail DEMİR- President of Defense Industries

readiness level and competency level. We need to carefully examine the pyramid structure where all kinds of preparation and infrastructure starting from human resources are accomplished and the supported sectors and technologies are thoroughly assessed, and we need to make sure that there is no gap within this structure. If we want to progress favorably with benefiting us in the coming years, I would like to emphasize that an extensive and dedicated study should be performed without missing the technologies of the future, while exerting efforts to achieve what others have achieved years ago."

Emphasizing the importance of transferring experiences accumulated in the defense sector to the civil sector in order to meet the needs of the Armed Forces and security forces with maximum national and local opportunities and to create a sustainable defense industry ecosystem, DEMİR said, "In order to reach our fully independent defense industry targets, while developing defense industry products with national technologies and domestic opportunities during the period of 2019-2023, foreign dependency at the system, subsystem and component level should be minimized. It should be noted that the investments and support to R&D still need to be increased, in relation to the resources allocated to R&D by our major companies, as per the analysis made in the overall country and in comparative analysis. While it is necessary to increase this resource, it is also essential to discuss how efficiently the resource is used by looking at the outputs and analyzing the data. First of all, we have to agree on the R&D and NPD (New Product Development) definitions, and then compare the concrete data such as the number of patents obtained, the number of products developed and the export figures against the allocated resources. Regarding exports, I believe that the

comparison on kg basis is no longer reasonable. We will not be able to measure things on kg basis one day; therefore, we can include criteria such as the export figure per employee."

After the opening speeches given by TSSK Chairman of the Board Zeynep ÖKTEM, METU Rector Prof. Mustafa Versan KÖK, President of the Presidential Human Resources Office Salim ATAY and President of Defense Industries Prof. İsmail DEMİR, the "Sectoral Cooperation" and "Qualified Workforce" panels were held during the afternoon session. During the Summit, participant companies also displayed their products all day at the stands in the exhibition area and B2B meetings were held as well.

Teknokent Defense Industry Cluster (TSSK)

ODTÜ TEKNOKENT hosts a total of over 400 companies actively involved in R&D, more than 130 of which are defense industry oriented, as well as many research centers and laboratories located in METU. As of 2010, these defense-oriented companies were assembled as the Teknokent Defense Industry Cluster (TSSK). These companies possess complementary and value adding vertical expertise in developing new products and services for the fields of defense, aviation, homeland security and cybersecurity.

The purpose of the Project Market event, organized for the seventh time this year by METU, ODTÜ TEKNOKENT and TSSK is to develop the relationship and communication between large, medium and small-scale companies in the defense industry sector and to contribute to them in undertaking more projects together, increasing domestic products, solutions and services, utilizing the existing industrial resources effectively, planning the prospective investments properly, opening them up to international markets and increasing exports. To this end, TSSK Project Market was organized under the main theme of "Sectoral Cooperation and Qualified Workforce" in 2020. The event has been held since 2010 to create an environment that will facilitate technology development and R&D oriented defense industry companies located in METU and other Technocities in the region or those incorporating R&D Centers within their bodies, to establish faster and more active communication, stimulating an exchange ideas and information, furthering their business development potential

FNSS Ramp-up Serial Production of KAPLAN ATV

by Cem Akalın

The Presidency of Defense Industries recently provided information about the delivery of the serially produced KAPLAN ATVs for the Land Forces Command within the scope of Anti-Tank Vehicle program via their official twitter account on 23 March 2020. According to the shared information, Six KAPLAN Anti-Tank Vehicles were delivered to the Turkish Land Forces.

Following the contract signature, the project kick-off meeting was held on October 14, in accordance with the decision of the Defense Industry Executive Committee (DIEC/SSIK) dated March 9, 2016, FNSS will develop a total of 260 vehicles, 184 of which are tracked and 76 of which are wheeled, as well as 64 KORNET-E Weapon Turrets and 196 OMTAS Weapon Turrets. All tracked & wheeled platforms and turret systems are expected to be included in the inventory of the Turkish Armed Forces by 2022

We will briefly glance at the history of the project such as the number vehicles procured and the far-reaching test campaign that commenced from the outset of the program schedule.

The ATV Project tender that adopted the local Production and Integration model initially started 11 years ago. At that time, the Undersecretariat for Defense Industries (SSM) (now SSB) had issued an RFP (Request for Proposal) on March 7, 2008 for the procurement of 1,075 tactical wheeled armored vehicles and an Integrated Logistics Support System to meet the needs of carrier vehicles for TOW, Milan and 40mm Automatic Bomb Launchers that were available in the inventory of the Turkish Land Forces Command, and for the KORNET-E ordered by SSM under the OMTAS Direct Procurement Project, and for the Medium Range Antitank Weapon (OMTAS) Missile Systems developed by Roketsan. The breakdown of the vehicles had been determined as 350 TOW, 344 Milan, 229 40mm Automatic Bomb Launchers and 152 OMTAS Carriers. On December 15, 2008, BMC, FNSS, HEMA Industry, Nurol Makina and Otokar submitted their bids and soon afterwards the number of vehicles was reduced to 846 vehicles that excluded 229 40mm Automatic Bomb Launcher Vehicles and then reduced to 260 vehicles as per the request of the Land Forces Command.

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Within the scope of the STA Project, on June 21, 2013, an RFP was issued to FNSS and Otokar for a total of 260 vehicles (184 tracked & 76 wheeled), FNSS Savunma Sistemleri A.Ş. had become the successful bidder and the signing ceremony was held on June 27, 2016 at the Undersecretariat for Defense Industries with the participation of FNSS, SSM (SSB) and MoND officials. The project kick-off meeting was held on October 14, 2016 in accordance with the decision of the Defense Industry Executive Committee (DIEC/SSIK) dated March 9, 2016, FNSS will develop a total of 260 vehicles, 184 of which are tracked and 76 of which are wheeled, as well as 64 KORNET-E Weapon Turrets and 196 OMTAS Weapon Turrets. The detailed design of the vehicles was approved by SSB and the Turkish Land Forces in the 15th month of the project and qualification tests started on December 3, 2018. Within the scope of the test campaign the following tests were carried out;

EMI/EMC test campaign of KAPLAN Anti-Tank Tracked Vehicle was carried out between 6-28 May, PARS test campaign was successfully accomplished between 13 June- 5 July 2019.

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KAPLAN ATV Firing Test

The Comprehensive Mobility and Durability test campaign was carried both with the KAPLAN ATV and PART ATV as well. Within the scope of planned-schedule program, KAPLAN ATV accomplished these tests in December, 2018 between September,2019 as for PARS 4x4 ATV these tests were accomplished between January 2019 and December 2019. Within the frame of qualification tests, the KAPLAN ATV successfully completed the 10,000 km durability driving test including performance tests on snowy terrain and the KORNET Turret qualifications as well as the PARS 4x4 ATV also successfully passed the 20,000 km durability driving test.

The Environmental Condition test campaign was carried out for the KAPLAN Anti-Tank Vehicle between December 2018 and November 2019 and the PARS 4x4 ATV test campaign was completed between January 2019 and November 2019.

The Mine Ballistic and Protection Test Campaign was completed for the KAPLAN ATV in September 2019 and for the PARS 4x4 ATV in March 2019.

The Amphibious capability test campaign was accomplished for the KAPLAN ATV in September 2019. The PARS 4x4 ATV completed this test campaign between January 2019 and September 2019.

Within the scope of the ATV Project, the integration test of the OMTAS antitank missile developed by Roketsan onto the KAPLAN ATV Anti-Tank Vehicle was verified by the firing test performed with the participation of the teams of the Presidency Defense Industries (SSB) and Land Forces Command in Karapınar, Konya on February 13, 2019. During the test on 6 April 2019 performed with the OMTAS missile launched from the Remote-Controlled Anti-Tank Turret integrated onto the KAPLAN ATV, the firing test towards a moving target from a stationary vehicle was successfully performed.

The video of the firing test with the OMTAS missile integrated onto PARS and KAPLAN vehicles (from a moving vehicle towards a stationary target) was made public on November 25th on the SSB's official twitter account. In the video the OMTAS missile is shown successfully hitting the target.

The test firing campaign of the KAPLAN ATV was successfully accomplished in December 2019. The delivery phase is expected to start in the upcoming period for the PARS 4x4 ATV after test firing and qualifications have been completed

KAPLAN ATV Amphibious Test

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T70 Getting Ready for its Maiden Flight!

by İbrahim SÜNNETCİ

Within the scope of the Turkish Utility Helicopter Program (TUHP) worth nearly US$ 3.5 billion, the ground tests of the first of the 109 T70 Helicopters (TLF-1/Turkish Land Forces version) to be serial-produced by Turkish Aerospace (TUSAS) as the main contractor, are being successfully conducted. The exhaustive flight testing for qualification and certification is expected to be started next month.

The Presidency of Defense Industries (SSB) shared the latest status of the T70 Utility Helicopter on its official Twitter account on March 25, 2020 with the following statement: "The ground tests of the T70 Helicopter manufactured within the scope of the Utility Helicopter Program are being successfully conducted."

The T70 TLF-1 was rolled out with a ceremony held at TUSAS facilities on November 25, 2019. In his statement made to Anadolu Agency regarding the latest status of the TUHP on November 28, 2019, TUSAS Executive Vice President of Helicopter Department, Kemal YILLIKÇI emphasized that Aselsan would manufacture the most advanced avionics systems for the helicopters and said, "They cannot be jammed or interfered in any way because the hardware and software were developed by us. Our helicopter will operate very safely and securely." YILLIKÇI also explained that the first serial production helicopter (TLF-1) was rolled out and integration and development activities for avionic systems were being carried out by Aselsan over a prototype provided by Sikorsky and added that a series of qualification and certification activities as well as test flights would be realized in 2020.

The deliveries are planned to be started by 2021 (the OGM configuration) under the TUHP, the contract of which was signed on February 21, 2014 and became effective on June 15, 2016 with the advance payment made to Sikorsky and TUSAS by the SSB, after Sikorsky obtained the necessary government licenses. When the indigenously developed Aselsan Integrated Modular Avionics System (IMAS) is integrated into the S-70i™ International BlackHawk (IBH), the final configuration of the helicopter is called the T70 Helicopter. Within the scope of the project, a total of 109 T70 helicopters, with two different configurations based on the S-70i™ IBH model, will be delivered within a 10-year period to a total of six end-users (Turkish General Staff [OzKK, 11], Land Forces Command [KKK, 22], Air Forces Command [HvKK, 6], Gendarmerie General Command [JGnK, 30], General Directorate of Security [EGM, 20] and General Directorate of Forestry [OGM, 20]).

The existing Flight Management System (FMS) on the Sikorsky S-70i™ IBH Basic Helicopter will be replaced by unique Aselsan IMAS, fully developed by Aselsan engineers with the contributions of Sikorsky and TUSAS test pilots and combat pilots of the TAF (Turkish Armed Forces). Through IMAS, Mission Computers and Color

Multifunction Display (CMFD) are combined on single equipment, and Navigation, Communication, Mission and Flight Management are performed at a single center. The IMAS avionics suite aims to minimize the workload of the pilot, and thanks to the smart point-and-click displays and ergonomically improved new Pilot Platform Interface, a series of navigational based improvements were also made in line with the requirements of the Turkish end-users. These improvements include an Integrated Terrain Awareness and Warning System, Integrated Digital Map and connected flight control functions for guided approach to the landing area. According to the contract signed with Sikorsky, IMAS will not only be used on the 109 T70 helicopters that Turkey plans to procure, but also on at least 164 helicopters to be sold to third countries by Sikorsky.

Following the completion of the development activities and laboratory tests of the devices covered by IMAS, it was planned to assemble such devices on an S-70i Helicopter to be brought to Aselsan by Sikorsky and to conduct flight tests with the participation of Aselsan engineers by Sikorsky pilots. As per the project, the development activities will be completed with the Approval of Airworthiness by the Sikorsky Quality Assurance Board (QAB).

The S-70i™ IBH Basic Helicopter manufactured at PZL Mielec facilities in Poland was handed over to Sikorsky in June 2016 and brought to Aselsan facilities in February 2017

Under the TUHP, the development, production and integration activities of mission, navigation, communication (including IFF Mod 5/C Responder) and electronic warfare systems are carried out by Aselsan under the subcontracting agreements executed by TUSAS and Sikorsky. Software and hardware development activities under the project were completed in 2018, and the testing and verification process are still going on. In Aselsan's 2019 Annual Report, it is stated that the platform flight tests are planned to be initiated in the first half of 2020.

Within the scope of the TUHP, the S-70™ IBH Basic Helicopter (with the registration no of SP-YVB) to be utilized as the Engineering Development Test Platform (Test Bed) during the integration, flight test and qualification processes of the IMAS avionics suite developed by Aselsan, was dispatched from Poland to Turkey on February 25, 2017. The S-70i™ IBH Basic Helicopter that took off from the PZL Mielec facilities in southern Poland landed at the Aselsan facilities in Akyurt, Ankara after a 9-hour flight. During the 930nm route, the helicopter passed through Slovakia, Hungary, Romania and Bulgaria and refueled twice on the ground.


The footage of T-70 TLF-1 IMAS

The T70 TLF-1 is fitted with Aselsan's IMAS avionics suit

A cockpit view of TGGC's S-70i™ utility helicopter

The TLF-1 ground test image was shared by the SSB on March 25, 2020 via an official twitter account. In this image we noticed that the color multifunction display in the helicopter's avionic suite differs from the model in the standard S-70i™ IBH in terms of the interior cockpit layout and the control buttons on them. In the new cockpit is structurally modified, two SMFD-810s and two VMFD-810s are available, which are part of the IMAS avionics suite. According to the information we obtained, the Aselsan logo has not been placed to ensure compliance with the S-70i™ IBH and for the reason that it will be used by helicopters to be exported to third countries by Sikorsky.

The main contractor TUSAS, under the Program, performs the assembly of gearboxes of T70 Helicopters, production of all main components such as cabin, cockpit, tail cone, horizontal and vertical tail, main and tail rotor blades, design and integration activities for modifications, final assembly, testing and flight activities of the helicopters as well as the deliveries. Moreover, the Integrated Logistics Support (ILS) activities of the Program will be carried out by TUSAS.

Within the scope of the Program, TEI, the Engine Subcontractor, will be responsible for the production of 60 different components corresponding to roughly 58% of the T700 engine, engine assembly, final testing, qualification and configuration management. Hot spot parts such as the engine's combustion chamber are manufactured by TEI. TEI also gets the opportunity to perform Depot Level Maintenance (DLM) of T700 engines in the inventory of the TAF with the local production parts and will carry out competitive DLM activities throughout a very large geography in addition to Turkey. TEI completed the manufacturing and final assembly activities of four T000-TEI-701D turboshaft engines with a capacity of 2,000 shp under TUHP and delivered them at a ceremony held on May 13, 2019. Under the Program TEI will manufacture a total of 248 T700-TEI-701D Turboshaft Engines (218 T70 platform engines and 30 spare engines).

The T70 Turkish Utility Helicopter is powered by a pair of 2.000shp class T700-TEI-701D turboshaft engines

Within the scope of the "Dynamic Components Project" under the TUHP program, Alp Aviation will produce the Main Rotor Heads, Main Gearboxes/ Transmission, and the Intermediate and Tail Rotor Gearboxes. Alp Aviation will also provide 104 chipsets for the dynamic components as part of the project.

Alp Aviation made the first delivery of T70 dynamic components and landing gear at a ceremony held on January 15, 2020

Nurol Makina Exports Ejder TOMA Riot Control Vehicles to Chile

The indigenously designed and produced by Nurol Makina, Ejder Riot Control Vehicle (Toplumsal Olaylara Müdahale Aracı/TOMA in Turkish) has been exported to Chile.

Nurol Makina, one of the leading domestic land vehicle manufacturers of the Turkish defense industry, achieved a new export success with Ejder TOMA (Riot Control Vehicle in Turkish), which features a uniquely designed military chassis. Chilean authorities signed an agreement with Nurol Makina to buy 12 Ejder TOMA riot control vehicles for its security forces. With this export Chile has become the newest user of the Ejder TOMA, which has also been selected by four countries, including Kuwait and Senegal. The sale to Chile is also the first armored vehicle exported by the Turkish defense industry to South America.

Ejder TOMA vehicles were recently transported to Santiago Chile, by air and the vehicles will go through cleaning and disinfection activities carried out against the Novel Coronavirus (COVID-19) outbreak in Santiago.

The Ejder TOMA 4x4 Armored Riot Control Vehicle

Based on an indigenous military chassis, the Ejder TOMA riot control vehicle was designed and developed by Nurol Makina in Turkey in 2002 to ensure that security forces respond quickly and effectively to incidents of civil unrest and rioting. Featuring a 4-wheel drive (4WD) fully independent suspension system, the Ejder TOMA was developed to maintain public order and security in rural and urban areas as well as border regions. Thanks to its high off-road performance, mobility, and protection levels, Ejder TOMA riot control vehicles are preferred by countries in many different geographies.

All the tools, equipment, hardware electronics, and software used in the Ejder TOMA 4x4, were developed originally by Nurol Makina. Thus, any configuration change or additional requirement can be implemented at minimum cost & time even to vehicles that are in service. The indigenously designed computer-controlled water cannon system has a maximum range of 60 meters and provides -15°/+60° vertical and 360° horizontal water spraying capability.

The Ejder TOMA can draw water automatically from lakes and wells and has a maximum speed of 110 km/h, a driving range of 750 kilometers, and a storage capacity of 5,000 liters. The remote-controlled water cannon system can use a variety of substances, including tear gas, paint and foam. Additionally, the vehicles are equipped with an automatic self-cleaning system to prevent corrosion and clogging. Based on a military vehicle chassis, the Ejder TOMA can also be built by converting a commercial vehicle chassis.

Type 214TN REIS Class & Submarine Capabilities in the Eastern Mediterranean

by İbrahim SÜNNETCİ

Unlike the surface combatants that can move and perform evasive maneuvers only in two dimensions, the submarine is a strategically important naval platform that can operate and carry out independent operations in a three-dimensional environment without any external support even in enemy-controlled waters with its silent, hidden, and surprising features.

The Hybrid powered Type 214TN REİS Class Submarines, which constitute one of the significant turning points in the Turkish submarine history which spans 134 years, has a quieter hull design, reduced flow noise as well as a lower acoustic, thermal and magnetic signature compared to the diesel/electric propelled diesel/electric powered AY (Type 209/1200), PREVEZE (Type 209/1400) and GÜR Class (Type 209/1400-Mod) Submarines in the inventory of the Turkish Naval Forces Submarine Group Command. Moreover, thanks to their PEM Fuel Cell (2x120kw) based an Air Independent Propulsion (AIP) System and high capacity batteries (2x324 units), they can conduct long-endurance operations (from 4 days to 3 weeks) without the need for snorkeling. With its superior features such as the ability to cross the Mediterranean underwater without snorkeling and sailing to the USA without refueling, REİS Class Submarines further enhance the operational activities and capabilities of the Turkish Naval Forces in the surrounding seas, especially in the Aegean and the Eastern Mediterranean.

The Submarine Group Command, which commands the strategic, silent, and hidden weapons of the Turkish Naval Forces, continues its activities in line with the mission of protecting the maritime relevance and interests of our country in the Blue Homeland exercise which covers 462,000 km2. By 2025, the Submarine Group Command is envisaged to have 2 AY Class submarines, 4 PREVEZE Class submarines (Two of them have been modernized as part of the Mid-Life Upgrade program, and the other two are in the modernization process. Under the MLU program, the submarines are equipped with the HENSOLDT products; new Navigation and Attack periscopes, locally produced sonar, ESM and MÜREN CMS systems, and AKYA National Heavyweight Torpedoes), 4 GÜR Class submarines, and 4 REİS Class submarines (Two more Type 214TN submarines will be under construction and expected to undergo Sea Acceptance Tests/ SAT).

In recent years, the ongoing drilling activities in the East Mediterranean have pit Turkey against Greece, Israel, and Egypt. Having sovereignty rights both in the Aegean and in the Eastern Mediterranean region, Turkey has repeatedly declared that it will not allow a fait accompli in these regions.

The tension between Turkey and these three countries has increased even more with the signing of an agreement between Turkey and Libya, aiming to create an Exclusive Economic Zone (EEZ) in the region from the southern Mediterranean shores of Turkey to the northeast coast of Libya. With this agreement, our country also disrupted the plans of Southern Cyprus, Greece, Israel, and Egypt to lay claim to the natural gas reserves in the eastern part of the Mediterranean Sea and also blocked the pipeline project, which will extend from Israel to Southern Cyprus waters, from the island of Crete to Mainland Greece and from there to the European natural gas network via Italy. Greece, Israel, and Egypt, which are currently in conflict with Turkey in the Aegean and Eastern Mediterranean regarding research and sharing of natural gas resources, are among the prominent countries with strong naval presence and submarine force in the region. Another submarine power in the region is Algeria, which has 4 Improved Kilo Class (Project 636) and 2 Kilo Class (Project 877EKM) submarines supplied from the Russian Federation.

Although Israel and Egypt are not at the level and capacity to compete with the Turkish Navy in terms of submarine strength and effectiveness, the Israeli Navy Submarine Flotilla Shayetet 7 (7th Flotilla), albeit it has a small number of submarines, is one of the most effective and qualified submarine forces in the Eastern

Mediterranean with the support of the technical and technological possibilities and capabilities of the Israel Defense Industry and considered as a serious competitor to the Turkish Naval Forces Submarine Group Command.

In addition to 3 Type 209/1100 and 3 Type 209/1200 Class diesel/electric propelled submarines, the Greek Navy operates 1 Type 209/1200 AIP and 4 Type 214HN AIP Submarines. The Egyptian Navy has 4 modernized Romeo Class (Chinese Type 033 Class, 831, 842, 852 and 858) submarines and 4 Type 209/1400-Mod diesel/electric propelled submarines, two of which have been delivered (S41/861 and S42/862), one in the Sea Acceptance Test (SAT) phase (S43/863) and one under construction (S44/864). Delivery of Type 209/1400-Mod Class Submarines is planned to be completed by the end of 2021. As of January 2020, Israel Navy Submarine Flotilla Shayetet 7 operates 3 diesel/electric propelled Dolphin-I Class Submarines and 2 Dolphin-II Class (also known as Dolphin AIP or Super Dolphin) Submarines. The construction activities of the third Dolphin-II Class Submarine INS Dragon (formerly INS Dakar) continue in HDW Shipyard in Germany, and the submarine is expected to be launched in 2020.

The Romeo Class Submarines, with a surface displacement of 1,330 tons and a submerged displacement of 1,712 tons, entered the Egyptian Navy service in 1982-1984. Under the US$133 million agreement signed on June 25, 1996, the submarines were modernized at Ras El Tin Naval Base in Alexandria, Egypt, by the main contractor Lockheed Martin Tactical

Greek Navy Type 214 Submarine on Dynamic Manta 2020 Exercise

Egyptian 209/1400 Mod Type Submarine

Defense Systems. As part of the modernization activities completed in the early 2000s, the Romeo Class Submarines were equipped with Kollmorgen product Model 86 Optronic Mast (Surveillance) and Model 76 Attack Periscope, a new generation of active and passive sonar systems (Loral and STN Atlas product), a modern fire control system, a new type of navigation and communication systems and Condor System AR-700-S5 ESM (Electronic Support Measures) System. Featuring UGM-84 Submarine-launched Harpoon Guided Missiles (Encapsulated Harpoon) and NT-37F Heavyweight Torpedoes, Romeo Class Submarines usually carry 4 Harpoon Missiles and 10 torpedoes. During the naval exercise conducted in December 2019, one of the Romeo Class Submarines (849) launched a Harpoon Missile from underwater, and the Egyptian Ministry of Defense shared the pictures on social media. Even though the Romeo Class Submarines are upgraded with modern sensors and Sub-Harpoon capability with the modernization program, I consider that in terms of operational performance, the Romeo Class Submarines cannot even compete with the modernized AY Class Submarines in the TNFC inventory. The Type 209/1400-Mod Submarines, the most modern submarines in the Egyptian Navy inventory, are the same platforms as the GÜR Class in the TNFC service and are similar in terms of sensor equipment and weapon loadout.

The Egyptian Navy signed a €920 million contract for two Type 209/1400-Mod Submarines in November 2011 and, in 2015, placed a firm order for two additional submarines included as options in the first contract. The first submarine S41 (861) was delivered in December 2016, and the second submarine S42 (862) was delivered in August 2017. The construction of the third submarine S43 (863) was completed, and it was launched on May 3, 2019. According to the open sources, Type 209/1400-Mod Submarines are fitted with a Combat Management System (CMS) based on ISUS-90 and carry a weapon load consisting of UGM-84L Block 2 Sub-Harpoon missiles (Encapsulated Harpoon) and DM2A4 Mod 4 Heavyweight Torpedoes (SUT Mod 264 in some sources). Egypt ordered 20 Harpoon Block 2 Guided Missiles through the Foreign Military Sales (FMS) channel in May 2016 for use in submarines.

Currently operating in two different seas, the Mediterranean and Aqaba Gulf (Red Sea), the Israeli Navy has naval bases in Haifa and Ashdod for the Mediterranean and Eilat for the Red Sea and has reshaped its organizational structure in recent years for the safety of natural gas wells and reserves in the Eastern Mediterranean off the coast of Israel. The Headquarters of the Shayetet 7, the Israeli Navy Submarine Flotilla is located in Haifa, and it consists entirely of volunteers. Established in 1959, Shayetet 7 (7th Flotilla) is the leading striking force of the Israeli Navy today. Under the agreement signed in June 1991, Shayetet 7 received Dolphin-I Class Submarines INS Dolphin on July 27, 1999, INS Leviathan on June 29, 1999, and INS Tekuma on October 22, 2000. Diesel/electric propelled Dolphin-I Class Submarines have a length of 57.3m, a height of 12.7m, a beam of 6.8m, and a draught

Super Dolphin CIC

Dolphin I

Israeli Navy Super Dolphin Submarines

of 6.2m with a surface displacement of 1,640 tons and a submerged displacement of 1,900 tons. Dolphin-I (Type 800) Class Submarines features a multi-compartment teardrop hull form and "X" shaped control surfaces (rudder) instead of "+" shape. The submarines have a total of 10 torpedo tubes (six 533mm and four 650mm) and are equipped with ISUS-90/1 Combat Management System (CMS). Dolphin Class Submarines can be armed with 16 heavyweight torpedoes, including their spares (6 spares and 10 in tubes) and different types of Guided Missiles that can be fired against surface targets and can carry 10 Special Forces (Shayetet 13/Flotilla 13) personnel in addition to 35 sailors. Dolphin-I Class Submarines designed exclusively according to the Israeli Navy requirements and used only by Shayetet 7. The unit cost of each submarine is US$340 million, and the total project cost is US$1,28 billion. Under the US$100 million modernization project launched in early 2010, Dolphin-I Class Submarines were undergone a comprehensive maintenance, repair and refurbishment work. As part of the modernization work carried out at the military shipyard in Haifa under the Main Contractor TKMS/HDW, all the valves, pipes, radar/periscope systems and the main diesel engine of the Dolphin-I Class Submarines were removed and refurbished, Rafael product Torbuster Torpedo Countermeasure System Launchers (10-cell) and decoys were installed, and the submarines were equipped with Rafael product SeaCom IP-based secure audio/data/video and SatCom communication system. Following the US$26.4 million modernization activities, INS Dolphin Submarine was relaunched in December 2011. Type 800/Dolphin-I Submarines constitute the 1st Submarine flotilla of the Shayetet 7. According to open sources, one of the submarines operates in the Red Sea and the Persian Gulf, and the other in the Mediterranean while the third submarine is located in Haifa (or Ashdod) to protect Israel's coast. Currently, Port of Haifa is the only submarine base of Shayetet 7.

The US$1.27 billion contract for the construction of the first two Dolphin-II (also known as Dolphin AIP or Super Dolphin) Class submarines was signed in 2005 between Germany and Israel. The official contract for the construction of the third Dolphin-II Class submarine, which was included as an option in the main contract was signed between Israel and Germany in March 2012 with the participation of the Israeli Minister of Defence Ehud BARAK. The submarines are built at Howaldtswerke-Deutsche Werft (HDW) Shipyard, which is part of the ThyssenKrupp Marine Systems (TKMS). Within the scope of the contract, INS Tannin was delivered in September 2014, INS Rahav was delivered in January 2017, while INS Dragon Submarine, which is still under construction, is planned to be launched in 2020. Dolphin-II Class Submarines, which are equipped with a hybrid propulsion system due to the integration of the Air Independent Propulsion (AIP) System, are 11.3m longer than the three Dolphin-I Class submarines and have a length of 68.6m, a beam of 6.8m and a draught of 6.2m with a surface displacement of 2,083 tons and a submerged displacement of 2,438 tons. Equipped with ISUS-90/55 CMS, each Dolphin-II Submarine can complement a crew of 50 (35 sailors + 15 Shayetet 13 Naval Special Force personnel) and can be armed with up to 21 heavyweight torpedoes (DM2A4) and Guided Missiles. Both Dolphin-I and Dolphin-II Submarines feature three MTU product diesel engines, Kollmorgen product Model 76 attack periscope and Model 90 Optronic Periscope System specially designed according to Shayetet 7 requirements for surveillance. The Elbit product ESM System antenna is also placed on the M90 periscope. It is stated that up to one-third (€135 million/US$168 million) of the total construction cost of the submarines (around €500 million/US$650 million each) was subsidized by the German Government. An additional 3 Dolphin-III Submarines will be procured for Shayetet 7, which plans to keep Dolphin-II submarines operational until the 2050s.In this context, a Memorandum of Understanding (MOU) worth US$1.3 billion was signed between Germany and Israel in June 2017. The official contract for the

procurement of Dolphin-III class submarines is expected to be signed in 2020, and the first submarine is planned to enter Shayetet 7 service in 2030 following the T0 8-year construction period (T_0=Contract start). Dolphin-III Submarines, which will be equipped with a hybrid propulsion system, are planned to replace the diesel/electric propelled veteran Dolphin-I submarines.

The exterior design of the Dolphin-II Class Submarines with a 7-blade composite propeller resembles the Type 212 Class, while the placement of the AIP System is similar to the Type 214 Class rather than the Type 212. Unlike Type 212, which has two Liquid Oxygen (LOX) tanks outside the pressure hull behind the sail, the LOX tank/tanks (I believe there is only one tank) in Dolphin-II Class Submarines are located inside the pressure hull. On the other hand, the Metal Hydride Tanks (MHT) are placed in a special compartment located at the bottom of the submarine body, three rows on the right side and three rows on the left side (considering the length of the pressure hull I believe that each row consists of 7 cylinders). The Metal Hydride cylinders are used to store the liquid hydrogen that provides the necessary energy for the Proton Exchange Membrane (PEM, also called as Polymer Electrolyte Membrane) Fuel Cell modules used in the AIP System. In Type 212 Class, Metal Hydride Tanks are placed circularly on both sides of the hull, just below the LOX tanks at the rear. Unlike the Type 214 Class, which has two Siemens product BZM120 PEM Fuel Cell modules (each generates 120 kW power), Dolphin-II Submarines, as in Type 212A Submarines, have 9 (one backup, eight active) BZM34 PEM Fuel Cell modules that generate a total of 306 kW (400 hp) power.

With the introduction of Dolphin IIs, it is considered that the Second Submarine Flotilla was established within Shayetet 7, which will focus on the Red Sea, the Persian Gulf, and the Indian Ocean. Previously, there were some speculations that Dolphin-II class submarines could be deployed in Eilat. Supporting this speculation, within the scope of the Polynom Project, Israel is currently building high-tech fortified hangars/shelters at Haifa, Ashdod and Eilat ports to protect the Israeli Navy surface and underwater platforms. In this context, new structures such as new warehouse facilities, maintenance/repair shipyards, ammunition shelters, and support facilities are being built at each port at costs exceeding US$100 million to support surface and underwater platforms. In June 2013, the Elbit Company announced that it had signed a contract under the Polynom Project to build a new submarine dock in Haifa Port for the Dolphin-II Submarines. The giant Fortification (Submarine Hangar) built at Haifa Port was clearly seen in the background in a photograph taken in December 2019.

It is claimed that Dolphin-I and Dolphin-II Submarines can fire submarine-launched cruise missiles (SLCM) from its 650mm (25.5-inch) torpedo tubes. According to open sources, the submarines can also be armed with 1,500km range Popeye Turbo Submarine-Launched Cruise Missiles that can be equipped with a nuclear warhead, providing Israel with a second-strike capability in case of a nuclear attack. Regarding the issue, on July 4, 2012, Kocaeli Deputy Lütfü TÜRKKAN asked a written question to the Prime Minister of the time, Recep Tayyip ERDOĞAN.In response, on November 5, 2012, the Minister of Foreign Affairs of the time, Ahmet DAVUTOĞLU stated that the three Dolphin-I Class submarines in Israel's inventory can only launch Popeye and Delilah Missile Systems that cannot be equipped with nuclear warheads and emphasized that "despite the media reports on Israel has modernized the submarines brought from Germany to launch nuclear-armed cruise missiles, there is no information confirming that this modernization was realized."

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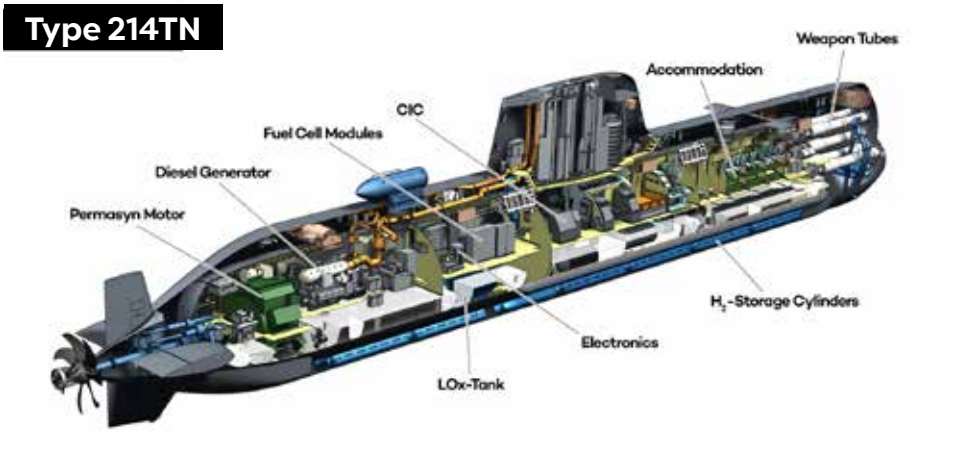
Super Dolphin Class INS Tanin seen here during sea trials executed within the scope of SAT Phase

Conclusion

As of January 2020, in terms of submarine power in the Eastern Mediterranean, Shayetet 7 (Flotilla 7) with 5 active Dolphin-I and Dolphin-II Submarines (3 diesel/electric, 2 hybrid-propelled) has fewer platforms when compared to the Turkish Naval Forces Submarine Group Command with 4 AY Class, 4 PREVEZE Class, and 4 GÜR Class diesel/electric propelled submarines. However, the hybrid (diesel/electric + AIP) propelled Dolphin-II Submarines have superior capabilities than the submarines operated by the Turkish Naval Forces Submarine Group Command in terms of their technical features. With the introduction of Hybrid propelled REİS Class Type 214TN Submarines from 2022 and PREVEZE Class Submarines, which would be modernized with national capabilities, from 2023, Turkish Naval Forces Submarine Group Command will also achieve technical superiority in terms of submarine strength in addition to its current numerical advantage. However, with the Dolphin-III Submarines (I believe that they will be equipped with AIP + Reformer + Lithium-Ion Battery) planned to be introduced from 2030, the technical/technological superiority will change again in favor of Israel. In this respect, it is highly crucial to complete the National Submarine Project (MİLDEN) in the 2030s.



The ability to launch nuclear-armed cruise missiles is the most significant superiority of the Israeli Navy Submarine Flotilla Command Shayetet 7 (7th Flotilla) over the Turkish naval Forces Submarine Group Command. However, Israel will only be able to use this weapon in retaliation for a hostile nuclear attack. Moreover, it is evident that the force structure of the Israeli Navy would not be enough if Israel engages in a long-term naval conflict without resorting to nuclear weapons because the current force structure of the Israeli Navy is not capable of supporting this country's maritime interests in the Eastern Mediterranean in a long-term naval war.

In the last ten years, various procurement projects that will shape the future of the Turkish Naval Forces Command (TNFC) and meet its critical needs have been accomplished with high domestic contribution rates under the successful coordination of the Presidency of Defence Industries (SSB). The Submarines of the Turkish Naval Forces Submarine Group Command are equipped with numerous high-tech products including Aselsan ARES-2SC (AY Class) and ARES-2NS (REİS Class) ECM systems, ASIST Submarine Intercept Sonar System, Meteksan Defence Intercept Passive Sonar (IPS) and MHS-01 Hydrophones, ArmerKom MİLPAS (National Passive Sonar, AY Class), ArmerKom/TÜBİTAK MÜREN CMS (Combat Management System, AY Class), TÜBİTAK MAM Submarine Active Sonar System (AY Class), ZARGANA Torpedo Counter Measure System Launcher and ZOKA Decoy Family as well as Radar Absorbing Materials (RAM). Within the scope of ongoing projects, integration activities of 6-cell ZARGANA TCMS Launchers (four units per submarine) into PREVEZE and GÜR Class Submarines are continuing (the work on the PREVEZE Class TCG Anafartalar was completed in the first quarter of 2019 and the

PREVEZE Class TCG Anafartalar has been fitted with Aselsan ZARGANA TCMS launchers

submarine was spotted on April 2, 2019, with the launchers installed). Additionally, under the MÜREN-PREVEZE Project, the PREVEZE Class submarines are equipped with ADVENT-based MÜREN CMS, and under the PREVEZE Mid-Life Upgrade (MLU) Project, Aselsan provides all wet-ends of the sonar systems to be used in the submarines. Furthermore, Aselsan products SatCom, Integrated Combat System, ARES-2SC Radar ESM System, and ALPER Low Probability of Intercept (LPI) Naval Radar Systems are also integrated into submarines. PREVEZE Class Submarines are expected to be equipped with AKYA National Heavyweight Torpedoes. During the Annual Evaluation Meeting for 2019 held at Bestepe National Congress and Culture Center in Ankara on January 16, 2019, President Recep Tayyip Erdoğan informed that the first launch test of the AKYA prototype was successfully carried out. According to the information we received, the last launch test with the AKYA prototype was successfully performed in December 2019, and the first torpedo launch integrated with MÜREN-CMS is expected to be completed at the end of 2020 or early 2021. On the other hand, ATMACA Block-II guided missile (submarine-launched Encapsulated ATMACA version) with both active RF and IIR seekers is expected to be used in both PREVEZE and REİS Class Submarines (CMS software modification is required). The development activities of the GEZGİN National Cruise Missile are ongoing, and it is considered to be used for the first time on MİLDEN platforms. However, when the missile is ready, I expect it to be used in PREVEZE Class Submarines equipped with MÜREN CMS from the mid-2020s.

The infrastructure established for REİS Class Submarines will be used in the design and construction of the first national submarine, MİLDEN, which will be designed and built with a high domestic contribution rate and national resources. Although initially thought to have similar dimensions and displacement as the REİS Class, I believe that MİLDEN boats will be slightly longer and heavier than planned. I think MİLDEN Submarines will have a length of around 75-80m, a beam of 7m, a draught of 6.5m, and a submerged displacement between 2,500-3,000 tons and unlike the REİS Class, MİLDEN Submarines will have at least one Reformer. Preferred for long-range missions, Reformer is preferred for large (over 2,000 tons) submarines. Both PEM Fuel Cell modules and Reformers to be used in MİLDEN submarines to be equipped with 300kW (400hp) AIP System will be designed and produced nationally, and the systems will also be developed domestically under the Submarine Propulsion System Components Development Project. The PEM Fuel Cell modules, which will be manufactured locally by the company to be selected under the project, are intended to replace the BZM120 modules currently used in REİS Class Submarines in the following years. Additionally, unlike the REİS Class, MİLDEN Class is expected to use locally produced Lithium-Ion (Li-Ion) batteries (LIB) with higher power and capacity instead of lead-acid batteries. Unlike REİS Class submarines, which are currently under construction, and AY, PREVEZE, and GÜR Class submarines, which have a single compartment cigar-shaped hull form, MİLDEN class submarines will have a multi-compartment teardrop hull form. I think that MİLDEN will have at least six 533mm heavyweight torpedo tubes and one 650mm deployment station to allow SAS/SAT underwater operations.

Turkish PREVEZE Class Submarine took part in NATO's Dynamic Manta 2018 Exercise

Dolphin-I

Length:	57.3m
Beam:	6.8m
Height:	12.7m
Draught:	6.2m
Displacement:	1.640 tons surfaced, 1.900 tons submerged
Surface Speed:	11 knots
Submerged Speed:	20 knots
Complement:	30 + 10

Dolphin-II

Length:	68.6m
Beam:	6.8m
Height:	12.7m (?)
Draught:	6.2m
Displacement:	2.083 tons surfaced, 2.438 tons submerged
Surface Speed:	11 knots
Submerged Speed:	25 knots
Complement:	35 + 15

Type 214HN

Length:	65.3m
Beam:	6.3m
Height:	13.1m
Draught:	6.0m
Displacement:	1.688 tons surfaced, 1.858 tons submerged
Surface Speed:	10.5 knots
Submerged Speed:	21 knots
Complement:	27

Type 214TN

Length:	68.35m
Beam:	6.3m
Height:	13.1m (16.5m with periscopes)
Draught:	6.0m
Displacement:	1.865 tons surfaced, ~2.050 tons submerged
Surface Speed:	12 knot
Submerged Speed:	22 knot
Complement:	27 +13

Type 209 / 1200 (AY Class)

Length:	61.2m
Beam:	6.2m
Height:	12m
Draught:	5.5m
Displacement:	980 tons surfaced, 1.185 tons submerged
Surface Speed:	11 knots
Submerged Speed:	21.5 knots
Complement:	38

Type 209 / 1400 Mod (PREVEZE and GÜR Class)

Length:	62m
Beam:	6.25m
Height:	12.5m
Draught:	5.5m
Displacement:	1.454 tons surfaced, 1.586 tons submerged
Surface Speed:	15 knots
Submerged Speed:	21.5 knots
Complement:	30

Koç Bilgi Sistem ve Savunma Teknolojileri A.Ş
Strategic Supplier of REİS Class Type 214TN Submarines

by ibrahim SÜNNETÇİ

Koç Bilgi Sistem ve Savunma Teknolojileri A.Ş (KBS) was established in 2007 by Koç Holding to develop critical technologies and to provide national and indigenous system solutions for the Defense Industry. The company has been operating with a focus on naval platforms electronic systems, underwater acoustics systems, and command & control (C4ISR) information systems since its establishment. KBS is one of the strategic suppliers of REİS Class Type 214TN Air Independent Propulsion (AIP) Submarines currently under construction at Gölcük Naval Shipyard Command under the New Type Submarine Project (NTSP).

The first vessel of the REİS Class Type 214TN Submarines, the TCG Piri Reis (S-330) was launched on December 22, 2019. As of February 2020, the outfitting activities of the TCG Piri Reis Submarine are continuing at drydock; the submarine is expected to be commissioned by the Turkish Navy in 2022 following the Factory Acceptance (FAT), Harbor Acceptance (HAT) and Sea Acceptance (SAT) Tests respectively.

Koç Bilgi Sistem ve Savunma Teknolojileri A.Ş, which has been working in the New Type Submarine Project since 2011, has developed and started to deliver five critical sub-systems for REİS Class Type 214TN Submarines, including:

- Torpedo Countermeasure System,
- Sonar "Beacon" System - "Pinger",
- PC Network System (Ship Integrated Information System),
- Breathing Air Monitoring System (BAMS) and
- Torpedo Engagement Modelling and Simulation (TEMS) software,

Within this framework, as of February 20, 2020, the deliveries of the Torpedo Countermeasure System (TCMS) and Torpedo Engagement Modelling and Simulation (TEMS) software for the 3rd submarines, the Breathing Air Monitoring System (BAMS) for the 4th submarine and the Sonar "Beacon" System and the PC Network System for the 5th submarine have been completed. **The Torpedo Countermeasure System (TCMS)**, developed for Type 214TN Submarines, is a passive torpedo Detection, Classification and Localization (DCL) System software that processes data from the submarine's side-scan and towed sonars without transmitting acoustic signals. Using sophisticated signal processing techniques, this system can detect incoming threats against the submarine and counter them with a combination of recommended maneuvers (different

avoidance maneuvers can be employed depending on the torpedo type) and expendable countermeasures. The TCMS can use expendable torpedo countermeasure systems consisting of both decoys as well as static and 5th generation mobile devices against active and passive torpedo threats. In line with the "domestic contribution" vision of the Presidency of Defense Industries (SSB), KBS has developed the Torpedo Counter-Measure System with a high national contribution to work compatibly with the ISUS-90/72 Integrated Underwater Command and Control System (IUCCS) used in the Type 214TN Submarines. Additionally, Decision Support Software, which determines the most appropriate tactic against the detected torpedo threat and executes it automatically when required, was also developed by KBS and was successfully integrated into the ISUS-90/72 Combat Management System (CMS). For the success of the TCMS, it is vital to create threat and tactical databases during the mission planning phase on the land and to program the jammers/decoys according to the mission. All software and hardware units (Torpedo Engagement Modelling and Simulation - TEMS software, Tactical Development Station, Launcher Interface Test Equipment and all Human Machine Interface - HMI software) used for this

SonarBeacon-LF Transduser

SonarBeaconMCU

purpose were developed by KBS and delivered to ThyssenKrupp Marine System (TKMS), the main contractor of the program. With its success in the Torpedo Countermeasure System, KBS attracted the attention of the Main Contractor TKMS; and thus, it started to take a more significant role in the Project by making four more sub-systems. TKMS also asked KBS to meet their infrastructure-related needs and included the company on their list of qualified subcontractors in this regard.

The second sub-system delivered by KBS under the New Type Submarine Project was the Sonar Beacon System, an acoustic system that allows locating the submarine when it becomes unable to function. It is vital for a submarine to report its location to the surrounding ships and the rescue vessels precisely in the event of an accident. The Sonar Beacon System developed for this purpose works as a pinger in case of emergencies and emits a sonar signal. Since the Sonar Beacon System is a piece of essential vital equipment, submarines with an inactive Sonar Beacon System or without a Sonar Beacon System are not allowed to dive. Sonar Beacon Systems of foreign origin are used in all submarines of the Turkish Navy. KBS produced the Sonar Beacon System with 100% national capabilities and eliminated external dependency on this matter. Furthermore, the Sonar Beacon System can compete with its competitors in the global market, as it does not have any recurring costs anymore. Operating independently from the submarine's electrical system, the Sonar Beacon System can broadcast in the 9 kHz Low-Frequency and 37.5 kHz High-Frequency bands automatically or manually thanks to its battery. With the low-frequency transmission, the submarine can be detected from very long ranges, while the high-frequency transmission allows the submarine to be detected from close range with high precision. The Sonar Beacon System, which has a lifetime of over 850 hours and does not need a battery replacement for five years when not in use, has Low and High-Frequency Transducers (sonar wet-ends) with a Navy Type Piezoelectric ceramic infrastructure.

Another subsystem study in which KBS takes part under the New Type Submarine Project is the PC Network System, which is the integrated information system of the submarine. In this framework, the company provides all the integrated information communication infrastructure and hardware. KBS will deliver a total of seven **PC Network Systems**, six for submarines and one for Ground Test Systems, within the scope of the PC Network System Project, which was initiated at the beginning of 2016. The PC Network System provides the electrical, physical, and functional integration requirements of the intranet, internet, server-client structures, and printer needs on the submarine.

The Breathing Air Monitoring System (BAMS) monitors and examines the gas concentration inside the submarine compartments that can affect both the crew and machinery. The Breathing Air Monitoring System is an independent system and automatically controls the gases in the submarine atmosphere in any operation. The system is developed to monitor the inhaled air components (hydrogen, oxygen, carbon dioxide, carbon monoxide, hydrogen sulfate, chlorine and refrigerant gases, etc.) inside the submarine and to warn the sailors when the air components have exceeded the threshold value and reached a dangerous level. The automatically operated Breathing Air Monitoring System consists of two independent sub-systems, namely, Analysis System and Sensor system. The Analysis System performs gas analysis of the air drawn from different parts of the submarine. The Analysis System has two pumps that take gas samples from 18 different points inside the submarine for measurement. Results, alerts, status signals, and central error reports are simultaneously displayed on the screen by the PLC (Programmable Logic Controller) according to the measuring point on the submarine. The Sensor System, which is located in a reinforced cabined, provides constant gas measurement values of the air inside the submarine through the sensors placed in 10 different compartments and displays the results via a touch screen on the cabinet according to the measuring point by the central PLC. The Breathable Air Monitoring System has been tested according to the environmental conditions applicable to submarine platforms.

In addition to the four critical subsystems mentioned here, KBS develops various test equipment/devices within the scope of the New Type Submarine Project and delivers them to TKMS; thus, the volume of cooperation with TKMS is increasing day by day. On the other hand, the participation of KBS in Sonar Beacon System and PC Network System Projects, which was initially planned to be foreign sourced under the New Type Submarine Project, was handled within the framework of domestic procurement activities carried out by STM, thereby providing a significant growth to the country.

Underwater detection & positioning System

AKYA National Heavyweight Torpedo

... **Indigenous Solutions of KBS for AKYA National Heavyweight Torpedo and Qualification Test Process**

The biggest challenge in the production of underwater systems, such as a heavyweight torpedo, is the carrying out of qualification tests in a marine environment with indigenous resources and capabilities. This is a complicated process that requires intensive effort and experience and may involve hundreds of trials.

Within the scope of the AKYA National Heavyweight Torpedo Development Program, the Phase-I (Development Phase) Agreement between the SSB and Main Contractor Roketsan was signed on May 8, 2009, and the Phase-2 (Industrialization and Pre-production Phase) Agreement was signed in July 2016. The last torpedo launch test that was carried out on December 20, 2019 as part of the ongoing qualification test process. During the qualification test, an AKYA Torpedo with a live seeker was launched for the first time from a 533mm torpedo tube located on an underwater test platform at a depth of 40m. KBS's acoustic buoys, equipped with smart embedded systems, are being used in the qualification testing phase of the AKYA Heavyweight Torpedo. The Underwater Acoustic Tracking System (UATS), which is developed by KBS detects and records active acoustic signals emitted by the pingers on underwater platforms while they are on a cruise, through the hydrophones located on the intelligent buoys. The system enables real-time tracking of target trajectory, transmitted to the monitoring platform, by transferring target detection and buoy position data to monitoring and control platform.

Under the AKYA National Heavyweight Torpedo Program, Roketsan will develop the warhead and guidance system, Meteksan Defense will develop the sonar transducer arrays (sonar wet end), and Koç Bilgi Sistem ve Savunma Teknolojileri A.Ş (KBS) will develop the Wake Sensors, Torpedo Test Range Underwater Detection and Positioning System, Acoustic Signal Generators, and the Underwater Acoustic Models (to verify the systems and software to be developed under the program).

The prototype of the Acoustic Wake Detector (AWD) developed by KBS for the AKYA National Heavyweight Torpedo was first exhibited during the IDEF 2017 Fair. The increasing population of air bubbles due to the motion of the surface target is the primary physical explanation of the so-called "wake." Moving surface targets generate a relatively long tracking wake. The physical constitution of surface target wakes brings into play several processes as thermal structure, turbulent motions or surface, and stern waves. Moving surface targets leave a long wake behind them. The wake produced by a surface target leaves such strong patterns that this makes it possible to detect, track, or identify surface targets with acoustic methods.

This wake can be detected by the AWD, which is integrated into the torpedo. The AWD makes use of the physical features of the wake to detect it or to distinguish it from an undisturbed water surface. The wake generated by a surface target reflects sound so strongly and so persistently that it may provide successful acoustic methods in naval warfare operations for detecting, tracking, or identifying the surface target which has produced the wake. The torpedo scans the target area with this AWD, locates the wake, and guides itself automatically to target e.g., by the suitable crossing of the wake.

There are two small sonar transducers on the AWD, which is located in the middle of the torpedo body. Thanks to these transducers located on both sides of the AWD body, air bubbles created by the surface vessel's wake are detected and analyzed with the electronic hardware located inside the AWD body. Acoustic transducers ping the air bubbles created by the wake, which can stand on the water surface for an extended period, and check the pings reflected from the bubbles to see if they were produced by a surface target. The AWD then transmits its analysis data to the torpedo (data sharing), and the torpedo's central processor makes the final decision. If the central processor gives the tracking command, the torpedo initiates the guidance sequence by using the AWD system. During the tracking phase, the torpedo uses sonar to look for changes in the water caused by the passage of the ship, such as the small air bubbles. When these are detected, the torpedo turns toward the ship then follows a zig-zag course, turning when it detects the outer edge of the wake, to keep itself in the wake. This will eventually bring it to the rear of the ship, where its warhead can do the most damage to propulsion and steering. The "wake homing" torpedoes equipped with the AWD system are difficult to counter with "soft-kill" (functional destruction) jamming systems, though they can be distracted by other ships crossing the wake. Since existing torpedo jamming and deception systems are ineffective against such threats, "wake homing" torpedoes can only be eliminated with "hard-kill" (physical destruction) torpedo defense systems

Aselsan Increases Its Turnover by 44% in 2019

The announcement of Aselsan's 2019 financial results were made on February 11, 2020. The growth trend in the company's turnover continued to rise in 2019. Aselsan's turnover grew by 44% compared to the previous year, exceeding TL 13 billion. The amount of export delivery increased by 50% compared to the previous year and was recorded as US$ 330 million, reaching its historical peak.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In 2019, the advancement in Aselsan's profitability indicators exceeded the growth in turnover. Earnings Before Interest Taxes Depreciation and Amortization (EBITDA) increased by 51% compared to the previous year and reached TL 2.9 billion. The EBITDA margin exceeded the 19-21% range, which the company shared for year end, reaching 21.9%. The net profit of the company was recorded as TL 3.4 billion with an increase of 45% compared to the previous year.

Strong Cash Position

Aselsan closed the year with a net cash position of TL 1.3 billion, due to the effective cash and receivable management maintained throughout 2019. The company's year-end cash also broke a historical record, reaching TL 3.5 billion. Aselsan continued to add new products to its product range in 2019 and received new orders accordingly. The volume of orders received in 2019 totalled US$ 3 billion and the total backlog was US$ 9.7 billion.

Aselsan Chairman and CEO Prof. Haluk GÖRGÜN said the following in his evaluation of the company's 2019 year-end financial results:

"We left behind a year in which we concentrated on deliveries and collections during the last months and we achieved success both in operational and financial terms. Aselsan achieved historical turnover and profitability figures as a result of its efforts both within the country and abroad. Our equities, reaching TL 13.5 billion as of the end of 2019, constituted 53% of our balance sheet and appeared as the main indicator of our sound financial structure. 2019 was also a year in which Aselsan's exports reached its peak. Aselsan, which has maximized its efficiency in international markets, is taking firm steps on its path to become a global defense industry company with 26 subsidiaries and branches, 11 of which are abroad. We have confidence that the growth trend of our country's economy will accelerate in 2020, and we anticipate that the turnover of Aselsan will increase by 40-50% next year. We believe the positive impact of both our organizational efforts and efficiency practices on profitability will noticeably be observed in 2020 and we increase our EBITDA margin guidance to 20-22%."

Aselsan is Growing Together with its Business Partners

"We continue our activities without slowing down with the goal of meeting the needs of our security forces with national resources and becoming a reliable business partner on a global level. Aselsan continues its nationalization activities, not limited to defense but also in non-defense areas such as transportation, security, energy and healthcare. Aselsan's most effectual power in a wide array of activities is the competent human assets that we have achieved in 45 years and our supplier companies exceeding 5,000. In 2019, we continued to support all of our small and large-scale subcontractors that we worked with, and we shared our financial means and R&D capacity with our suppliers. I am fully confident that we will achieve new successes in 2020 with the continuous efforts of our stakeholders."

The Sky's No Longer the Limit for Start-Ups

David ZIEGLER | Vice-President Aerospace & Defense Industry, Dassault Systèmes

In recent years, the aviation and space industry has become extremely attractive to start-ups and small businesses. The boom of start-ups in the aerospace industry began in 2010 with new initiatives from Elon Musk (SpaceX), Jeff Bezos (Blue Origin) and Bertrand Piccard (Solar Impulse) – all of them being successful entrepreneurs. With a gleam in their eyes, they demonstrated that smaller companies can take to the skies on par with huge, established corporations. And the trend continues. Today, the aircraft industry is rife with opportunities for start-ups. New players not only offer innovative solutions, but also radically change the nature of the entire market. Now, the industry is flooded with new players. According to recent research conducted by NewSpace Global, the number of start-ups in the industry has grown almost tenfold since 2013 - from 120 to more than 1,000 today. In tandem, in 2018 alone, £25.6 billion was invested in aerospace start-ups, according to the British venture fund Seraphim capital.

However, the aerospace industry has many hurdles to overcome in order to compete. The tightly regulated and safety critical industry is understandably meticulous but slow to adopt new technology. Arguably, this is leaving the door wide open for start-ups. Unlike the state-owned companies or large international corporations, start-ups use their "no fear of failure" approach. They strive to reduce the final cost of their products and services to make them accessible to a wide range of customers. To do this, they have to work faster, generate more new ideas and use a number of cross-sectoral technologies and solutions. For example, it took SpaceX five years and £307 million of investments in order to develop the carrier rocket Falcon 9, while NASA would have spent about £1.0 billion for a similar task, according to the agency's own calculations.

Start-Ups Take to the Sky

Over the past few decades, the quality of technologies and various components has improved while their manufacturing costs have dropped. As a result, start-ups are now present in almost every segment of the aerospace industry. The fastest growing trends in the industry are unmanned aerial vehicles, satellites, space communication systems, various services for maintaining space and aviation infrastructure, and finally, suborbital tourism.

For example, Chinese start-ups Space Transportation and Linkspace have recently launched their reusable rockets – an affordable alternative to Falcon 9. In the UK, OneWeb is already launching miniature

satellites into the low Earth orbit. By 2021, the company intends to use it to provide high-speed Internet access throughout the world. Orbex, is preparing the commercial release of its Prime rocket, which is specifically designed to launch ultralight satellites. By 2023, it should put into orbit the nanosatellites of Swiss start-up Astrocast, which plans to deploy a global support network for the Internet of things. Elsewhere, the Canadian company LEO will launch a service that monitors the chemical composition of the earth's surface and track space debris by 2021.

The list of start-ups doing innovative work within the industry could go on. Each example highlights that start-ups are moving from just talking about projects to actioning them, and at a rapid pace.

Agility within Startups

Start-ups are not afraid to experiment, and as a result, new types of transport, new markets, and new categories of consumers are born right in front of our eyes. Dassault Systèmes works with many aerospace and defense startups including AeroMobil, a company creating a prototype of a roadable aircraft, the first vehicle of its kind, due to be released in 2020. The AeroMobil vehicle will make it possible to move around in any terrain and in any weather. As they say in the company itself, developing such a project required a

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multitude of cross-sectoral interaction. After all, in order to successfully pass certification, such a flight-and-ground apparatus should meet the requirements of regulators of both industries at once. But the emergence of this type of transportation will give impetus to the development of new related types of business – schools for drivers/pilots and even flight-car service.

So, how do start-ups manage to compete on equal terms with big companies? First, by using the same engineering and marketing tools as established market leaders. In fact, start-ups have an advantage when implementing new technology such as cloud computing, computer vision, big data, as well as business intelligence and digital IT platforms. Much like Boom Supersonic, that uses the 3DEXPERIENCE platform to help accelerate the design and development of its Overture airliner, a commercial aircraft achieving the speed of Mach 2.2, which in turn will make supersonic flights ubiquitous and accessible. Boom uses the same platform for its ideation, production and certification that industry leader Airbus uses to develop and build its aircraft.

Furthermore, start-ups have an advantage in terms of having greater flexibility and mobility. The use of agile principles in product development, and the ability to find and occupy new niches in the market. This gives start-ups a great advantage over large companies. With the 3DExperience platform on the cloud, they can scale without having to own a huge IT infrastructure network – a true recipe for speed.

What's Next?

Of course, market leaders won't be quick to give up their positions to new players. Traditional players also seek the advantages innovative technology offers. To achieve that, aerospace and defense companies are acquiring startups, setting up corporate venture funds and developing "skunkworks" projects and partnerships to support develop new products. For example, Airbus now has its own startup accelerator, Airbus Bizlab, which has helped 72 external and 54 internal projects over the four years.

Dassault Systèmes too has its own international network of 3DEXPERIENCE Labs and Centers that help start-ups and large companies alike to improve products and develop the concepts for next-generation air transport. Two startups that have brought projects to the 3DEXPERIENCE Lab are, Xsun and Zero 2 Infinity. Xsun is developing new types of long-range

unmanned aerial vehicles powered by solar energy. Zero 2 Infinity is building an inexpensive and environmentally friendly platform for launching small-sized satellites using stratospheric balloons.

Large players also see the value in rapid innovation projects. One collaborative project with Dassault Systèmes and the National Institute for Aviation Research at Wichita State University resulted in Airbus successfully developing a new thrust reverser prototype. Northrop Grumman, Lockheed Martin and Raytheon all work closely with satellite start-ups. For example, Lockheed Martin has a stake in Terran Orbital, which offers satellite surveillance services to various government departments. Tighter collaboration between large and emerging players will bring more innovation to the market and help it transform further.

Although start-ups embrace new ideas and technology, they often face a much bigger threat than large players: they cannot afford to fail in this highly regulated industry. They need to pass long and complex certification processes before launching their product despite being both cash-strapped and time-constrained.

Online, cloud-based virtualization and product innovation platforms offer new ways for ideation, design, manufacturing, testing, certification and operation, helping start-ups optimize their processes and keep their activity focused on their products. These platforms automate routine operations, streamline business and engineering processes, reduce time spent on administrative tasks and vastly improve strategic and routine access to information. As a result, start-ups can accelerate their programs and be the first to bring their prototypes to market. Investments in digitalization can pay off in as little as 6 to 18 months, fast-tracking the start-up's journey to profit. Providing young companies with the resources to centralize all their operations helps start-ups focus on what they do best: devise creative ideas to complex issues and challenge the big players. This creates a much more vibrant industry that pushes the boundaries of the atmosphere ■

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Otokar Concluded 2019 with Record Growth

Otokar, a Koç Group company, announced its 2019 results. Serdar GÖRGÜÇ, General Manager, Otokar, noted that the company's 2019 revenues reached TL 2.4 billion with 45 percent increase, "We left behind a difficult year as both the global and Turkish economy faced many challenges. Despite uncertainties worldwide, we strived to represent Turkish automotive and defense industries successfully in the international arena. With broad product ranges in commercial vehicles and defense industry, and technology, design and engineering capabilities, we strengthened our position among global brands. In 2019, our exports grew 78 percent year on year, and we posted TL 352 million profit with an increase of 114 percent."

Otokar, Turkey's leading automotive and defense industry company disclosed its 2019 financial results. Otokar, which operates in more than 60 countries on five continents with products with owned intellectual property rights, ended 2019 with a record growth of 45 percent. General Manager Serdar GÖRGÜÇ said that Otokar continued its operations with a focus on long-term goals without the impact of short-term fluctuations and despite the uncertainties across the globe and the tightening in the domestic market, "We defined our strategy as increasing exports and expanding globally. We continue to take bold steps as we aim to sustain our growth. In 2019, our exports increased by 78 percent to $340 million while the share of exports in revenues reached 80 percent. With record growth, our net profit increased by 114 percent year on year, reaching TL 352 million. And our R&D spending amounted to TL 136 million in 2019."

Serdar GÖRGÜÇ pointed out that Otokar also maintained a balance between commercial vehicle and defense industry sales in 2019, adding that both product groups captured similar shares in total revenues.

Serdar GÖRGÜÇ: "Ahead of International Competition"

GÖRGÜÇ noted that Otokar's greatest motivation is its commitment to fulfilling its mission with success, "Through our 57-year history, we brought to life numerous successful projects with our responsibility to our clients. We launched countless commercial vehicle and defense industry projects, each with great pride. Armed with this awareness and responsibility, we strived to represent Turkish automotive and defense industries successfully in the international arena. Our efforts culminated in undertaking several challenging projects on a global scale ahead of our international competitors, and we achieved success in every project we received."

Serdar GÖRGÜÇ also provided information about export of defense industry and commercial vehicles. Noting that Turkey's land vehicles exports rose 73 percent in 2019, he said "We continued to export armored vehicles in 2019. We doubled our exports of defense industry products compared to the previous year. We analyze user expectations and needs with great care to design and manufacture products that align with requirements, and as a result our company also continued to grow in the commercial vehicles segment, opening to new markets. We overcame tightening in the domestic bus

market, which shrank 58 percent, with exports as we expanded our vehicle park in several countries, particularly in Europe. Today, our buses successfully serve millions of passengers in more than 50 countries. The number of Otokar brand buses used in passenger transportation surpassed 2,200 in France alone. We aim to grow our share in the bus market, especially in Europe, and to rapidly elevate our position globally."

GÖRGÜÇ: "Number of Companies Established Abroad on The Rise"

GÖRGÜÇ said, "The fact that Otokar continues to strengthen its position in the regions where it operates by establishing affiliates and subsidiaries also had a positive impact on last year's growth figures. In line with our goal of crowning our international expansion with new achievements, we established our fourth company abroad in Kazakhstan. With this company, we intend to take advantage of various opportunities such as joint product development and engaging in local business partnerships, local production and technology transfer in Kazakhstan and Central Asia, where our defense industry products and commercial vehicles are actively used."

GÖRGÜÇ "Leading the Industry with Pioneering Work"

Serdar GÖRGÜÇ pointed out that Otokar, supported by its strong R&D capabilities, continues to elevate its position in the global market, especially in the last decade, taking important steps in new technologies and applications, "Our investments, our engineering and production capabilities, and the flexibility to produce according to user requirements have made us a pioneer and leader in commercial vehicles and the defense industry in Turkey. In 2019, our R&D spending amounted to TL 136 million. After developing Turkey's first electric bus in the 2010s, we continued to work on vehicles powered by alternative fuels in 2019. We added the new 12-meter electric urban bus to our product family. We are currently promoting this bus in Europe. We also launched Turkey's first electric armored vehicle, Akrep IIe. Our goal with these vehicles is for Otokar to gain even more experience and knowhow in alternative powertrains such as electric, diesel and hybrid to accelerate transition to autonomous vehicles. We will continue to work and invest toward becoming a future ready company that shapes and leads the industry."

Graphene and 2D Material Focus Technology Network (OTAG)


© SSB

March 7, 2020. In order to manage transformation in defense industry technologies and for development of indigenous systems, subsystems and products, through investing in future technologies, Focus Technology Network (OTAG) was established under the guidance of the Presidency of Defense Industries (SSB).

Within this framework, one other has been added to the OTAGs in the Composite and Additive Manufacturing technology fields. The introductory meeting for Graphene and Two-Dimensional Material Focus Technology Network (OTAG) was held at the SSB.

More than 200 academicians, personnel and researchers from 50 universities, 15 companies and various research centers participated in the introductory meeting, where industry, universities and research institutions gathered pursuant to the SSB's call.

It is considered that graphene and 2D materials will play an active role in the projects to be implemented in the coming years with the aim of gaining critical technologies that support the operational capabilities of our safety and security forces, minimizing foreign dependency, intensifying indigeneity and increasing the competitiveness of our defense industry.

Within this framework, it is important to determine the point where graphene and 2D material technology has reached in our country, the actions to be taken for current and future studies and to plan complementary studies. The workshop activities introduced will be conducted through the focus groups "Electronics/ Optoelectronics", "Composites, Protective Coatings and Paints" and "Energy".

Following the workshop, the aim is to determine technology priorities by considering the objectives of our country and the skill needs of our safety and security forces, to define cooperation methods and to establish acquisition plans. Within this scope, the plan is to organize the Graphene and 2D Material Focus Technology Network Workshop Final Meeting in September 2020, and then create a roadmap by publishing the Graphene and 2D Material Focus Technology Network Report.

Dynamic Manta 2020 (DYMA20) - NATO's Advanced Anti-Submarine Warfare Exercise

Hosted by the Italian Navy (Marina Militare), the "Dynamic Manta 2020" (DYMA20) Submarine Warfare Exercise was held between February 24 – March 6, 2020, in the Mediterranean Sea off the coast of Sicily with the participation of NATO allies Canada, France, Germany, Greece, Italy, Norway, Spain, Turkey, the United Kingdom, and the United States.

by Saffet UYANIK

The aim of the annual exercise hosted by NATO's Allied Maritime Command (MARCOM) is to boost the coordinative capacities of all participating countries in anti-submarine warfare (ASW) and anti-surface warfare (ASuW) and to enhance interoperability and overall multi-lateral operations among NATO allies.

As the host nation, Italy provided operational support in Catania Harbor, the Navy Helicopter Base in Catania and Naval Air Station Sigonella, as well as logistic support (refueling operations, medical assistance, and personnel accommodation) at the Augusta Naval Base. A total of seven frigates, four submarines, and five maritime patrol aircraft (MPA) from the allied nations participated in the Dynamic Manta (DYMA20) exercise. Submarines from France, Greece, Italy, and Turkey under NATO Submarine Command (COMSUBNATO) joined the surface ships from Canada, France, Greece, Italy, Spain, and Turkey. The team simulated a multi-threat environment with maritime patrol aircraft from Canada, Germany, France, Turkey, and the United States and shore-based helicopters from Italy and the United Kingdom operated from Sigonella Air Base and the Italian Navy's Helicopter base in Catania, under the control of NATO Maritime Air Command (COMMARAIRNATO).

The sophisticated training exercise was orchestrated principally to test out NATO's maritime forces to evaluate the Alliance's capacity in case of unexpected and urgent events. Dynamic Manta is one of two annual NATO-led Anti-Submarine Warfare interoperability exercises. Manta is conducted in the Mediterranean (focused on finding boats in warmer waters), and the other ASW exercise, Dynamic Mongoose, is carried out in the North Atlantic region. Dynamic Manta is based around Standing NATO Maritime Group 2 (SNMG 2) which is one of four very high readiness surface forces that NATO maintains under its Maritime Command (MARCOM). NATO Maritime Command leads four Standing Maritime Groups (two destroyers/ frigate groups and two mine countermeasures groups), which are multinational, integrated maritime forces made up of vessels from Allied countries.

These vessels are under continuous NATO command to perform a wide range of tasks ranging from deterrent presence and situational awareness to exercises and the conduct of operational missions. These groups provide NATO with an immediate operational response capability both in peacetime and in crisis. They demonstrate Alliance resolve and foster solidarity, as well as enhance the Alliance's relations with Partner nations through visits and exchanges. These four groups comprise the core of the maritime component of the Very High Readiness Joint Task Force (VJTF) in the NATO Response Forces (NRF), providing timely maritime support to NATO operations in a contingency. Additional forces could be added

to these groups, with the NATO command staff on board and the ships of the group as the nucleus. The purpose of exercises like Dynamic Manta and its sister exercise in the North Atlantic, Dynamic Mongoose, is to allow those task groups to prove their proficiency in specialized warfare areas.

Alongside the traditional assets, there were also several unmanned systems, some of which are provided by NATO's Centre for Maritime Research and Experimentation (CMRE). The Alliance's Italy-based research laboratory participated in the exercise with unmanned undersea vehicles and gliders to contribute to sub-hunting operations as additional submarine hunters while also testing out the new gear and new tactics. During the Dynamic Manta, CMRE deployed two Ocean Explorer large autonomous unmanned vehicles (AUVs) fitted with thin-line towed array sonar systems, along with Liquid Robotics Wave Glider unmanned surface vehicles (USVs) that are acting as communications nodes between the surface and sub-surface domains.

On the morning of the first day of the Dynamic Manta, allied frigates and submarines left the port of Catania and conducted their first joint drills with helicopters. An SH-90 helicopter from Italian frigate ITS Carabiniere (F 593) deployed its dipping sonar into the Ionian Sea to detect the submarine movements in the region where the Turkish frigate TCG Salihreis (F-246), Canadian frigate HMCS Fredericton (FFH 337), and the Italian submarine ITS Salvatore Todaro (S 526) were located. One of the Turkish Navy's most critical striking forces, the TCG Salihreis frigate, also participated in the NATO exercise to boost cooperation between allied countries. Turkish Naval Forces, with more than ten warships operating across the Eastern and Central Mediterranean region, was one of the naval forces that provided maximum support to the NATO exercise Dynamic Manta 2020. The Turkish Naval Forces took part in the exercise with the

Barbaros class frigate TCG Salihreis (F-246), Preveze class submarine TCG 18 mart (S-355), and a P-235 Maritime Patrol Aircraft (MPA). In addition to these elements, the Gabya class frigate TCG Gaziantep (F-490) also provided partial support to the exercise. On March 9, 2020, the Turkish Ministry of National Defence made an announcement on the social media stating that the Turkish Maritime Patrol Aircraft, flew 15 sorties during NATO Exercise "Dynamic Manta 2020", detecting all four allied submarines and reaching highest operational tempo and detection rate among all participating aircraft.

During the exercise, each surface ship had the opportunity to conduct a variety of submarine warfare operations. The submarines took turns hunting and being hunted, closely coordinating their efforts with the air and surface participants. NATO exercise Dynamic Manta (DYMA20) showcased the collaborative approach required for effective ASW operations by providing an invaluable opportunity to improve the collective NATO anti-submarine warfare (ASW) capabilities by flexing NATO tactical ASW doctrine against some very challenging targets.

Resilience Decision Support Project of NATO HQ SACT was Supported by STM Thinktech

STM ThinkTech, Turkey's first technology-based think tank, has developed a Resilience Decision Support Model to assist NATO in decision making processes when encountering large-scale and complex problems.


Murat İKİNCİ

Carrying out significant projects in the fields of engineering, technology and consultancy under the leadership of the Presidency of Defense Industries (SSB), STM Savunma Teknolojileri Mühendislik ve Tic. A.Ş. continues in its efforts to develop innovative and unique solutions. The Resilience Decision Support Model developed indigenously for NATO- by ThinkTech – STM's technology-based think tank – assumes an important role in the accurate analysis of the effects of large-scale, complex problems and in determining the road maps to be drawn by decision-makers.

STM Supporting NATO's Decision Making Processes Related to Resilience

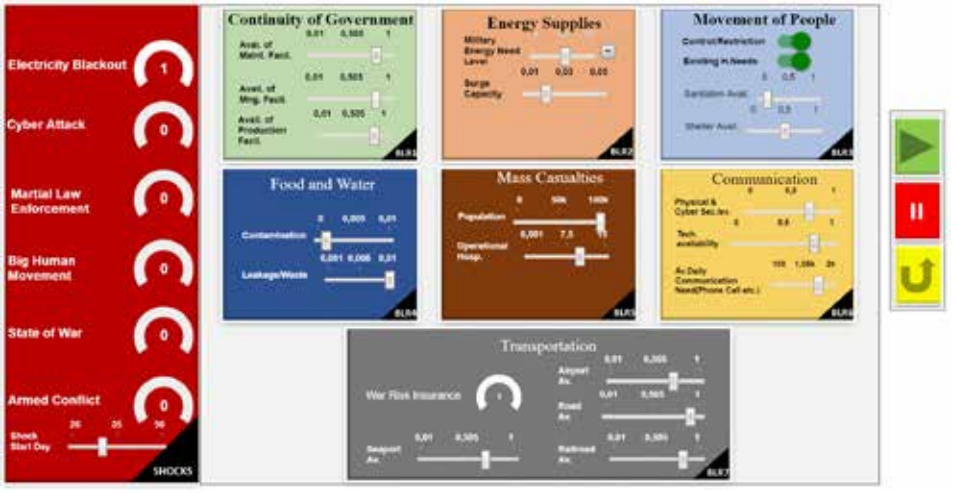
The Resilience Decision Support Model developed by STM ThinkTech is based on the "System Dynamics" approach and has been successfully completed and delivered to NATO's Allied Command Transformation (ACT) within the scope of a project launched on 29 October 2019. The second phase of the project was just started by a new contract and over a period of five months the existing model will be upgraded

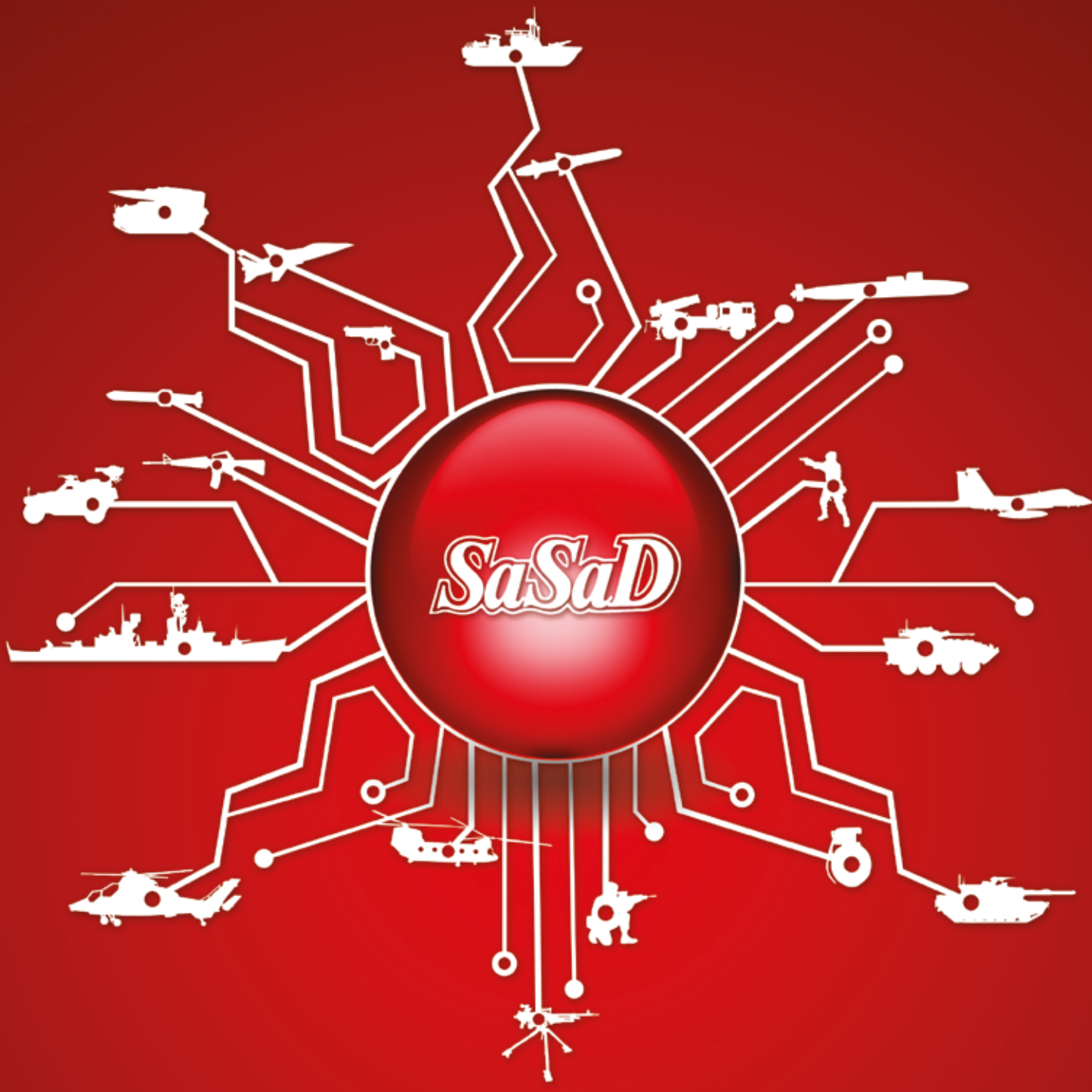
The Decision Support Model analyzes which areas and infrastructures will be affected, and to what extent, in the event of various types of shocks determined at the outset of the project by NATO, such as large migration movements, the build-up of a conflict environment, large-scale power outages and natural disasters. It provides significant support to decision makers when deciding on the allocation of resources and investments by showing them the strategic impacts of such shocks, including those with potential social and political effects, and their possible consequences on civil and military system elements, along with potential changes in the performance of such elements. The model, which also supports decisions of what kind of a recovery process should be initiated in the face of such shocks, facilitates the decision making processes of authorities in terms of the actions and measures they need to take.

STM Contributes to National Security

Emphasizing that STM ThinkTech works with the aim of developing sustainable solutions in the fields of defense and security, Murat İKİNCİ, General Manager of STM, said: "ThinkTech has transformed STM's almost 30-years of know-how and competency into both intellectual and technological outputs and forecasts, and not only raises awareness in the local ecosystem in our country, but also undertakes a global mission to produce indigenous models that provide concrete outputs to critical organizations. The Resilience Model we have developed specifically to support NATO decision making processes makes an important contribution in this sense. We will continue to diversify our solutions to address situations that threaten national security, both in the national and international arena, and to cooperate with such prestigious institutions as NATO."

As a system that can be adapted to different scenarios in accordance with the duties and needs of institutions, the Resilience Decision Support Model constitutes a unique solution for the sustainability of security, both at home and abroad.





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Qualification Tests of HGK-83 Ammunition Completed Successfully!

President of Defense Industries Prof. İsmail DEMİR made a public statement saying that the qualification tests of the HGK-83 ammunition had been successfully completed and the ammunition is ready for mass production, through the video he shared on his twitter account on January 22, 2020.

HGK-83 is a GPS/INS guidance kit that turns existing 1,000 lb Mk-83 general purpose bombs into air to ground smart weapons which can be released in multiples by using the BRU-57 multiple-weapons carriage system.

What is a Precision Guidance Kit?

A Precision Guidance Kit (PGK) is the guidance package that converts general purpose bombs (Mk-84) into smart weapons. A PGK basically consists of the control drive system on the tail side, the GPS/INS guidance control unit and the overall liner.

A PGK, which can be released from the F-4E/2020s and F-16s in the inventory of the Turkish Air Force, can be used in almost every weather condition and hit targets at a range of 15 nm.

Mission information that includes the target point and hit parameters of the PGK is uploaded to the aircraft while the aircraft is on the ground. During the captive carriage, the weapon automatically performs initialization as soon as the aircraft powers the weapon and matches its own navigation system with that of the aircraft. Mission data is automatically transferred from the aircraft to the weapon before shooting. When the release point is reached during the shooting, the aircraft releases ammunition. After leaving the aircraft, the guidance system of the ammunition is activated and takes the bomb to the target under any weather condition. In case any GPS signal loss for any reason after it is released from the aircraft, the INS system is activated and hits the target successfully through only INS mode performance.

The PGK guidance kit family, which converts 500lb Mk-82, 1,000lb Mk-83 and 2,000lb Mk-84 general purpose bombs into air to ground smart weapons with the INS/GPS guidance system, is named HGK-82, HGK-83 and HGK-84.

PGK activities were first started in 2001, and the certification of the HGK-84, developed by TÜBİTAK-SAGE with national facilities, to F-4E/2020 aircraft was completed in 2005. Afterwards, it has been used by the Turkish Air Force in many operations and continues to be used as needed. Certification of PGK to the F-16 aircraft in the Turkish Air Force inventory was achieved in 2013. In 2014, it was selected by the NATO working group for the UAI (Universal Armament Interface) demonstration and was successfully released from a UAI-compliant U.S. F-16 aircraft. With the project signed with the MoND, the mass production of the HGK-84 as started by

Aselsan in 2014 and more than 1,500 deliveries have been made so far. On the other hand, in order to be used effectively against moving targets, the HGK-84 was also equipped with the Laser Seeker feature, and the nationalization efforts to eliminate the foreign dependency on the sub-parts of the HGK-84, which has a great export potential, will continue.

On the other hand, the development and certification tests of the HGK-82 were completed at the beginning of 2018 and the first delivery was made to the Air Force command on October 31, 2018. Following this delivery, during the test fire on November 2, 2018, the HGK-82 successfully hit the target 17 kilometers away at 37,500 feet. This test was realized at the Konya Karapınar Firing Test and Evaluation Center where the Minister of Industry and Technology Mustafa VARANK was present. In the statement made by TÜBİTAK-SAGE on August 9, 2019, it was announced that the Air Force Command performed 4 more operational test fires under challenging conditions and that the HGK-82 became operational.

Within the scope of the projects aiming to minimize foreign dependency and increase indigenization, the active GPS antenna developed by TÜBİTAK-SAGE for use in smart ammunition and operating at L1/L2 bands has completed all development tests including firing tests, and another progress has been achieved for indigenization in this field to reduce foreign dependency. On the other hand, "KAŞİF", the Local Global Positioning System receiver to be used in HGK kits, was first exhibited at the TÜBİTAK-SAGE booth at the IDEF'19 Fair. Additionally, the production of MARK series Mk-81, Mk-82, Mk-83 and Mk-84 General-Purpose Bomb body and tail units is also performed in Turkey as domestic production by the company ASSAN.

Contract Signed for MMU's Lightning Testing Center

A signature ceremony was held between Turkish Aerospace and HIZAL companies for the establishment of a "Lightning Testing Center" for the National Combat Aircraft (MMU) Project. The center to be built within the scope of the agreement will be able to test the direct and indirect effects of lightning on the MMU during the development phase.

During the ceremony, Turkish Aerospace President and CEO Prof.Temel KOTİL said, "With the support of our Presidency of Defense Industries, conducting these tests at our center will provide a serious advantage. The tests will also be regarded as R&D projects. Further test centers will be acquired to our company soon."

HIZAL CEO Prof. Mizrahan HIZAL said, "Conducting such important tests with domestic facilities is important in to detect the deficiencies on-site. We would like to thank Turkish Aerospace for choosing our company for the establishment of this center that will carry out such tests."

During the development phase of the MMU, which is among the most important projects of Turkey, the infrastructure activities of the Lightning Testing Center to be built on approximately 4 thousand square meters for testing the direct and indirect effects of lightning will be performed by the company HIZAL, which has in-depth experience in the area of high voltage.

The center will enable the elimination of the effects of lightning damage or equipment failure on the MMU under challenging weather conditions, and is expected to be completed in 2022.

ARES on Course to Break yet Another Record in Shipbuilding History

Turkey's record holding shipyard ARES, is running for another one: The Largest Serial Production in Shipbuilding with the 122 fast patrol boats program for the Turkish Ministry of Interior-Coast Guard.

The project is currently close to the end of design validation, with recent accomplishments of model tests in the CDR (Critical Design Review) phase. Serial production is scheduled to start in the second quarter of 2020.

One Boat Every Week...

Utku ALANC, CEO of ARES Shipyard stated that "The project represents the largest volume serial production in Turkey's shipbuilding history, and it will certainly put a significant record in the world's shipbuilding archives as well. The project is planned to last for five years and it will involve construction and delivery of 122 ARES 35 FPB boats to meet the needs of the Turkish Coast Guard. On the other hand, the contract allows for additional vessels which may end up with even twice as much. We will deliver six boats every two months based on our production program. Thus, one boat will be made ready to launch in only one week... This is something only ARES can achieve!"

ARES 35 FPB, the first of which will be commissioned in 2020, will serve in tasks such as combatting irregular immigration, search and rescue, anti-human trafficking and maritime security missions. To be built according to the Turkish Lloyd's norms and rules, the boats will carry out operations in all coastal areas of Turkey, from Artvin in the Northeast of the Black Sea and to Hatay in the Southeast Mediterranean.

About ARES 35 FPB

ARES 35 FPB will be manufactured using vacuum infusion technology from carbon-reinforced advanced composites. The outlined technical characteristics of the boats are as follows:

- Overall Length: 12 meters
- Width: 3.75 meters
- Draft: 0.80 meters
- Main Propulsion System: 2 x Inboard Diesel Engines and Water Jets
- Maximum Speed: 35 knots
- Range: 160 nautical miles

Havelsan Technology Oman LLC Officially Inaugurated

The opening ceremony of Havelsan Technology Oman LLC, founded by Havelsan in Muscat/Oman, was held with the participation of Ambassador of the Republic of Turkey to the Sultanate of Oman Ayşe Sözen USLUER.

Ambassador Ayşe Sözen USLUER, Havelsan Chairman of the Board Prof. Hacı Ali MANTAR and Masirah International Chairman of the Board Saad Al JENAIBI wished success to Havelsan Technology Oman LLC.

Havelsan Top Management and representatives of Havelsan's local business partners in Oman also attended the opening ceremony. Havelsan established a joint venture with Masirah International after exporting its Command, Control, Computer, Communication and Intelligence System (C4I) to Oman. The company, in which Havelsan owns 70% and Masirah International owns 30% of shares, aims to make Havelsan's presence in Oman more permanent.

6 Bayraktar TB2s Delivered to the Gendarmerie General Command

February 28, 2020 - President of Defense Industries Prof. Ismail DEMIR announced that 6 Bayraktar TB2 Armed UAVs were delivered to the Gendarmerie General Command.

Stating on his Twitter account that 6 Bayraktar Armed UAVs were delivered to the Gendarmerie General Command, President of Defense Industries Prof. DEMIR said, "Turkish Defense Industry will continue to exert efforts each day to better produce for our hero soldiers."

TS1400 Turboshaft Test and Subsystems Workshop Held in Eskişehir

The "Turboshaft Test and Subsystems Workshop", hosted by the Presidency of Defense Industries (SSB) and TEI and with the support of Erciyes Technopark, was held at the TEI Eskişehir Campus on February 10, 2020.

Özdemir ÇAKACAK, Governor of Eskişehir, SSB Department Head of Engine and Power Transmission Systems Yakup ERTAŞ, TEI President and CEO Prof. Mahmut F. AKŞİT, officials from the SSB and universities and private sector company representatives attended the workshop.

Delivering a speech at the opening ceremony, Özdemir ÇAKACAK, Governor of Eskişehir wished success to all participating company representatives in their activities and said, "Our country has achieved significant progresses in recent years, especially in the defense industry, and from education to health, from transportation to industry, from trade to tourism. Eskişehir is one of the important centers of our country in high-tech product exports, especially in rail systems and aerospace/aviation. The enterprises that have made substantial investments, such as TEI, have been contributing to the economy and employment of our country by carrying out important activities. Turkey is located in one of the world's most important

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regions in the world. When we look at the history, our ancestors suffered a lot in every period of our history to make and maintain these lands a homeland for us. Today, under the leadership of our President, the Turkish defense industry has reached a level capable of producing its own needs. There is nothing this nation fails to do in unity and solidarity. I hope this nation will be at the level it deserves also by meeting the targets of 2023 and 2071 with the unity and solidarity of our industrialists."

Taking the floor at the ceremony, SSB Department Head of Engine and Power Transmission Systems Yakup ERTAŞ said, "We conduct workshops when needed throughout the Turboshaft Engine Development Project, which we initiated as the SSB, and this is our second workshop for this project. In this workshop, we will be seeking how we utilize the industry for test infrastructures and other sub-systems, and how we transform them into domestic products. I would like to thank all the industry representatives for being here and I wish the negotiations will be fruitful."

TEI President and CEO Prof. Mahmut F. AKŞİT also delivered a speech and said, "Today we organize our second workshop within the scope of our project, hopefully we will organize the engine delivery ceremony instead of our third workshop, and that time is near. In this workshop, we want to carry out our meetings in a more specialized way than the previous one. We want to satisfy our engine test systems and engine sub-systems needs with our domestic and national facilities. I believe today will be an important occasion for our indigenization and nationalization efforts. I wish all the meetings to take place today will be beneficial and our national helicopters will fly with the parts to be produced also by you."

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Following the speeches, SSB Turbine Systems Manager Bedriye CİCİOĞLU and TEI Turboshaft Programs Director Dr. Mehmet DEMİROĞLU made presentations about the project and the workshop.

Within the scope of the Turboshaft Engine Development Project, which was launched in 2017 and is being carried out within the scope of the Indigenous Helicopter Program to meet the engine needs of the GÖKBEY helicopter with domestic facilities, another important leap has been achieved with the bilateral talks during the workshop organized by TEI, the main contractor of the project, under the auspices of the SSB, and for the increase of domestic and national possibilities for the TS1400, Turkey's first national helicopter engine, in order to ensure the continuation of the project.

Aspilsan Energy's Transition to Havelsan Cloud Computing and the Opening of New Warehouse/ Administrative Building

With the ceremony held in Kayseri on January 29, 2020, the transition of Aspilsan Energy to Havelsan Cloud Computing and the New Warehouse/Administrative Building Opening were realized.

This important cooperation between Aspilsan and Havelsan, the two subsidiaries of the Turkish Armed Forces Foundation (TAFF), has served as a model for the nationalization and indigenization move of our country in technology and software.

With cloud computing technology developed by Havelsan and put into the use of the Turkish Armed Forces Foundation for the first time, Aspilsan has had the opportunity to renew its server rooms and network infrastructure, to obtain the installation and maintenance services for its network devices, to obtain services over a fiber line for its servers with the move of servers to Havelsan facilities, and to manage all its campuses from a single point.

During the ceremony attended by the TAFF Deputy General Manager V. Sadık PİYADE and Aspilsan and Havelsan Senior Executives, Havelsan Cloud Computing technology was tested and verified through the live connections made to Aspilsan's Ankara and Istanbul offices.

Acting General manager of TAFF V. Sadık PİYADE highlighted his confidence in Havelsan that it will successfully implement the Cloud Computing Service also in Aspilsan and said, "I have no doubt that Aspilsan will achieve significant success with this strength backed by Havelsan."

While Havelsan Vice President of the Board of Directors Mustafa ŞENOL stated that the cloud computing technology that is secured by Havelsan's own cyber security products is an extremely reliable, indigenous and national solution, Aspilsan President of the Executive Board İlhan BÖLÜK said that he believes this cooperation intended for the national technology will set an example for all domestic and national efforts, particularly for other Foundation companies.

While Havelsan General Manager Ahmet Hamdi ATALAY stated that Havelsan has undertaken a crucial task in increasing the software localization rate in our country; Aspilsan General Manager Ferhat ÖZSOY said that with Havelsan Cloud Computing Technology, they now have access to the requested files and software applications wherever and whenever they want, regardless of location.

New Generation EO/ IR Targeting Pod Development Workshop

The 'New Generation EO/IR Targeting Pod Development Workshop' was held at Aselsan facilities by the Presidency of Defense Industries and Aselsan with the participation of the Turkish Armed Forces and other security forces officials. During the workshop, the existing capabilities and studies for the targeting pod, which is planned to be developed for use in air platforms, were shared, and the needs of users regarding reconnaissance-surveillance and targeting were evaluated. In this context, project studies have been initiated for the development of the 'New Generation EO/IR Targeting Pod'.

FNSS Achieves Another First with KAPLAN MT (Harimau)


© FNSS

The Medium Weight Class Tank KAPLAN MT, developed by FNSS jointly with the company PT Pindad, the Indonesian State Defense Corporation, has successfully completed all the qualification tests of the Indonesian army and has qualified for serial production.

With the joint production agreement signed during the IDEF fair last May, which became effective in December of the same year, the activities for mass production started at FNSS facilities. A total of 18 KAPLAN MT tanks will be produced within the scope of the agreement, 10 of which will be produced in Turkey and the remaining 8 will be produced in in Indonesia.

The KAPLAN MT Project, to be realized by a technology transfer model from FNSS to PT Pindad, attracts attention in terms of being the first export agreement of Turkey in the Middle Weight Class Tank and as the first project which was launched within the framework of Defense Industry Cooperation Agreements signed between Indonesia and Turkey.

FNSS General Manager and CEO K. Nail KURT: "The Indonesia Kaplan MT project also gains importance in terms of the fact that we have implemented many firsts that were referred to as "not possible" and we have satisfied user demands in a short period of time in the design, qualification and serial production processes of tracked and wheeled armored vehicles. At this stage, we are proud to be able to fulfill our commitment for adding value to our stakeholders once again with the comprehensive international technology transfer we have made for the fourth time."

More than 200,000 Pistols Delivered Under the ÖYTG Project!

According to the Presidency of Turkish Defense Industries (SSB) under the Indigenous Local Handgun Development (ÖYTG) Project more than 200,000 METE pistols manufactured by Sarsılmaz and Samsun Yurt Savunma (SYS, CANIK) have been delivered to the Turkish Armed Forces (TAF) and the Turkish National Police (TNP).

The SSB shared the latest status of the ÖYTG Project on its official Twitter account on March 15, 2020 with the following statement: "The delivery number of METE pistols produced by Sarsılmaz and SYS within the scope of the Indigenous Local Handgun Development (ÖYTG) Project exceeded 200,000. Under the ÖYTG project more than 280,000 pistols will be manufactured, more than 180,000 by Sarsılmaz and 100,000 by SYS."

Sarsılmaz was initially selected by the SSB under the ÖYTG Project and secured an order for the delivery of a total of 110,242 9mm SAR 9 METE pistols to the Turkish Land and Naval Forces as well as to the Turkish Coast Guard and National Police (Security General Directorate). With the follow-on contract the number of METE pistols to be delivered by Sarsılmaz has been increased to over 180,000. According to contract, Sarsılmaz will deliver 30,142 SAR 9 METE pistols in 2018, 55,300 pistols in 2019 and 24,800 pistols during 2020-2022. Sarsılmaz also won a tender from the Turkish National Police for the delivery of 40,000 SAR 9 pistols in addition to ones that were ordered under the ÖYTG Project.

Within the scope of the ÖYTG Project, SYS was contracted to deliver 100,000 METE-S and METE pistols. On June 18, 2018 SYS completed the deliveries of the first batch TP9SF METE-S pistols to the Turkish Naval Forces (will procure a total of 8,700 TP9SF METE-S pistols) under the ÖYTG Project. The company developed two different models within the scope of the ÖYTG Project: the Type-A (TP9SF METE-S) and Type-B (TP9SF METE). The TP9SF METE-S, which is equipped with a safety catch, is being delivered to the Turkish Armed Forces (TAF), while the TP9SF METE, which lacks a safety latch, enters the service of the Turkish National Police (TNP, 29,700 pieces in three batches of 10,000, 10,000 and 9,700). Both models are equipped with a striker mechanism and a single action trigger, and are delivered with three magazines each, 1 x 15 round and 2 x 18 round capacities. In accordance with the contract, awarded by the SSB on February 7, 2018, the company manufactured and delivered 45,000 pistols for the ÖYTG Project by the end of 2018. SYS also delivered 2,500 pistols in March 2018 to the Turkish Air Force (TurAF) under a direct procurement contract awarded in 2017.

Qualification Tests of KTJ-3200 Engine Still Ongoing

by İbrahim SÜNNETCİ

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According to the information we obtained, the final test of KTJ-3200 Turbojet Engine, which was developed by Kale ArGe to be used within the scope of Stand-off Precision Guided Munition (SOM) Project (Turkey's first national Air-Launched Cruise Missile - ALCM), was conducted successfully in the first half of January 2020.

During the test conducted at Kale ArGe Development and Test Center which incorporated Turkey's first and only Altitude Test System, successful results were obtained with the KTJ-3200 Turbojet Engine, which is technologically 100% indigenous and national. Thus, another important milestone has been achieved within the scope of the Turbojet Engines Development Project, the contract of which was signed on February 22, 2012 and initiated on April 13, 2012 and the first engine start test was carried out on September 19, 2013. Qualification Tests will continue in upcoming days.

The KTJ-3200 is Turkey's first national turbojet engine optimized for use especially on cruise missiles as well as unmanned platforms such as target drones and etc. The engine had previously demonstrated its performance under different altitude/speed conditions in 2019, with the utilization of the Altitude Test System. The KTJ-3200, using the Altitude Test System, various tests comprising a High Altitude and Flight Speed Test, were performed in the first half of 2019 and the related videos were shared with visitors on the LCD screen at the company's booth during the IDEF '19. In addition, the KTJ-3200 is qualified by subjecting to many different tests such as endurance, water ingestion, distortion and environmental tests.

Within 2020, the qualification of the KTJ-3200 Engine is planned to be completed and it is expected to take its place in the TAF inventory to be used in the SOM Cruise Missile Family, which was developed by TÜBİTAK SAGE and the serial production activities of which were carried out by Roketsan.

So far, a total of US$ 50 million has been allocated for the design and development of the KTJ-3200 Turbojet Engine, led by the Presidency of Defense Industries (SSB), and half of this amount has been funded by the SSB and the other half by Kale ArGe. In one of his previous statements, Kale Group Vice President Osman OKYAY said that the KTJ-3200 engine, which can reach 38,000 rpm and generate 900hp, exploded 5 times during the development process, but they have successfully completed all of the challenging tests.


Altitude Test Chamber

"It will be utilized primarily in SOM Missiles. Before the end of 2020, we plan to conduct firing tests on these missiles. Then the serial production can start for 100+", said OKYAY.

Two KTJ-3200 Turbojet Engine prototypes, in operating state, were planned to be delivered to the SSB in June 2016 (previously announced as April 2016) for flight testing, but the delivery date was later updated to the end of 2017 and then to the first half of 2018. A Kale R&D official, whom we had the opportunity to meet at the SAHA Expo 2018 Fair held in Istanbul between September 13-15, 2018, stated that the delivery of the KTJ-3200 to the SSB could be realized as of late 2018 or early 2019.

The KTJ-3200 Turbojet Engine is planned to have a service life for 17 hours and has a 3.2kN thrust producing capacity and an alternator with a 6kVA capacity for the production of electrical energy to be required in

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the SOM ALCM. For Bearing lubrication, the KTJ-3200 Turbojet Engine uses the fuel lubrication technique just like the TR40 Turbojet Engine with a 2.5kN-3.4kN (560lb to 750lb) thrust capacity, which is still used in the SOM Missiles. This method significantly increases the lifespan of the engine. The KTJ-3200, which can operate with JP8 and JP10 synthetic liquid jet fuels, has a four-stage axial compressor like the French Safran Power Units TR40 Turbojet Engine. Monolithic (single-piece) machined rotors are used in the compressor section of the KTJ-3200 Turbojet Engine, which consists of three main sections, Compressor, Combustion Chamber and Turbine. Indigenously designed and produced, the KTJ-3200 Turbojet Engine is 77cm in length, 30cm in diameter, and has a total weight of 50kg. The KTJ-3200 engine can generate 900hp/3.2kN of thrust and is designed for a flight altitude of 5,000m and 0.95 Mach (1,095km/hr) flight speed. While the engine's running time on cruise missiles is given as 15-30 minutes, this duration can be further developed depending on the requirement and the platform to be used. The KTJ-3200 can also be used in ATMACA Block-I and Block-II Surface-to-Surface Guided Missiles currently powered by the TR40.

Although designed in the French style like the TR40, the KTJ-3200 does not have full interchangeability with the TR40; therefore, several modifications are required on the SOM for the KTJ-3200 integration. There are some key differences in the turbojet engine design between the US and French styles. Since the turbojet engines designed in accordance with the US style do not have a separate Engine Control Unit (ECU), the power pack is in one piece/unit, while the French style engines have a separate ECU, and the power pack consists of two separate units. Since the control algorithms in the US style turbojet engines are embedded on the missile task computer, the manufacturer itself develops the control algorithms for the missile. On the other hand, since turbojet engines designed according to the French style, for example the TR40s have a separate ECU, and several modifications are required for the missile's avionic equipment and design, as well as for the placement if a US style engine is used.

Turkish Aerospace Receives Long-Term Export Award

© Turkish Aerospace

March 7, 2020. Turkish Aerospace was deemed worthy of the “Long-Term Export Award” at the Stars of Export/Turkey’s Hidden Champions Award Ceremony organized by the Dünya Newspaper. At the award ceremony, Turkish Aerospace President and CEO Temel KOTİL received the award from the Chairman of Turkish Exporters Assembly İsmail GÜLLE.

Held for the 18th time since 2002, the Stars of Export/Turkey’s Hidden Champions Award Ceremony was organized in Istanbul. According to 2019 Turkish Exporters Assembly data, Turkish Aerospace became the first company that continuously increased its exports with an average of 14.9% annually in the last decade and was awarded with the "Long-Term Export Award".

Turkish Aerospace combines domestic and national resources with high technology and is one of the world's top 100 aerospace and defense companies in terms of global competition. Turkish Aeropsace positions innovation and technology as the fundamental element and continues uninterrupted efforts geared toward meeting the objective to become one of the world's top 10 companies in the aerospace industry. Turkish Aerospace, which is closely followed in our country and the world due to its indigenous products, has increased its turnover by 265% in the last 2 years, to TL 3.4 billion with the R&D investments it has realized.

Continuing its activities for the development of indigenous products with R&D investments and having received many national and international awards so far, Turkish Aerospace continues to serve as a model in Turkey's aerospace and defense industry with the "Long-Term Export Award".


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Winners of METU 17th International Robot Days Announced


© METU

February 25, 2020. METU 17th International Robot Days, sponsored by STM, one of the leading companies of the defense industry with its innovative solutions, brought together thousands of young people interested in the world of robotics.

METU 17th International Robot Days, which was sponsored this year by STM, a company that develops critical technologies under the leadership of the Presidency of Defense Industries (SSB), hosted another exciting competition this year. High school and college students from different cities accross Turkey showed their talents during the event that took place at the METU Cultural and Congress Center on February 22-23. It was an event organized for the promotion and expansion of robotics throughout Turkey.

In the competitions lasted for two days and where 2,500 people attended, the “Bürküt” drone of the Kusbegi team from Ankara University was the champion in the Autonomous Unmanned Aerial Vehicle - Autopilot Category, the drone of the HU-35 team from METU was the second and the drone of the DRONTEAM. İO team named “Frank” from Marmara University came in third.

In the Autonomous UAV - Computerized Vision Category, Konya Technical University RAC-LAB team came first with "RAC-LAB Tuğberk". Ankara University Kusbegi team with "Kolbala", Hacettepe University Robotic Group Autonomous Drone Team with "Buraya Bakarlar",

© METU

Karabük University KBUİHA team with "KBUİHA Tulpar" and Mehmet ŞANSAL from METU with "Ayasoft" were worthy of honorable mention.

While the top three winners received TL 15,000, TL 10,000, and TL 5,000 awards, each team that was awarded honorable mention received TL 3,750.

METU International Robot Days organized free workshops and interesting robot shows and hosted nearly 8 thousand visitors during the two days with a program full of science and technology.

STM, the main sponsor of METU 17th International Robot Days aims to publicize robot technology and carries out activities to expand the impact of its efforts with its young and dynamic vision. STM organizes a wide range of activities from competitions to training, from projects to events in order to raise awareness, creating a spark of inspiration within the scope of its activity fields to contribute to the development of future of Turkey’s qualified human resources.


© METU

Teknopark Istanbul Prepping for the Establishment of Turkey's first Cyber Security Incubation Center

Bilal TOPÇU - General Manager of Teknopark Istanbul

Teknopark Istanbul is the Turkish defense industry's innovation center and it is getting ready to host Turkey's first Cyber Security Incubation Center. The center, which will host initiatives conducting studies on deep technology based cyber security ideas, is expected to become operational in 2021. Over TL 70 million has been invested for the Cyber Security Incubation Center to be established in an area that will span 2,000 square meters in the Cube Incubation building, which is under construction within the scope of the 3rd Stage buildings of Teknopark Istanbul. The center will host entrepreneurs operating in the field of cyber security. They will focus on the objective of developing technology to support 15 initiatives that are focused on doing business internationally within a period of 6 months and a total of 30 initiatives annually. In the center, entrepreneur and entrepreneur groups will be able to benefit from opportunities such as office, online/offline training, mentoring, laboratory, clean room infrastructure and technical consultancy for free or at a very low cost.

Cyber security is a crucial area across the globe. Looking at the statistics, there is an attack every 39 seconds, on average 2,244 times a day. According to these rates, the need for cyber security experts has increased worldwide by 700% during the period of 2016 and 2019. Again, according to research Turkey is the 5th most cyberattacked country in the world. All such figures necessitate that our country has to develop its own cyber response system. In order to achieve this, indigenous ideas need to be developed and supported. Teknopark Istanbul will focus on efforts to overcome such cyberattacks against our country with domestic solutions at the new cyber security Incubation Center.

Indigenous Cyber Security Ideas will be Supported Attentively

Bilal Topçu, General Manager of Teknopark Istanbul said, "We take responsibility for our country by transferring the knowhow in the entrepreneurship ecosystem to the cyber security ecosystem. Cyber security has been dealt with as an issue in public policies of many countries and there are very effective models of the center that we will establish here as well, they are seen in countries such as UK, Israel, Singapore and Estonia. Though there are 70 start-ups working in the field of cyber security in Turkey, only 5 of them are registered in the global database. The amount of investment made to entrepreneurs in the field of cyber security around the world exceeded US$ 7 billion as of 2019, whereas in our country the investment in 2019 amounted to around US$ 102 million. It can easily be seen that the investment amount in Turkey is less-than-ideal on a global scale. In this center, we will host entrepreneurs that have brand new ideas that will realize indigenous and national projects to contribute to minimizing the impact of cyberattacks against our country. We will offer our entrepreneurs training and mentoring opportunities, at no cost, on business plan preparation, successful presentation techniques, marketing and finance. Furthermore, free of charge consultancy services will be available for our entrepreneurs in accessing the financial support that they need and they will be advised on how to expand their business by benefiting from investor meetings."

STM Announces New Cyber Threat Status Report

In 2020, Cyber Attacks are expected to mostly affect the health sector. Critical infrastructures, industrial systems, mobile devices, election data, IoT devices are also at risk.

Putting its signature under important projects and domestic products in the field of cyber security in Turkey, STM's Technological Think-Tank Center "ThinkTech" announced the new Cyber Threat Status Report covering the period of October-December 2019. The report highlighted the cyber threats that occurred in 2019, and new cyber-attacks predicted for 2020.

STM Experts have been examining cyber threats and cyber incidents caused by these threats and has shared their insight with the public throughout the year. A declaration was made that the health sector will be affected the most in 2020, and that attack campaigns against critical infrastructures and industrial systems such as energy, communication and transportation will also face risks. The Cyber Threat Status Report predicts that the material size of damage will increase, and intangible damage will reach a crucial level with the threat of the disclosure of critical data such as blood values and DNA information. The report also noted that attacks on medical systems used in the healthcare industry continue be at risk because of exposure to the ransomware attack in 2019.

In the report attention is drawn to the increase in the attacks on electronic election studies, it emphasized that wireless network attacks will be seen more often due to the emergence of new threats and vulnerabilities upon the implementation of 5G technology that is expected to be introduced in 2020. While fake applications threatening mobile devices and cloud systems also remain on the agenda this year, smart devices used in daily life are becoming the new target of attacks and cyber espionage campaigns.

Turkey being targeted with e-government deceptions!

STM's new report has revealed that the use of fake e-government applications, which is a system frequently used by the citizens of the Republic of Turkey, is a new method of cyber attackers. The most striking and dangerous attack in the fake applications category during the the last quarter was a malware that imitates the "e-Government" application, where almost everyone has access to their personal information. This phishing attack which targeted Turkey took place in the Play Store for a short while in September of last year.

The rise in the number of fake applications today increases the danger. Harmful software which imitates one of the most preferred browsers Chrome and one of the popular electronic book reading applications "E-Book Reader", in addition to the e-Government app was found to have threatened many users.

Credit card details disclosed!

More than 455,000 credit card details of Turkish banks were put up for sale on the "dark web" last year. This cyber security incidents were observed in the last quarter of 2019. The Cyber Threat Status Report analyzed the leak which occurred between October 28 and November 27, and announced that the leak was due to online service platforms, not banks, since the card details belong to different banks.

Modems in our homes at risk!

The Cyber Threat Status

Report warns against Mirai malware, which contains many threats against modems as well as IoT devices. In the Mirai attack, the newly variant of the harmful Gafgyt software detected in 2019, allows the device to be hijacked and run remotely. This technique increases risk to small business and home routers. According to the report, there are more than 32,000 Wi-Fi routers in the world that are potentially vulnerable to such exploits. For protection against such malware, security updates of modems need to be made, or upgraded, if appropriate. Taking precautions against the security gaps of the Zigbee protocol, one of the most common and important wireless communication technologies used on IoT devices, is also of great importance to protect the privacy of users.

Be Cautious about smart devices leaking personal information!

It is estimated that there will be 20 billion IoT devices in the world in 2020 and there is also a big threat regarding the leak of sensitive and personal data. According to the report, data breach tests at two separate laboratories in the UK and the US revealed that some of the devices received unexpected video and audio recordings. In addition, it was observed that 56% of the devices tested in the US and 83.8% in the UK interacted with devices or applications outside their particular region.

Turkish Defense & Aerospace Industry Performance First Two Months of 2020

Turkey is able to sell its NATO-standard compliant, state-of-the-art indigenous products at a cheaper price compared to the normal market prices, and more importantly along with technology transfer and local production options, Turkey notably increased its arms exports (specifically armored vehicles, naval vessels/boats and weapon systems) during 2013 - 2019 and this trend is expected to last also in 2020.

Thanks to its steadily increasing export figures, Turkey is also progressing on the list of the 25 largest major arms exporters of the world during recent years. According to data collected by the Stockholm International Peace Research Institute (SIPRI), while it was the 25th largest exporter in 2011 during 2015-2019, with a share of 0.8% Turkey ranked 14th on the list of the 25 largest major arms exporters in the world.

Emerging as a new arms exporter the Turkish Defense & Aerospace Industry has managed to put 5 firms (Aselsan [52nd], TUSAŞ [69th], STM [85th], BMC [85th] and Roketsan [89th]) on the world's 100 largest defense companies in 2019. According to export figures revealed by the Defense and Aerospace Exporters' Association (SSI) and the Turkish Exporters' Assembly (TIM), the Turkish Defense and Aerospace Sector increased exports by 34.6% during 2019 compared to 2018. According to the figures Turkey has realized US$2,741 Billion worth of defense and aerospace exports to 164 countries around the globe in 2019. The annual turnover of the Turkish Defense & Aerospace Industry also rose to the US$9 Billion level in 2019. The exports of Turkish Defense and Aerospace Industry are expected to exceed US$3 Billion by the end of 2020.

According to TIM figures, the total arms exports carried out by the Turkish Defense & Aerospace Industry soared by 5% during the first two months of 2020 and reached US$348,697 Million. With a total of US$135,085 Million in purchases North America/US countries took the lion's share in Turkish Defense & Aerospace Industry's exports, followed by EU countries with US$84,813 Million and Middle East countries with US$62,187 Million in purchases.

According to TIM's data as of February 29, 2020 the list of the top 10 countries that imported defense and aerospace products from Turkey is composed of; the US (US$131,257 Million), Germany (US$38,229 Million), UAE (US$26,091 Million), India (US$23,984 Million), the Netherlands (US$16,305 Million), Qatar (US$12,728 Million), Switzerland (US$12,062 Million), Saudi Arabia (US$11,354 Million), the UK (US$8,653 Million) and Azerbaijan (US$8,364 Million).

As it was pointed out in the "Strategic Plan 2019-2023," document, which was published by the Presidency of Defense Industries (SSB), the procurement authority under the Turkish Presidency, in December 2019, the Turkish Defense and Aerospace Industry's annual turnover is targeted to rise to US$26,9 Billion in 2023, from US$8,761 Billion in 2018. According to the "Strategic Plan 2019-2023," document Turkey also plans to boost its defense and aerospace (both military and commercial) exports to US$10.2 Billion (from US$2,188 Billion in 2018) by 2023. As indicated in the "Strategic Plan 2019-2023" the share of domestic procurement should reach 75% by the end of 2023, up from 65% in 2018.

PNS YARMOOK
Commissioning Ceremony of Offshore Patrol Vessel

The Pakistan Navy has commissioned a 2,300 Ton Corvette PNS YARMOOK (F-271) – a Damen OPV 1900 – in a ceremony held at Constanta Port, Romania on the 13th of February 2020. Attending the event was Vice Admiral Muhammad Fayyaz Gilani HI (M), Vice Chief of the Naval Staff as Chief Guest. The ceremony was also attended by teams from the Ministry of Defense Production Rawalpindi, Chief Naval Overseer (Romania) and senior management of Damen Shipyards Group.

Damen signed the contract with the Ministry of Defence Production for two multipurpose OPVs for the Pakistan Navy on the 30th of June 2017 following a tender process. Damen will deliver the Second vessel PNS TABUK (Designate) in May of this year. The PNS YARMOOK is capable of performing a variety of maritime operations and can transport both a helicopter and a UAV. The ship can launch two high speed RHIBs of 11.5 meters and 6.5 meters simultaneously and it also has the capability to accommodate two TEUs for special mission-based operations.

Speaking during the launching ceremony, the Chief Guest highlighted the importance of the Project for the Pakistan Navy and stated that the vessels will significantly enhance the Pakistan Navy's capability to safeguard its maritime


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borders. The Chief Guest also acknowledged the professional competence of Damen and the prospects of future cooperation in delivering cutting-edge naval technologies to the Pakistan Navy.

Damen constructed the PNS YARMOOK at its yard in Galati. The yard has built nearly 40 vessels for the defense and security segment, including the last seven complex naval vessels for the Royal Netherlands Navy, the Stefan cel Mare offshore patrol vessel, and the flagship of the Romanian Border Police, showing time and time again that is a trustworthy and highly capable international player in naval shipbuilding.

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Airbus A400M Transports Masks to Spain in Support of COVID-19 Crisis Efforts

An Airbus A400M airlifter has performed an air-bridge between Toulouse and Madrid in order to deliver critically needed mask supplies to the Spanish health system.

The aircraft, known as MSN56 and operated by an Airbus crew, took off on 23rd March 2020 from Airbus' headquarters in Toulouse at 18.07 local time (CET) landing at the Getafe Air Base (Madrid) at 19.05 to off-load and deliver the masks to the Spanish Ministry of Defense.

The cargo is part of the approximately 2 million masks transported over the weekend by a test Airbus A330-800 aircraft from Tianjin, China, to Europe.

"We will continue to support with additional flights planned to take place in the coming days in coordination with national authorities" made by written statement of Airbus press office.

This air-bridge will enable the delivery of a significant supply of masks to the Spanish public health network in support of current COVID-19 crisis efforts.

Airbus Helicopters Continues the Militarization of the H160 and its Support Framework

On February 6, 2020 Airbus Helicopters disclosed that together with the French Armament General Directorate (DGA) they are pursuing a new set of studies to further the militarization of the H160 and to define its associated support ecosystem in the frame of the Joint Light Helicopter Program (Hélicoptère Interarmées Léger: HIL) This contract launches pre-development activities for the military version of the H160, also called the Guépard by the French Armed Forces, in order to meet the delivery schedule that was brought forward in May 2019 by the French Minister of Armed Forces, Florence PARLY.

The new set of studies will also focus on defining the optimal set-up for supporting the tri-service H160M fleet. Airbus Helicopters, Safran Helicopter Engines, and the DGA will work closely together in order to maximize the availability rate of the helicopters, as well as optimizing the cost of supporting the fleet.

"Launching this collaborative work between Industry and the Ministry of the Armed Forces in order to define the support framework for the Guépard and the associated processes, as early as the pre-development phase, is essential. The output

will provide us with all the levers necessary to ensure a high level of availability at the H160M's entry into service in the French Armed Forces," said Alexandra CROS, Vice President and Head of Governmental Affairs France at Airbus Helicopters. "The studies build upon the work and commitments taken recently in the global support contracts for the Cougar, Caracal, and Tiger fleets of the French Armed Forces".

The H160 was designed to be a modular helicopter, enabling its military version, with a single platform, to perform missions ranging from commando infiltration to air intercept, fire support, and anti-ship warfare in order to meet the needs of the army, the navy and the air force through the HIL Program. Bringing the launch of the HIL Program forward to 2021 will enable the first deliveries to be made to the French Armed Forces in 2026.

BAE Systems will Develop Next Generation IR Seeker for the THAAD Weapon System

In February 2020 BAE Systems was awarded a contract from Lockheed Martin to design and manufacture the next-generation infrared seekers for the Terminal High Altitude Area Defense (THAAD) Weapon System, providing critical targeting technology that helps protect the U.S. and its allies from ballistic missiles. The sensor design work will improve the missile defense system's ability to neutralize more threats and improve its manufacturability.

"The THAAD seeker is a key product in our precision munitions portfolio that's recognized for its proven intercept capabilities. It demonstrates our ability to deliver advanced targeting and guidance systems for critical precision munitions," said Barry YEADON, THAAD Program Director at BAE Systems." This award is a testament to our ongoing success with the program and enables us to advance our proven design and take the program into the future in support of the Missile Defense Agency's mission."

The THAAD Weapon System intercepts hostile ballistic missiles with kinetic force during their final, or terminal, phase of flight. BAE Systems' seeker provides infrared imagery that guides interceptors to their intended targets, destroying enemy warheads inside or outside the Earth's atmosphere. The company has been developing and producing missile defense seeker technology for more than four decades and has delivered more than 500 THAAD seekers to date.

THAAD is an integral part of the U.S. Missile Defense Agency (MDA)'s mission to field an integrated, layered, ballistic missile defense system. Its high-altitude intercept capability mitigates the effects of enemy weapons before they reach the ground, and its non-explosive kinetic impact minimizes the risk of detonation. THAAD is a highly effective system for addressing ballistic missile threats.

BAE Systems' THAAD seekers are assembled, integrated, and tested at the company's facilities in Nashua, New Hampshire and Endicott, New York. Portions of the design work for the next-generation seeker technology will be conducted in Huntsville, Alabama, where the company is actively hiring and building a state-of-the-art facility.

Bell Boeing CMV-22B Osprey Successfully Completes First Flight

January 21, 2020, the first CMV-22B Osprey, built by Boeing [NYSE: BA] and Bell Textron Inc., a Textron Inc. company, completed first flight operations at Bell's Amarillo Assembly Center. The CMV-22B is the latest variant of the tiltrotor fleet, joining the MV-22 and CV-22 used by the U.S. Marine Corps and U.S. Air Force.

The U.S. Navy will use the CMV-22B to replace the C-2A Greyhound for transporting personnel, mail, supplies and high-priority cargo from shore bases to aircraft carriers at sea. Bell Boeing designed the Navy variant specifically for carrier fleet operations by providing increased fuel capacity for the extended range requirement. The mission flexibility of the Osprey will increase operational capabilities and readiness, in addition to ferrying major components of the F-35 engine.

"With the ability to travel up to 1,150 nautical miles, the CMV-22B will be a lifeline for our servicemen and women out at sea," said Kristin HOUSTON, vice president, Boeing Tiltrotor Programs and director, Bell Boeing V-22 Program. "The quality and safety built into this aircraft will revolutionize the way the U.S. Navy fulfills its critical carrier onboard delivery mission."

Bell Boeing will deliver the first CMV-22B to Air Test and Evaluation Squadron (HX) 21 in early 2020 for developmental test.

Lockheed Martin Elects James D. TAICLET as President and CEO

Marillyn A. HEWSON to Become Executive Chairman

The Board of Directors of Lockheed Martin have elected James D. TAICLET, 59, as president and CEO, effective June 15. TAICLET will continue to serve as a member of the corporation's board, which he joined in 2018. He has served as chairman, president and CEO of American Tower Corporation since 2004 and CEO since 2003. During that time, American Tower grew significantly and increased its market capitalization from approximately $2 billion to approximately $100 billion. TAICLET guided the company's transformation from a primarily U.S. business to a global player in its industry, with significant assets and operations in 19 countries.

TAICLET will succeed Marillyn A. HEWSON, 66, who has served as chairman, president and CEO since 2014 and president and CEO since 2013. Hewson will become executive chairman of the board, also effective June 15, subject to her re-election to the board by the stockholders at the upcoming annual meeting.

"I know it is the right time to transition the leadership of Lockheed Martin. The corporation is strong, as evidenced by our outstanding financial results last year and a record backlog of business. We have a bright future – particularly with Jim and our outstanding leadership team at the helm," said Hewson. "I'm pleased the board agreed with my recommendation. As Lockheed Martin's next CEO, Jim will lead the company forward in its next phase of growth and value creation."

Prior to joining American Tower in 2001, TAICLET was president of Honeywell Aerospace Services, a unit of Honeywell International, and prior to that he was vice president, engine services at Pratt & Whitney, a unit of United Technologies Corporation. He also previously was a consultant at McKinsey & Company, specializing in telecommunications and aerospace strategy and operations. TAICLET began his career as a United States Air Force officer and pilot and served a tour of duty in the Gulf War. He holds a master's degree in public affairs from Princeton University, where he was awarded a fellowship at the Woodrow Wilson School and is a distinguished graduate of the United States Air Force Academy with degrees in engineering and international relations.

"I'm honored to be asked to succeed one of the most respected CEOs in America. While serving on Lockheed Martin's board, I've not only been impressed by the company's continued growth as a leader in aerospace & defense but also by the dedication and commitment of Marillyn and Lockheed Martin employees to deliver for its customers," said TAICLET. "As a military veteran, I understand the mission of this great company to provide global security and innovative solutions for the brave men and women who protect our freedom."

Frank A. St. John, 53, the current executive vice president of Lockheed Martin's Rotary and Mission Systems (RMS) business, was elected by the board to serve as chief operating officer. Stephanie C. HILL, 55, senior vice president, Enterprise Business Transformation, was appointed to succeed St. John as executive vice president, RMS. Their appointments are also effective June 15.

Reporting to the new CEO and president, the COO will be responsible for the strategic, operational and financial performance of all the corporation's lines of business. All four-business area executive vice presidents – Aeronautics, Rotary and Mission Systems, Space and Missiles and Fire Control – will report to the COO. This includes the corporation's entire portfolio of products and capabilities, which totaled almost $60 billion in sales in 2019 ---or which totals almost $ 60 billion annually.

St. John joined Lockheed Martin more than 30 years ago and took on roles of increasing responsibility in engineering and program management before joining the corporation's executive leadership team. Most recently, he has served as executive vice president of RMS and prior to that as executive vice president of Missiles and Fire Control.

Hill has served as senior vice president, Enterprise Business Transformation, where she led the corporation's Digital Transformation and Enterprise Information Technology teams. Prior to that, HILL was deputy executive vice president of RMS and senior vice president for corporate strategy and business development. She held positions of increasing responsibility since joining Lockheed Martin in 1987 as a software engineer.

"Marillyn and the board have been focused on developing talent and ensuring a high-quality succession plan," said Dan AKERSON, Lockheed Martin's lead director. "On behalf of the board and our shareholders, we would like to thank Marillyn for demonstrating a strong commitment to the customer, shaping the company's portfolio to meet the challenges of today's global security environment and growing the business and driving long-term sustainable growth."

USAF Orders 105 AN/APG-83 SABR AESA Radars for its F-16s

On February 28, 2020 the U.S. Air Force (USAF) granted Northrop Grumman a US$262.28 Million contract for 15 examples of the SABR, which includes Engineering, Manufacturing and Development (EMD) and the production of 90 AN/APG-83 Scalable Agile Beam Radars (SABR). The USAF announced on June 17, 2017, that it had selected the AN/APG-83 SABR to upgrade 72 F-16s to meet a Joint Emergent Operational Need raised by U.S. Northern Command for homeland defense.

The USAF plans to keep 350 of its F-16 Block 40/42/50/52 aircraft through at least 2048 and is putting them through a service-life extension program (SLEP). As part of the SLEP the aircraft will undergo extensive structural work—including re-winging in some cases—to extend their service lives by 4,000 hours to 12,000. New avionics, and a new AESA radar in particular, is a key element of the SLEP. The new avionics and new APG-83 SABR AESA radar integrated on the aircraft under the SLEP upgrade extends the operational viability and reliability of the F-16 and provides pilots with 5th generation fighter radar capabilities to counter and defeat increasingly sophisticated threats.

Drawing on experience with the F-22's AN/APG-77 and F-35's AN/APG-81, Northrop Grumman developed the AN/APG-83 SABR as an active electronically-scanned array (AESA) fire control radar that can be scaled and tailored to meet a number of applications including the replacement of the mechanically-scanned APG-66/68 radars fitted in the F-16s.

In its F-16 configuration, the APG-83 SABR is designed to be of similar form-fit to the original sensor, with similar power/cooling requirements and connections in order to keep necessary modifications to a minimum. A trial unit was test-flown in an F-16 at Edwards AFB, California, in November 2009.

The greater bandwidth, speed, and agility of Northrop Grumman's AN/APG-83 SABR enables the F-16 to detect, track and identify greater numbers of targets faster and at longer ranges. In addition, the radar can operate in hostile electronic environments and features all-weather, high-resolution synthetic aperture radar mapping, which presents the pilot with a large surface image enabling precision target identification and strike.

The launch customer for AN/APG-83 was Taiwan, for its F-16V upgrade program. The AN/APG-83 SABR has also been selected by a growing number of international customers and is the base radar for Lockheed Martin's F-16 Block 70/72. Production of export AN/APG-83 SABR radars started in 2016 and Northrop Grumman began delivering production AN/APG-83 radars for its first international customer on schedule at the end of 2016.

As of January 2020, more than 200 AN/APG-83 SABR systems have been built at Northrop Grumman's radar assembly facility in Baltimore, for U.S. and international customers.

Ultra Continues Support of Electro-Optical Tracking Systems for the UK Royal Navy Type 45 Destroyer

Ultra is pleased to announce its continued support of the Electro-optical tracking system as part of Babcock's UK Royal Navy Type 45 Destroyer 'Gun System, Automation '(GSA9) in service support contract with the UK Ministry of Defense. The three-year contract, with the option for a two-year extension, will provide support for all aspects of the electro-optical tracking system for GSA9.

Ultra's Electro-optical tracking system is based on its proven Type 2500 design and employs the latest proven sensor and servo technologies, configured from a common set of commercially/ modified of the shelf (COTS / MOTS) baseline modules. This modularity permits a system to be assembled to meet specific requirements without technical, delivery or price risk.

Featuring high resolution video performance with extensive levels of automation requiring minimal operator intervention, the system simplifies operations throughout all stages of surveillance, detection, acquisition, tracking and engagement.

Ultra's electro-optical tracking systems operate in all regions and climatic conditions, from arctic to tropical waters and are installed on all classes of vessel, from small patrol boats operating in coastal, offshore and EEZ patrol operations to major naval surface combatants, aircraft carriers and auxiliaries operating in littoral and blue water environments.

Mike WILLIAMS, Managing Director, Ultra CSS said: "Ultra is pleased to be engaged with Babcock in supporting this important frontline system and looks forward to delivering high levels of availability and service throughout the contract."

Future Combat Air System Takes Major Step Forward

12 February 2020 – The governments of France and Germany have awarded Dassault Aviation, Airbus, together with their partners MTU Aero Engines, Safran, MBDA and Thales, the initial framework contract (Phase 1A), which launches the demonstrator phase for the Future Combat Air System (FCAS).

This framework contract covers a first period of 18 months and initiates work on developing the demonstrators and maturing cutting-edge technologies, with the ambition to begin flight tests as soon as 2026.

Since early 2019, the industrial partners have been working on the future architecture as part of the program's so-called Joint Concept Study. Now, the FCAS program enters into another decisive phase with the launch of the demonstrator phase.

This phase will, as a first step, focus on the main technological challenges per domain:

- Next Generation Fighter (NGF), with Dassault Aviation as prime contractor and Airbus as main partner, to be the core element of Future Combat Air System,
- Unmanned systems Remote Carrier (RC) with Airbus as prime contractor and MBDA as main partner,
- Combat Cloud (CC) with Airbus as prime contractor and Thales as main partner,
- Engine with Safran and MTU as main partner.

A Simulation Environment will be jointly developed between the involved companies to ensure the consistency between demonstrators.

The launch of the Demonstrator Phase underlines the political confidence and determination of the FCAS partner nations and the associated industry to move forward and cooperate in a fair and balanced manner. The increased momentum enables industry to deploy the necessary resources and best capabilities to develop this decisive European defense project. FCAS will be the cornerstone project guaranteeing Europe's future operational, industrial and technological sovereignty.

The next important step in the FCAS program will be the onboarding of Spain and the involvement of additional suppliers from Phase 1B onwards, which will succeed Phase 1A after its successful conclusion.

MBDA Completes Second Test Firing of MARTE ER Anti-Ship Missile

European missile house MBDA, announced with a press release issued on February 12, 2020 that they have conducted the second test firing of the MARTE ER anti-ship missile at the PISQ (Poligono Interforze del Salto di Quirra) test range in Sardinia in early February. According to a press release, by confirming the overall design and performance of the missile, this firing marks a critical milestone on the development path of the MARTE ER missile.

Compared to the first firing, which took place in November 2018, several additional features and functionalities were tested. These included an integrated navigation system, proximity fly-over fuse, with weapon controller and actuation system in advanced configuration. The missile also featured terminal guidance with a new seeker, engineered and developed by the MBDA Seeker Division.

The floating target was hit with an "almost zero" miss distance after a flight of about 100 km. The missile pushed its envelope to the limit with several major maneuvers including very low sea skimming at a very high speed.

MBDA said in a statement: "Hitting the target confirmed the perfect behavior of the missile and the telemetry system recorded a huge amount of data. Flight data showed very good alignment with simulation outcomes."

"The MARTE ER program is progressing at full speed in order to meet our customers' requirements and the full integration of the MARTE ER on the Eurofighter Typhoon platform is proceeding at pace in order to implement an anti-ship capability onto the fighter."

Representing the 3rd generation within the MARTE Family of missile systems and is derived from the MARTE Mk2/S variant which is already in service with the Italian Navy on its NFH90 and AW101 helicopters. The MARTE ER missile weighs 315kg and is 3.6m-long. Instead of a solid fuel rocket motor the MARTE ER missile uses a turbojet engine. To be fitted with new Store Management System (SMS) the NFH90 and AW101 helicopters will able to operate both MARTE MK2/S and MARTE ER anti-ship missiles. With the ability to hit targets well beyond a distance of 100km, the MARTE ER missile is also going to be integrated on the Eurofighter Typhon and other fast jets.

Northrop Grumman Successfully Demonstrates "On-The-Move" Ground Radar Capability

In early March 2020, Northrop Grumman Corporation completed a successful government customer demonstration of the Highly Adaptable Multi-Mission Radar (HAMMR) System at Eglin Air Force Base, Florida. During the successful live fire demonstration, Northrop Grumman used the HAMMR System, mounted on a High Mobility Multipurpose Wheeled Vehicle (HMMWV) as an Integrated Air and Missile Defense (IAMD) sensor to detect and track an unmanned aerial vehicle target.

The demonstration represents the first customer-validated sense on-the-move capability against an unmanned aerial vehicle. "This first-of-its-kind demonstration validated the sense on-the-move capability in concept for the Department of Defense's IAMD enterprise and proved that this capability can be developed and fielded to warfighters much sooner than anticipated," said Mike MEANEY, Vice President, Land and Maritime Sensors, Northrop Grumman.

Northrop Grumman's HAMMR is a short-to medium-range X-Band three-dimensional (3D) radar that utilizes the proven Active Electronically Scanned Array (AESA) AN/APG-83 F-16 fighter radar in a ground-based, sense on-the-move role. HAMMR provides robust multi-mission 3D performance for air surveillance, weapon cueing and counter-fire target acquisition missions in either a 360-degree or sector-only staring mode. HAMMR delivers the unprecedented ability to provide force protection while operating on the move, significantly increasing warfighter survivability.

MBDA's Sea Venom/ANL Anti-Ship Missile Succeeds in First Qualification Firing

MBDA successfully carried out the first qualification firing trial of the Sea Venom/ANL helicopter-launched anti-ship missile at the French Directorate General of Armaments (DGA) Essais de Missiles (DGA EM) test site at Ile Du Levant in the Mediterranean on 20 February 2020.

The missile was launched from a Dauphin helicopter close to the minimum release height, reaching its cruise phase whilst sea skimming at very low height. During its terminal phase, the aircrew used images from the infrared seeker – transmitted through the datalink – to perform a successful manual aim point refinement. The missile then followed this designated point until hitting the target with a very high degree of accuracy.

This latest firing builds upon two previous ones that have all tested the missile to the very edge of its capability. The previous firings demonstrated the Sea Venom/ANL's lock on after launch (LOAL) and lock on before launch (LOBL) capabilities. They also validated its low-altitude sea-skimming flight and its autonomous guidance capability using images from its uncooled imaging infrared (IIR) seeker.

The Sea Venom/ANL is a purpose-built anti-ship missile for the French and UK navies' shipborne helicopters and is suitable for a wide range of platforms. It will safely engage hostile vessels amongst civilian assets, even in congested littoral environments and will defeat a broad spectrum of targets including small fast-moving craft through to larger ships – at sea or in port – as well as coastal land targets.

Éric BÉRANGER, MBDA CEO, said: "The Sea Venom/ANL is the first Anglo-French co-operation program to take full advantage of our centers of excellence, created following an Inter-Governmental Agreement ratified by both nations' Parliaments in 2016. MBDA is putting full effort into the successful implementation of the Sea Venom/ANL program, recognizing it should exemplify the benefits of the close co-operation UK and France are sharing in defense – enhancing both nation's sovereign capabilities in armaments while reducing costs."

The UK Royal Navy will use the Sea Venom/ANL on its AW159 Wildcat, replacing Sea Skua, while France's Marine Nationale will operate the missile from its future H160M Guépard Light Joint Helicopter (HIL – Hélicoptère Interarmées Léger).

The Sea Venom/ANL is a 110 kg-class high-subsonic missile (carrying a 30 kg semi-armor piercing blast/fragmentation warhead) designed to disable targets from fast-attack craft up to corvette size, and also offers capability against coastal and land targets.

USAF Purchases A-29S from SNC

Sierra Nevada Corporation (SNC), the global aerospace and national security contractor owned by Eren and Fatih Ozmen, was awarded an undefinitized contracting action by the U.S. Air Force to provide A-29 aircraft ground support equipment, pilot training (including difference training and instructor pilot upgrade training), contractor logistic support, aircraft sparing and sustainment for the Combat Air Advisor mission for Air Force Special Operations Command.

"SNC is honored to build and deliver the combat-proven A-29 to the U.S. Air Force," said Mark WILLIAMS, Vice President of aviation strategic plans and programs for SNC's IAS business area. "The U.S Air Force will now have the opportunity to deploy the A-29 in support of U.S. and allied operations. This acquisition provides long-overdue capabilities to the warfighter and best value to the U.S. taxpayer."

The A-29 is the gold standard of light attack combat and reconnaissance aircraft. Work begins immediately under this award in Jacksonville, Florida, and Centennial, Colorado. Aircraft deliver in 2021, and training and support activities continue through 2024.

The A-29 has already been selected by 14 partner air forces around the world to deliver cost-effective close air support and reconnaissance capabilities. For more than a decade, U.S. Special Forces have sought to secure the A-29 for close air support and reconnaissance operations.

A-29 Super Tucano

The A-29 Super Tucano is the gold standard for light attack, combat and reconnaissance aircraft. Built in the U.S. by Sierra Nevada Corporation and its partner, Embraer Defense & Security, the A-29 has been selected by 14 air forces including Afghanistan and Lebanon. The A-29 is a versatile and powerful turboprop aircraft and is known for its rugged and durable design, which allows it to perform operations from unimproved runways and at forward operating bases in austere environments and rugged terrain. The A-29 is the only light attack aircraft in the world with a U.S. Air Force Military Type Certificate.

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