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DEFENCE TURKEY

ISSN 1306 5998

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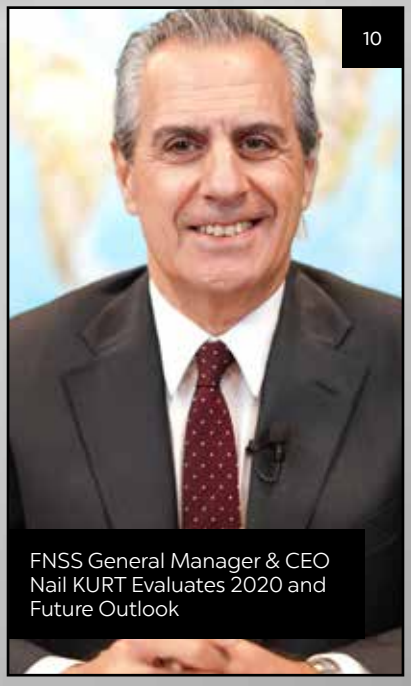

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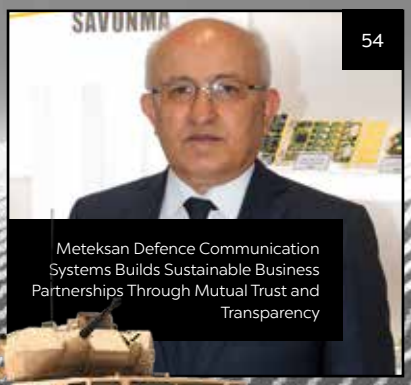

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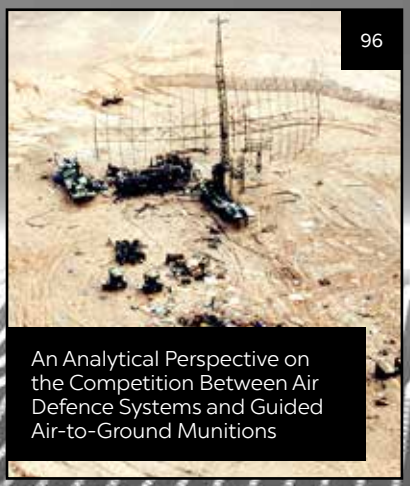

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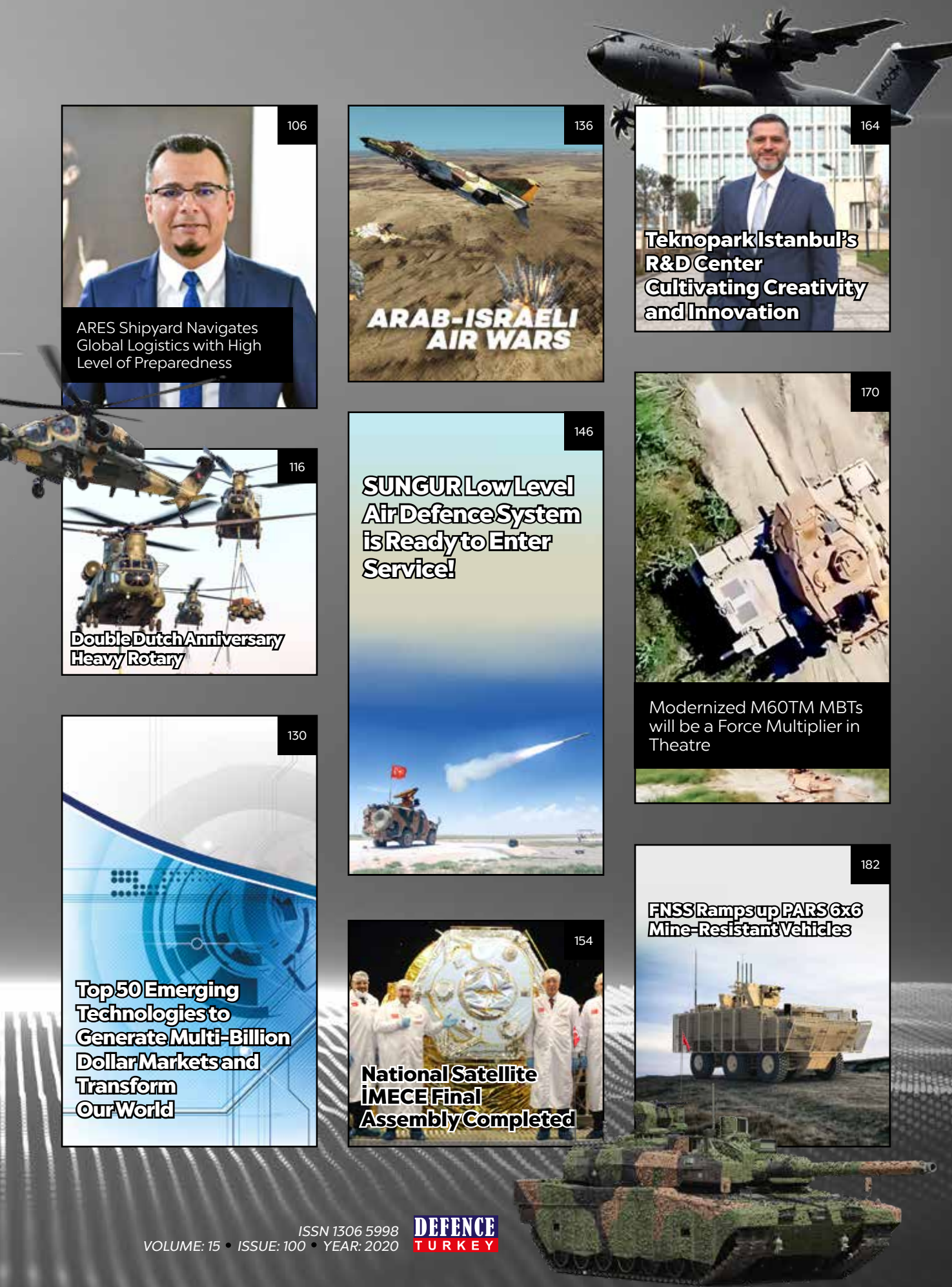

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DEFENCE TURKEY

100 Sayı...

Yüzlerce röportaj, yüzlerce makale, yüzlerce haber. Ziyaretler, fuarlar, toplantılar, basın toplantıları, konferanslar. Ve yüzlerce anı.

Savunma sanayi gibi dünyada ve Türkiye'de erkek egemen bir sektörde bir kadın olarak yayıncılığa başlamak, şu an bulunduğum noktadan baktığımda büyük bir cesaret gibi görünüyor.

Dergi yayınlamaya başladığımız ilk günlerde Muharrem DÖRTKAŞLI, TUSAŞ'a yeni Genel Müdür olmuştu ve şöyle demişti bir basın toplantısında: "Savunma sanayi firmaları, müşterileri ve basınıyla bir bütündür". O zaman kendimi sektörün bir parçası gibi hissetmiş, uzun bir yolda bana güven vermişti bu sözler. Şimdi görüyorum ki bu bütünlük duygusu beni sektöre bağlayan.

Bütün firmalara, kişilere basın etiği içerisinde eşit mesafemizi koruyan yayın anlayışımızın yanında, belki de en büyük başarımız insan biriktirmek ve insana yatırım yapmak oldu. Unvanlar, görevler değişiyor ama güzel anılar, kalpten dokunuşlar unutulmuyor. İçten bir gülümseme, başarıları, sevinçleri, üzüntüleri içtenlikle paylaşmak gerçek bildiğimiz, kuralları katı ve disiplinli olan iş hayatlarımızda bizleri birbirimize bağlıyor ve soluk oluyor hayatlarımıza. Defence Turkey olarak yüzümüzdeki içten gülümseme bu nedenledir ki belki de bizi gerçekten biz yapan.

Hayat yolları zaman zaman taşlı hepimizin yaşadığı gibi. Ama 100 sayı boyunca öğrendiğim inancından vazgeçmemek ama hiç. Hayat bazen direndiğinde, bazen direnmekten vazgeçtiğinde kapılar açıyor insana. Tüm sektör bütünüz demiştim ya bazen o taşlı yollardan beraber yürüyoruz, birbirimizi anlıyoruz ama inancımızı kaybetmiyoruz.

Teşekkür edecek ne çok şey var aslında. Türk ve yabancı savunma ve havacılık kurum ve firmalarına, artık dostlarımız olan tüm çalışanlarına, basın mensubu tüm meslektaşlarımıza çok teşekkür ediyorum. Defence Turkey ekibimiz, çalışmaktan çok mutlu olduğum ve keyif aldığım, değerli arkadaşlarıma, en başta Cem Akalın'a; Yeşim Bilginoğlu Yörük'e ve Şebnem Akalın'a, editörlerimiz İbrahim Sünnetçi ve Saffet Uyanık'a; tasarımcılarımız Gülsemin Bolat ve Görkem Elmas'a; fotoğraf sanatçımız Sinan Kutsal'a,; çevirmenimiz Tanyel Akman'a; editing ve proof reader Mona Melleberg Yükseltürk'e ve tüm değerli danışma kurulu üyelerimize de çok teşekkür ediyorum. Birlikte harika bir ekibiz...

Bir teşekkürüm daha var o da "kendime.". Cesaretle adım atarak bu işe girdiğim, çok severek yol aldığım, güzel insanlar biriktirdiğim ve bunun için emek verdiğim ve yaşadığım tüm bu deneyimler için....

Şairin dediği gibi:

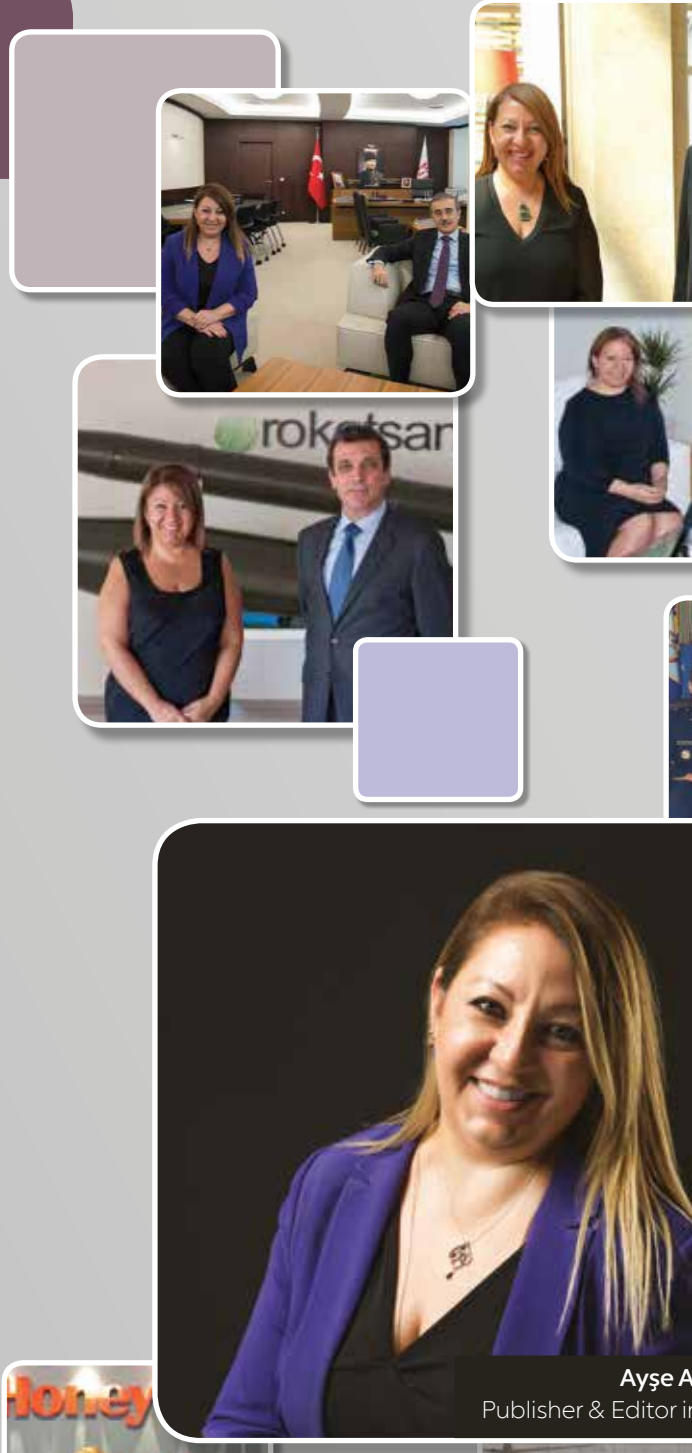
"Bütün iyi kitapların sonunda,

Bütün gündüzlerin, bütün gecelerin sonunda,

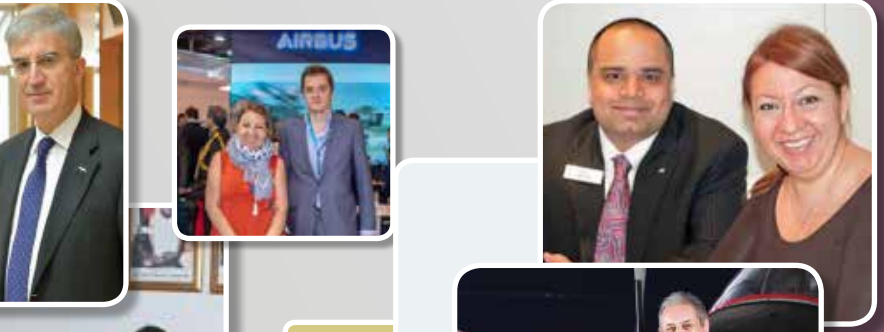
Meltemi senden esen, soluğu sende olan

Yeni bir başlangıç vardır"

"Defence Turkey 100. Sayısı yeni ve parlak bir geleceğin başlangıcı olsun.."



Ayşe A
Publisher & Editor i
















100TH ISSUE
BUILDING A STRONG FUTURE

Hundreds of interviews, articles, news... Visits, fairs, meetings, press conferences, events... And hundreds of memories...

Taking up a career in the publishing business as a woman in the defence industry, which is a male-dominated industry both in Turkey and in the world is a feat of courage, when I look back on it. These 100 issues represent so much: hard work and an undying passion...

When I first started as publisher, Muharrem DÖRTKAŞLI had become the new general manager of TUSAŞ and he once said in a press conference that "Defence industry companies are a whole with their customers and the press". At that time, these words made me feel like a part of the industry and gave me confidence in this long journey. Now I see that this sense of integrity connects me to the defence sector.

In addition to our understanding of objectivity for all companies and people in ethical journalism, perhaps our biggest success was to invest in people. Job titles and responsibilities change, but good memories and relationships are not forgotten.

This network we have established in the Defence Industry both in our country and abroad, and our neutral and ethical journalism approach will open a new era for Defence Turkey Magazine after 100 issues.

Without our readers, advertisers and content providers and our Defence Turkey team, we wouldn't be celebrating our 100th issue. Thanks so much for making it all happen...

Stick around! We have another 100 ahead of us, and we'll continue to try to make each issue better than the previous one.

Enjoy this issue...

I congratulate the 15th anniversary and 100th issue of Defence Turkey magazine, one of the distinguished organizations of our defence industry media.

The Defence Industry Executive Committee, chaired by the then Prime Minister Recep Tayyip Erdoğan in 2004, constitutes an important milestone in the target of becoming a country that can meet its own needs in the defence industry. During the last 15 years, our Turkish defence industry has met the needs for systems required by our security forces mostly with domestic and national production. In this process, while becoming one of the leading countries of the world in certain areas, new technology acquisitions have been achieved in certain areas, and significant progress has been achieved regarding the systems of the future.

Defence Turkey has been announcing to the industry and the public the developments in the best way over the past 15 years since its establishment. Besides, it has been providing a better understanding of these developments with its analyses and evaluation.

Today, our defence industry has reached a vast ecosystem, from our main contractor companies to subcontractors and SMEs at all levels, from our clusters and universities to our techno-parks and research centers. While our ecosystem is moving towards the "Fully Independent Defence Industry" target with all its stakeholders, we know that our defence industry press enlightens the public both within the country and abroad with the same target.

On this occasion, I congratulate once again those who contributed to the achievement of Defence Turkey's 15th year and 100th issue and all the employees who have worked since its establishment.

Prof. Dr. İsmail Demir
President of Defence Industries

Congratulations

for the 100th issue

Serdar Demirel
SSB, Vice President

With the establishment of the Republic, our country initiated a development move in the defence industry as in every field. Nuri Killigil, Nuri Demirağ, Vecihi Hürkuş, Şakir Zümreler were the heroes of this period. Later, the Defence Industry Move, which had been wasted due to unpredictability and political reasons, was relaunched in the 1980s with the initiative of the late President Turgut Özal in order to regain this capability, and after the initial period, it reached a maturity level especially with the favor and support shown in the last 15 years.

Defence Turkey magazine has been the showcase of these golden years of the Turkish Defence Industry, which went beyond the borders of the country and is talked about with appreciation in all over the world. In this respect, Defence Turkey magazine, its investors and employees at all levels have become a symbol for us in receiving the fruits of our labor and endeavors.

Our hope is to walk together towards further successes with Defence Turkey and to carry the pride of this miracle that we have accomplished together to the next generations.

Happy anniversary and thanks for being with us!

Celal Sami Tüfekçi
SSB, Vice President

On the occasion of its 15th anniversary, I would like to congratulate all executives and employees of Defence Turkey magazine, which has been contributing greatly to the awareness in the defence industry for 15 years, since its first issue in 2005, by conveying the developments in the defence industry to the public through valuable analysis and news, and I wish them success in their future endeavors.

Today, the level we have reached with all our stakeholders in the defence industry makes us all very pleased and proud, but our country has much bigger goals for the years ahead. Together, we exert efforts with determination for a sound defence industry that possesses advanced technology, produces its own technology, is competitive and has overcome all kinds of dependencies.

I wish Defence Turkey all the success in its mission to share the developments and results with the public regarding our R&D projects we initiated especially within the scope of our technology roadmap, and extensive calls, indigenization and operational area support activities, our efforts to create and analyze the industry talent inventory in a way that will provide advantage to our industry, our industry support and industrialization activities. I believe it will continue to do so with the same excitement and success as in its 100th issue.

Mustafa Murat ŞEKER
SSB, Vice President

I congratulate the 15th anniversary of Defence Turkey magazine and its 100th issue.

As you know, we have made important progress and achieved success in the field of the Defence Industry after the 2000's. Today, the defence industry is the locomotive sector in our country's technology move efforts. Our citizens and especially the younger generation pay close attention to the defence industry and follow it closely.

Our defence industry media, and especially Defence Turkey magazine, performs an important task in raising awareness and directing our young people to technology, which is a critical factor for the development of our country.

On this occasion, I wish you continued success. To many more issues!

Congratulations

for the 100th issue

Harun Çelik
SSB, Vice President

The Turkish Defence Industry has gained great momentum during the last 15 years under the leadership of President Recep Tayyip Erdoğan and has achieved important successes.
Defence Turkey magazine has achieved a key role by conveying these prominent achievements to the world.
As SSB, under the leadership of Prof. Dr. İsmail Demir, we are taking firm steps towards our target of becoming a Fully Independent Defence Industry. We know that, like all stakeholders in our defence industry ecosystem, the defence industry press and media is with us in this journey.
I congratulate the 15th anniversary of the Defence Turkey magazine, one of the important defence industry media organizations, and also the team who has exerted efforts in reaching the 100th issue.

Prof. Dr. Faruk Yiğit
SSB, Vice President

I congratulate the 15th anniversary and 100th issue of Defence Turkey magazine, and would like to pass on good wishes to all the employees who have contributed to its publishing since the first issue. I wish them continued success in promoting the Turkish Defence Industry at home and abroad.

Sadık Piyade
TAFF Deputy General Manager

Dear Defence Turkey Team,
I congratulate you for reaching the 100th issue of your magazine and for practicing with great commitment and determination since its first issue.
With your successful and reliable publishing and positive criticism on the Defence and Aviation industry with your expert staff, your mission for the promotion of the domestic defence industry and the advanced technology products of ASELSAN, TUSAŞ, ROKETSAN, HAVELSAN, İŞBİR and ASPİLSAN, which are the Subsidiaries of the Turkish Armed Forces Foundation, as well as your exemplary publishing principles are praiseworthy.
I wish you success on behalf of TAFF in your future broadcasting life with the belief that Defence Turkey Magazine will continue to make a great contribution to the promotion of the Defence Industry both in our country and abroad, with the issues it will release in line with the same principles as it does today.

Serdar Hüseyin Yıldırım
President of Turkish Space Agency

On the occasion of its 15th year and 100th issue, I sincerely congratulate Defence Turkey, which is one of the leading publications of our country in the fields of defence, aviation and space, and I wish the team continued success in their efforts to make known the capacity reached in the related sectors in foreign countries.

Congratulations

for the 100th issue

Prof. Dr. Haluk Görgün
Chairman, President and CEO - ASELSAN

YOU ARE CREATING AN IMPORTANT MEMORY FOR OUR INDUSTRY

Defence Turkey Magazine, which is one of the leading organizations that aims to reflect our vision in the field of the defence industry, also constitutes an important memory and values composition within the Turkish defence industry.

I know that your magazine, which is an important and exclusive magazine to announce our voice to the world, will continue to execute its mission of informing the public by preserving its reliable and principled journalism approach in the coming period. With these feelings and thoughts, I congratulate the hundredth issue of Defence Turkey Magazine and I wish success to every member of your magazine.

Murat İkinci
ROKETSAN General Manager

Keeping its finger on the pulse of the Turkish defence industry, Defence Turkey magazine has been sharing the latest developments with its readers for many years. I sincerely congratulate the 100th issue of Defence Turkey magazine, which is a valuable member of our industry press, which is our major solution partner in terms of achieving of public support and recognition through articles and news that increase the awareness of our innovative work both at home and abroad, and I wish them continued success in their future endeavors.

Dr. Mehmet Akif Nacar
HAVELSAN General Manager

On the occasion of the 100th issue, I sincerely congratulate the Defence Turkey team for their contribution to the development and recognition of the Turkish defence industry. I wish them continued success in the promotion of our industry's activities.

Prof. Dr. Temel Kotil
President and CEO of Turkish Aerospace (TUSAŞ)

I am pleased that Defence Turkey magazine has reached its 100th issue. It has achieved a successful momentum with its in-depth analysis, recent and qualified news in the field of Aviation and Defence.

Defence Turkey, which has contributed to the recognition of the defence and aviation projects of our country, both nationally and internationally, has been pursuing its activities as a respected media institution that scrutinizes the news with its expert writers.

I believe that Defence Turkey, which hosts the most important representatives of the Defence Industry in its publications, will maintain its quality level in the future. On this occasion, I wish continued success to the entire staff, especially Editor-in-Chief Cem Akalın, which has helped Defence Turkey continue its publishing life successfully.

FNSS General Manager & CEO Nail KURT Evaluates 2020 and Future Outlook

General Manager and CEO of FNSS Nail KURT recently talked with Turkey's major defence industry magazines during the live stream on FNSS's YouTube account. Defence Turkey's Managing Editor, Cem AKALIN, Executive Editor of MSI Magazine Ümit BAYRAKTAR, Editor in Chief of C4 Defence Özgür EKŞİ and Anadolu Agency's Reporter Göksel YILDIRIM attended the live stream where Nail KURT answered some "burning questions" and he provided candid statements on the measures adopted by FNSS throughout the COVID-19 pandemic, the company's export activities and ongoing projects during this period.

Underlining that their company had adopted measures against COVID-19 pandemic quite early, KURT added that in particular, they took steps to increase communication by establishing a committee that involved contributions from certain departments to implement the precautions that need to be adopted. KURT continued, "FNSS faced the pandemic with early measures. We have been following the developments very closely since February, and we have worked on increasing awareness about this pandemic. We placed special importance on communication and built a committee with valuable contributions from our unit related to healthcare and from our legal department. Our aim was to be able to make immediate decisions on the measures that had to be adopted. Since February, we have been doing the best that we can possibly do in this respect. We have adopted measures with the highest standards of hygiene. When the virus began to spread in Turkey, stricter measures came up on our agenda. Foremost among these was our decision to request our employees to take their annual leave early; this usually takes place during summertime. We applied an earlier date for this and thought that we could prevent the spread of the pandemic by implementing it in March, at least in the company. So, in a way, we temporarily closed the company for three weeks. This has been quite advantageous for our employees and their families. As we

relaunched our activities, we thought of ways to keep our staff of 1,000 distant from each other in order to maintain social distancing. Throughout this maintenance period, we never had more than 100-150 staff on site at one time at the company. To prevent any delays in ongoing project deliveries, a part of our workforce, never exceeding 150 people, worked in the office."

FNSS General Manager and CEO Nail KURT: "On account of the measures we adopted, only two of our colleagues have been diagnosed with COVID-19 so far."

Affirming that teams continued to work in two shifts, KURT underlined that so far during this period, they have had only two employees test positive for COVID-19. KURT continued, "We made a plan to limit simultaneous operations, allowing a maximum of 400 employees on site at FNSS at any given time, until the end of May as part of our relaunch process. We have been successful by working in two shifts, grouped as the morning - afternoon and from the afternoon until the evening. Moreover, a considerable number of colleagues have started to work from home. We were able to achieve this with the help of the IT infrastructure we launched 3-4 years ago, and this subsequently enabled 200 - 250 of our colleagues to work from home with safe working conditions. Nearly 100 employees from the remaining group were in the risk group, so we kindly asked them to remain at home. Additionally, we avoided physical gatherings as much as possible and took advantage of meeting applications such as Zoom or Microsoft Teams. We continue to practice all of these hygienic measures, such as those implemented in the cafeteria, and especially being aware of maintaining social distancing in personnel vehicles. We started off June with a slight change to our shift system; we will assess this new implementation in July and decide on a plan thereafter. Presently, our engineering department comes to work in the morning in a single shift. Therefore, a group of 500-550 employees can be at the office at any time of the day, while the previous method we practiced prior to June set a limit at 400-450 employees. As a result of all these precautions, only two of our technicians have been diagnosed with COVID-19 so far. They are both in good health now and it was determined that the virus had contaminated these employees outside the premises. We quarantined about 40 of our colleagues who either were in the same personnel vehicle or worked together during the shifts with them. None of them caught the virus. For the time being, we are going through this pandemic with a total of two cases out of 1,000 people employed with the company. From July onward, we will carry out the existing measures with a slight update. We are also working on the psychological dimension of this pandemic as well. Our psychologists are providing attentive support to our colleagues. Therefore, we believe that we are doing almost everything that we can possibly do in a physical sense on behalf of FNSS during this period."

23 More Vehicles to be Delivered as Part of the Oman PARS-III Program

Stating that FNSS has not experienced any delays in deliveries due to the pandemic, KURT added that there had been setbacks, however, in the schedules of certain projects because of their customers. "No FNSS-induced postponements have occurred in our ongoing deliveries. We place great importance on this issue. Deliveries of the Anti-Tank Vehicle program continue, we did not encounter any disruptions in this process. Moreover, we adopted certain measures to avoid any delays in the deliveries that will take place by the end of this year or within the next year. Regarding our urgent deliveries such as the Anti-Tank Vehicle program, we kept our workforce in the facilities and avoided any postponements. Then again, certain delays may

occur because of our customers; for instance, the delegation of Oman could not attend the acceptance test, and then the travel restrictions were launched. 2 to 3-month delays may occur, but they will be due to the acceptance process of the vehicles rather than the production process. Still, presently we are not experiencing a situation that would affect the completion of the deliveries in Oman. The acceptance period will be accomplished around September - October instead of June. The last 23 vehicles will be delivered before the end of the year. We have a final acceptance process remaining, and we will complete it towards the end of the year to the extent allowed by travel restrictions. Our deliveries to Malaysia have already been completed. A delay is expected due to the overall lockdown in Malaysia, yet there will be no postponements due to FNSS' deliveries to our local partners, DEFTECH company."

General Manager and CEO of FNSS Nail KURT: "The impact of the COVID-19 pandemic will be felt in the next six months to one year."

Nail KURT stated that a decline by 15% was expected in total turnover due to the delays in the processes of SPTWAV and ACV Modernization projects and he noted that though there was no decrease due to the virus, they might be experiencing certain negative impacts in the upcoming period due to delays in fairs and events. "Although there is no decrease in the budget yet due to the potential delays in our production, there may be a decrease in our total sales within this year because of delays in expected or signed projects. There will be a decline of around 15% this year but pointing to COVID-19 as the actual reason would be wrong. We consider the delay in T+0, particularly in SPTWAV and ACV Modernization Projects, to be among the main factors. We will most likely observe the actual impact of COVID-19 in the upcoming period. The impact may appear in 6 months or a year as setbacks occur in terms of marketing and business development. Due to the travel restrictions, major fairs and events have been postponed. These events enable quite fruitful meetings with the end-users and customers. For instance, the exhibition in France (Eurosatory 2020) has been canceled. Then the fair in Malaysia (DSA) was put off until next year, the same happened in Indonesia as the Indo Defence exhibition was postponed. Therefore, we believe that the lack of contact that we typically would have made during these fairs and B2B meetings, or their delay of 6 months or a year, will have certain effects. In this sense, COVID-19 will have more repercussions. To be frank, I do not expect a significant impact this year."

KURT underlined that no critical disruption occurred on the basis of local manufacturers regarding the supply chain during the pandemic and noted that even so, foreign suppliers were affected by the process. "I actually find it useful to divide the supply chain into two groups, as local suppliers and our foreign suppliers of parts and systems. At this point, we observe that the impact of the pandemic process has been felt to a greater extent by foreign countries. Our local companies made sacrifices and have continued their production activities. However, certain disruptions have been observed in the activities of our suppliers who ran their business locally yet imported parts from foreign countries. Still, so far, there have been no delays that have significantly affected us. The Turkish Defence Industry entered this period with the blow it had already received from its suppliers. Export restrictions are the actual reason, in other words, as we are going through a period that is shaped by political motives, which are overwhelming us. I may state that COVID-19's impact was actually less of a factor than these pre-existing factors. We have nearly 600 domestic subcontractors. We strive to support them by helping them in their payments so that they survive through this process. Subcontractors play a key role within the ecosystem of FNSS, and small-scaled companies may be influenced severely by financial fluctuations. Therefore, we aim to support them as much as we can. If the economic difficulties continue, the payments are suspended, and new orders are not placed; if the defence industry is affected overall, the sub-industry, which is a critical part of the ecosystem, will inevitably be affected in the next six months or one year. I believe that the subcontractors will be able to survive this process if sustainability can be achieved at the level of major contractors."

General Manager and CEO of FNSS Nail KURT: "The Defence Industry has built an ecosystem over 30-35 years, and it has achieved substantial momentum in recent years. We should maintain this."

Nail KURT also mentioned that FNSS adopted financial measures to help protect subcontractors from the effects of the recession during the pandemic and continued, "Surely we strive to assist our stakeholders that have special demands regarding this issue. As I mentioned previously, I hope there will be no major setbacks in the defence industry in a general sense and its ecosystem so that our subcontractors can survive this process with the slightest effect. From the perspective of the Turkish defence industry, the requirements of the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Armed Forces continue. In other words, no suspension or decrease is in question here as there are active theaters of operation. There are still needs, but I do not think there are any problems on the users' side. The Presidency of Defence Industries has been supporting the projects with all its power. At this point, cash flow is quite critical in an economic aspect. Where to transfer the funds or how to cut the funds is a matter of choice. As employees of the defence industry, we state that there is an ecosystem that was built over a period of 30-35 years, and this ecosystem has gained significant momentum in recent years. We should not lose this momentum as having to regain our footing, to tread forward, and gain traction again would be quite difficult. It would also be very costly. Measures to maintain the sustainability of this ecosystem must be taken. Shrinkage, recession, constriction, which would cause downsizing in the sector, may also generate quite serious and negative consequences. These impacts can be minimized by ensuring there is continuity in our projects and by funding the projects."

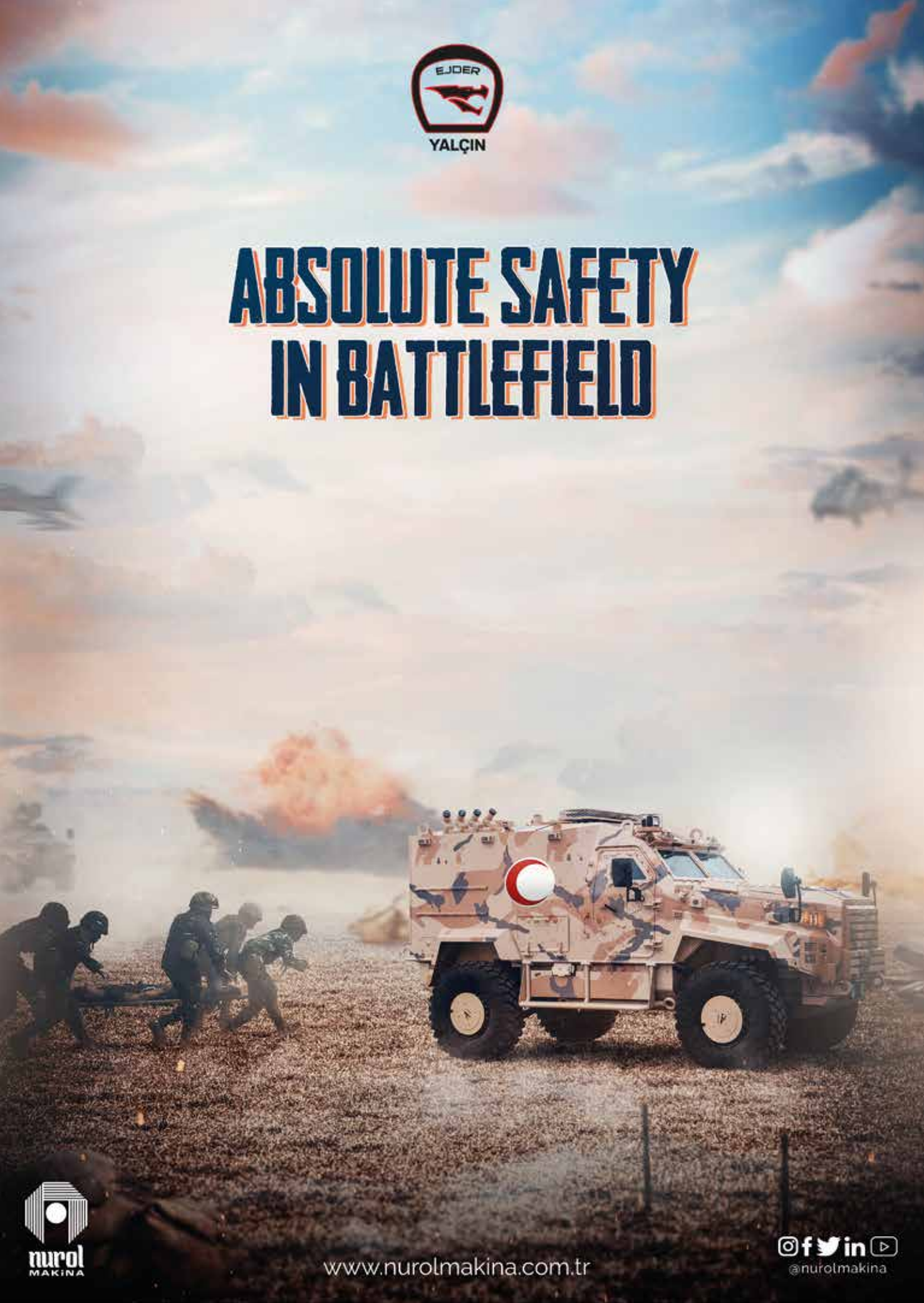
Nail KURT: "Ensuring the continuity of local programs is possible despite economic difficulties."

KURT emphasized the fact that an economic recession might be felt in the aviation sector to a certain extent as a natural outcome of the pandemic period and noted that it was possible to maintain the continuity of local projects despite the economic difficulties. KURT: "Too much effort is being exerted in local projects to finalize the programs. Yet, with projects abroad, export activities play a major role in our business. Presently, there are cuts in the budgets of foreign countries. There may be a reduction, particularly in the defence systems to be imported. And this may create substantial effects, especially in civil aviation as well. Our companies, such as Turkish Aerospace (TUSAŞ) and TEI, have materials and products that are included in their export items. I do not clearly know their condition. A recession may occur as a natural consequence of this process, but I do not know how to overcome this as it does not fall under my specialization. Then again, it is still possible to ensure continuity in domestic projects despite the economic difficulties. As a matter of fact, we went through such difficulties before, the ACV project was in full flow, and a substantial amount of payments were delayed while deliveries still continued during the economic crisis at the beginning of the 90s. The government found a way out, the treasury stood as a guarantor, and we floated a loan. Hand in hand, the state, and the private sector maintained the continuity of the project throughout the period of one and a half years without any disruptions in the delivery or production. Surely, the number of such great projects was limited in those days; today hundreds of critical projects are carried out by the SSB, simultaneously, Therefore, such a solution may not be introduced these days easily. The potential suspension in payments stands out as the greatest threat at this point. This problem must be solved. Otherwise, the economic recession will be inevitable. Without a doubt, we absolutely do not wish to experience any of these repercussions. Users have certain demands and requirements, and with respect to the economy, the global impact of this process would naturally be felt in our country. Certain measures need to be adopted to minimize this and to provide relief to companies. Other than

PARS-III

EJDER YALÇIN

ABSOLUTE SAFETY IN BATTLEFIELD



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that, new projects should not be put-off, because when a pause is made, one may not project the next year very clearly. In this sense, our expectation from our government is the adoption of measures that will maintain sustainability. Regarding exports, this needs to be evaluated within the dynamics of each company and each market. We have this misfortune regarding exports; oil revenues are of major importance for our customers in general. Since the oil prices fell by half, we expect a delay in these projects as well. We were expecting major projects this year and for the next year, and now we project postponements in them. It is true that there has been a recovery in oil prices but now we are speaking of US$ 30 while we spoke of US$ 60 six months ago. We need to figure out how the budgets will be affected by this adverse change."

FNSS General Manager and CEO Nail KURT: "Our military operations in Syria and Libya did not serve the purpose of many countries in the West in particular. They put pressure on export licenses. They aim to play their last card."

Noting that international relations was another key factor that impacted export activities, Nail KURT noted that especially the recent military operations in Syria and Libya did not serve the purposes of many Western countries and that they were feeling the impact of this development in terms of export licenses. KURT: "International relations are another factor shaping export activities. Our recent military operations first in Syria and then in Libya did not gain recognition for many countries in the West. They are overstraining us with respect to export licenses. They wish to play their trump card. However, we have experienced this problem before, and sometimes it becomes an unforeseen advantage. The issue of indigenization rapidly comes up on the agenda, but without a doubt, these are problems that could not be solved in just a couple of months. Even so, in a general sense, if we tackle this issue within the context of the pandemic, there may be a bottleneck and a decline in exports in the short term. This decline can be observed in the figures declared by the Defence and Aerospace Industry Exporters' Association at the beginning of the year."

Speaking on the topic of the global tendency towards shifting defence expenses to the healthcare sector following the COVID-19 pandemic, KURT informed the participants on their plans for the aftermath, in 2020-2021 regarding the changes that may emerge in the defence industries of countries such as Malaysia, Indonesia, and Oman who are becoming home countries for FNSS. "We have plans in this region, but plans alone, we are not enough; we also need to take action. FNSS has crucial projects that have been continuing for 3-4 years, and these are still not concluded. We never gave up on them, and there are no indications of their cancellation, and for these, we anticipate delays of 4-5 months. There are no changes in our medium- and long-term plans and projects. We have been working fervently on certain projects in addition to the ongoing projects in Oman. As the AV8 project in Malaysia took a lot of time and furthermore due to the COVID-19 pandemic, there may be a delay in new projects, but this does not imply that there will be no new projects. We are pursuing 3-4 new projects which particularly involve after-sales support, renovation, and the time for modernization of ACVs is coming up. Therefore, our export plans continue in Malaysia, Indonesia, and Oman. Hopefully, we also expect to receive a greater order from Indonesia in the 1-to-2-year-period ahead. Our business development project that is under the tender process in South Korea continues, and we are hopeful about it. With respect to new markets, we have certain initiatives in South America. We have developed contacts with 1-2 countries among the Turkic Republics. As I mentioned before, there may be certain postponements in the short term, and it is quite natural, but we do not anticipate a decrease or a contraction in our export plans in the medium and long term."

Nail KURT informed participants about the latest status of FNSS's activities in Oman and underling that customer satisfaction in Oman was at the highest level, he said "Presently, our deliveries in Oman are being carried out, and only the delivery of the final batch of vehicles is left. Final acceptance tests in Oman will be completed, and we already have resident teams there. Our customers in Oman are extremely satisfied; by the way, we have a substantial offset commitment. We are planning this in a way to create the maximum advantage for Oman and to elevate FNSS's leverage in new projects to the highest level. We are conducting negotiations for a project, and surely these negotiations are being held as business correspondence due to the pandemic. Still, we will make an official visit Oman for a face-to-face B2B meeting at the earliest opportunity. The establishment of a facility in Oman and the launch of new projects are on the agenda. But Oman's Sultan, who was the leader of Oman for many years, has passed away, and a traumatic period followed this loss. Now a new Sultan has sworn in a new leader, and after these crucial changes, the oil crisis has emerged. Crucial incidents occurred in Oman prior to the COVID-19 pandemic that escalated the crisis in the country. Nevertheless, I believe that the effects of the pandemic, particularly over state matters and the defence industry, can be minimized in 2 to 3 months, and our activities will lead to a pre-pandemic recovery.

KURT: "Turkey, acquiring know-how from Hyundai Rotem as part of the development stage of Altay MBT, will now provide the know-how to South Korea."

KURT stressed that, with the assistance of the business models constituted in Indonesia and Malaysia, FNSS had uplifted its reputation to an extremely high level in this region, and the company wishes to carry their partnerships in this region to more advanced stages to make their mark on new achievements. KURT: "We have two proven successful business partnerships in Malaysia and Indonesia. Of course, this development served as a model for other companies as well. Hopefully, we will be taking the partnership in that region to more advanced stages and embracing new achievements. We accomplished a new partnership through a project-based model with the Hyundai Rotem company in South Korea, and this partnership comprises technology transfer. I am not capable of giving detailed information as the tender process is ongoing. In respect to this collaboration project, we signed a cooperation agreement with the Hyundai Rotem, which also involves technology transfer. We will be transferring the know-how to South Korea. Hereby, I would like to remind you of the fact that Hyundai Rotem supported Turkey during the development process of Altay MBT. We will be giving technological support to South Korea hopefully if we win the tender. There are regions where we have built cooperation in the industry. We also have business models where domestic companies would be able to act as Main Contractors. We are proceeding with this model, particularly in South America. This model is quite efficient, especially for countries that wish to improve their defence industries. Instead of direct sales like as major European, American, or even Russian Defence Industry companies, this model becomes a considerable marketing advantage when offering joint & local production."

Regarding the question requesting detailed information on the Rapid Deployable Amphibious Wet Gap Crossing System (OTTER) tender conducted with South Korea, KURT said, "They are quite sensitive about this tender process. Therefore I apologize for not being able to give details on this issue. The process is ongoing, and we made a proposal that also includes technology transfer. I am not able to express any further points. Hopefully, we project it to be completed in the first months of next year. Of course, these are only our estimations; we have not been notified of any developments by the other party. An unbelievably challenging process is being experienced. We are going through a very detailed examination in technical terms."

Nail KURT: "Malaysia is interested in PARS 4X4 and EJDER YALÇIN 4X4"

KURT replied to a question on the ongoing delivery of 257 AV-8 Armored Vehicles in the Far East in Malaysia. This export sale was Turkey's greatest export in 2011 at that time and stating that their local partner DEFTECH was proceeding with the deliveries, KURT added, "DEFTECH has been carrying out deliveries to the end-user. We have accomplished our deliveries to DEFTECH. Only the last eight recovery vehicles remain. There was a difference between the technical requirements and the specifications envisaged by the contract. Eventually, the end-user, Malaysian Land Forces, decided on a solution at the beginning of this year and notified our company of their latest decision. So, instead of the PARS 8x8 based solution, we modified another commercial vehicle according to their specifications. We will mount the equipment they requested, add ballistic protection, and deliver the vehicle. As a result, due to the delays in the decision-making process, the delivery of the eight vehicles has been extended to 2022. Besides, there are developments regarding the second phase of Tactical Wheeled Vehicles. The activities related to this project are in progress as well. Our negotiations with the Armed Forces over the configuration of the vehicle are being carried out together with DEFTECH. The pandemic process led to a 3-4-month delay, but we launched the negotiations. There is an interest in our PARS 4X4 vehicle and Nurol Makina's EJDER Yalçın 4x4. I have already mentioned the modernization of ACVs, also dubbed ADNAN vehicles. In this respect, an upgrade beyond Extend Service Life is in question as well. The French company, THALES, offers certain solutions in terms of electronic systems. The modernization of ADNAN ACVs is inevitable. If not this year, it will absolutely be taking place next year. They are complaining about the maintenance process, which they are in charge of; therefore, there is a view that the execution of this process by the OEMs would be better. So, our negotiations on the after-sales support of both ADNANs and 8X8s are being carried out. They are leaning towards these projects; therefore, we are observing signals that indicate our presence in this country will continue for a long while."

PARS 4X4 Anti-Tank Vehicle

Nail KURT: With PT PINDAD, we are conducting significant marketing activity for the KAPLAN MT with a country in Southeast Asia."

General Manager & CEO of FNSS Nail KURT mentioned the changes in requirements and demands in Indonesia regarding the Medium Weight Tanks with an answer to a related question and made statements on the latest status of the KAPLAN MT medium weight tank and its export to third countries via Indonesia. KURT: "KAPLAN MT is a distinctive tank in the medium weight class. This is not a brand-new concept. In fact, it is quite popular in the western world. A rather substantial project was conducted at the end of the 1980s and at the beginning of the 1990s in the United States. Quite significant activities were conducted over a light-weight concept that employed 105mm Gun, and sourcing was allocated to this end. Yet, the project was shelved when the development project of the 8x8 Stryker vehicle was initiated. And later, with the emergence of asymmetrical conflicts in the world at that time, this concept was revisited again. They prefer this concept due to the challenging environmental conditions of Indonesia, its perception of threats, and tactical requirements. Therefore, they have 90mm or 105mm guns adapted over existing vehicles. As a result, the request for a new armored vehicle weighing nearly 30 tons came up on the agenda, and the idea of a joint development project followed. Our infrastructure was already available as we had accomplished business development activities for nearly 4-5 years up until that point. Thus

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we launched the joint design process, and the design activities were conducted in Turkey. They came from Indonesia and were involved in the design stage, actually, it was rather a training opportunity for them. At this point, we launched the project as a joint project of Turkey and Indonesia as the specifications of the users remained at the forefront. We transformed their criteria and specifications into a design. Another factor that facilitated our activity was the fact that they had already determined the 105mm gun and turret, and the design of the tank was shaped according to the turret. I mentioned it as it is a distinctive characteristic; it has a striking power like a Main Battle Tank as well as in the lower silhouette. Last but not least, in terms of difference is that we achieved it at one-third of the cost of the Main Battle Tank. Without a doubt, the high mobility of the tank and the low cost brought forth great advantages. Actually, we were not expecting this much interest. With PT PINDAD, we have been conducting critical marketing activities with a country in Southeast Asia. Our cooperation agreement envisages that if Indonesia has more sway in powerful political affairs, PT PINDAD will take the lead, and FNSS will take the lead in countries where Turkey has more dominant relations."

Mentioning the new generation ACV project conducted in Indonesia as well, KURT underlined that FNSS was quite active in the country and added, "With respect to the new generation ACV, we are speaking of a vehicle that weighs over 30 tons. It will feature robust ballistic protection. The 30mm Unmanned Turret is requested as part of the project. The FNSS portfolio contains these products, and we also wish to proceed with a similar product. Indonesia is a huge market; it is the big brother of its region. With its population of 220 million people, it has a considerable role among the developing countries, and therefore it has great demands. It is a very challenging market at the same time. We have a rather favorable position in Indonesia, and we have a strong partner. When a new project emerges, it could even be a wheeled vehicle or the ACV version of a heavyweight tracked vehicle which is currently on the agenda, and as FNSS, we are always active in such projects."

T-155 Self-Propelled FIRTINA Howitzer is seen crossing over the river thanks to the OTTER - Rapid Deployaple Amphibious Wet Gap Crossing System

Following his remarks on the export programs, KURT informed the members of the press in detail about domestic projects that they have executed under the coordination of the Presidency of Defence Industries (SSB) and on their development programs for the future.

KAPLAN MT

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Nail KURT: "The CDR stage in the MAV (Marine Assault Vehicle) Program has been Accomplished. The qualification tests will be launched in the autumn."

Touching upon the development process of the 27 Marine Assault Vehicles, to be manufactured for the TCG Anadolu LHD, KURT underlined that the serial production process would be completed at the end of 2021 or in the beginning of 2022 and continued, "You have already seen our Marine Assault Vehicle at IDEF'19, there are no major changes from that day. We have been discussing certain issues in terms of indigenization with the Presidency of Defence Industries. Though it was not planned before, we are focusing on the utilization of indigenous components. Other than that, the vehicle is currently available for test campaigns such as FNSS' engineering tests as well as mine and ballistic tests. Then we will launch the qualification tests with the coordination of the Presidency of Defence Industries as stipulated by the contract. The test scheduled is being discussed by the parties. The Critical Design Review (CDR) stage has recently been completed, and the qualification tests will be launched at the end of summer (2020) at full speed, and we predict that they will be completed by the middle of the following year. The serial production will be accomplished by the end of 2021 or at the beginning of 2022, and a total of 27 vehicles will be delivered."

Answering a question on the development of a unique engine for the Special Purpose Tactical Wheeled Armored Vehicle Project (SPTWAV) and on the local content rate in the overall the program, KURT noted that they have signed a contract to this end with TÜMOSAN and commented on the developments regarding the engine. KURT: "The engines may bear a cost that varies from 5% to 15%. When we approach it cost-wise, we need to analyze the total local content rate in the vehicles to perceive the case clearly. Though it shows an alteration from one vehicle to another, there is a local content rate that ranges from 55% to 65%. We may say it is 60% on average. This should not be perceived as the components are not being manufactured indigenously due to technical incompetence. All components are procured, where it is more feasible in economic terms. With respect to the technology, this case can be reduced to either an engine or a higher caliber weapon. Particularly, the restrictions imposed in terms of engine licenses in the recent period have indeed been challenging for our defence industry, but it is not a process that can be accomplished in a short span of time. I'll say it over again that in the automotive industry, the Engine is manufactured in the beginning. We are speaking of the mass production of millions of engines extending over the years. If a company designs and manufactures an engine for a vehicle of which you will be producing 100-150 annually, then bankruptcy could not be avoided as it is not feasible to do so. Therefore, it has to be considered along with the automotive industry; it should not be tackled based on a defence industry product. Surely, there are special cases of exception. There is a powerpack (engine and transmission) development project for Altay MBT. Turkey accepted the cost of this in advance as it was perceived as a technology development project, and it was correct to do so. If we heavily invested in design and manufacture the engines for the vehicles, we would not have had made it this far, and we would have collapsed. The SPTWAV Project is a great example of this. We venture forward as FNSS since it is a source of pride for us. Currently, we are the only company that declared to utilize unique engines in land platforms. As soon as we found the opportunity, we advanced upon this by taking the risks that came along with it. TÜMOSAN was quite assertive in this field; the company had 350hp based engines. The engine emissions may have limited the production to 350hp, particularly in commercial utilization. Still, they believed that this could be boosted to 450hp and then to 550hp with certain modifications and additions and hardware and software updates for military utilization. The engine was not off-the-shelf, nor was it tested or qualified.

FNSS, TÜMOSAN, and the Presidency of Defence Industries took a significant risk at this stage. We will definitely provide a solution required by the 450hp version or the specifications of the vehicle. If you ask if we have any other solutions, of course, we do. But as we have been collaborating with foreign companies building engine groups for years now, we took this risk as we believed that we owed this success to ourselves. Many people are saying that we would fail. Yet, we are insistently focusing on achieving. We must get rid of the mindset of failure and collectively support pathways for achievement. We believe we will achieve the project by searching for ways to succeed instead of losing time on negative thoughts and thus making our mark. The development activities are currently in progress. There is a proven concept, and the activities on its implementation are being carried out with practical tests. Hopefully, we will pass another milestone in the next 2-3 weeks, and we plan to reveal the 450hp prototype physically by the end of this year. The tests will probably be launched over this vehicle next year."

KURT also made statements on the 4th generation PARS Tactical Wheeled Armored Vehicle concept, which was launched in 2018 and underlined that its difference from the PARS-IIIs concept was based on the criteria set by the end-users. "The request for payload has been increasing both in Turkey and abroad. There is pressure on the weight, and in addition, the protection levels have substantially been increased. As a result, the tonnage will increase towards 35 tons. The engine and transmission will get larger accordingly. Therefore, a more costly and heavier vehicle with greater capacity will be revealed. This surely happens in line with the requests of our customers. Protection and situational awareness will be prioritized further as well. Moreover, it will feature a weight advantage in terms of the integration of sub-systems and payloads. Hopefully, you will see the new generation PARS vehicle at IDEF 2021."

KURT: "As part of the Anti-Tank Vehicle Project, 26 vehicles have been delivered so far."

Stating that the deliveries were in progress within the scope of the Anti-Tank Vehicle Project, KURT relayed information on the current status of the project. "Deliveries have been launched, and a total of 26 vehicles have been delivered to date. The last two of these vehicles have been delivered equipped with the OMTAS missiles with an Anti-Tank Remote Controlled Turret (ARCT). Therefore, mounted over these vehicles, the OMTAS (Medium Range Anti-Tank Missile) developed by Roketsan also entered the inventory. We have a rapid delivery program, and we took all the measures

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TÜMOSAN's PowerPack was displayed at the FNSS Booth at IDEF'19

to prevent it from being affected by the COVID-19 pandemic. Delivery of the Pars 4x4 Anti-Tank Vehicle, also with OMTAS turrets, will be launched towards the end of the year. The qualification tests of that vehicle have also been successfully completed except for a minor procedure. The project has been proceeding well, and the initial feedback is quite positive."

KURT also provided information on Shadow Rider (Gölge Süvari) as part of the project executed by the Presidency of Defence Industries and underlined that these vehicles could be retrofitted and get into service within a short period with very cost-effectively. KURT continued, "Shadow Rider is quite basic, but it has been customization that exceedingly serves its purpose. In this project, we aimed to prove that a large vehicle could be transformed into an unmanned vehicle with a very simple process. It reached its goal. We know that the Armed Forces has been conducting a conceptual project in this area from the feedback received, particularly from recent military operations and from the integration of UAVs. We wanted to be involved in the business as part of heavyweight land vehicles, and we developed Shadow Rider accordingly. It is a very cost-efficient solution. First off, to render it different from a simple remote-controlled gadget, the integration of situational awareness systems was prioritized so that it will not endanger the soldiers around it. Moreover, activities

on the integration of the GPS systems for autonomous functioning are being conducted. The Presidency of Defence Industries has executed several activities, and we are waiting for the activities to determine the scope of the development project. We wish to reveal an end-product in line with the requests of our end-users instead of developing a concept by ourselves. To this end, the integration of situational awareness systems, GPS systems, and short and long-range communication systems play a key role. Otherwise, the product will not become anything but simply a huge toy. We wish to accomplish these with the Presidency of Defence Industries. It may be quite useful in terms of logistics, and if a concept is identified for mine dragging, we may be able to configure it accordingly. Furthermore, we executed substantial activity together with STM and accomplished the integration of STM's small-sized drones. We procured 30 or more M113 armored vehicles at a very low price, and they may be launched to service in no time for a very low cost. When we compare it with the cost of an armored vehicle of 20-25 tons manufactured from scratch, we have 30 manufacturable and feasible vehicles. We are capable of adapting them in a very short period of time. I believe that Shadow Rider will play a major role within the project to be launched by the Presidency of Defence Industries."

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Shadow Rider Configuration of M113 was demonstrated at IDEF'19

Nail KURT: "133 Vehicles in the first lot will be modernized as part of the ACV Modernization Program."

KURT shared information on the ACV Modernization project and noted that they hoped that the vehicles, except for the ones to be modernized in the first lot, would be modernized afterward. KURT continued, "Substantial improvements will be made in the vehicles in terms of capability and protection. The vision systems that will significantly increase environmental awareness will be integrated into the vehicles with the sub-systems of Aselsan. The Remote-Controlled Weapon Station, also manufactured by Aselsan, will be integrated, and the interior of the vehicle will gain considerable space. Though it is not covered yet, hopefully, there will be a renewal in the engine and transmission. In this way, I believe the malfunctions that occurred in the last 30 years would be minimized, and these vehicles will once again become very reliable. There are also enhancements in ballistic protection. Moreover, the electric and electronic parts of the vehicle will be improved. These vehicles, the lifecycles of which are to be extended, are large in number, and we cannot lay them aside. They took part in the forefront in the recently conducted military operations as well because we only have ACVs as the "Armored Combat Vehicle." Activities on the new generation vehicles are ongoing, but there is still much time ahead before their production and inclusion in the inventory. According to our estimations, nearly 2,000 vehicles will be used effectively for 15-20 years ahead. Hopefully, this project will continue as well since there are only 133 vehicles in the first lot. In addition, the remaining ACVs in the inventory will also come up on the agenda and will be renewed. Presently we are speaking of certain vehicles without any alternatives. I do not see any correlation in terms of the technical level reached by FNSS in this case, as we are capable of designing and manufacturing more advanced vehicles. Still, from an emotional perspective, we feel as if our first child is back home. By the way, these vehicles were manufactured here, and we learned by experienced military production in the Defence Industry with these vehicles first. Therefore the emotional dimension outweighs the other aspects. We are quite pleased about it, it is very important for us and my colleagues are approaching the project with the same feelings, but when one takes

a look on a technical level, the technical properties featured in the vehicles that we will manufacture from scratch will most certainly be much better."

KURT added that R&D activities on turret systems were also in progress and underlined that with its new generation turret systems, FNSS is maintaining marketing activities both at home and abroad "The Weapon turrets are essential parts of the vehicles. Though we do not manufacture any weapons, we are working on the weapon turrets that will be integrated and utilized. In our first ten years, TOW turrets were manufactured with imported technologies, and then we had the 25mm sharpshooter turrets. But the eventual choice of Turkey was Dragar turrets, and after the first 133 turrets were manufactured, Dragar Turrets were selected. These were manufactured by Nurol Company under license. Later, we exported the one-man 25mm Sharpshooter Turret to Malaysia, we sold one to Egypt a long while ago, and a limited number of them were sold to the Philippines. A substantial number of these turrets were exported to Malaysia, and we sold them the FNSS turrets within the second package. The improved version of the turrets is being utilized in Oman. These turrets procured by Oman are quite different from the first turrets as they contain a substantial amount of FNSS engineering. With an amazingly competitive price, ATV (Anti-Tank Vehicle) turrets were also designed, manufactured and qualified by FNSS in a way to employ both KORNET (Anti-Tank Guided Missile) and OMTAS (Medium Range Anti-Tank Missile System). There are 12.7mm remote-controlled turrets which were used in the MAVs (ZAHA program) and sold to Oman. In terms of development activities, we worked on the 30mm two-man turret and on the unmanned version. The activities were quite advanced, as can be considered in the preliminary stages of the projects in America. Furthermore, our activities on 35mm manned and unmanned turrets are in progress. We place great importance on turrets as our customers demand them, and we are obliged to fulfill their requirements. Aselsan's turrets were selected within the scope of the last two projects that we have signed; the Project on the Modernization of Special Purpose Tactical Wheeled Armored Vehicles and the Modernization of ACVs, and we respect that. We are capable of integrating the turrets of other companies in line with the criteria set by our customers, but we certainly prefer the utilization of our own turrets. Then again, we have a target of being active in turrets ranging from 12.7mm to 35mm as much as possible."

In the final session of the live stream, KURT answered a question regarding the importance of the balance between exports and domestic sales. KURT underlined the requirement of a balance between export sales and domestic sales and noted that they have aimed to achieve a balance in their sales to this end over the last five years. KURT: "Speaking of the recent past, when we take a look at the last decade, export sales constituted 80% of our total sales. In the period after 2010, it even went to 90% for two consecutive years. On account of the projects we undertook in recent years, such as the SPTWAV and ACV Modernization Projects and MAV, we will achieve a balance of 50%-50% in the next 1 to 2 years. Domestic sales will reach a level of 60%. Though the projects have a local focus, a long-term shift towards one side ranging from 70%-80% is not quite sound, in my opinion. With respect to sustainability, a company must remain at a range of 40% - 60% for a period of 5 years. Indeed, we focused mainly on export sales for a long time. Then again, when the domestic projects are launched, especially after the accomplishment of their deliveries, if no projects replacing them are launched in foreign countries, the domestic projects tend to come to the forefront. Still, I am quite sure that once the domestic products are matured and revealed, their export sales will follow naturally. ATVs, MAVs, and SPTWAVs will be exported, and all these products will have great export potential. Therefore, I do not think that our exports will ever fall below 50%. In fact, I do not believe that our export sales will ever decline. Our achievements speak for themselves. Also, our end-users conduct our public relations activities for us in the best way as fruitful projects pave the way for their own advertisement and sales. Our export sales will continue to increase as long as we conduct successful projects in our country and abroad." ■

Congratulations

for the 100th issue

Kadir Nail Kurt
General Manager and CEO of FNSS

Dear Defence Turkey Team,
I congratulate Defence Turkey magazine, embellishing Turkish defence journalism, on the occasion of its 100th issue. Defence Turkey, with its publications in Turkey and 52 countries, continues to add value to the sector by conveying to us the developments in international defence and the security industry while relaying our country's defence and security technologies and capabilities to international stakeholders. I congratulate the Defence Turkey team, who has been working with journalistic objectivity and with quality news journalism approach since the first issue, and I wish them continued success.

Serdar Görgüç
Otokar General Manager

Defence Turkey, aiming to bring a fresh perspective to defence industry publishing, has been successfully conveying the developments in our industry to its readers for many years. As Turkey's first periodical in a foreign language, it's the voice of our industry abroad and promotes our country's defence industry and the successes achieved in the international arena. I congratulate the 100th issue of Defence Turkey Magazine, which publishes all developments in our sector, holds valuable interviews, analyzes the past, present and future of the industry and communicates its challenges.
I wish you all the success in your future endeavors with many more issues for many years…

Taha Yasin Öztürk
BMC Executive Board Member

We would like to thank DEFENCE TURKEY Magazine and its team, which supports the domestic and national production activities of the defence industry in our country, and contributes greatly to promoting the industrial developments in the national and international arena, and we wish to meet again in new issues in which we will achieve greater success together.

Engin Aykol
General Manager/CEO
Nurol Makina

"On behalf of Nurol Makina, I present my congratulations to Defence Turkey Magazine, one of the distinguished publications of the Turkish Defence Industry, in reaching their 100th issue.
I am delighted to say that we do enjoy and benefit the insight covered in the magazine. On this occasion, we wish your principled and impartial publishing to last for many years to come and we wish for the continued success of the entire Defence Turkey team."

Congratulations

for the 100th issue

Esad Akgün
ASFAT General Manager

With over 30 years of experience in manufacturing, modernization, repair, maintenance and sustainment of 27 military factories and 3 naval shipyards with our qualified and expert labor force, ASFAT, deeply appreciates "Defence Turkey" for its great contribution in our defence community.

It's very hard to sustain a Nations' Defence Industry and keep up with operational and technical developments just with domestic sales and requirements. Upholding the ever-increasing requirements of the Turkish Armed Forces and providing their needs in a cost effective way also makes exports, not just an option but an imperative.

Knowledge and understanding of the Turkish Defence Industry by our potential partners and allies are prerequisites to building bridges. Demonstration of experience, trust, reliability and sustainment of support are the ingredients of collaboration upon these bridges.

With its prominent writers and insightful stories, "Defence Turkey" has been doing, masterfully, just exactly what is needed, by sounding the virtues of the Turkish Defence Industry to our potential partners and allies in its 100 issues.

ASFAT as a family have full confidence and belief in "Defence Turkey", that its readership will expand worldwide and reach the desks of all decision makers as a reference periodical.

Furkan Katmerci
Katmerciler Deputy Chief Executive Officer

As a sector representative, I am proud of the fact that Defence Turkey magazine, which is a strong voice of our rapidly developing defence industry in our country and international arena, has reached the 100th issue, and I congratulate each team member who has contributed since its first issue. While the Turkish defence industry is developing, it always receives the support of the press and media and will continue to receive it. Defence Turkey magazine has always had a reputable place in the sectoral media and has made the industry's voice heard on an international scale. We will grow together, we will strengthen our position together not only on a national scale but also in the international arena.

To more 100th issues Defence Turkey...

İsmail Başyiğit
General Manager, MilSOFT Yazılım Teknolojileri A.Ş

My heartfelt congratulations on this significant anniversary-one that marks the 100th issue since the foundation of Defence Turkey Magazine.

Over the years, your publications have always had memorable and newsworthy information about upcoming events, and interviews and articles, which has made your magazine a trustworthy and significant source in the industry.

Thanks to the professionalism of your team, your expressiveness of language and the contributions of respected Turkish and foreign authors, Defence Turkey is a very popular and notable magazine in the defence sector.

Wish you all future success, longevity and good fortune.

Anıl Karel
Deputy General Manager, Nurol Makina

Dear Ayşe, Cem and the Defence Turkey Team,

I remember the first issue of Defence Turkey magazine and its first anniversary as if it happened only yesterday. I wish you continued success in sharing the news about our developing defence industry with the sector and the relevant people in many more issues.

A Look at Major HWTs & LWTs in NATO Countries & Ongoing Torpedo Programs in Turkey

by İbrahim SÜNNETÇİ

The first true torpedo was invented in 1866 by British engineer Robert WHITEHEAD, based on the ideas of Austrian Navy officer Johann LUPIS. The word 'torpedo' (derived from the word 'torpere,' which means 'to stun' in Latin), was created in 1800 by the American inventor Robert FULTON, who also invented the first steam-powered ship.

Since their first use during the Russo-Turkish War of 1877-78, torpedoes have proven to be one of the most effective and lethal naval weapons. During the war, (also referred to as the 'War of 93,' named for the year 1293 in the Islamic calendar) the 381mm diameter Whitehead Torpedo, launched at a distance of about 65m from a torpedo boat under the command of Russian Vice Admiral Stepan Osipovich MAKAROV in January 1878, sank the armed cargo ship 'İntibah,' which was anchored in Batumi Port. Thus, İntibah went down in history as the first ship sunk by a self-propelled torpedo. Even the emergence of Anti-Ship Guided Missiles (ASMs) could not eliminate the role and importance of torpedoes.

Torpedoes can be used for both offensive and defensive purposes. Today, torpedoes are the primary weapon system of both nuclear and conventional (diesel/electric) and Air Independent Propulsion (AIP) type submarines and some fast attack crafts. Torpedoes are also carried by numerous surface vessels, Maritime Patrol Aircraft (MPA), and Anti-Submarine Warfare (ASW) Helicopters to defend against enemy submarines. In the past, torpedoes were not highly accurate weapons, and their maneuverability was limited. Therefore, multiple torpedoes had to be launched to score a single hit on the target. However, with the advancement of technology, torpedoes have undergone a significant transformation in the last two decades. Today, a single wire/fiber optic guided, or fully autonomous torpedo launched by a skilled operator can achieve at least a 95% hit probability.

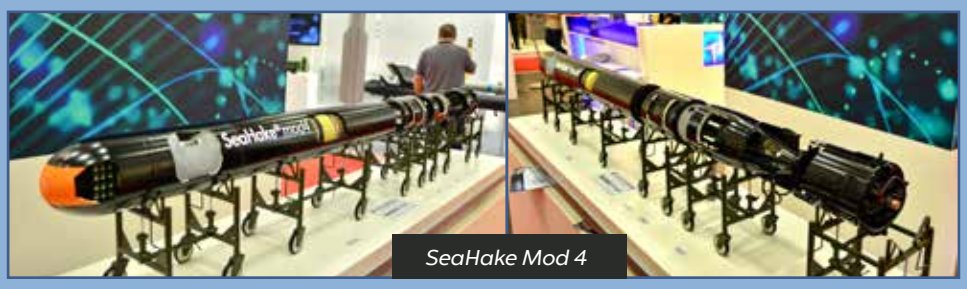
The size of the global torpedo market in 2018 was US$805.3 Million, and by 2026 this figure is expected to reach US$1.114 Billion. On the other hand, the global Underwater Unmanned Systems market, which was US$2.96 Billion in 2018, is expected to reach US$7.53 Billion by 2026. The size of the Autonomous Underwater Vehicles (AUV) market, which is envisaged to be US$638 million in 2020, is planned to reach US$1.638 Billion in 2025. Torpedoes are expected to

During the White Storm 2016 Exercise, which also included a live-fire ship sinking mission, a decommissioned Tepe (Ex US Navy Knox) Class Zafer Frigate was used for target practice. The lethal effect of the DM2A4 HWT that was launched by a GUR Class Submarine on the Zafer Frigate highlighted in sequences. The DM2A4 HWT hit the Zafer amidships, breaking her keel and sending her below.

take the lion's share in the Underwater Unmanned Systems market in the next ten years.

Currently, two main types of torpedoes are used by the world's Navies: heavyweight (HWT) and lightweight torpedoes (LWTs). Heavyweight Torpedoes (HWTs) are carried by submarines for use against both enemy surface vessels and enemy submarines. Most HWTs have a diameter of 533mm (21 inches), while some Russian torpedoes have a diameter of 650mm (25.6 inches). Today's major HWTs are US Mk48 Mod 7 ADCAP and Mk48 Mod 7AT, British Spearfish Mod 1 (can reach 80 knots [148km/h] and 50km range), German DM2A4 SeeHecht (exported version SeaHake Mod 4), Italian Black Shark Advanced (BSA), French F21 Artemis and Swedish Type 62 Torpedoes. The main Russian heavyweight torpedoes are Type 65 (650mm), Test-71M and Test 96, and gas turbine propelled DST-90, DST-92, and DST-96 models. As of October 2019, the major 533mm Heavyweight Torpedoes used in the Russian submarine fleet consisting of 58 submarines of different types and tonnages are electrically propelled Test-71 MKE and UET-1E (replacing USET-80), UGST (Universal Deepwater Homing Torpedo) powered by a liquid fuel thermal propulsion system (gas turbine engine) that operates a pump-jet, and its improved version, the UGST-M torpedoes. The 7.2m and 2,200kg UGST also has a 6.05m and 1,880kg version that can be launched from NATO standard tubes. The first drawings of Russia's new long-range and nuclear-propelled torpedo were accidentally disclosed on the Russian NTV television channel on November 10, 2015. It is claimed that the new Status-6 heavyweight torpedo, also known as Poseidon (called Canyon in the USA), will be armed with a 100-megaton nuclear warhead. The Poseidon/Status-6 torpedo is also one of the 'super weapons' introduced to the public on March 1, 2018, by the President of the Russian Federation Vladimir PUTIN.

Light Torpedoes (LWTs) are carried by surface ships, Maritime Patrol Aircraft (MPA), and ASW/ASUW Helicopters to use against enemy submarines. The surface ships use LWT as offensive and/or defensive antisubmarine weapons. In western navies, the most common diameter/calibre for lightweight torpedoes is 324mm (12.75 inches). The US Mk46 NEARTIP (Mod 5) and Mk54 LHT (Light Hybrid Torpedo) are used by the United States Navy and many other Western navies, including the Turkish Navy. The British lightweight torpedo Stingray, the 3rd generation MU90/IMPACT, and Sweden's New



SeaHake Mod 4

A Mk46 Mod 5A Recoverable Exercise Torpedo (REXTORP) being air launched by a Turkish Navy P235 MPA (tail number TCB653) to hunt a submarine it detected during a naval exercise. The parachute that ensures the nose hits the water first is clearly visible

Lightweight Torpedo (NLT, also known as Torpedsystem 47 [TP 47]) are other notable lightweight torpedoes on the market. Most Russian ASW torpedoes are 406mm (16 inches). Most lightweight torpedoes (LWTs) use electric motors that are quieter while retraining enough reserve power to chase the target. One of the latest used in Eurotorp's MU90/Impact LWT is an Atlas Elektronik's stepless, variable speed, 120kW electric motor. In this weapon and the BAE Systems StingRay, which has a 63kW motor, a propulsor is used. Some weapons of slightly earlier design, such as the Whitehead Alenia Sistemi Subacquei (WASS, a Finmeccanica Company) A244/S (which uses a DC counter-rotating motor) and the Bofors Underwater Systems (şimdi SAAB) TP 43/TP 45, continue to use conventional propellers. American lightweight torpedoes not only use propellers but also have propulsion systems based upon high-energy chemical reactions, a hangover from the Cold War. In this context, Raytheon Technologies Mk46 and Mk54 LWTs uses Otto II fuel and a five-cylinder motor.

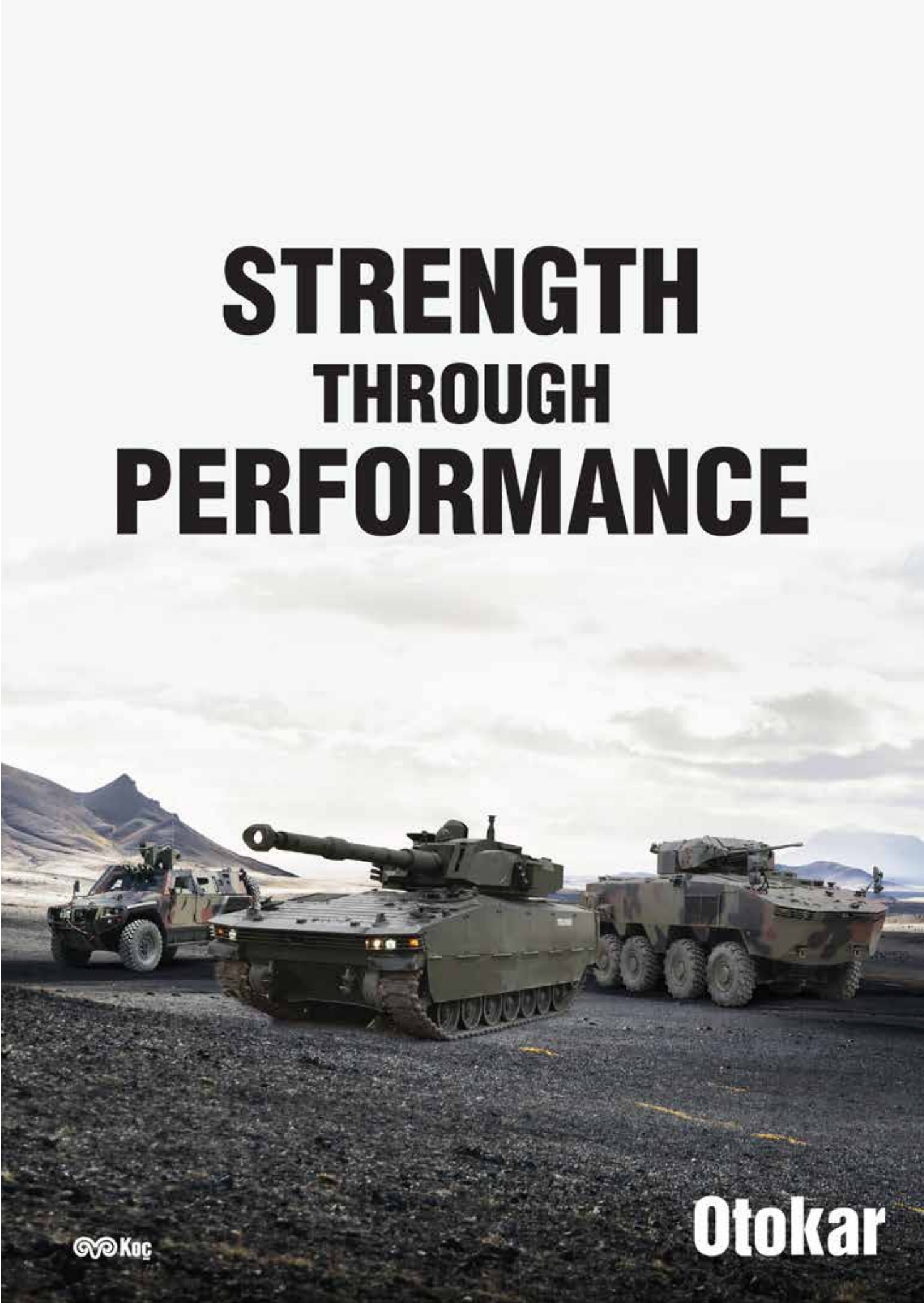
As of June 2020, it is estimated that around 520 frigates and about 310 corvettes carrying LWTs are operating worldwide. In 2008, approximately 385 submarines, including 105 nuclear and 280 conventional diesel-electric attack submarines, were operating worldwide, this number reached 451 in 2016. Currently, it is estimated that around 510 submarines operate in different types and tonnages around the world. While the size of the submarine market was US$22.4 Billion in 2019, this figure is expected to reach US$31.3 Billion in 2029.

Although long-range modern HWTs used in submarines have an average range of 40-50km, a submarine that detects a surface target with its passive sonar usually approaches the target silently and launches a torpedo from a short distance. Because whatever the propulsion system (battery, piston engine, or gas turbine) of the torpedoes, the propeller creates a specific sound in the water, and this sound wave is either way detected by the sensors on the target ship. If the torpedo is fired at close range, there will not be enough time for the vessel to use countermeasures and perform avoidance maneuvers, as the time between the launch of the torpedo and its detection by the ship will be minimal due to the speed of sound waves propagating in the water. Thus, the probability of torpedo hitting the target will increase.

A frigate can detect a submerged diesel/electric submarine at an average distance of 9.14km via a hull-mounted sonar at favorable sea conditions and tries to engage it with a lightweight torpedo at 4.57km (light torpedoes approach their target by turning side to side and following a snake-like path). During a naval exercise, one of the ADA Class corvettes was able to detect an AY Class Submarine at a distance of 11.4km with its hull-mounted mid-frequency YAKAMOS active/passive sonar. With its low/medium frequency passive sonar, a submarine can detect a frigate at favorable sea conditions from a distance of 45.7km and attack it from a much further distance (effective range of LWT) through its long-range modern heavyweight torpedoes such as the DM2A4 or Mk48 Mod 6AT (unlike lightweight torpedoes, heavyweight torpedoes approach their target on a straight path). The GÜR Class diesel/electric submarines of the Turkish Navy can detect very weak signals at approximately 50km under favorable sea conditions with low-frequency passive sonar listening. Moreover, the Royal Navy (RN)'s Astute Class nuclear submarines' processing power is claimed to be equivalent to 2,000 laptops or 60,000 home PCs, and the Thales product Sonar 2076 System can detect the sounds of other ships 3,000 miles away.

Modern torpedoes have a much longer range and durability, much higher speed, more effective homing systems, and greater lethality than their predecessors from 20 or 10 years ago. Torpedoes, which now have built-in intelligence (guidance and control algorithms) and re-attack capabilities, pose the deadliest threat to submarines. Torpedoes, together with the Anti-Ship Cruise Missiles (ASCM), pose the most severe threat to the large naval warships, especially those operating in littoral waters. They are also highly effective weapon against merchant vessels. While the role of torpedoes in the surface versus surface ship engagement has been significantly reduced, they remain the most effective weapon in anti-submarine warfare (ASW). They also remain a potent weapon for submarines in attacking large enemy surface combatants and merchant shipping.

STRENGTH THROUGH PERFORMANCE



Torpedo Studies and Turkey

The number of countries that can design, develop, and manufacture torpedoes can be counted on the fingers of both hands: The United States (USA), Germany, China, France, South Korea, India, UK, Sweden, Italy, Japan, and Russia. Several countries, including Turkey, are trying to enter this 'elite' group with their indigenous projects that they have started to develop domestic heavy and lightweight torpedo systems.

Turkey took its first step in the heavyweight torpedo field with the AKYA National Heavyweight Torpedo Development Program, which was signed on May 8, 2009, with several domestic companies' participation under the coordination of the Presidency of Defence Industries (SSB) and the Main Contractor Roketsan. The first launch test of the 533mm AKYA HWT without the warhead and active/passive acoustic sonar sensor was carried out successfully in the Sea of Marmara on July 11, 2013, with the support of the Turkish Naval Research Center Command (TNRCC/ARMERKOM). Under the AKYA National Heavyweight Torpedo Program, Roketsan will develop the warhead and guidance system, Meteksan Defence will develop the sonar transducer arrays (sonar wet end), and Koç Information and Defence Technologies (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).

AKYA National HWT

The AKYA Phase-2 Project was signed between the SSB and Roketsan in July 2016 to industrialize the AKYA National HWT prototype (controlled test torpedo) and make it ready for serial production by developing its critical sub-systems in line with the capabilities of the sector companies. The last publicized launch test with the AKYA HWT, qualification process of which is still ongoing, was carried out on December 20, 2019. During the trial, the AKYA HWT was equipped with a live active/passive acoustic sonar for the first time and launched from a detailed 533mm torpedo tube replica installed to an underwater test platform at a depth of 40m with 'swim out' launch mode. During the International Store Certification Tests Symposium held on November 4, 2019, TÜBİTAK SAGE introduced a detailed replica of 533mm diameter torpedo tube, which is entirely similar to an authentic 533mm diameter torpedo tube and capable of firing both cruise missiles (ATMACA B1/B2 and GEZGİN), and heavyweight torpedoes (AKYA) from underwater.

Aside from the AKYA National Heavyweight Torpedo Program, development studies are also carried out on Lightweight Torpedoes in Turkey. Thanks to its infrastructure and experience from the Anti-Torpedo Torpedo (TORK) Project, which was initiated in 2014 with the support of TÜBİTAK TEYDEB 1501, Aselsan also started to develop a prototype Lightweight Torpedo that can be used against submarines and other underwater targets. Aselsan introduced the first mock-up of the National Lightweight Torpedo ORKA, which the company developed with its own resources, during IDEF '17 Fair.

AKYA HWT being fired from a detailed 533mm torpedo tube replica at a depth of 40m on December 20, 2019

Aselsan TORK is an anti-torpedo torpedo developed to destroy acoustic homing, wire-guided, non-wire guided, and wake homing torpedoes launched against surface ships and submarines. TORK can precisely locate the incoming torpedo threat with its sonar seeker. TORK moves towards the threat torpedo by measuring the distance from it and explodes at an appropriate range using advanced interception algorithms. According to Aselsan TORK has a diameter of <30cm, a length of <3m, and weighs <200kg.

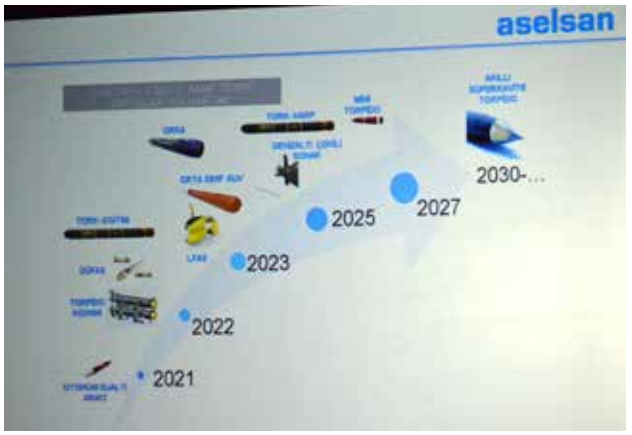
COTS type sub-systems on TORK are being replaced with domestic ones

Aselsan displayed mock-ups of TORK Anti-Torpedo Torpedo (foreground) and ORKA LWT (background) at its stand during IDEF Exhibition

The first performance tests carried out in the maritime environment with the passive acoustic seeker equipped TORK system were completed in early September 2018. Within the tests' scope, TORK successfully identified the surface targets with its sonar seeker and moved towards the threats with its own guidance. Thus, the Development Process, which constitutes the first phase in the TORK Anti-Torpedo Torpedo Project with Hard Kill capability, was completed in the last quarter of 2018. In this context, the first guidance tests were carried out with TORK, and the Aselsan product passive seeker in the torpedo performed successfully. The second phase of the project aims to turn TORK into a Training Torpedo. In the meantime, localization studies on TORK continued and within this scope, for example, the Lithium-Ion (Li-Ion) Battery (a special battery with 100 amps current draw capacity is designed), Phased Array Sonar, Dry-End & Wet-Ends, Control Surface Motors, and the electric propeller were localized. The previous COTS (Commercial off-the-shelf) type Li-Ion Battery of the TORK was replaced with a domestic Li-Ion battery produced by Aspilsan. The Li-Ion Battery and Battery Management System developed in cooperation with Aselsan-Aspilsan will be tested on TORK in the second phase. An active seeker will also be developed in the second phase. In the third phase of the project, TORK will be finalized and produced with the warhead and war battery. According to the current calendar, a test torpedo prototype with an active seeker and training warhead will be produced and prepared in the next three years. In the second phase of the project, the TORK's diameter will be increased to the standard lightweight torpedo diameter of 32.4cm (324mm). Since the volume of TORK has grown, its body length will be shortened. Thus, TORK will be able to be launched from the Mk-32 lightweight torpedo launchers that are currently used onboard the warships. In the first phase, TORK is aimed to be used integrated with HIZIR Torpedo Countermeasure System (TCMS) to protect surface platforms against torpedo threats. In the future, the submarine-launched version of TORK will also be developed. Currently, the Seeker (Aselsan is also developing training Warhead), Battery (Aspilsan), Control Surface Motors of the Propulsion and Steering System at the tail section, and the propellers (Aselsan) used in the TORK are domestic products. TORK is electrically propelled. The propellers and the subsystems receive the power they need to operate from a Li-Ion Battery in the torpedo. The energy generated by the battery is distributed to the control surface motors and the main propellers via the Power Distribution System. TORK was designed to detonate at proximity of incoming hostile torpedoes and neutralize the threats with the pressure effect it creates. Therefore, TORK does not need to hit the hostile torpedo threat physically.

The working principle, dimensions, and subcomponents of the TORK System have similar characteristics to Light Torpedoes. Some of the most critical subsystems of TORK (engine, steering, guidance, and control systems) is designed to be used in the Lightweight Torpedo without any modification. The National Lightweight Torpedo, which is aimed to have similar capabilities to the Mk46 and Mk54 Lightweight Torpedoes in the Turkish Navy inventory, is developed to be launched from existing torpedo tubes on the naval warships, ASW Helicopters and Maritime Patrol Aircraft (MPA). According to Aselsan Torpedo and Torpedo Countermeasure Systems Road Map, dual configuration lightweight

Shots from TORK's marine tests performed in 2018. The TORK succeeded in marine tests conducted with the first-ever domestically-produced sonar seeker



torpedo tube will be ready in 2022, TORK Training Version in 2023, Medium Class AUV & ORKA LWT in 2023-2025, TORK Live (Combat) Version in 2025, Miniature Torpedo in 2027, and the Smart Super-Cavity Torpedo will be available in 2030.

Head of Aselsan Naval Systems Group, Behçet KARATAŞ, who made a presentation titled 'ASELSAN Combat System Solutions for Naval Platforms and the Vision' at the 9th Naval Systems Seminar held on October 14-15, 2019 in Ankara, shared the following information about these projects: "We are planning to complete the Torpedo Tube development in 2022. The studies on low-frequency active sonar are already continuing with the SSB R&D Department, and we plan to complete it in 2023. We are planning to complete the development of TORK's Training Version by 2023. The Medium Class Autonomous Vehicle is also expected to be completed between 2023-2025. We also plan to introduce our own Lightweight Torpedo, which we call ORKA, before 2025. We continue our works on Submarine Towed-Array Sonar, combat version of TORK, Miniature Torpedo, and later Smart Super-Cavity Torpedoes..."

In the meantime, within the scope of the New Generation National Torpedo Technologies Development Studies, TÜBİTAK Defence and Security Technologies Research Grant Committee (SAVTAG) issued a wide-area call for Torpedo Batteries (T-BAT) in July 2019 under the 1007 Program. The scope of the call aims to develop torpedo batteries and charge/discharge units of these batteries by using long-lasting lithium-ion (Li-Ion) cells. Accordingly, multiple R&D intensive work packages will be realized and verified in a real-life environment. The studies aim to develop a form-fit lithium-ion (Li-Ion) torpedo battery system with national resources to replace (same size and weight) the Silver Oxide-Zinc (AgO-Zn) batteries used in training torpedoes without additional modifications. The project aims to eliminate foreign dependency, reduce the battery cost per launch, create a domestic and national design/production infrastructure for new generation national torpedo battery systems, and to eliminate different battery requirements for training and heavyweight torpedoes by providing a single common battery type.

Main Heavyweight and Lightweight Torpedoes in Turkish Navy and NATO Countries

The presence of different types of torpedoes produced by different companies/countries in a submarine is considered as a factor that increases its deterrence. Mk24 Mod 2 TigerFish and DM2A4 Torpedoes in PREVEZE and GÜR Class Submarines, Mk14, Mk23, Mk37 Mod 2 and Mod 3 and SST-4 Mod 0 Torpedoes in AY Class Submarines, and DM2A4 Heavyweight Torpedoes are used in addition to classic torpedoes in modernized AY Class Submarines of the Turkish Naval Forces Submarine Group Command. According to open sources, the Turkish Navy has 48 DM2A4, over 85 Mk24 Mod 2 TigerFish, around 50 SST-4 Mod 0, and about 50 Mk37 Mod 2 and Mod 3 HWTs. In 2014, 48 Mk48 Mod 6AT Heavyweight Torpedoes were ordered for the REİS Class Type 214TN Submarines, which will be commissioned from 2022, under a FMS approach that expected to reach about US$170 Million, including spare parts, training, and logistics support items. REİS Class Submarines will be equipped with both Mk48 Mod 6AT and DM2A4 HWTs.

A total of 50 DM2A4 SeeHecht HWTs, including training models, were ordered under an agreement signed in June 1999 for PREVEZE and GÜR Class Submarines (Type 209/1400 and Type 209/1400 Mod). Although the delivery date of DM2A4 SeeHecht Torpedoes, each of which was about €2,3 Million at the time (the cost of switching from the two-battery export configuration to the four-battery German Navy configuration and the modifications to the torpedo tubes are also included in this figure), was stated in the contract as of June 2003, deliveries were started only in 2005 and completed in February 2008. On the other hand, the German Navy received the first serial production model DM2A4 Torpedo it ordered for use in Type 212A Class Submarines from Atlas Elektronik Company on December 3, 2008. A maintenance & assembly line was set up in Başiskele, Gölcük, for DM2A4 SeeHecht Heavyweight Torpedoes.

The Turkish Navy performed its first live fire with the DM2A4 SeeHecht Heavyweight Torpedo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A Mk24 Mod2 TigerFish HWT being loaded into the Turkish Navy's PREVEZE Class Submarine

We congratulate
the 100th issue of
Defence Turkey Magazine
and best wishes for
its future publication.

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Atlas Elektronik's DM2A4 HWT

against the Tepe (Knox) Class Zafer Frigate, which was used as the target ship during the Beyaz Fırtına (White Storm) 2016 Exercise held on May 16-28, 2016. The DM2A4 Heavy Torpedo launched from a GÜR Class submarine scored a direct hit on the target, and the Zafer Frigate, which was retired in 2012, sank within 15 minutes after its hull split into two parts.

The new generation DM2A4 SeeHecht Heavy Torpedo is faster and has a longer range than the veteran Mk24 Mod 2 TigerFish Torpedoes in the Turkish Navy service. The torpedo can perform target motion analysis with its own acoustic seeker and can transfer data at high capacity via the fiber-optic guidance wire.

The first live firing of with the Mk24 Mod 2 TigerFish Heavyweight Torpedo, which entered the Turkish Navy inventory in 1993 (90 of them were ordered) and is still used in PREVEZE and GÜR Class Submarines was performed during the Deniz Kurdu (Sea Wolf) 2001 Exercise. On June 15, 2001, the TigerFish Torpedo launched by Preveza Class TCG 18 Mart (S-355) Submarine to the target ship Tepe (Knox) Class USS Miller Frigate, got out of control 3,000 yards (approximately 2.7km) before the target impact and sank after 30 minutes due to running out of fuel. The ship was then sunk with the Mk23 classic Heavyweight Torpedo launched from the TCG 18 Mart Submarine. The second firing with the Mk24 Mod 2 TigerFish Heavyweight Torpedo was planned to be carried out between March 27 and April 7, 2017, during the Deniz Yıldızı (Sea Star) 2017 Exercise in the Marmara Sea and the Black Sea, but according to the information we obtained, the launch could not be executed due to a technical problem. The second (third planned) live fire with the Mk24 Mod 2 TigerFish Heavyweight Torpedo was carried out within the scope of the Lieutenant Erdem ÖZTÜRK Tactical Exercise 03/17, on October 4, 2017, against the USS Duncan Frigate which was previously hit by the Sub-Harpoon and Harpoon Block II ASMs during the Deniz Yıldızı (Sea Star) 2017 Exercise on March 31, 2017 but did not sink. After the USS Duncan Frigate was hit with a wire guided Mk24 Mod 2 TigerFish Heavyweight Torpedo, it sank in a short time since its hull broke into two parts. Within the scope of the Deniz Yıldızı (Sea Star) 2017 Exercise, live firings of RGM-84L Harpoon Block II Anti-Ship Guided Missile (ASMs) that can be launched from warships to land targets and UGM-84 Sub-Harpoon Missile, which can be launched from submerged submarines to surface targets, were carried out on March 31, 2017. In this context, for the first time in the history of Turkish Naval Forces, 150km range RGM-84L Harpoon Block II missile from TCG Heybeliada (F-511) Corvette and UGM-84 Sub-Harpoon missile from the GÜR Class TCG Çanakkale (S-358) Submarine were fired against the target ship USS Duncan Frigate. However RGM-84L Harpoon Block II and UGM-84 Sub-Harpoon missiles hit were not enough to sink the US Duncan Frigate.

Additionally, on October 17, 2018, Mk37 Heavyweight Torpedo was launched from the AY Class TCG Batıray (S-349) Submarine to the target ship 'Münfesih Taşkızak' and on June 11, 2018, SST-4 Heavyweight Torpedo was launched from TCG Yıldıray (S-350) Submarine to the target ship 'Lieutenant Commander Sadettin Gürcan' logistic support ship, and the target ships were sunk.

On the other hand, a total of eight HWT firings, including a DM2A4, were performed in 2018 using the MÜREN Integrated Underwater Combat Management System installed in the AY Class TCG Doğanay (S-351) and TCG Dolunay (S-352) Submarines, which were modernized under the MÜREN CMS AY Project. The Turkish Naval Forces became the first Navy to fire DM2A4 Heavyweight Torpedo with the AY Class (Type 209/1200) submarine. As Mk48 Mod 6AT and AKYA Heavyweight Torpedoes are not defined within this project's scope, only DM2A4 SeeHecht Heavyweight Torpedo can be used with MÜREN CMS. Under the 'MÜREN CMS PREVEZE Project', contract signed in August 2017, MÜREN CMS will be integrated into a PREVEZE Class submarine by 2023. In this project, besides the DM2A4 SeeHecht Torpedo, Mk48 Mod 6AT and AKYA Heavyweight Torpedoes can also be launched with MÜREN CMS. Within the scope of the MÜREN CMS PREVEZE Project, which has been in progress since 2017, the tests are expected to start in late 2020 or early 2021.

© US Navy

A Mk48 HWT being loaded into a US Navy submarine

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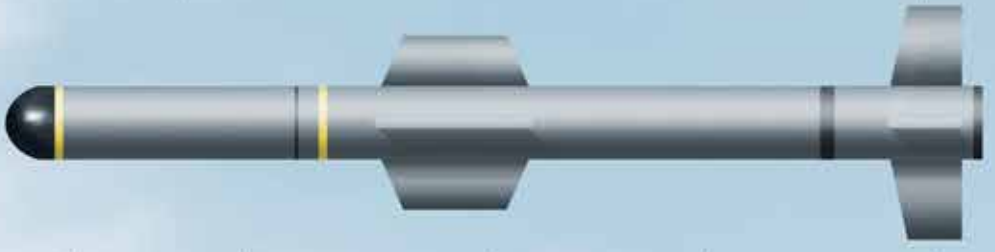

RF/mmW Seeker

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METEKSAN SAVUNMA

DM2A4 SeeHecht Heavyweight Torpedo

The 532mm diameter DM2A4 SeeHecht Heavyweight Torpedo, which is currently in service with the German, Turkish, Spanish, Pakistani, and Israeli Navy, was also recently selected by the Greek Navy. The DM2A4s selected by Pakistan in December 2008 use the Positive Water Discharge (enables the submarine to launch silent torpedoes) launch method instead of the Swim-Out method, and the DM2A4 Torpedo Training was given to the Pakistan Navy personnel at Gölcük Submarine Training Center. Live firing tests were carried out from Super Dolphin Class Submarine on June 18-19, 2018 with the DM2A4 Heavyweight Torpedoes named Kaved. It was announced that the deliveries of Kaved were completed in 2019, and it will be used in both Dolphin and Super Dolphin Class Submarines. In 1999, Israel ordered some 30 DM2A3s for its Dolphin Class submarines, which were built by Germany. In May 2020, the Greek Parliament approved the procurement of 36 DM2A4 Heavyweight Torpedoes and the modernization of 112 old-generation SUT Heavyweight Torpedoes in the inventory. The DM2A4 SeeHecht (exported version SeaHake Mod 4) Heavyweight Torpedo consists of eight parts, including:

- Conformal Array Sonar and wide-angle panoramic homing seeker up to a maximum of 220° (+/- 100° azimuth and +/- 24° elevation),
- Fully insulated battery (each Silver Zinc (Ag-Zn) battery contains 86 cells and generates over 150V power) compartment (can hold four batteries) with an internal cooling system activated by the acid-water mixture,
- 260kg of plastic-bonded explosive (PBX) warhead (equivalent to 460kg TNT) with proximity (magnetic influence) and contact fuses and safety and arming devices,
- 300kW high-frequency permanent magnet motor with a low self-noise planetary gearbox,
- Two asymmetrical inclined contra-rotating propellers made of GRP material with nine blades in the front and seven in the rear,
- Electronic compartment with a central processor that manages the wake homing sensor and all torpedo functions,
- Guidance section with the fiber-optic cable (300 micrometers thick)
- Tail section,

Thanks to the fact that its batteries can be activated in a short time, the 6.9m, 1670kg (four-battery version, standard version has 6.22m length and 1.530kg weight) DM2A4 Torpedo can be launched from the torpedo tube within 10 seconds (with four batteries), and it has a completely digitized, jamming resistant signal processor. Although the torpedo is designed for dual-purpose (ASuW/ASW) use, DM2A4's primary targets are believed to be naval warships because of the conformal array sonar, passive acoustic homing, and wake homing sensor preferences. It is stated that the four-battery version of the DM2A4 can reach a range of 50km with 40 knots, 38km with 55 knots, and approximately 100km with a low speed. It is stated that thanks to its advanced guidance and control algorithms, DM2A4 can distinguish the fake targets from the real ones.

Atlas Elektronik also markets the SeaHake Mod 4ER (Enhanced Range) Torpedo designed for network-centric warfare, coastal attack, and coastal defence. The maximum combat range of the torpedo is given as 150km. The 8.7m long DM2A4 SeaHake Mod 4ER Torpedo, which can be launched from naval warships and attack submarines, can also use satellites for communication and navigation (SatNav and SatCom) through its telescopic antenna in addition to its fiber-optic cable. The DM2A4 SeaHake Mod 4ER Torpedo, which can operate in shallow waters, ascends close to the water surface (7m) to receive target data or communicate with the main vessel or shore via the retractable telescopic antenna and dives back to the planned depth after communication. The torpedo, which was delivered to an unnamed customer, can be launched from the coastal installations and surface combatants. The SeaHake mod4 ER, which was delivered to an unnamed customer, can be deployed from seagoing platforms and special land-based platforms. The sea trials took place in cooperation with the German Armed Forces Technical Centre for Ships and Naval Weapons in the Eckernförde Bay in March 2012.

During the sea trials carried out with Aselsan HIZIR Torpedo Countermeasure System (TCMS) in the first half of 2018, the DM2A4 Torpedo was detected, classified, and successfully deceived/jammed approximately 10-12km away. DÜLGER Acoustic Target Emulator and MEZGİT Acoustic Jammer, which are members of the ZOKA Acoustic Decoy Family developed under the DAKA Project, are used in the HIZIR system. In the tests conducted previously (in 2014), ZOKA Acoustic Decoys managed to deceive the DM2A4 Torpedo (training version) for a short time. However, thanks to its advanced guidance and control algorithms, the torpedo was able to distinguish the fake target from the real one and re-engage the actual target by analyzing the engine noise emitted by the target ship. This success is even more critical considering the fact that the DM2A4 Heavyweight Torpedo is still used by the Israeli Navy Dolphin and Super Dolphin Class Submarines and will enter service with the Greek Navy (Type 214HN and Type 209/1200 AIP) in the near future...

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Mk48 Mod 6AT (Advanced Technology) Heavyweight Torpedo

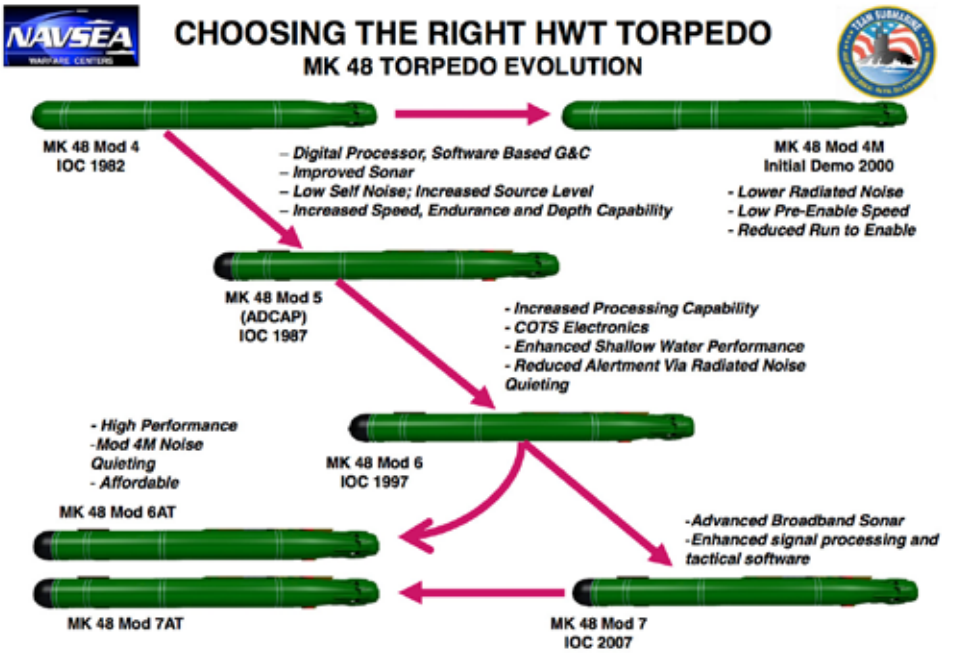
The Brazilian Navy (Marinha do Brasil), which ordered 30 torpedoes in 2005 (bought for around US$60 Million) as part of the modernization of 5 Tupi and Tikuna Class five submarines (US$35.3 Million agreement was signed with Lockheed Martin for the modernization of 4 Tupi Class submarines), became the first international customer of the Raytheon Technologies product Mk48 Mod 6AT (Advanced Technology) Heavyweight Torpedo. Turkey was the second customer of the Mk48 Mod 6AT torpedoes.

In May 2014, 48 Mk48 Mod 6AT Torpedoes were ordered (estimated as US$170 Million) via Foreign Military Sales (FMS) for 6 REIS Class (Type 214TN) Air Independent Propulsion (AIP) submarines built by Gölcük Naval Shipyard Command under HDW license. Initially, the class was to be called 'CERBE,' and the first vessel was planned to be commissioned in the first half of 2018. However, in the second half of 2014, the design of the submarines was updated, and their total length and weight were increased. The new design was renamed as 'REİS Class,' and they were intended to be delivered to the Turkish Navy in 2020-2025 with a 12-month phase difference. This delivery schedule was later updated to 2021-2026 and finally to 2022-2027.

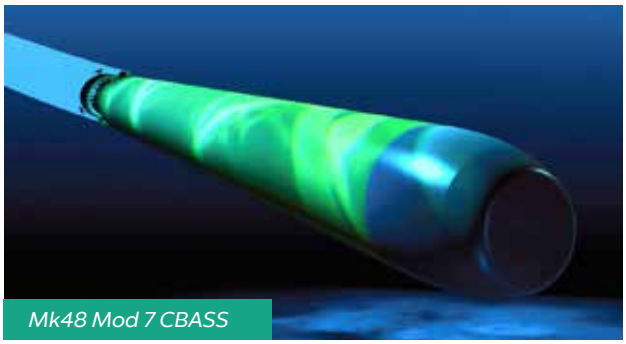
Sailors and Military Sealift Command civilian mariners transferring an M48 HWT to the Los Angeles Class Fast Attack Submarine USS Topeka (SSN-74)

In fact, Mk48 Mod 6AT HWT was created by combining the tail section of the Mk48 Mod 4M Torpedo, which is the export version of the Mk48 Mod 4 HWT (Initial Operation Capability (IOC) declared by the U.S. Navy in FY1982) with a silent propulsion system and the COTS (commercial off-the-shelf) hardware, sonar, guidance, and control electronics of the Mk48 ADCAP (Advanced Capability) Mod 6 Torpedo. Therefore, Mk48 Mod 6AT has the performance of ADCAP Mod 6 and the operating depth and speed of Mod 4M. The export version of Mk48 Mod 7 CBASS Heavyweight Torpedo, the newest version of Mk48 in the U.S. Navy service, is named Mk48 Mod 7AT. Mk48 Mod 7 CBASS, the development process of which was completed in November 2005, and the Initial Operation Capability was declared in 2007, is an improved version of the Mk48 ADCAP Mod 6 Advanced Common Torpedo (ACOT) produced by Raytheon Technologies.

The first delivery of the Mk48 Mod 7AT CBASS Heavyweight Torpedoes, the production of which started in 2016, was carried out in 2019. Mk48 Mod 7AT CBASS, initially ordered by Australia, Canada, and the Netherlands, has the Guidance and Control Section (includes CBASS/ Common Broadband Advanced Sonar System) developed by Lockheed Martin's Sippican brach.



Mk48 Mod 7 CBASS Heavy Torpedo can work in both deep and shallow waters. Within the framework of the agreement signed with Lockheed Martin in 2011, the US Navy has been modernizing 1,263 Mk48 Torpedoes (20 CBASS kits per month) to the Mk48 Mod 7 CBASS level. The Netherlands signed a US$85 Million contract with the U.S. Government in March 2020 to upgrade 16 Mk48 Mod 4M Heavyweight Torpedoes used by the Royal Netherlands Navy (Koninklijke Marine) in Walrus Class Submarines to the Mod 7 AT level. Each Mk48 Mod 7 CBASS Conversion Kit is claimed to cost US$5.31 Million. On the other hand, another user of the Mk48 Mod 7AT paid an estimated US$41 Million (US$3.41 Million per kit) for 12 Mk48 Mod 7AT Torpedo Conversion Kits on September 24, 2014. Meanwhile, the U.S. Government gave the green light to Taiwan's request for 18 Mk48 Mod 6AT Heavyweight Torpedoes in mid-May with a price of US$180 Million. In addition to torpedoes, the package also includes spare parts, support and test equipment, technical documents, user manuals, and engineering, technical and logistic support services. In case of purchase, Taiwan will be the third customer of the Mk48 Mod 6AT Heavy Torpedo. Taiwan, the third customer of the Mk48 Mod 6AT HWT, previously ordered 48 Mk48 Mod 6ATs in June 2017 via FMS channel for an estimated cost of US$250 Million to replace with around 60 SUT HWTs in the Taiwanese



Mk48 Mod 7 CBASS

Navy service. Taiwan also ordered 168 Mk54 upgrade and conversion kits through FMS with an estimated cost of US$175 Million in June 2017 to upgrade Mk46 Mod 5 LWTs in the inventory to Mk54 level.

The two-way wire-guided MK 48 Mod 6AT Heavyweight Torpedo is equipped with the MK 107 Mod 1 high-explosive (HE) Warhead loaded with 295kg (650lb) of PBXN-105, MK 22 Mod 1 Warhead Electronic Sensor, and MK 21 Mod 3 Exploder. Equipped with a pumpjet propulsor (six-cylinder piston engine) fueled by Otto Fuel II monopropellant, the Mk48 Mod 6AT Heavyweight Torpedo has a length of 5.86m, a diameter of 53.2cm, and weighs 1.691kg. According to the product brochure of the Mk48 Mod 6AT Torpedo equipped with an active electronically steered phased array sonar on the nose cone, the active/passive acoustic homing seeker can scan an area of over 1.6 million m3 per second. Although the torpedo is designed for dual-purpose (ASuW/ASW) use, its primary targets are believed to be submarines because of the phased array sonar and active acoustic homing sensor preference.

Havelsan was selected for the integration of Mk48 Mod 6AT Torpedoes to the ISUS-90/72 CMS in REIS Class Submarines, and the company was deemed worthy of a 3-star supplier award by Raytheon in 2016 for its success in this work. The U.S. Navy and manufacturer Raytheon Technologies guaranteed supportability for the Mk48 Mod 6AT Torpedoes until 2025. However, due to the delays in the NTSP calendar, the first submarine, TCG Pirireis, is presumed to be delivered to the Turkish

Navy in 2022 and the 6th and the last submarine TCG Selmanreis in 2027 with the full operational capability. Therefore, the need to update the Mk48 Mod 6ATs has emerged in case of the problems that may occur in the maintenance due to the relative aging of the torpedoes when the last submarine is commissioned. In this context, we received information that the Turkish Navy would modernize the Mk48 Mod 6AT Torpedoes to the Mod 7AT level in mid-2017. To support this information, on September 23, 2017, Lockheed Martin signed a US$53 Million contract for the production of the command and control units of the Mk48 Mod 7 Heavyweight Torpedo and the Mk48 Mod 7 CBASS Conversion Kits for Australia, Netherlands, Canada, Turkey, and the U.S. Navy. In the press release, Turkey's share in the order was stated as 1%, and the works under the contract would be completed by November 2020. Then on August 14, 2018, Lockheed Martin signed a new contract worth US$59.1 Million for the production of the Mk48 Mod 7 CBASS Conversion Kits through the FMS channel only for the Netherlands, Canada, and Turkey. The completion date of the deliveries under this new agreement is given as March 2021. In light of this information, I believe that the 48 Mk48 Mod 6AT Heavyweight Torpedoes ordered by the Turkish Navy are being upgraded to Mk48 Mod 7 CBASS level using the Mk48 Mod 7 CBASS Conversion Kits supplied in batches.

AKYA National Heavyweight Torpedo

Technical Specifications of AKYA National Heavyweight Torpedo.	
Length:	≤6.6m (Length of 533mm torpedo tubes is 6.6m according to NATO standards)
Diameter:	21 inches/53.3cm.
Weight:	1.4 - 1.6 ton.
Propulsion:	Electric.
Battery:	It is thought that Silver Oxide-Zinc (AgO-Zn) type batteries are used.
Range:	15km (with 40 knots).
Max. Speed:	40kt (40 nautical miles per hour).
Propeller:	Two contra-rotating propellers on a single axis.
Guidance:	Fire and Forget type, Active/Passive Acoustic Sonar + Fiber Optic Cable Guidance + Magnetic Proximity Sensor (Acoustic Sensor can be used in the future) and Wake Homing Sensor.
Body:	Metal body (prediction), fiber nose.
Sonar:	Conformal Array Sonar located inside the Parabolic nose cone of the torpedo made of fiber material (Parabolic nose structure both reduces the sound of the torpedo and cavitation).
Warhead:	AKYA is expected to use a warhead heavier (350-380kg) than that used in the DM2A4 Torpedo (260kg PBX).
Target:	Although the torpedo is designed for dual-purpose (ASuW/ASW) use, its primary targets are believed to be naval warships because of the conformal array sonar preference.
Unit Cost:	The unit cost of AKYA is expected to be lower compared to DM2A4 and Mk48 Mod 6AT Heavyweight Torpedoes.

The AKYA HWT is planned to be used as the first alternative to the veteran heavyweight torpedoes (Mk14, Mk23, Mk37 Mod 2, Mk37 Mod 3, SST-4 Mod 0, and Mk24 Mod 2 TigerFish) onboard the submarines in the Turkish Naval Forces inventory. The AKYA HWT is designed to be fired against both surface targets (ASuW) and submarines (ASW). It is a battery-powered (Otto Fuel II is not preferred), wire/fiber-optic cable guided heavyweight torpedo, equipped with an active/passive acoustic sonar, magnetic proximity sensor (can be replaced with an acoustic proximity sensor in the future), and wake sensor (wake-homing capability). Following the industrialization activities, the AKYA HWT is expected to be ready for the Serial Production Phase by the end of 2020.

The AKYA is planned to be tested for the first time in the PREVEZE Class Submarines that will be equipped with the MÜREN Combat Management System (CMS) and subsequently used as the first alternative torpedo in all submarines in the Turkish Naval Forces inventory. The first torpedo launch with the MÜREN CMS is expected to be carried out at the end of 2020 or the beginning of 2021.

AKYA National Heavyweight Torpedo will be equipped with a warhead designed to break the keel of a surface ship and destroy its structural integrity using the 'blast' effect. Thus, instead of hitting the target ship's hull, AKYA will detonate a few meters under the target vessel and will split its hull into two with the pressure effect it creates. AKYA's parabolic nose structure, wake homing sensor, and warhead configuration reinforce the claims that AKYA was primarily designed for surface targets. AKYA is expected to use a warhead that will weigh between 350-380kg.

Mk24 Mod 2 TigerFish Heavyweight Torpedo

The Mk24 Mod 2 TigerFish, which first entered service with the Royal Navy (RN) in 1987, is an electrically propelled, 533mm diameter, wire-guided heavyweight torpedo developed by Marconi Underwater Systems. The RN adopted its increased performance version in 1992. The maximum speed of the Mk24 TigerFish Torpedo, which is 6.46m long and weighs 1,551kg, is given as 35 knots (65km/h). TigerFish has 39km (21nm) range at low speed, and 13km (7nm) range at high speed. The torpedo has an active and passive sonar and is armed with a warhead containing 340kg (750lb) Torpex type explosive. The RN replaced Mk24 Mod 2 TigerFish Heavyweight Torpedoes with SpearFish HWTs on February 27, 2004, after 37 years of service.

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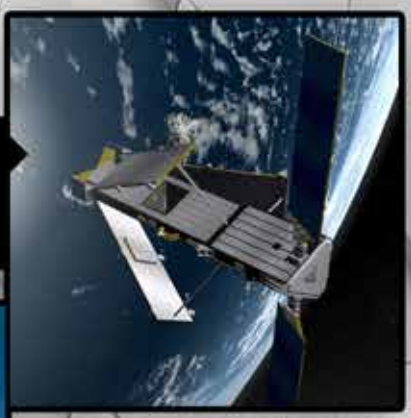

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F21 Artemis Heavyweight Torpedo

The first customers of the F21 Artemis Heavyweight Torpedo (HWT) developed by Naval Group were France and Brazil. The Brazilian Navy will use the torpedoes in four Scorpene-type diesel-electric attack submarines that were first ordered in 2009 and built by DCNS's Itaguaí Construçoes Navais and Odebrecht Defesa e Tecnología in Brazil. The first of the submarines was launched on December 14, 2018 and is planned to be delivered in 2020. On the other hand, France ordered the F21 Artemis Heavyweight Torpedoes to use in 4 'Triomphant' Class and 6 'Suffren' Class (Barracuda) nuclear-powered attack submarines and to replace the F17 Mod 2 torpedoes used in 'Rubis' Class submarines. Although the F21 Artemis HWTs are expected to be commissioned by the end of 2015, the first batch of 6 torpedoes was delivered to the French Navy (Marine Nationale) only in November 2019.

The Brazilian Navy received the first batch of F21 Artemis Torpedoes in January 2020. France initially ordered 93 F21 Artemis HWTs. The F21 HWT has a diameter of 533mm, a length of 6m, and a weight of about 1.5 tons. The F21 has an endurance of around 1 hour and a combat range of over 50km (27nm) and can be operated in depths ranging from 33ft (10m) to 1,630ft (500m). F21 Artemis consists of an acoustic seeker, a fully insensitive warhead with 660lb. (300kg) PBX B2211D high-explosive and an all-electronic detonator, electric propulsion system based on the Silver Oxide-Aluminum (AgO-Al) primary battery and the guidance and control parts. Wire guided F21 Artemis is launched via the MIGAL Fire Control System, which acts as an interface between the torpedo and the submarine's SYCOBS Combat Management System (CMS).

MU90/ IMPACT Lightweight Torpedo

The MU90 torpedo was developed in cooperation with DCNS (now Naval Group), Thales Underwater Systems (TUS), and Whitehead Alenia System Subacquei (WASS) within the scope of G.E.I.E EuroTorp Consortium, where Saft, Nexter, and Atlas Elektronik GmbH are the Main Subcontractors. It is a long-range, multi-role fire-and-forget LWT torpedo designed to counter all types of nuclear and conventional submarine threats. The torpedo consists of a digital acoustic seeker capable of simultaneously sending and receiving multiple beams, a propulsion system with an advanced closed-loop electrolyte recirculation system powered by silver oxide aluminum (Ag O-Al) battery that uses sodium dioxide dissolved with electrolyte, and a shaped charge warhead that contains 32kg high-pressure V350 explosive. The warhead has been proven to penetrate all types of double hull submarines. The 323.7mm diameter torpedo has a maximum engagement range of 46,3km (25nm). More than 1,000 MU90 torpedoes have been produced for Australia, Denmark, France, Germany, Italy, Poland, Egypt, and Morocco.

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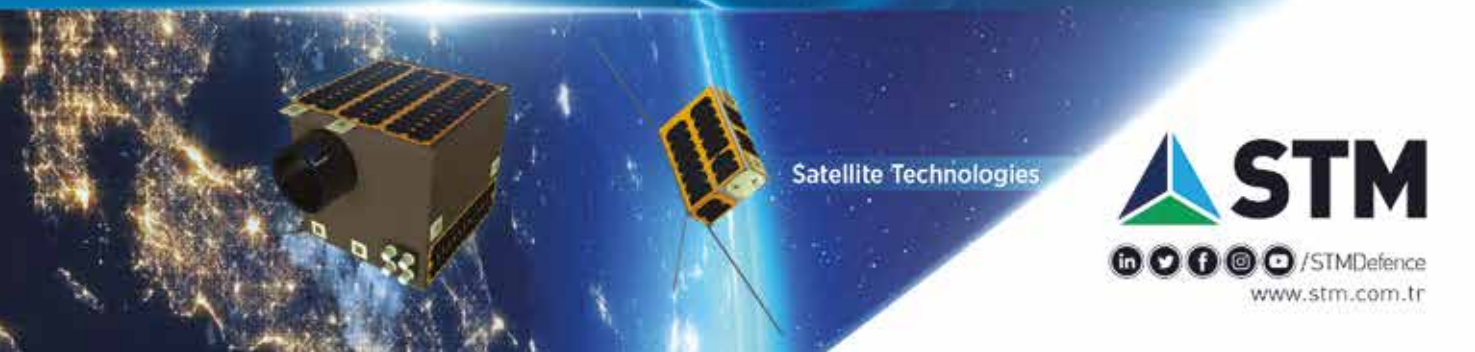

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BAE Systems Spearfish Mod 0 and Mod 1

The Spearfish from BAE Systems is an advanced heavyweight torpedo designed to operate totally autonomously from all Royal Navy (RN) submarines and is effective against submarine and surface threats both in deep and shallow waters. It is equipped with an open-cycle variable speed 1,000hp turbine thermal engine using Otto Fuel II as a liquid monopropellant, and Hydroxyl Ammonium Perchlorate (HAP) as oxidant, both contained in separate tanks. The maximum speed of Spearfish is an astonishing 80kts with a maximum range of 12.5nms at 60kts. It can also operate down to 900m. The 1.850t Spearfish torpedo carries PBX explosive warhead of 300kg and is directed towards the target by high-capacity guide wire system and passive and active sonar. The torpedo's sonar and homing system enable it to operate primarily in a passive mode. However, when required to operate against a very quiet target, or in the final stages of attack, the active mode is used.

Spearfish Mod 0 is in service with the RN. The final weapon was handed over on 24 November 2003. It is believed that around 400 torpedoes are held in inventory. The weapon is projected to remain in service until 2025.

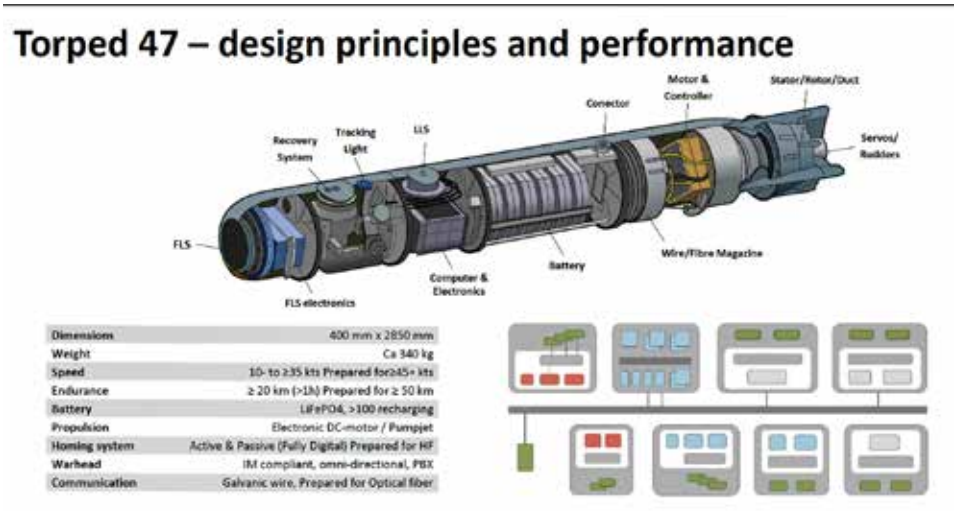
A Spearfish Mod 0 HWT being loaded onto a Royal Navy submarine

The UK's Ministry of Defence (MOD) awarded BAE Systems a £270 Million contract in 2014 to upgrade the Spearfish Heavyweight Torpedo for the Royal Navy's Trafalgar, Vanguard, and Astute Class Submarines. Following the completion of the design phase, existing Mod 0 torpedoes will be upgraded by BAE Systems at its Broad Oak facility in Portsmouth to the new design, known as Spearfish Mod 1, with initial deliveries scheduled to take place in 2020. Deliveries are expected to be completed in 2024. The Mod 1 upgrade extends the life of the torpedo, improves safety through the introduction of an Insensitive Munitions warhead and by utilizing a single fuel system and provides more capable data links between the weapon system and the launching vessel. This results in capability improvements for the RN as well as significant reduction in through-life operating costs.

SAAB Defence Torpedo 62 & New Lightweight Torpedo (NLT)

The dual-purpose, wire-guided Saab Underwater Systems Torpedo 62 (TP 62, designated Torpedo 2000 in export markets) began development in 1988. It uses a bi-propellant propulsion system (a combination of 85 per cent HTP and 15 per cent kerosene). Torpedo 62 uses a propulsor based upon the one used in the Spearfish and can trade off speed against range up to a maximum of about 50kt and 50,000m, respectively. The Torpedo 62 has a length of 5.9 meters and weighs 1,450 kg. It is in use with the submarine fleet of the Royal Swedish Navy. On July 9, 2020 SAAB announced that it has received a first order from the Swedish Defence Materiel Administration (FMV) for the life extension of the TP 62 heavyweight torpedo system. The order value is approximately 485 MSEK and deliveries will take place during 2020-2024. The order is part of a life extension program for the heavyweight torpedo and mainly comprises a review of the system, modifications, and enhancements. The order also includes preparations for upcoming stages of the life extension program. Thanks to this life extension


Torped 47 (TP 47) LWT being fired from a Visby Class Corvette



effort the TP 62 HWT will be able to remain in operation with the Swedish Navy until the mid-2040.

Under a contract awarded by the Swedish Defence Materiel Administration (FMV) SAAB Defence has also developed a new generation lightweight torpedo under the Lightweight Torpedo (NLT) Program. Based on the proven Torpedo 45 (TP 45, entered service in 1995) with its outstanding shallow-water anti-submarine warfare capability, the 400mm New Lightweight Torpedo is designed to operate in the complex shallow water environment of the Swedish archipelago and the Baltic Sea and will deliver significant performance improvements to deal with evolving threats in international scenarios. Under the project, successful firing trials campaign of the NLT was successfully conducted from a Visby Class corvette and a Gotland Class submarine between February and March 2020. The NLT weapon system is also known as Torpedo 47 or Torpedo system 47 (TP 47) by the FMV and the Swedish Armed Forces.

The NLT/TP 47 can be indifferently used for surface and underwater platform applications, the difference being in the launching system. On ship, the torpedo is ejected from the launcher by a compressed air system while on submarines it is released by the launch tubes via a passive swim-out procedure, or active ejection launch system. The NLT/TP 47 is expected to be operational by late 2022 initially on surface vessels and later soon on the submarine class types.

Featuring a near-neutrally buoyant wire-guided torpedo design, the 2.85 meters long and 400 mm diameter NLT/TP 47 torpedo presents a fully acoustic homing head with active/passive, full digital sonar, high-performance COTS-based processing in guidance and control, an insensitive munition (IM)-compliant warhead, a new two-way data communications protocol in the wire-guidance link based on galvanic wire – already used on current Swedish torpedoes, allowing seamless transition from the Torpedo 45 (TP 45) - to provide platform sensors information to the torpedo, a rechargeable lithium-iron phosphate ($LiFePO_4$) battery technology for exercise and war-shot uses, and an electronically commutated DC propulsion motor coupled with a pump-jet (ducted rotor/stator) system design for silent and energy-efficient propulsion. The approximately 340 kg heavy weapon has a 10-40+ knots speed and 20+ km range (over one-hour endurance) and can be launched in shallow water, while being capable to reach over 300 meters depth.

The NLT/TP 47 has already found an export customer. In January 2018, the Finnish Navy placed an order for the torpedo, as a part of the Squadron 2000 Mid-Life Upgrade Program. The Finnish Navy will operate the system on-board the upgraded Hamina Class vessels as well as the new Pohjanmaa Class corvettes of the Squadron 2020 Program.

Raytheon Technologies Mk46 & Mk54 LWTs

Featuring many improved capabilities, the Mk54 is the next generation of the Mk46 lightweight torpedo (LWT). Designed to attack high-performance submarines, the Mk46 LWT is the NATO standard and has been acquired by more than 25 countries including Turkey. The Mk46 has various configurations to enable use by surface combatants, fixed-wing, and rotary-wing platforms. Since its entry into service in 1965

A Mk54 LWT being launched from a surface vessel

P235 MPA of the Turkish Navy can be armed with two lightweight-torpedoes for the Anti-Submarine Warfare (ASW) role. An Mk46 Mod 5A REXTORP seen here at P235's underwing pylon.

various modifications - including improved acoustics, guidance and control upgrades, and countermeasure detection capability - have been introduced into the weapon. In this context during the early 1990s, a major system upgrade - Mk46 Mod 5A(S) -was developed to improve weapon performance in shallow water. The Mk46 Mod 5A(S) is an active or passive/active, dual-speed torpedo, is the ASW weapon for surface ships and ASW fixed-wing and rotary-wing aircraft.

In September 1996, the Mk-46 Mod 5A (S) Service Life Extension Program (SLEP) LWT was introduced to the US Navy fleet in September 1996. It has improved counter-countermeasure performance, enhanced target acquisition, a bottom-avoidance preset, and improved maintainability and reliability.

The new generation Mk54 LWT was created by combining the homing and warhead portions of the Mk50 LWT and the propulsion unit of the Mk46, improved for better performance in shallow water, and with the addition of commercial off-the-shelf (COTS) technology to further reduce costs. It shares much of the software and computer hardware of the Mk48 ADCAP HWT, based around a custom PowerPC 603e chip. The Mk46 LWTs are being replaced in the US torpedo inventory by the Mk54. The Mk54 is the first all-digital lightweight torpedo, significantly enhancing options for weapon employment. The use of COTS technology and open-systems architecture enables the Mk54 to be cost-effectively upgraded to incorporate the latest technology to counter evolving threats. The Mk54 can be deployed from a surface ship, helicopter, or fixed wing aircraft to track, classify and attack underwater targets. It uses sophisticated processing algorithms to analyze the information, edit out false targets or countermeasures, and then pursue identified threats. The Mk54 Mod 0 reached IOC in 2004. Under an FMS contract that notified to US Congress on April 20, 2007 Turkey has procured a total of 100 Mk54 Mod 0 LWTs with an estimated cost of US$105 Million. Deliveries took place in 2012 and 2013 in two batches each contains 50 torpedoes. Each Mk54 Mod 0 LWT is estimated to cost around US$1 Million.

The Mk54 Mod 1 adds a new sonar array assembly that provides higher resolution than previous Mk54 Mod 0 and improved processing capability. The Mk54 Mod 1 uses Advanced Processor Build 5 (APB 5) software that shares many components with the APB 5 variant of the Mk48 HWT. The Mk54 MOD 1 LWT Conversion Kit includes a 112-element sonar array, transmitter, receiver, Processor Group Assembly (PGA), Modular Recording and Exercise Control System Second generation (MRECS2), and associated cables. On July 9, 2020, the U.S. State Department approved the sale of Mk54 LWTs to Germany and Belgium. The German Foreign Military Sale (FMS) contract worth US$130 Million and covers the procurement of 64 Mk54 All Up Round LWTs and 10 Mk54 Conversion Kits to be used with fleet exercise sections as Mk54 Exercise Torpedoes. The Belgian FMS contract valued US$33.3 Million and includes supply of 29 All Up Round Mk54 Mod 0 LWTs. The Mk54 Mod 2 is expected to deliver in FY26. The Mk54 Mod 2 will have a new propulsion system and warhead.

Leonardo Next Generation Black Shark Advanced (BSA) & Black Shark HWTs

Under a Euro87.5 Million contract the NSP/BSA (Nuovo Siluro Pesante/ Black Shark Advanced) long-range, multi-purpose, Heavyweight Torpedo was developed by Whitehead Sistemi Subacquei S.p.A. (WASS), a subsidiary of Leonardo, as an evolution of the original Black Shark HWT that entered service in 2004 and can be launched in "Push Out" and "Swim Out" modes at any operational depth of a submarine. The 6.3m long, 533mm diameter

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wire-guided torpedo is designed for a life of more than 20 years and can be deployed on attack submarines, midget submarines, surface vessels or stations ashore to defend it against any surface or underwater targets. Made in Italy at Leonardo's Livorno plant the BSA HWT integrates an innovative energy production section that can be optimized, according to the use of the system, for training or operational purposes. When the BSA is used for training activities, a newly developed rechargeable battery is used that allows a higher number of launches – up to one hundred – compared to that of previous versions, providing significant cost savings.

On January 28, 2014 the first test launch of BSA HWT was conducted from the Italian Navy's SSK Scire' (S 527), a Series 1 U212A Todaro Class attack submarine of Italian Navy, in the La Spezia Gulf. The torpedo launched in "Push Out" mode (water ram expulsion system, which ejects the torpedo by means high water-pressure), was equipped in a totally innovative way, thanks to the new Lithium-Polymer Battery. On June 19, 2014 second test launch of BSA HWT was conducted again from SSK Scire' (S 527) submarine. Following the completion of development and sea trials

in June 2018 Leonardo secured a contract to supply next generation Black Shark Advanced (BSA) Heavyweight

Leonardo's Black Shark Advanced HWT beign loaded intothe Italian Navy U212A Submarine.

Torpedoes and associated logistic support services to equip the Italian Navy's Second Batch U212A Submarines. The BSA HWT will significantly increase the ASW and ASuW capability of the Italian Navy. Over the next few years, the BSA HWT is replacing the old A-184 HWTs in the Italian Navy inventory. Italian Navy is expected to procure around 80 BSA HWTs and first deliveries shall take place in 2020. The BSA HWT is also to be deployed on board new Italian Navy PPA vessels (Full version), with two launchers under the flight deck.

Designed to operate in deep and coastal waters the Black Shark HWT is already acquired by many countries including Italy, Chile, Ecuador, Indonesia, Malaysia, Portugal, and Singapore for their U209, U214, U212 and Scorpene submarines. More than 100 Black Shark HWt have been manufactured and delivered. The acoustic head of the Black Shark, named ASTRA (Advanced Sonar Transmitting and Receiving Architecture), is a state of the art active and passive acoustic head for modern torpedoes, which represents the latest effort made by Leonardo. The Advanced ASTRA active and passive acoustic head features improved signal processing with real-time multiple digital processing and incorporates a new flat, steered, multibeam phased array which offers increased bandwidth in two operating frequencies - 15kHz medium (MF) passive only and 30kHz active and passive high frequency (HF). The HF mode provides high resolution over a short range while the MF mode provides long-range acquisition. The seeker can operate simultaneously in both frequencies in passive mode, allowing the torpedo to discriminate between signals from the real target and signals from acoustic countermeasure decoys. The torpedo is fitted with STANAG 4439 and MURAT-2 insensitive munition explosive warhead and can track the targets in both acoustic and wake modes. The Black Shark HWT is powered by an electrical propulsion system, which is based on a Silver Oxide and Aluminum (AgO-Al) battery. Developed by Saft, the AgO-Al batteries are provided with high energy density and high electrolyte conductivity offering maximum safety and storage life of up to 12 years. The system delivers twice the power and energy of a standard Zinc/Silver Oxide (Ag-Zn) battery

A Black Shark Torpedo being loaded onto a Scorpene Class Submarine

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Congratulations

for the 100th issue

Alberto Gutiérrez
Head of Military Aircraft at Airbus

I would like to congratulate Defence Turkey for its 100th issue and for its prominent position as one of the main defence publications in the country.
Turkey is an essential customer and a long-term partner of Airbus' Military Aircraft, firstly as a leading operator of the CN235 and today with the A400M, an aircraft that has demonstrated its versatility and strategic value following intensive operations in support of the COVID-19 crisis, where the Turkish Air Force has shown its strength and solidarity with many countries around the globe

Jonathan Hoyle
Chief Executive, Lockheed Martin Europe

Congratulations to all the team at Defence Turkey on the publication of your 100th issue. At Lockheed Martin we have enjoyed watching Defence Turkey develop into a highly respected specialist publication covering the aerospace and security sector in Turkey and beyond. Congratulations on achieving this important milestone and best wishes for continued success in the future.

Michele Di Nunzio
MBDA Vice President EURASIA

Celebrating the 100th issue of Defence Turkey reminds me of all the cooperation between MBDA and Turkey. Over the decades, we have supported the country's Armed Forces and have been working with its industries. Roketsan in Turkey produces the rocket engine of our Aspide 2000. We have an enduring relationship with this company, much like our relationships with the Turkish shipyards. There is also SAMP/T, the integrated air and missile defences to which MBDA contributes through its joint venture EUROSAM. Deployed by Italy as part of NATO Operation Active Fence since June 2016, this system has protected Turkey and its population against potential missile threats from beyond NATO's southeastern flank. MBDA is determined to support Turkey more in the air and ballistic missile defence sector and is open to any further requirement the country may have, such as with the new generation fighter TF-X. Defence Turkey has always followed our activities and reported on our major successes for which we are appreciated in the country. Congratulations on reaching 100 issues, I thank you for your constant and professional support!

Adam Thomas
MBE| Senior Press Officer and Spokesman | Department for International Trade, Defence and Security Organisation

"The United Kingdom Department of International Trade's Defence and Security Organisation have been delighted to work with Defence Turkey for more than 15 years, which included a very successful UK Supplement highlighting our relationship with the Turkish Government, Turkish Armed Forces and Turkish companies. We are delighted to help celebrate this centenary edition and wish Defence Turkey every success in the future".

Congratulations

for the 100th issue

Steve Ziff
President and CEO, NOVA Power Solutions

NOVA Power Solutions, Inc., offers our congratulations to DEFENCE TURKEY on the publication of your 100thissue! Your coverage of emerging defence technology and corporate capabilities has impacted procurement decision-making in ways that strengthen the Turkish Armed Forces. NOVA Power Solutions has been honored to appear in several of your one hundred published issues, and we look forward to your continued role in informing Turkey's decision makers and connecting the nation's defence manufacturing base. Cheers to the next hundred issues!

Camillo Pirozzi
Head of Leonardo Turkey Representative Office

I would like to send my heartfelt congratulations to Defence Turkey as you celebrate your 100th issue, a milestone that can only be achieved by being a consistently valuable and trusted resource. Since it was first published, Defence Turkey has been a fair and prestigious showcase for Leonardo (under a number of different names throughout the company's history) as we have continued to contribute to the security and safety of daily life in Turkey. Some examples include the SMART programme (Systematic Modernisation of ATM Resources) which supports air traffic management operations in Turkey's airspace, connecting more than 20 remote control towers encompassing over 600 ATC-related workstations. Turkey has also chosen Leonardo's technologies to secure more than 1,500 km of Turkish coast, has selected our defence systems and radars and, most recently – picked our company Telespazio to provide the Gokturk satellite. Leonardo is "at home" in Turkey, where we have a subsidiary (newly rebranded as Leonardo Turkey Havacılık, Savunma ve Güvenlik Sistemleri A.Ş.) and a very fruitful industrial partnership with TA in the helicopter field. Defence Turkey has always been a professional partner to Leonardo and we wish you and the nation of Turkey prosperity and success for years to come.

Pablo Menéndez
Navantia Commercial Manager in Turkey

Congratulations on the publication of your 100th issue. Defence Turkey magazine is a magnificent editorial production that contains a wealth of defence industry information and does a great work promoting the Turkish defence industry. We have been working with Defence Turkey for a long time, which has been very fruitful for Navantia, and intend to follow our relationship in the future.
Navantia wishes Defence Turkey to keep publishing and disseminating the excellent articles and reviews for which the magazine is known for 100 more issues.

Bernd Krekeler
Thyssenkrupp Marine Systems

Defence Turkey is a magazine always worth having a look at. It gives an overview deep as well as broad about developments in the defence and industry. Best congratulations to issue 100 – and all the best for the future!

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Meteksan Defence Communication Systems Builds Sustainable Business Partnerships Through Mutual Trust and Transparency

"We Aim to Export UAV Data Links, Missile Data Links and our GNSS Anti-Jamming Products in 2020!"

In our exclusive interview, Dr. Erdal TORUN, Vice President in Charge of Communication Systems - Meteksan Defence discusses collaborative projects between University, Industry and Users that promote the creation of synergy within the sector

Defence Turkey: Mr. TORUN, first off, all thanks so much for your time today. Meteksan Defence was established in 2006 to gather defence industry related projects and activities of high technology companies that operate within the structure of Bilkent Holding Group under a single roof. Communication Systems is one of Meteksan Defence's three main departments; could you please inform us on this department's staff size, services provided, and its technological experience and vision?

Erdal TORUN: Regarding Meteksan Defence's technology domain, I would initially like to touch upon the company's position in defence technologies.

As we all know, the cooperation between university and industry is essential for achieving technology ownership. In my opinion the close cooperation that we have with academic institutions is one of the most critical factors that enables the ownership of technology. Building a triangle between university, industry and the users is among the issues that have been discussed over the years. We believe that we are among the establishments that achieve this well in our sector.

As a technology development center with the vision of developing indigenous solutions, in line with our strategy of building a sustainable structure, we directed our resources towards certain areas and restructured our organization on three main areas in 2019 in a way to render it available for the production of competitive products.

Communication Systems is one of these areas and this department effectively and swiftly executes the design, business development and program activities in an integrated manner with nearly 70 personnel. Without doubt, departments in charge of the execution of production, quality and administrative processes also provide services to our group as well.

Communication systems that enable the interoperation of systems such as network-based operations and the required smart munition, reconnaissance and surveillance systems and electronic warfare, and transfer and sharing of data such as targets, status, position, intelligence, time to strike and damage assessment (C4ISR) between the relevant platforms and the users, have become an essential part of modern operations. To this end, the electronic warfare resistant data links developed by our company particularly for missile systems and unmanned air vehicles add tremendous value to the related platforms. Generally, the following solutions are included in our product range:

- Missile Data Links
- Tactical Data Links
- C-Band Data Link for Manned/Unmanned Platforms
- Flight Control Computer for Air Vehicles
- TMV Telemetry Transmitter
- Anti-Jamming GNSS
- GNSS Antenna and Receiver Solutions
- Broad Band LOS / NLOS Tactical Communication Radios
- Vehicle Electronic Control Systems
- SATCOM RADOM

Our technology know-how and design capability enable us to offer custom solutions with these products for every platform. The main principles within our vision as a Technology Development Center are to create designs with low size, weight and power consumption (SWaP), electronic warfare resistant and secure communication solutions within modular structures optimized specifically for platforms.

Defence Turkey: Before moving onto the details of the projects, could you inform us on Meteksan Defence Communication Systems' 2019 performance (its turnover and share in exports) as well as the expectations and targets for 2020?

Erdal TORUN: In 2019 we achieved our targets to a large extent both as the company and as the Communication Systems Group. Within a new organization, we demonstrated utmost attention in taking careful steps. We strived to maintain a controlled financial structure in order to avoid any negative impacts of the cash insolvency experienced in our sector. We implemented the strategies we envisioned accordingly and established the targeted institutional structure in the new organization to a considerable extent. Naturally, when a new structure is established, the identification of its functioning and business processes takes time. I will not mention the figures, but in 2019 as we realized our existing projects in accordance with the foreseen schedule (for instance the KEMENT project which I will be proudly mentioning later), we also added quite prominent projects that paved the way to brand new areas in our portfolio such as Portable Electronic Warfare Systems.

We revealed our C-Band Data Link product for ISR application of unmanned and manned aircrafts. I. This solution we generated enables real-time high rate data transfer with electronic warfare protection between the air platform and ground systems in minimum 200 km LOS range and its competitive superiority is certainly a source of pride for us.

Another product group we developed contains the Global Navigation Satellite System (GNSS) Antenna, GNSS Receiver and our Anti-Jamming GNSS (CRPA Antenna) solutions. The Anti-Jamming GNSS is distinguished from its peers with the advanced technologies it features, its size and lightweight and because it is a product that could be utilized by all types of platforms, particularly by missile systems and unmanned air vehicles.

Speaking of the year 2020, surely we are observing the unfavorable impacts of the novel type coronavirus (COVID-19) pandemic in the sector, a challenge that we all have been facing this year. Therefore, we have identified realistic and cautious targets. There is a point that I frequently emphasize and which I believe in; times of crisis and periods of economic recession should be regarded as an opportunity to prepare for the future with fewer resources. In this regard, Meteksan Defence has also been investing with our internal R&D resources in areas that will maintain our sustainability.

I can summarize our targets for the year 2020 with certain concrete examples. Firstly, the C-Band Data Link systems will be employed by critical platforms. We launched our GNSS receivers and Anti-Jamming systems for utilization on both missiles and UAV platforms. Moreover, we will be launching the KEMENT outputs to various applications within this year.

As you know, data links are one of our main areas. We have been improving our product range in this area in terms of both quality and quantity. Our starting point within the scope of our development activities has been to achieve high-tech competitive products suitable for the platforms. We will be introducing our new data link products to the sector in 2020.

Regarding your question on exports, we have been active with many of our contacts in 2019 and we accomplished our operations to a certain extent and despite the travel restrictions in 2020 we have been carrying out our marketing activities related to exports through video conferences, correspondence and over social media, while continuing our negotiations on system solutions with our potential customers without experiencing any suspensions. The data link applications require custom solutions usually in platforms such as missiles and air vehicles and the development of tailored solutions for each platform takes a long time. In summary, we aim to export UAV data links, missile data links and our GNSS anti-jamming products in 2020.

Defence Turkey: The Novel Type Coronavirus (COVID-19) pandemic hit all companies hard and conducting physical contact became quite difficult. We do not observe any changes in your activities and strategies on the international level. Have there been any new contracts signed regarding

your domestic and international programs or any changes to deliveries of existing contracts during this period?

Erdal TORUN: As you also mentioned, no changes have been made in our strategies or targets, and we are continuing our activities in this direction. However, it should not be misinterpreted that none of our activities have been affected by the pandemic. Even though our speed has slowed down in general, the targets have remained the same. We have no difficulties in carrying out our domestic activities and somehow, we find a way to gather our efforts and make it happen. The defence industry needs continue in the international arena as well. Despite the severe conditions affecting social life, the demands of foreign companies signal their tendency to maintain cooperation with us. Of course, meeting physically is quite important but we endeavor to continue our activities remotely. Indeed, there are changes in our working shift system but there have been no changes in our targets.

Defence Turkey: Back to the details of the projects, the missile data link is among the areas where Meteksan Defence stands out and the activities to this end have been continuing for many years. Could you briefly mention the latest developments in this area?

Erdal TORUN: Starting with the OMTAS/UMTAS and HİSAR data links, the Missile Data Links we developed for SOM, ATMACA, MAM-L, MAM-C, TEBER and LAÇİN systems, these are among our top areas.

With the solutions we develop that enable secure and high-speed communication, we provide major operational superiority to our Armed Forces. We started our journey in this area with the OMTAS (Medium Range Anti-Tank Weapon System) data link in 2009 and upon completion of production line qualification, we launched serial production in 2019. Meanwhile, we also reached the serial production stage after accomplishing the data link development process as part of HİSAR (surface-to-air defence missile system) and our contract negotiations on the serial production of the KEMENT Tactical Data Link systems developed for SOM (Stand-off Missile) and ATMACA (Anti-Ship Missile) are ongoing.

Within the scope of the design of Missile Data Links, we aimed to develop software-based, interoperable systems with a modular architecture containing an integrated infrastructure and our objective is to also have a share in new markets by extending the product family with this architectural philosophy.

Defence Turkey: Thanks to the network enabled capabilities of the Turkish Air Force and Naval Forces, smart capabilities gained through our national cruise missiles such as SOM and ATMACA and with the critical capability gained with the KEMENT program, our country has achieved crucial level operational superiority. Which key features of KEMENT render the system superior to its competitors? Could you tell us about the flight tests and the qualified products in addition to your plans and activities for the future?

Erdal TORUN: KEMENT is the very first indigenously developed TDL (Tactical Data Link) system. We take justified pride in owning a product that was qualified with performance beyond the contract criteria during the flight tests.

Besides its indigenous waveform and encryption with near real-time image transfer capabilities, KEMENT is the first version of the standardized and adaptable product with physical and performance capacities way above its equivalents in the world. We have accomplished the most critical stage of an improved data link which we will be able to launch into the utilization of the Turkish Armed Forces (TAF) and this brings an advantage to our country, advancing it a minimum of 5-10 years compared to the countries that recently started this project. KEMENT is a TDL developed for cruise missiles and it was developed in a flexible and modular structure to be able to fulfil the demands of all the intended platforms in line with the Network Enabled Operation (NEW) concept. We have achieved a system that was developed in the Software-Defined Radio (SDR) architecture that can be updated according to the operational requirements of platforms and that is compliant with the internal or external DLP (Data Link Processor). The preparations for taking part in network enabled TDL projects that will take our country to the next level are in progress.

KEMENT Terminals

Without doubt, the SWaP designs capable of functioning under challenging conditions and our national and indigenous solutions that can be manufactured without export licenses are among Meteksan Defence's most prominent values. Still, the experience we gained through KEMENT are beyond any achievement. Collaborating in harmony particularly with the Presidency of Defence

Industries and the TAF and with TÜBİTAK BİLGEM, TÜBİTAK-SAGE, Roketsan and 1st Air Supply Factory in Eskişehir within the scope of a heavy and challenging schedule has made us more agile. As a result of the intensive activities conducted with the aforementioned institutions regarding our existing projects on the task systems for aircraft and missile data links, we have reached a vision of providing system solutions that are most compatible with the demands of the end-users and interoperability of the systems in a cost-efficient way.

I would like to add one more point. We had close cooperation with TÜBİTAK-SAGE as part of the KEMENT project and specifically over SOM and this collaboration is still in progress. SOM is a very valuable platform over which we wish our products to be used. We reached prominent achievements in the first trials that we ran with SOM and KEMENT.

Defence Turkey: Specifically, about the KEMENT project, what type of feedback have you received from the end-users?

Erdal TORUN: The feedback from the users regarding KEMENT is quite positive. As a result of such feedback, the requirements for fulfilling the new demands related to its upper version have been defined. We believe the implementation of this system to the platforms will be launched.

Defence Turkey: By nature, missile data links are products specifically designed for missiles. The detailed structure and the parameters of the missile are required for their design and production. What are your comments on the cooperation built during the Missile Data Link development process with Roketsan as the manufacturer of the missiles, and on the experience gained?

Missile Data Links

Erdal TORUN: Our qualified business partnership with Roketsan has been continuing for many years in various areas and as I mentioned before we have reached a certain level of maturity with serial production projects in this period and we are aware that we need to be more agile to be ready to manufacture our products in higher volumes. We are carrying out our investments by taking the required steps to this end.

With Roketsan, we have been conducting projects that start from the R&D and product development stages. In the first stage, we initiate the mutual information exchange process with cooperation protocols and start working over the technical specifications. As you also mentioned, we consider the technical requirements we matured through analyses that contain various engineering disciplines such as the location of the equipment over the missile, the volume, weight and power balances of the missile; its adaptation to environmental conditions such as the temperature, altitude, vibration and shock, etc. as one of the most critical stages prior to the design stage. At this stage, the most critical capabilities that have brought acclaim to Meteksan Defence are the electronic hardware and software design, electromagnetic analyses and antenna designs, RF layer solutions and our mechanical designs that enable physical resistance. Due to these projects, Meteksan Defence has developed systems and solutions at the 0.1 – 35 Ghz band that are capable of operating in all types of environmental conditions, from underwater to space and has gained significant infrastructure.

We complete the prototype production upon the design and development stages and provide absolutely all types of support to Roketsan during the qualification of our first products, their integration to the platforms and throughout the field / flight tests. Following our experienced system engineering and deliveries, then our ILS teams follow up and take action. I would like to underline that mutual trust and transparency are the most critical factors in our sustainable business partnership.

Similar to our previous data link projects, we aim to offer our Missile Data Links and TDL solutions for utilization by friendly and allied nations and we believe the trust and synergy formed in the projects we executed with Roketsan will pave the way for prominent achievements in the international arena as well.

Defence Turkey: You announced in 2018 that you completed the C-Band Data Link product developed for UAVs with the know-how accumulated in the design and production of the Data Links and unveiled this product at IDEF'19. The C-Band Data Links with directional or undirected antennas that enable peer-to-peer communication between UAVs performing at high, medium and low altitudes and ground systems, at a range of 200 km (minimum 10 Mbps user data). What feedbacks have you received so far from the related UAV users - the TAF and Security Forces? Could you mention which platforms will be using the C-Band Data Link System and the technical and economic superiorities it has compared to its rivals? Are there any orders from domestic or foreign buyers for the system?

Erdal TORUN: The actual area we targeted with the C-Band Data Link is manned reconnaissance aircraft and unmanned air vehicles


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C-Band UAV Data Link Ground Directional Antenna

(UAVs), then again we are aware that the solutions we offer could also be used for other unmanned systems and we have been receiving demands in this direction as well.

The modular structure, flexible interfaces convenient for integration to various systems and cost-efficiency are the critical advantages of the solution we developed. Above all, we have manufactured the very first indigenously and nationally designed system solution that has surpassed foreign systems in terms of performance and economy and that has reached great achievements in the field. Presently, to extend this system we are negotiating with companies that own indigenous platforms and we may give you the good news soon.

Our products are compliant with MIL-STD-810, MIL-STD-461/464 and MIL-STD-704 standards, which are extensively used by our Armed Forces. Capable of transmission at the data speed up to 13 Mbps over a range of 200 km and in addition to providing secure communication with its frequency hopping and direct - sequence spread spectrum(DSSS) features, we have an architecture that enables the simultaneous and joint utilization of the spectrum for multiple UAVs in the same region. When assessed from a tactical perspective in terms of system utilization, this indeed is among the features that are in high demanded by users.

As a result of our internal R&D activities, you will soon witness our solutions that enable the simultaneous and air-to-air interoperability of multiple UAVs with the Remote Video Terminal (RVT) and STANAG 4586 compatibility. I have mentioned this previously as well. We are conducting many of our R&D activities without getting any orders from any companies and the RVT is one of the good examples in this respect.

We have been receiving positive feedback from the users and platform contractors about the RVT during our first trials and integration activities. The negotiations on extending the system are in progress.

Defence Turkey: Within the scope of export activities, which Meteksan Defence products will we be seeing more frequently in foreign markets? Could you share your assessments related to your future expectations?

Erdal TORUN: We have been exerting utmost efforts to offer secure and high-speed communication solutions on an international scale.

As of January 2019, we took on a brand-new structure as Meteksan Defence. With our product-oriented approach and by identifying our strategic targets in accordance with the markets, we aim to conduct sales and marketing to reach every customer possible. We strive to determine our product strategies and to shape the future by placing as much importance on foreign markets as the domestic market.

In addition to providing finished products that could be integrated to platforms, we approach every customer and platform owner as a business partner based on open communication and trust. I can say that we are about to reap the fruits of this approach in the international arena soon.

Defence Turkey: By putting forth a new military doctrine in the operational field, the TAF has been utilizing UAVs simultaneously in an integrated fashion. The C-Band Data Link stands out at this point in particular. Have you received any orders from domestic or foreign customers recently?

Erdal TORUN: Yes, there are certain negotiations in progress to this end, and we believe they will be launched into utilization within this year and we will share details about this in the future. We will start to use this system in our country and regarding the international arena, we have a product and our negotiations regarding this product are in progress, yet each user has been demanding a custom integration and compatibility specific to their platform. As I previously mentioned, the design capability and engineering capacity of Meteksan Defence has been giving our company an advantage abroad in the integration of these systems to missile platforms as well as to UAV platforms. Our negotiations specific to the C-Band are positive and in progress within the international market.

Defence Turkey: What would you like to say about the delivery activities regarding the ANKA SATCOM Radome designed, manufactured and tested for the protection of the Broad Band Antenna and the L-Band Antenna used for SATCOM communication as part of the ANKA-S Project? Can you share some details about the structure and technical data (weight, length and height) of the Radome? Could you also touch on the ongoing negotiations and activities, if there are any, on the utilization of this capability in another UAV Projects?

Erdal TORUN: The design and production of the ANKA SATCOM Radome is a unique engineering project. The production was accomplished after the execution of the design and it is now being utilized by ANKA. Our negotiations with Turkish Aerospace (TUSAŞ) on the new orders are in progress. In reference to the Radome, in addition to the ANKA project, our negotiations on various projects including other UAV platforms, Land Platforms and Radar systems are continuing and this is one of the areas where we acquired quite impressive capability. We have been collaborating with our stakeholders in material and production areas; ownership of both design and measurement capabilities are a critical issue. Since the Radome is used under quite challenging conditions, a failure in signal transmission must not occur.

In respect to the technical specifications of the Radome, well these are defined based on the characteristics of the antenna they are used on. The most critical parameter at this point is smooth transmission; any weakening of the signal should be avoided.

Our negotiations on the utilization of this infrastructure in other platforms are also in progress.

Defence Turkey: In recent months, Meteksan Defence launched the Anti-Jamming and Anti-Spoofing Global Positioning Antenna and Receiver System - the Anti-Jamming GNSS. Frequently utilized in military operations and exercises conducted in the north of Syria and Libya by units of the Turkish Armed Forces, to what extent will this system be useful against GPS Jamming and Spoofing threats? What is your assessment on the value that it will add to the Turkish Armed Forces and to our security forces upon its entry into the inventory?

Erdal TORUN: First of all, I would like to say that these types of navigation systems are always subject to jamming as neutralizing GNSS based systems in an area by establishing an electronic jamming environment in that area is among the most popular measures.

Anti-Jamming GNSS

Our active and passive GPS antennas are our first serial production products that we designed in the GPS field and manufacture for ammunition. In this way, we entered the GPS field way ahead, the academic studies launched on the working principles of GPS satellite systems and receivers were followed by the engineering activities that continued with conceptual analyses; by improving our engineering capabilities we established our own test and verification environment and our GPS receivers and Anti-Jamming GNSS (CRPA Antenna) solutions that we revealed recently have found their place in the tactical field.

Developing a countermeasure against GPS jammers and the functioning of GPS receivers despite the jammers are of vital essence in the field. Another dimension of this issue is Electronic Warfare and Meteksan Defence's infrastructure and design capability in this area played a major role in our success. We design and manufacture optimum custom solutions for platforms by using spatial filtering methods to suppress the signals of GNSS jammers. In this way, the error margin of the missile in target acquisition is reduced while the survivability of Unmanned Air Vehicles and Manned Reconnaissance Aircraft is increased.

Based on the feedback we received as a result of the interoperation of the ammunition and UAVs in

GNSS Receiver

the field, we also diversified our products for UAVs, ammunition, land and naval vehicles and built modular solutions with various antenna units. I can say that we developed the best systems also in terms of weight and size; we observed critical advantages of the discipline formed as a result of the fact that we are an ammunition data link company. We are able to introduce the most optimum and cost-efficient solution to the user without requiring another external GPS receiver and this is certainly another benefit. We can offer this feature on account of the software-based design, the internal receiver of our Anti-Jamming GNSS Antenna and our signal processing unit.

Our GPS products and system solutions have been tested in the field and have been qualified to a large extent; we are conducting our first deliveries and preparing for extensive utilization through our contract negotiations regarding serial production. As I mentioned previously, these systems have contracts both for missile systems and for UAVs.

Defence Turkey: With its expertise, Meteksan Defence has been introducing products that could not be easily procured from other countries to the service of the Turkish Armed Forces and providing a new and extremely critical power factor. Looking at 2020 and 2021, which products and which markets are targeted for communication systems?

Erdal TORUN: I would like to start with the Anti-Jamming GNSS systems. Certain countries have taken part in certain markets in this area. While we design our systems, we develop them based on their qualities, features and performance. As a result, we have reached a level at which we are capable of competing with our products on a global scale. As a matter of fact, we are negotiating over certain proposals and I am sure that we will be exporting the Anti-Jamming GNSS within 2020.

Another crucial and exciting point in the communication field are C-Band Data Link solutions. Some countries are willing to use C-Band not only for UAVs but also for manned platforms and missile communications, and our negotiations with them are in progress. The critical point here is not installing a product over a platform; instead it is to adapt it to the platform at the same time. As we experienced during our previous activities with missile manufacturers, one must identify the features of a missile to a certain extent in to adapt it to a platform.

TMV Telemetry Transmitter

Our contacts and negotiations with UAV and Missile manufacturers are in progress, and the activity in the Asian region is prevalent for the time being. We have prominent cooperation with countries that manufacture their own platforms. I believe it will be useful to underline this fact through your magazine; when Meteksan's products are compared with products of Western Countries, it is noticed that they are quite cost-efficient products that contain high technology and that are capable of competing on the international market.

Regarding our other products, our telemetry transmitters and flight computers are being utilized in the armies of other countries in manned and unmanned air vehicles. Our goal for the next stage is to be able to introduce Tactical Data Links to the market. Every product in the Data Link field that we supply to Roketsan or other local customers is also being utilized by foreign countries as a result of their exports. We strive to extend our export potential in the data link field with the inclusion of tactical data links in the forthcoming period.

The KEMENT Tactical Data Link is a highly important subject. As you know, NATO countries have their own systems. However, when we take a glance at other geographies of the world, we recognize

GNSS Antenna


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that the transfer of images and data between various forces during network enabled operations in countries without these systems emerges as a critical requirement. In fact, the infrastructure of our data link is fully capable of fulfilling such needs. To this end, we have been negotiating with countries in the international market for these types of TDL requirements. We consider that these negotiations will gain momentum in the upcoming period and will lead to prominent cooperation.

Defence Turkey: In terms of platforms, missiles and unmanned air vehicles, we are speaking of quite critical products that are also used in the field. One of the most critical subsystems within this scope is one of your products. Do you believe that this success in the field will further accelerate exports in the international arena?

Erdal TORUN: The Turkish Armed Forces is a quite good reference for the armies of other countries. We are utilizing almost all of our products in the real environment, in the field and other countries are aware of this, and every country has a military attaché which closely observe the products on site. Moreover, on account of Turkey's geographical conditions we are able to generate solutions that are convenient for any type of climate. We manufacture products that are capable of functioning both in considerably low temperatures and in high humidity as well as in extremely hot environments. Therefore, as our products have managed to enter the inventory of the TAF then


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other countries often tend to procure them without even testing them very extensively.

From time to time we confront problems. For instance, in the case of an implementation regarding C-Band; if a country procured the product of another and extended it in its own platforms then your company has to offer them a package when it offers that country its own product; we will have to replace all the air and ground terminals with the new ones as they all have to be compatible with each other. We also run our marketing activities to this end.

Defence Turkey: Returning to the COVID-19 process, the Novel Type Coronavirus (COVID-19) pandemic deeply affected the defence and aviation sectors as well as our daily lives. Could you inform us on Meteksan Defence's efforts against the COVID-19 pandemic, the measures it adopted and any ongoing operational changes?

Erdal TORUN: Human health is our priority. Following the breakout of the pandemic, we adopted all the recommended measures to protect our staff while planning all details needed to keep the wheels turning. Then we announced our approach through a press statement on March 23rd to our staff, their families, to our suppliers and our business partners.

In line with the circulars and advice placed by our government, we were on duty and we continued to work on developing new technologies to fulfill the demands of Turkish Armed Forces. We maintained our devoted manner and our maximum level of efficiency with the slogan "together we will achieve" by implementing methods such as annual leaves, working from home and working in shifts that would increase social distancing, in solidarity with our employees.

During this process, we aimed to enable our stakeholders by providing equipment, services and solutions to our company to reassure their own employees without going through any economic bottlenecks. We strived to continue making our payments even though we faced difficulties in debt collection, and we still strive to do so despite the challenges.

In an effort to proceed without any setbacks in our projects, we have been running tests and hold meetings in line with social distance rules and through video conferences. In accordance with the main principles of the Bilkent Holding Group, our company has been fully implementing all the measures against the COVID-19 pandemic determined by the Committee established within the body of our company.

Defence Turkey: Have any changes been made to Meteksan Defence's 2020 action plan regarding turnover / export targets in this unprecedented environment that we've been experiencing due to COVID-19?

Erdal TORUN: We witnessed certain irregularities in cash flow and recession in the sector in 2019 which we were not accustomed to. We stood by our government and dealt with the difficulties. We started to experience certain irregularities in 2020 as well and then the COVID-19 pandemic caused a halt particularly in international affairs, naturally. We sense that we need to run a quite methodical fiscal policy under these circumstances. We strive to maintain our turnover and export targets at 2019 levels and act more disciplined and controlled. Still, we will not be withdrawing our strategic moves. As I mentioned previously, we have adopted an approach on seizing the opportunities created by the crisis. We aim to prepare for the future through R&D, innovation and product development by achieving a robust financial structure.

We identified 2020 to be the year to focus on exports and we have worked diligently on developing strategies to this

end. We strive to develop the mechanisms and structure that will enable us to focus on exports. We have recently identified our target to be that of achieving 50% of our revenues through exports and the remaining 50% from the domestic market. Even if we are not able to fully achieve these defined targets due to further impacts of COVID-19, we will undoubtedly continue to keep our pace moving forward as we stretch to reach for our targets.

Defence Turkey: How have activities proceeded at Meteksan Defence during this period, have there been any changes in operations such as the working style / shifts and how have processes been managed for new contracts and acceptance / tests?

Erdal TORUN: In order to prevent any postponements in the order of activities, at Meteksan Defence we implemented methods such as working from home or working in rotations. There have been certain partial disruptions in the execution of scheduled meetings with our stakeholders and the tests in line with project processes, but we exerted efforts to prevent any major setbacks. For example, we realized certain test processes through video sharing or reporting methods.

We conducted many contract negotiations through video conferences, and new approaches will inevitably emerge in these areas in the upcoming period. As a majority of the projects carried out in the defence industry area are classified and confidential, data cannot be shared via the internet environment; therefore, a certain slowdown is experienced naturally in the speed of the execution of activities in this regard. I expect that activities on maintaining secure information exchange will be realized in the future.

Defence Turkey: As you know, to maintain a well-functioning supply chain, all stakeholders should be involved in the project. Some of the projects may contain imported products or some may contain subsystems procured from domestic sources. Have there been any setbacks in your supply chain caused by other companies during this process? How have you managed this process?

Erdal TORUN: For the company in general, I can say that we have not experienced any setbacks causing severe delays in our orders and deliveries. We have strived to prevent potential delays by increasing contact frequency to ensure clear communication when we worked on importing any equipment. We work to execute deliveries with products that already exist in our own stock. Additionally, we don't have any restrictions by third countries regarding any of our products and this is a plus as well. We identify designs that are in line with this approach and maintain our product supplies accordingly. Generally speaking, there have not been any difficulties that have delayed our deliveries.

Defence Turkey: Lastly, would you like to convey any messages to our readers as well as domestic and foreign stakeholders?

Erdal TORUN: Thank you for this opportunity. I would like to once again underline certain points with a few sentences. Meteksan Defence is a Technology Development Center. We consider our company to be one of the most prominent examples of the cooperation between Universities and Industry. Here, we carry out our activities not only backed by the academic power of Bilkent University but also with the support of many of the universities in our country and we believe that we will enhance our technological ownership in this way. Surely our main mission is to provide funds to Bilkent University and to maintain the flow of funds in order to ensure the continuity of the education at this university. To that end and with this divine mindset, every professional employed at Meteksan Defence has been working in furtherance of the company, directing our collective steps towards a secure future.

Ayşe AKALIN met with Erdal TORUN at Meteksan Defence's premises.

Our overall principle is to operate without compromising our ethical values. We wish to maintain our relations with our stakeholders within the defence industry in this sense. We believe in the essentiality of competition. Competition brings advantages both to the state and to the sector in terms of technological acquisitions; then again it is also essential to operate control well through the use of rule-making mechanisms. In cases where small-scaled companies are positioned as centers of excellence, sustainability should also be secured as these companies have many investments and these investments can only be maintained through new projects. Meteksan Defence is not a company that operates by getting engineering projects from other companies. Therefore, such competition must be weighed well in order to engage our engineers and to create sustainable opportunities, not only for us but also for all companies.

The domestic share of the defence industry is at a certain level, so our focus should be on foreign markets. In my opinion, there is a constant need for building synergy by gathering as a sector with the slogan 'together we will achieve'. I would like to thank you again for giving me this opportunity.

Defence Turkey: Dear Mr. TORUN, thank you for sparing your time for our readers

Congratulations

for the 100th issue

Hüseyin Baysak
Secretary General, SaSaD

Defence Turkey Magazine has undertaken a very important mission in promoting the Defence, Aviation and Security sectors on behalf of our domestic / foreign stakeholders and increasing the awareness of our sector both within the country and abroad. As one of the important publications that fill the gap in this field, it has become a publication where the sector players are excitedly waiting for the release. I wish Defence Turkey Magazine, which now publishes its 100th issue, will continue its publishing life for many years, maintaining its success and quality level.

Orhan Aydın
OSTİM Organized Industry Zone Chairman

I have been following Defence Turkey magazine closely and I congratulate you for the 100th issue.
As an important media institution in the sector, I would like to thank you for attaching importance to SMEs and your diligent efforts.

Yılmaz Küçükseyhan
TOBB Turkey Defence Industry Board President

DEFENCE TURKEY, with which we have been doing good things since its foundation, continues to contribute significantly to the development and expansion of the Turkish Defence and Aviation Industry through timely and accurate news, interviews and conversations. Beyond being a magazine that supports everyone in the sector with its work and plays an active role in many sectoral events, it also acts as a source that makes successful organizations.
I would like to thank the DEFENCE TURKEY team for these valuable contributions and wish them continued success.

Ahmet Mithat Ertuğ
OSTİM Defence and Aviation Cluster (OSSA)
Chairman of the Board

On behalf of OSSA, I congratulate the 100th issue of Defence Turkey Magazine, which has never left us alone and has always supported us with its staff, acting as a means of introducing the capabilities and potential of our SMEs both in our country and abroad. I would like to thank the team that offers such a beautiful magazine to us.

Congratulations

for the 100th issue

Abdullah Naki Polat
Chairman of the Board of SSI

The 100th issue of Defence Turkey Magazine, which is among the most significant media publications making our sector become known, is showing us how hard it is to achieve continuity, stability and absolute success in this sector. I would like to congratulate the employees of Defence Turkey magazine, for allowing the developments in our sector to be followed by the broad masses and enlightening its readers with up-to-date news, technical innovations and interesting topics, and I wish to be together in countless 100th issues

Haluk Bayraktar
SAHA İstanbul Chairman

We, as SAHA İstanbul, congratulate the 100th issue of Defence Turkey Magazine, one of the leading publications in the defence industry.
In the recent period, along with the National Technology Move, there have been success stories written in the Turkish defence industry, which are closely followed globally.
I wish continued success to Defence Turkey Magazine, which contributes to the recognition of these achievements and developments both in Turkey and abroad, with its English publication, and which plays an active role in the development of the industry.

To more 100th issues...

Bilal Topçu
General Manager
Teknopark İstanbul

I congratulate Defence Turkey, keeping its finger on the pulse the Turkish defence industry, on the occasion of its 100th issue and I wish them continued success. I hope that this year, which we celebrate the 10th anniversary of Teknopark Istanbul, the center of the defence industry in Istanbul, will bring a new momentum into our cooperation and take it further.

Serdar R. Alemdar
General Manager
ODTÜ TEKNOKENT

Defence Turkey Magazine, which is a platform for the Turkish defence industry decision makers, supply chain managers and members of the Turkish defence industry to receive important news about the developments in national and international defence industry, capabilities and technologies. At the same time, Defence Turkey is the voice of the Turkish defence industry to the world with its reliable and principled journalism stance. I congratulate the team for their 100th issue and wish them continued success.

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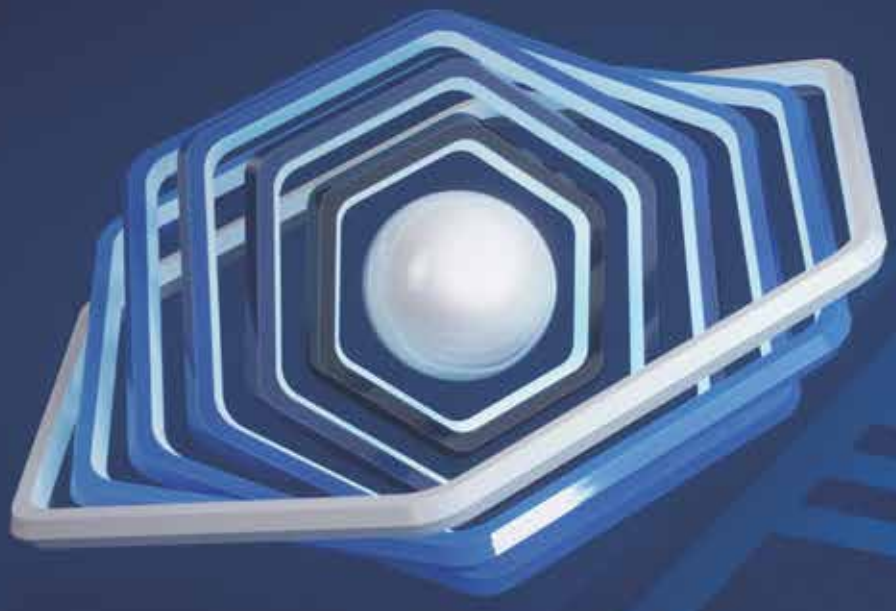

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A Look at the Current Status of the Turkish MMU/TF-X Program

by İbrahim SÜNNETÇİ

The TF-X (Turkish Fighter-Experimental) a proposed single-seat, twin-engine all-weather multi-role fighter being developed by Prime Contractor TUSAŞ/ Turkish Aerospace with technological assistance from BAE Systems. Turkish Aerospace refers to this program as the Turkish Fighter (TF) and exclude the "X" at the end of its title with an emphasis that it is no longer an Experimental aircraft.

Unveiled for the first time via a full-sized mock-up (which was constructed by Turkish Aerospace-KALAY Joint Venture Company in Germany within 35 months, cost the company almost Euro2 Million [US$2.25 Million]) during the Paris Air Show(PAS) on June 17, 2019 and later in September 2019 at the Teknofest Istanbul, Turkey's next generation National Combat Aircraft (abbreviated as MMU in Turkish), also known as TF-X, will replace the F-4E 2020 Phantom IIs and F-16C/D Fighting Falcon combat aircraft currently in the service of the Turkish Air Force (TurAF)during the first quarter of the 2030s.

Featuring Low Observability and Supercruise capabilities and to be equipped with domestically developed systems and sensors, the MMU/TF-X will be a 5th Generation indigenous air superiority fighter with secondary ground attack capability. The TurAF currently operates some 30 F-4E 2020s (which were planned to be replaced by F-35As and to be phased out of TurAF service in 2020 but now expected to remain in the service until 2025) and 238 F-16C/D aircraft and Turkey is likely to procure some 150 to 200 TF-Xs in the long term to replace F-4E 2020s and F-16s. Since the F-16C/D combat aircraft, that forms the backbone of TurAF's airpower, will be deactivated from the service starting from 2030 (Block 30 and Block 40 versions) and the deliveries of F-35As (procurement of up to 110 aircraft were planned) to TurAF has been halted by the US Government in 2019 the MMU/TF-X Program has became more important for the Turkey. In December 2019 the US Secretary of Defence has been authorized to fly up to 6 Turkish F-35As (tail numbers AT-01 to AT-06) to a storage location in the US and to induct these 6 aircraft into a long-term storage condition.

According to Turkish Fighter General Characteristics data that was released by Turkish Aerospace during Paris Air Show 2019, the aircraft would measure 21 meters in length, have a 14-meter wingspan, will be 6m in height, with a wing area of around 60sqm and a maximum takeoff weight (MTOW) of over 60,000lb (27,215kg+). To be powered by a pair of 27.000lb class indigenous turbofan engines (prototypes will be powered by a pair of F100-GE-129E engines, each generating 29.500lb of thrust) the TF-X is intended to have a maximum speed of Mach 1.8, a service

ceiling of 55.000ft and a combat radius of 600 nautical miles carrying four beyond-visual-range (BVR) and two within-visual-range (WVR) air-to-air missiles and internal fuel. The TF-X will be capable of pulling negative 3Gs to positive 9Gs. In the light of this data in every aspect of size – height, weight, wingspan, weight – the TF-X is bigger than the existing 5th Generation fighters including F-22 Raptor, F-35 Lightning II, J-20A/B Mighty Dragon and KF-X. Nevertheless, the overall design of the TF-X mock-up bears similar features to the F-22 Raptor (such as twin-engine, fixed diverter inlets, Air Pressure Relief Doors on the back of fuselage, super cruise, Thrust Vector Control [TVC, either 2D or 3D, a round exhaust which is needed for 3D thrust vectoring reflects more radar energy back to the radar receiver than a rectangular (2D) one that the F-22 Raptor has], internal weapons bays and canted vertical tail design) and F-35 Lightning II JSF (internal weapons bays, Electro-Optical Targeting System [EOTS] and a Integrated Cockpit Display System) stealth fighters, but with a narrower and longer fuselage and wider wingspan.

Even if it will be an all-weather, multirole fighter the MMU/TF-X's primary role would be air-superiority. Like the F-22 Raptor air superiority fighters the MMU/TF-X has both cheek and ventral internal weapons bays. The ventral internal weapon bay can hold up to four launchers for

medium/long-range (BVR) air-to-air missiles and air-to-ground munitions and missiles weighing between 250lb to 2.000lb. Each cheek weapons bay, on the left and right of the fuselage, can hold two launchers for short-range (WVR) air-to-air missiles.

The MMU/TF-X will also have new generation features including Low Observability, High Maneuverability (to be better than F-16C), Internal Weapon Bays, External Weapon Carriage (for NATO and Indigenous weapons), Increased Situational Awareness, Interoperability with AEW&C aircraft, UCAVs and AARs, Super cruise, Advanced Avionics for Sensor Fusion (5th Generation avionics suit) and Independent Operation Capability (no need for other A/C). The aircraft will be equipped with an indigenously developed gallium-nitride (GaN) Active Electronically Scanned Array (AESA) Radar, Integrated Processing Computer (Mission Computer), Infrared Search and Track (IRST) System (in front of the cockpit), Integrated EW Suit, as well as a Integrated Electro-Optical Targeting System (which is abbreviated as BEOS in Turkish and will have a similar function as the Electro-Optical Targeting System [EOTS] on the F-35), Helmet Mounted Sight System (HMDS, there is no HUD at the cockpit) and an Integrated Cockpit Display System (panoramic cockpit display) like that on the F-35 Lightning II aircraft. Aselsan has been contracted to develop indigenous AESA Radar, BEOS, IRST System and EW Suit. Negotiations regarding the Integrated Cockpit Display System (panoramic cockpit display) and HMDS are currently on-going. TUBITAK, on the other hand, has been contracted for the development of the Integrated Processing Unit (IPU, a mission computer and abbreviated as BÜİT in Turkish). Within the scope of the MMU/TF-X Program, Aselsan also is developing Integrated RF System (abbreviated as BÜRFİS in Turkish) for the MMU/TF-X. The BÜRFİS Project aims to increase the Technology Readiness Level (TRL) by developing critical technology elements with national means such as:

- Low Visibility Radar and Electronic Warfare Integrated Antenna Designs suitable for 5th Generation aircraft structure
- Radar and EW Integrated Receiver/ Transmitter Structures
- AESA-based Combat Aircraft Radar Algorithms with simultaneous function capability
- Broadband high-performance RF Components.

Within the course of the MMU/TF-X Program, new capabilities and equipment will be added to the aircraft under a "Block Development Approach", and in each

Block, the level of local content ratio will be increased. The first TF-X prototype will be in Block-0 configuration and is expected to be rolled-out in 2023 (on March 18, 2023 is planned), when Turkey will celebrate its 100th anniversary of the founding of the Republic. Following the ground tests that are scheduled to start some time in 2023 and to last around 2 years, the maiden flight will be performed with the first prototype aircraft. The Block-0 configuration will not feature either stealth capability or some of the main internal avionics and equipment (such as AESA radar) and various sub-systems onboard the aircraft will be procured from abroad such as turbofan engines, integrated cockpit display system (panoramic cockpit display) and landing gears. The Block 0 aircraft is expected to be in 4th++ Generation configuration. The Block-I prototypes, that expected to feature 4.5th Generation Fighter performance and sensor fusion capability, will be in air superiority configuration and the first aircraft that expected to enter TurAF service in 2029 will be in Block-I configuration. The TurAF will achieve/declare IOC with Block-I TF-X. A Turkish Aerospace official who spoke to us during PAS 2019 had underlined that the TurAF had originally planned for the first entry into service to occur in 2029 but since they have accelerated their efforts the date of entry into service was brought forward one year.

However, in November 2019 Turkish Aerospace President & CEO Temel KOTIL announced that TF-X delivery to the TurAF would be commenced in 2029. According to Program schedule Turkish Aerospace will start MMU/TF-X Block-II (in full 5th Generation fighter configuration) deliveries in 2031 and following their entrance into TurAF service, FOC will be declared by the end of 2031. The MMU/TF-X Block-IIs, multi-role model, will have the capability to perform a full air-to-air and air-to-ground combat mission and to feature increased local content share thanks to their indigenously developed turbofan engines, sub-systems and avionics. If it can be implemented and realized as planned the TF-X Program would elevate Turkey into the "elite" of the handful of nations such as the USA, Russia and China who have afforded the development and production of a 5th Generation Fighter.


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MMU/TF-X Program Schedule

The Preliminary Design (Phase-I Stage-I) contract was signed between Turkish Aerospace and the Presidency of Defence Industries (SSB) on August 5, 2016 and on January 28, 2017 BAE Systems and Turkish Aerospace signed a US$156 Million to collaborate under the Preliminary Design (Phase-I Stage-I) Phase of the MMU/TF-X Program. The Turkish Aerospace-BAE Systems Collaboration Agreement became effective on August 25, 2017.

The Project Implementation Schedule (To) was started on September 17, 2018 following the selection of TR Motor Power Systems (started operations in April 2018) as Prime Contractor and Supplier for the turbofan engines that will power the MMU/TF-X production aircraft. In October 2018 Turkish Aerospace selected General Electric (GE)'s F110-GE-129 (probably the F110-GE-129E version due to twin-engine configuration) to power the MMU/TF-X prototypes and initial batches of series production aircraft. On November 8, 2018 the SSB signed a Framework Agreement with TR Motor Power Systems for the development of a next generation turbofan engine that will power the MMU/TF-X.

The MMU/TF-X Program is planned to be carried out under three Phases as the Preliminary Design (Phase-I Stage-I, September 2018 - September 2022), Detailed Design & Qualification (Phase-I Stage-II, September 2022 – September 2028), Acquisition of Initial Operation Capability and Full Operation Capability (IOC/FOC, Phase-II, September 2028 – December 2031) and Serial Production (Phase-III, 2032-2035+). Turkish Aerospace was designated as the Prime Contractor for the MMU/TF-X Development Program's Engineering Development & Preliminary Design Phase in line with the Defence Industry Executive Committee (DIEC, the highest decision-making body on defence procurement in Turkey) Decree dated April 2015. Under the Engineering Development & Preliminary Design Phase, the Preliminary Design Review (PDR) document is expected to be completed in late 2021. During the Preliminary Design Phase beyond the design and development of the TF-X aircraft, engineering capabilities, technology development activities (for key sensors like radar, electronic warfare, etc.), test

infrastructure establishment and certification processes will be performed and extensive capabilities for a new generation jet fighter design, development and production will be gained by the Turkish Defence & Aerospace Industry.

As of July 2020, the Engineering Development & Preliminary Design Phase (Phase-I Stage-I) is continuing. Developing a stealth fighter is an expensive enterprise. The Preliminary Design Phase, scheduled to last four years, is expected to cost around US$1.3 Billion (according to Turkish Aerospace President & CEO Temel KOTIL around US$300-400 Millions of this figure would be allocated for infrastructural investment and around US$1 Billion for the engineers).

This will be followed by a nine-year Detailed Design & Qualification Phase (which also covers Critical Design Review [CDR] and Prototype Production and the Qualification Phase) and IOC/FOC, which are estimated to cost around US$7.3 Billion. A total of 12 TF-X jets will be manufactured to achieve the declaration of IOC and further 20 jets for FOC. According to Turkish Aerospace engineers taking part in MMU/TF-X design activities, under the Detailed Design & Qualification (Phase-I Stage-II, September 2022 – September 2028) Phase, a total of seven Turkish Fighter prototypes (six for flight tests and one for ground tests) in three different configurations namely; Block-0, Block-I and Block-II, will be manufactured for test, evaluation and qualification purposes. However, during the PAS 2019 it was reported that there would be five MMU/TF-X prototypes.

Another US$14 Billion is earmarked for the Serial Production of the MMU/TF-X fighter jets. The production of the first TF-X prototype was expected to start in 2020 but due to delays that stem from both internal (unfavorable impacts of the novel type coronavirus [COVID-19] pandemic on the Turkish Defence & Aerospace Sector, lack-of sufficient number of experienced engineers/staff [mainly a result of brain drain, hundreds of experienced staff have left the country during recent years] in local companies that take part in TF-X Program, and national motivation difficulty experienced in local companies and their personnel) and external reasons (impacts of COVID-19 and heavy embargoes implied by so-called friendly and allied countries have caused several months of delays in procurement and deliveries of some subsystems, Governments of some European countries even did not allow their local companies to obtain RFP documents issued by Turkish Aerospace for the procurement of subsystems to be installed on prototype aircraft within the scope of TF-X Program) it is believed that this schedule could not be kept and can be postponed to 2021.

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During his address at unveiling ceremony held on June 17, 2019 at PAS 2019 Turkish Aerospace President & CEO Temel KOTIL had underlined that TF-X would be able to carry long-range, air-to-air METEOR missile of the European manufacturer MBDA and disclosed that the aircraft would be rolled-out in 2023, first flight would take place in 2025 and the next generation fighter to enter service with the TurAF in 2028. In July 2019 President for Defence Industries (SSB) Ismail DEMIR disclosed that they have been working to brought forward the date of TF-X's first flight from 2026 to 2025 and said, "The MMU/TF-X may have A, B and C versions." In July 2019 Turkish Aerospace Deputy General Manager Responsible for the MMU/TF-X Program Prof. Dr. Mustafa CAVCAR (also Chief Engineer of the Program) said, "Studies on different solutions of the TF-X aircraft are continuing. Meanwhile, some wind tunnel tests were carried out. Very good results obtained from the initial tests." On November 5, 2019 SSB DEMIR announced that the 48-month Preliminary Design Process was withdrawn to 36 months in the MMU/TF-X Program schedule and disclosed that there were 2-3 countries seriously interested in the MMU/TF-X Program. At hiss address performed on November 16, 2019 SSB DEMIR named Azerbaijan, Pakistan, Qatar, Indonesia and Malaysia as countries seriously interested in the MMU/TF-X Program. The TF-X unveiling ceremony held at PAS 2019 was attended by Royal Malaysian Air Force (RMAF) Commander General Tan Sri Dato' Sri Affendi bin BUANG. Turkey has been looking for international joint development partners to collaborate with Turkish Aerospace and various Turkish sub-contractors on the MMU/TF-X Program, and Malaysia is one of the potential candidates for this role. According to local sources, such as Malaysia Flying Herald, Malaysia feels the need to join TF-X Program because it sees two nearby neighbors namely Indonesia and Singapore will have next generation aircraft, namely IF-X and F-35. The initial step to join TF-X Program was marked by a MoU signed between Turkish Aerospace and DefTech in 2018. The MoU is said to be a basis for Malaysia to get TF-X in next 10 years. Malaysia is reported to plan replace RMAF's F-18Ds and Su-30MKMs, which will be retired in 2035 and 2042 respectively, with the MMU/TF-X fighters. Spoke to Anatolian News Agency (AA) on January 10, 2020 Turkish Aerospace President & CEO KOTIL stated that Turkey has invited Malaysia to join a mutual production of the MMU/TF-X and Turkey's indigenous jet trainer and light attack aircraft, the HURJET. "We made them a proposal and they showed great interest," KOTIL said. He added that Malaysian Prime Minister Mahathir MOHAMMED had previously visited the Turkish Aerospace Ankara facilities, adding they also held bilateral meetings during President Recep Tayyip ERDOGAN's visit to Malaysia in December 2019. Turkey wants the MMU/TF-X Program to be a multi-partnered program, like the one enjoyed by the F-35 JSF Program.

At his address during Turkey 2023 Summit held on November 30, 2019 KOTIL said that TF-X delivery to the TurAF will be commenced in 2029 and Turkish Aerospace would be able to deliver 2 aircraft per month with a combined production capacity of 24 aircraft per year. Speaking at 'Turkish Defence Industry - MMU/TF-X Dialogues Conference held at Cukurova University on December 13, 2019 Head

of SSB Aircraft Department Abdurrahman Seref CAN disclosed that currently on-going Preliminary Design Phase would be completed in 2022, first MMU/TF-X prototype would be rolled out in 2023 and first flight would be carried out in late 2026 or early 2027. He also disclosed that as of December 2019 a total of around 400 Turkish Aerospace engineers from different disciplines are currently taking part MMU/TF-X design activities and BAE Systems supports design of the MMU/TF-X with some 90 engineers based in Ankara. Speaking at the same Conference Turkish Aerospace Deputy General Manager Responsible for the MMU/TF-X Program Prof. Dr. Mustafa CAVCAR underlined that the TF-X will have super cruise capability and to feature internal weapon bays. According to CAVCAR, during 2018 successful wind tunnel tests were carried out, in 2020 further wind tunnel tests will be performed. "The TF-X will undergo over 20.000 hours wind tunnel tests," CAVCAR said. According to data from the American Institute of Aeronautics and Astronautics (AIAA), approximately 35,000 to 45,000 hours would be required to develop a typical modern transonic/low supersonic military aircraft (the F-35 required 63,000 hours for three variants) (AIAA 2009). At his address CAVCAR also shared a slide showing MMU/TF-X technical characteristics. According to this slide, which contains some different data on the official specifications of the TF-X that released by Turkish Aerospace first in December 2017 and then during PAS 2019, the aircraft would measure 19 meters (60ft) in length, have a 14-meter (46ft) wingspan, with a wing area of 70sqm (750sqft) and a maximum takeoff weight (MTOW) of over 60,000lb (27,215kg+). To be powered by a pair of 29,000lb class indigenous turbofan engines (prototypes will be powered by a pair of F100-GE-129E engines, each generating 29,500lb of thrust) the TF-X will have a combat radius of 500 nautical miles carrying four beyond-visual-range (BVR), two within-visual-range

Temel KOTİL - Turkish Aerospace President & CEO

(WVR) air-to-air missiles and internal fuel. According to official specifications, which had released by Turkish Aerospace in December 2017 the TF-X would have a MTOW of 60,000lb (27,215kg+), a length of 19m and a wingspan of 12m, an operational radius of over 1,100km, a flight ceiling of over 16,700m (55,000ft) and a maximum speed of Mach 2.

According to Turkish Aerospace President & CEO KOTIL, during next 10-year period a total of 10,000 Turkish and foreign (including those from BAE Systems) engineers from different disciplines, with supersonic fighter design and manufacture experience (know-how), will work under the MMU/TF-X Program. Under the contract BAE System will provide 400 personnel/year engineering support for a period of 4 years to Turkish Aerospace under the Engineering Development & Preliminary Design Phase (Phase-I Stage-I) of the MMU/TF-X Program.

The computer generated footage of Lightning Test Facility

New Capabilities & Infrastructures for the MMU/ TF-X

To support the MMU/TF-X Program Turkish Aerospace is also establishing new infrastructures in its Ankara facilities such as Near Field Radar Cross Section Test Facility (contract was signed between Turkish Aerospace and TUBITAK BILGEM on December 26, 2019, test facility is planned to be completed in 2021) and Lightning Test Facility (Yıldırım Test Tesisi, contract awarded on February 6, 2020 and the facility is scheduled to be ready for use during the first half of 2022) that to be fully established under Phase-I Stage-I and Full Anechoic Chamber Test Facility and Far Field RCS Test Facility (Uzak Alan RKA Test Tesisi) that to be partially established under Phase-I Stage-I. Moreover, on May 2, 2019, during IDEF '19 Fair held in Istanbul, Turkey, Turkish Aerospace signed an agreement with Aiolos Engineering Corporation, based in Canada, for the construction of a "Subsonic Wind-tunnel" at the Turkish Aerospace facilities in Ankara to support the MMU/TF-X and other future programs. Turkish Aerospace aims to build one of the World's three ''Subsonic Wind-Tunnels", and to activate it in 2022. Turkish Aerospace also previously signed a contract on 19 July 2018 with the company Aircraft Research Association (ARA), an independent research and development organization providing a range of specialist services to the worldwide aerospace industry, of the UK regarding the risk reduction phase of the wind tunnel tests for the TF-X aircraft. The highest level of quality wind tunnel data is required to verify an aerodynamic design. Since Turkey presently lacks a sufficient infrastructure in high-speed wind tunnel testing, BAE Systems capabilities in this field have been planned to be utilized during TF-X's wind tunnel test phase especially at supersonic speeds. The BAE Systems Wind Tunnel facility is home to two tunnels, known respectively as the low speed and high-speed tunnels. In the latter, tests can be carried out at speeds up to Mach 3.8, which makes it perfect for transonic work. Meanwhile, on June 7, 2020 TR Airworthiness Services Inc., a subsidiary of Turkish Aerospace, commenced its operations with the aim of getting certified by local and international civil aviation authorities and becoming an authorized audit organization in the field of airworthiness and certification. TR Airworthiness Services Inc. will provide consultancy services in airworthiness and certification processes in both civil and military aviation. The company will also take part in military certification of the Turkish Fighter Jet (MMU/TF-X), which is Turkey's largest aviation project and will provide technical support to Turkish Aerospace in military certification activities for HURJET, Multirole Heavy Combat Helicopter (ATAK Mk-II) and HURKUS-B New Generation Trainer Aircraft.

Turkish Aerospace also signed an agreement with Havelsan to carry out software development and embedded training among others to speed up development of the TF-X National Combat Aircraft Program. Announced by SSB DEMIR on May 2, 2020, the agreement covers; Embedded Training, Flight Training and Maintenance Simulators and Engineering Support (Virtual Test Environment, Project-Level Software Development, and Cybersecurity). SSB DEMIR said, "With this cooperation, Turkish Aerospace and Havelsan will carry out many works such as software development, simulation, training and maintenance simulators. When the TF-X project is completed, our country will be among the countries with the infrastructure and technology that can produce a 5th Generation combat aircraft after the USA, Russia and China. " Within the scope of TF-X Program Turkish Aerospace is constructing a new MMU/ TF-X facility (a total of 3.000 engineers will be employed at this facility) at the Ankara Aerospace Industrial Zone as well as new Composite Building (spreading on 95.000 sqm area of which 63.000 sgm is indoor and consists of 9 blocks), both of which are scheduled to be completed in 2021. On April 22, 2020 Turkish Aerospace President & CEO Temel KOTIL disclosed that the works at the new Composite Building (where the composite parts of the MMU/TF-X to be manufactured) continue despite COVID-19. KOTIL stated that the construction activities were planned to be complete in July 2020 and that the installation of the machinery/equipment would start by September 2020. Underlining that autoclave machines and robots are about to be delivered, KOTIL stressed that production would start at the beginning of 2021 at Turkish Aerospace' new Composite Building. In his comments to Anatolian News Agency on January 3, 2020 KOTIL stated that Turkish Aerospace has hired 2,500 engineers during last 3 years and procured two 10,000-core "supercomputers" (the first one was purchased in March 2018). These supercomputers have sufficient calculating power to shoulder the detailed design of the TF-X and its subsystems.

10.yıl Türkiye'de Türkiye İçin

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First Piece of TF-X is Revealed: Air Inlets

Having spoken with C4 Defence on December 30, 2019 Turkish Aerospace President & CEO Temel KOTIL stated that Turkish Aerospace and TUBITAK BILGEM have started to work on the reflection of radar waves from the TF-X aircraft. KOTIL said, "We have started cutting the air inlets, we made the first air inlets. We began to work on their electromagnetic reflection with TUBITAK BILGEM. The first air intake is now at TUBITAK. We want to see whether the inlet is swallowing or reflecting the RF waves. We have started to analyze this and are physically hands-on in the process now. So, it's not just on paper anymore."

Supplying the engines with the necessary quantity of air for generating thrust takes place by specially designed air inlets. The task of the air inlet is to supply the engine with a uniform, stable, low-loss flow. The air inlets come in a variety of shapes and sizes with the specifics usually dictated by the speed of the aircraft. One of the critical designs affecting the performance of the aircraft engine at subsonic, supersonic speeds and high angle of attack is the air inlet design of the aircraft. The geometric shape of the air inlet also closely concerns its reflection from the radar.

The MMU/TF-X will be fitted with a pair of Fixed-Shape Supersonic Inlets with stationary diverters (fixed diverter inlets). When the airframe design of the TF-X mock-up is examined closely, one of the first details that draws attention is that the air inlets are fixed as in the F-22 and there is a 3-4 inch gap between the fuselage and the air inlets, which aims to isolate boundary layer airflow. Just like the F-22, there are also Air Pressure Relief Doors on the back of the TF-X fuselage. The 5th Generation aircraft, such as the F-35 JSF, J-20 and FC-31, are usually fitted with Diverterless Supersonic Inlets (DSI). DSI type supersonic air inlets have better stealth ability than fixed diverter air inlets and are more efficient, but they have a performance limit that will not allow the aircraft equipped with them to exceed Mach 1.8 - Mach 2.1. The F-35 JSF is a multi-role combat aircraft, which is designed primarily for air-to-ground combat, so it doesn't need either to fly at high speeds or to have supercruise capability. Because of that, the F-35's maximum speed is Mach 1.6. The F-22 and TF-X, on the other hand, are air superiority fighters (MMU/TF-X's primary role would be air-superiority), which means they should be capable of flying at high speeds. It is believed that with the 29,000lb class indigenous turbofan engines the TF-X might exceed the speed limit of DSI type air inlets. So using DSI type air inlets on the aircraft would not be a good idea for the MMU/TF-X. Moreover, as in the case with the F-22, which could achieve Mach 1.5+ speeds without the use of afterburners (supercruise capability), the TF-X will also have supercruise capability.

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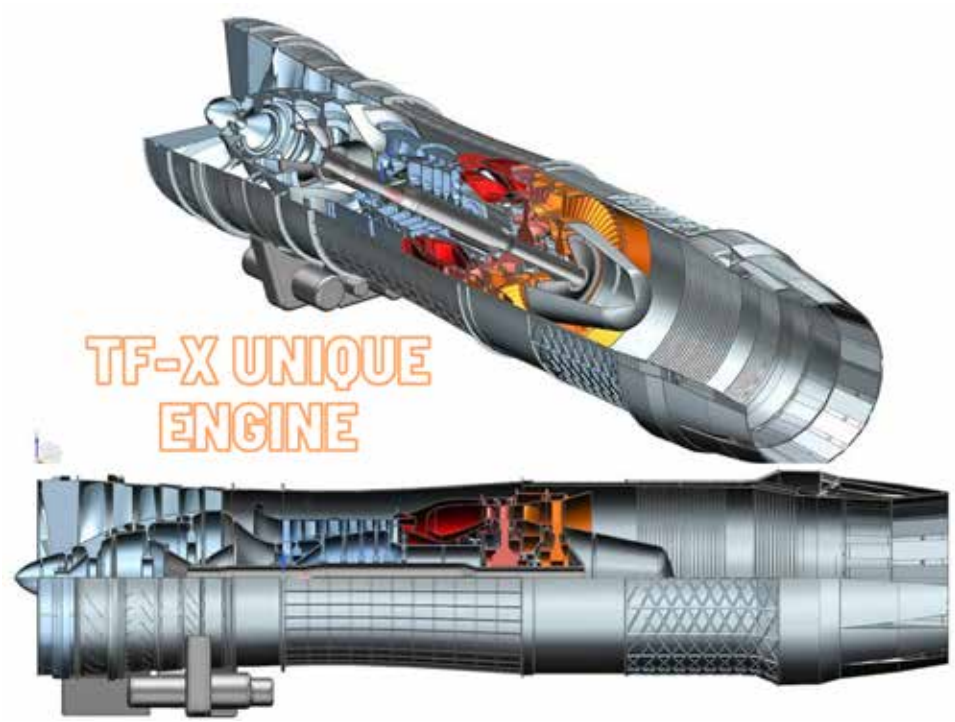
TF-X and Indigenous Turbofan Engine

General Electric's F110 Turbofan Family has been selected as a stopgap solution until Turkey has built its indigenous turbofan engine for the MMU/TF-X. On June 23, 2019 Turkish Aerospace President & CEO Temel KOTIL disclosed that they have ordered 5 turbofan engines from General Electric (GE) and they are currently in the delivery state. "We will use F-16 engines (probably F110-GE-129E version due to twin engine configuration) in the first prototypes of the TF-X for the first flights. The development of indigenous turbofan engine is continuing" KOTİL added. We estimate four of the engines will be installed on two of the Turkish Fighter prototypes and the fifth engine will be used as a spare. Starting from the third prototype, the MMU/TF-X aircraft is planned to be powered by a pair of indigenously developed turbofan engines to be developed by TR Motor Power Systems, a national engine consortium (formed by BMC Power [55%], Turkish Aerospace [35%] and the SSB [10%]).

On 8 November 2018 the SSB signed a Framework Agreement with TR Motor Power Systems for the development of a next generation turbofan engine that will power the MMU/TF-X, or Turkish Fighter, aircraft. Speaking at the signing ceremony



President of Defence Industries (SSB) Ismail DEMIR said the final goal is that the engine would not face limitations from foreign countries in terms of use and exports, and for Turkey to control all technological features and Intellectual Property (IP) rights. The SSB's President DEMIR also noted that development of the indigenous turbofan engine would be a long process, nearly 10 years, and the agreement that was signed with TR Motor will serve as a framework in this process. On the occasion of the signing ceremony on November 8th, a computer-generated image (CGI) of TR Motor's Turkish Indigenous Turbofan Engine was also shared with the media. Our initial analyses suggest that the current design has several similarities in terms of internal configuration with the F110 Turbofan Family.

Osman DUR - General Manager of TR Motor Power Systems - Prof. İsmail DEMİR- SSB President

In this context for example, like the F110-GE-129 and -132 engines the Turkish Indigenous Turbofan Engine also features a Variable Inlet Guide Vane and as in the case with the F110-GE-132 engine it features "blisks" (bladed-disks) in the three-stage modular fan section in lieu of traditional blades to improve performance and maintainability. The engine also incorporates one High Power turbine (HPT) and a Low Power Turbine (LPT). According to our sources the Turkish Indigenous Turbofan Engine to be supplied by TR Motor Power Systems will have similar dimensions and weight with F110 Turbofan Family.

A CGI of turbofan engine to be developed by TAEC for the TF-X

After cancelling the first tender (for which the RFP was issued on January 17, 2014 and covered the direct procurement of 7-sets of turbofan engines to be used on TF-X prototypes) in mid-2017, during the second half of 2017 the SSB had issued a new tender for the development of a totally new national engine, the IP rights of which would belong to Turkey (SSB), with a foreign engine supplier/ Technical Support Provider. The winner of the tender would cooperate with TR Motor Power Systems for the development and manufacture of 27,000lb class indigenous turbofan engine. The SSB received proposals from TEI (without GE) and TAEC (Kale Group and Rolls-Royce JV company) in December 2017, while EuroJet decided not to participate in the tender. On May 8, 2017 Kale Group announced that they would set up a joint venture company (TAEC, 51% Kale Group and 49% Rolls-Royce) with UK-based Rolls-Royce to develop civilian and fighter aircraft engines, including Turkey's planned TF-X fighter jet. According to Kale Group if they are selected, they will develop the first production engine by 2023 and start serial production of the engine by 2030 following the completion of all certification processes. According to Chris CHOLERTON, the then President of Rolls-Royce Defence Aerospace (currently serves as President – Civil Aerospace of the Company), they plan to develop an engine from scratch for the planned TF-X fighter jet and Turkey will hold the intellectual property (IP) rights of this new engine. During the second half of 2018 Rolls-Royce was selected as the Engine Technical Support Provider and negotiations were launched with the company. However, in early March 2019 it was reported that Rolls-Royce has backed out of the project due to a dispute on the IP issue. Rolls-Royce has made clear that they are unwilling to share Intellectual Property (IP) with BMC Power. In November 2019 the SSB's President DEMIR disclosed that they have restarted negotiations with Rolls-Royce, and they were about to make a deal with the company. In his statement to Bloomberg News Agency on December 13, 2019 regarding the Turkish Indigenous Turbofan Engine for the MMU/TF-X fighter jets, DEMIR said; "We may find middle ground with Rolls-Royce for an engine... We shall solve the issue if we sit down at the table." Answering questions from Turkey's leading defence magazines, including Defence Turkey Magazine, during a live interview broadcast via a domestic video conferencing system on May 7, 2020 DEMIR said, "Our main target for the TF-X Project is to utilize Turkey's capabilities to the maximum extent possible. We remain in contact with all partners, and especially the major defence companies and TUBITAK (The Scientific and Technological Research Council of Turkey). The utilization of foreign subsystems, even only in the transition process, would obstruct us in the future. We will not rely on any foreign systems in the future, as no matter how binding the agreement, there can be blockages. We have had our fingers burnt before in similar situations. Making every system indigenous is a costly process in the global system. In the first phase, we will use an off-the-shelf engine, but the final engine will be indigenous... We have started working on the TF-X engine, but the F110 engine will be used in the first phase. We consider a twin-engine design. Currently, there is no problem with the supply of F110 engines, which is an engine that

we know very well. 5-6 engines have already been supplied. It is an engine that TEI has extensive experience in maintaining and repairing, so we feel it would be safer to start with this engine. Work on an indigenous engine is currently underway, but we are also in contact with numerous countries about the jet engine."

During the online panel organized by the SETA Foundation on May 28, 2020, the SSB's DEMIR made critical statements on the TF-X Program. Answering questions about the TF-X Program and the Turkish Air Force's new generation fighter aircraft requirement that arose after the US Government halted the delivery of F-35As to the TurAF, DEMIR said: "In particular, I can say that off-the-shelf procurement of a new fighter is not on our agenda at the moment. All our efforts are concentrated on the 5th Generation TF-X. We have determined to realize this Program under a 'Block Development Approach' (the performance and capacity of the TF-X fighter aircraft will be improved with each block). That is, instead of providing all the desired performance parameters that were defined in the Operational Requirement List of the aircraft in one stroke; we will determine an approach where certain parameters are provided, put on top of each other and the final performance target is achieved within phases. In this sense, our first prototypes may not be in 5th Generation configuration and would have 4.5/4++ Generation fighter performance, but in time as we progress the 5th Generation configuration is eventually achieved."

According to Osman DUR, General Manager of TR Motor Power Systems, work to develop the indigenous turbofan engine continues at full speed, in cooperation with related institutions and as of January 2020 some 80 engineers are working on the TF-X fighter jet's domestic engine project, in cooperation with the Turkish Air Force Command. "We will run the first-ever start test of our engine in 2026 or in 2027. Then the ground tests will start. Our National Combat Aircraft (TF-X) will perform its first flight with our indigenous engine in 2029," DUR added. Speaking to Anatolian News Agency (AA) on January 10, 2020 TR Motor Power Systems General Manager DUR said the firm had been negotiating with international engineering and design firms, along with Original Equipment Manufacturers (OEM), given that design and production represented two separate operations. "There is no point in designing technologies that we cannot put into production. Therefore, we continue our best efforts to develop local suppliers for the domestic aircraft industry," DUR said.

According to the information obtained from the TR Motor Power Systems official, with whom we had the opportunity to meet at the company stand during Teknofest Istanbul 2019 September 17-22, 2019, the Conceptual Design Phase for the MMU/TF-X Engine was ongoing, and the engine development/design work was being carried out in parallel (rubber to rubber) and in coordination with the aircraft development. As of September 2019, more than 50 engineers including Turkish engineers working in foreign engine companies abroad were working on the project. As of September 2019, the delivery of the first set of indigenous turbofan engines to the TurAF for testing on the TF-X is planned to take place in 2028 ■

Congratulations

for the 100th issue

Öner Tekin
General Manager, AYESAŞ

Dear Defence Turkey Team,
I congratulate all the editorial and management team for their success in publishing the 100th issue of Defence Turkey Magazine, which has been shedding light on the Turkish Defence Industry for 15 years and conveying news about the defence industry activities to readers with a neutral and reliable publishing principle.
On this occasion, I wish you a long-lasting publishing life with the same vision and mission.

Ömer Korkut
General Manager, SDT

Congratulations to Defence Turkey for the 100th issue of this outstanding magazine. It has always been a highly valuable resource for all defence professionals in Turkey. SDT follows Defence Turkey closely and benefits from timely and accurate information, market analysis, visionary insights, interesting interviews and more provided by the great editorial team.
We, at SDT, wish you continued success and many more hundreds of editions.
Yours sincerely,

Selçuk Kerem Alparslan
President, Meteksan Savunma Sanayii A.Ş.

I congratulate the 100th issue of Defence Turkey magazine, which has been providing great support to us to increase its recognition both at home and abroad since its foundation, sharing the developments in the defence sector with its expert staff without interruption for many years, and has been exerting great efforts to promote the achievements of the Turkish defence industry in the international arena. I wish Defence Turkey magazine, one of the exemplary periodicals of the defence and aviation industry, continued success!

Özgür Güleryüz
General Manager STM Savunma Teknolojileri Mühendislik ve Tic. A.Ş.

Dear Defence Turkey Team,
Defence Turkey magazine has become a valuable platform where decision makers and the entire ecosystem can closely follow the defence industry developments both in our country and in the world and has been taking part in important events of our defence industry that contribute to the awareness of our industry.
I congratulate the Defence Turkey team for reaching the 100th issue, and I wish you continued success in publishing many more issues that will shed light on the future of our industry.
Respectfully,

Congratulations

for the 100th issue

Tuncer Alpata
Chairman of Alp Aviation

Dear Defence Turkey Magazine Family,
You have taken a very valuable responsibility and are performing it diligently, acting as a bridge to reach sectoral knowledge, sharing current news, and developments to a global audience, and making information accessible to all partners in the Aerospace & Defence Sector.
On behalf of Alp Aviation, I celebrate your 100th issue and wish you great success for many years to come.
Kind Regards,

Osman Okyay
Vice Chairman of Kale Group and President of Technical Division

The defence and aviation industry is one of the most prominent sectors for a country's independence and growth. In this sector of huge impact, nonetheless developing within defined boundaries due to its nature, there is a need for specialized media like all stakeholders as in every sector. We witnessed that Defence Turkey magazine has played an important role in the last 15 years of our country's success in defence and aviation, together with other specialized magazines of the industry. I congratulate the whole team. The fact that a magazine is publishing its 100th issue in the digital era that we are in is an indication of striking root. I wholeheartedly believe that Defence Turkey magazine will continue its journey in our country for many years by maintaining its quality level, and I wish them success on this path.

Cem Uğur
General Manager of ESEN

I would like to congratulate the 100th issue of Defence Turkey Magazine, steadfastly proceeding since its first issue, has taken its place in the defence and aviation media and contributed to ESEN and other industry players with its high quality journalism approach. I also congratulate all the team members and those who contributed.

Eray Gökalp
BAE Systems Nurol Air Systems (BNA) General Manager

Carrying our defence industry, which has become the locomotive of our national economy, to higher levels and taking its rightful place in the global market is only possible with the growth of all components in the sector with the same determination.
I congratulate the 100th issue of Defence Turkey magazine, which is one of the most valuable publications of the defence industry media and has an important place in our ecosystem with its guiding content.
I believe we will meet with plenty of good news and agendas on these pages for many years to come and I wish you continued success.

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Turkey's Medium Segment System Provider / Integrator SDT Accelerates on Export Opportunities

In this interview Ömer KORKUT General Manager of SDT Space & Defence Technologies discusses how the company benefits from seasoned expertise in electronic production and how this has become an advantageous and complementing factor as exports sales increase.

Defence Turkey: Established in February 2005, SDT Space & Defence Technologies Inc. or SDT in short is celebrating its 15th anniversary this year. Could you please review SDT's 15th year in terms of figures such as turnover, number of staff, number of projects in progress, export sales, R&D budget, etc.? Bearing in mind the added value it creates and the vision it presented, what is SDT's role in the Turkish Defence and Aerospace Industry?

Ömer KORKUT: First of all, I would like to state that to me the 15 years that passed since the establishment of SDT as a private company with local capital is a success story. If we review the last ten years as an indicator, our Defence Industry came into prominence due to the developments based on global and regional balances and it achieved critical growth through the substantial move it made with the support of our state. During this ten-year period, the Defence and Aerospace turnover of our country increased from US$ 2.9 billion to US$ 10.9 billion. In other words, it increased by nearly 3.8 times. In concern with SDT's turnover in the last decade that the figure increased from US$ 5 million to US$ 25 million by the end of 2019. Therefore, this 5-fold increase over the average of the sector is one of the most distinct indicators of the growth trend and success of SDT. Considering the number of staff, we also come across a regular increase consistent with the economic growth of SDT. The number of our employees was 184 by the end of 2017, as of the end of 2018 it was 198 and reached 214 by the end of 2019. These figures indicate 7% and 8% increases respectively in the last two years. By the end of the first five months of 2020 - half of which was the pandemic process - the number of our employees reached 224 and this corresponds to a 4% increase compared to the end of 2019. These figures point out to SDT's determined and balanced growth. In regard to projects, which increase every year, the number of projects in which SDT takes part either as the main contractor or as the sub-contractor has reached 90 at present. In addition to the figure, I would like to underline a fact. In its first years, within the scope of our sector's prominent projects, SDT frequently acted as the system/sub-system provider as a sub-contractor of major systems integrator companies. However, recently, with the capabilities and products it developed in the recent period, the company has started to act as

the main contractor in medium-scale system and integration projects. I interpret this as being a result of the trust that the sector has in SDT. When we look at the export sales as another indicator, we witness that the share of export sales in SDT's turnover in 2019 exceeded 20%. For defence industry companies, positioning their products and solutions in foreign markets is a crucial indicator regarding maturing of their capabilities and marketing capabilities. Therefore, SDT has made substantial progress in this area in recent years. Regarding the R&D issue in your question, as a technology company, at present SDT is conducting its R&D activities not only with the investment items in the budget it takes part in or through the projects funded by grants, but also with its own resources. These R&D activities executed with company equity are based on the target of meeting the requirements of domestic and foreign markets with products developed with the latest technologies. This at the same time is a part of SDT's understanding of product-based development which the company has adopted as a principle since its development. To sum up all these figures and developments, I believe we could claim that within the 15 years since SDT's establishment, the company has achieved stable and sustainable growth with the help of value-added products and solutions. The company has secured its position as a prominent player with the trust it has built and has made great progress towards becoming a medium segment system provider / integrator company.

Defence Turkey: After a 22-year-long career in the Turkish Armed Forces, you served as the Deputy General Manager in Charge of Technology for 4.5 years at STM and have worked for 6 years in total at STM. Then, this March you have started working as the General Manager in SDT. What would you like to share with us about the activities you plan to launch in 2020 and about your targets?

Ömer KORKUT: 2020 has really been a different year so far, not only for our sector and our country but also for the entire world. Altogether, we have been experiencing this ever since the first days of the year. A pandemic alone is an incident that occurs quite rarely, altering the former way of living, and this has been admitted by the whole world in addition to our country. In my opinion, the global and regional developments besides COVID-19 also make 2020 a different and unique year. Even though these times bring ambiguity along with it, as it often is the case in times of crises, I believe that every crisis is an opportunity. The critical point here is to be able to recognize such opportunities. Thus, in 2020 as SDT we aim to maintain our business continuity and continue the growth trend we achieved in the recent period by correctly using the opportunity brought by the crisis. To this end, we determined revising our existing strategic plan as our priority. I mentioned that COVID-19 has been a game changer in my first interview with SDT that coincided with the first days of the emergence of outbreak in our country. Particularly with the pandemic we have been going through, the upcoming period seems to be a game changer. Focusing on more suitable areas and being agile and proactive are becoming more important in this process to achieve targets. Agility in particular, is already one of SDT's most prominent characteristics since its establishment and the company has always maintained this trait despite its growth. Therefore, 2020 will be a year where SDT will take critical steps toward improving the company's activities in progress and for further strengthening its institutional infrastructure In 2020, SDT will create a roadmap that will further advance the company as we approach the celebration of our 20th year of establishment. While we are making all these plans and conducting all these activities, we surely aim to take concrete steps regarding innovations we will be launching in the next 5 years.

Defence Turkey: The novel Coronavirus (COVID-19) pandemic has profoundly affected the defence and aerospace realm as well as our daily lives. Could you please inform us on SDT's activities regarding the COVID-19 pandemic, the measures it has adopted and the ongoing application?

Ömer KORKUT: As I mentioned earlier, the Coronavirus pandemic caught everyone off-guard. Moreover, there were so many unknown points regarding the virus and the pandemic, so the only thing we could do was to adapt to this environment of ambiguity with maximum precautions and in line with the developments to take the required measures dynamically. These measures must be updated in accordance with developments and as SDT we followed such a strategy. We formed a Crisis Management Team and designed a Crisis Management Plan immediately after the official announcement of the first case in Turkey. In addition to the routine measures to be adopted throughout the pandemic, the Crisis Management Plan contained the lines of action to be pursued according to the potential scenarios where a case or cases emerge. We designed all these plans by focusing on the well-being of our employees as we treasure them the most. The second target thereafter was to preserve our business continuity. We aimed to maintain our well-known sensitivity in fulfilling our responsibilities and the commitments we assumed in our sector in this process as well. To this end, primarily, we implemented the same measures adopted and implemented by the


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government in the public realm, we applied exactly the same measures at SDT. We gave administrative leave to our employees in the risk group and followed this measure until it was lifted by the government. We launched a collective leave for a brief period of 5 days in the last week of March when the ambiguity during the pandemic process had reached the peak level. However, even in that period our executives and core staff continued their activities uninterruptedly. Later, in line with the plan we made, we continued our activities without interruption by working in three groups, in rotation for 9 weeks, from March 30th to May 30th. We carried out our activities from 07:00 a.m. to 23:59 p.m. This plan included Saturdays and increased social distancing measures to the maximum in our working environment by having only one-third of our staff at our facilities at all times. Moreover, we launched the utilization of personal protective equipment, particularly the use of masks. We started to measure body temperatures at the entrances, had meetings in virtual environments, suspended visits and travel as much as possible, prioritized hygiene, provided our staff with transport options to prevent a reliance on public transport and suspended all socializing in the common areas in our facilities. Furthermore, we constantly reminded our staff of the personal measures they needed to take against the disease. While we took all the aforementioned steps, we never applied any restrictions on the personal rights of our employees and maintained previous conditions in this sense. As of June 1, 2020, with the launch of the normalization process, we changed our shift operations to rotating two groups from three groups. We also increased our weekly working hours from 30 hours to 39 hours including Saturdays and, in this way, we returned to our normal standard of 42.5 working hours per week. We deemed it appropriate to observe the developments for a while longer before relaunching to a pre-pandemic type of shift system.

Defence Turkey: Are there any changes on SDT's activity schedule for 2020 in this unprecedented environment we have been experiencing due to COVID-19 pandemic?

Ömer KORKUT: Though there has been a slight decrease in our working hours, we did not face any critical problems and found the opportunity to conduct our activities continuously with the help of the measures we adopted. We did not need to make any changes in our schedule so far. Then again, we experienced setbacks in certain activities since a part of our local and foreign stakeholders were negatively affected by the pandemic. However, as I mentioned, none of them requires a change in our activity schedule and I hope we will not be obliged to make any alterations in the upcoming period.

Defence Turkey: How did the business proceed at SDT in this period, did you make any changes in the working / shift system and how did you manage processes for new contracts and acceptance / testing?

Ömer KORKUT: I touched upon the changes in our working order and our present implementation in my previous reply regarding the measures we adopted. I would like to underline that with the measures we adopted in the last 3 months where our country has been most affected by the pandemic, we primarily aimed to make our employees feel safe in their working environment. In my opinion, we have been successful in this. Since SDT continued activities throughout this period, the determining factor in the management of new contracts, acceptance / tests and other activities has been the pandemic management methods of our counterparts in those activities and their working system during the pandemic. Our only expectation from our counterparts regarding collaborative work has been the strict implementation of the measures dictated by the pandemic as part of the activities conducted outside SDT's facilities and we have not faced any problems in this regard so far.

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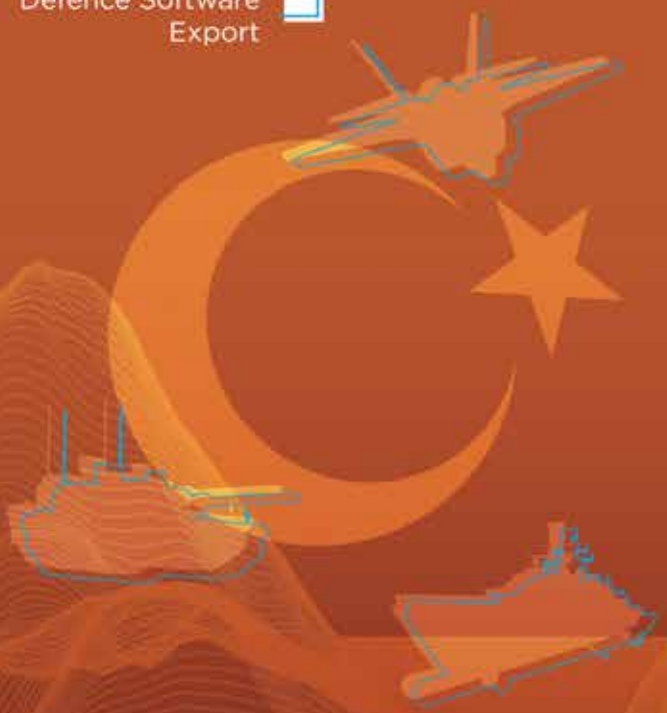

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Defence Turkey: Could you please inform us on SDT's export activities?

Ömer KORKUT: As I also mentioned during the first part of our interview, we, as SDT, have increased the share of export sales in our turnover to over 20%. Still, we aim to reach higher figures. The size of the defence market in our country alone cannot maintain sustainable and robust growth in our sector. Therefore, marketing both our products and our solutions to foreign countries at competitive prices has become a requirement. The revenue we will achieve this way is vital in funding our R&D activities and for the development of high technology solutions to meet the requirements of the Turkish Armed Forces' and our security forces' through national facilities as much as possible. We are pursuing our activities in line with this target. Though the on-site performance of such activities has been affected by the COVID-19 process to a certain extent, we still conduct our business development, marketing and bidding activities in a quite extensive geography from the Middle East to South and South East Asia and from Africa to South America uninterruptedly via the contacts we have made in the electronics sector. Within this framework, I believe that speaking of our data link project which is in progress as part of South Korea's New Generation Combat Aircraft (K/FX), would be appropriate in terms of displaying the level achieved by our export activities as they are a high technology country.

Defence Turkey: You mentioned the Far East, Middle East, and Africa as SDT's target markets. Could you please inform us on the ongoing tender processes in these regions and the needs of these regions?

Ömer KORKUT: As a defence company, surely our focus is on covering domestic and foreign defence requirements and to establish a significant market presence. On the other hand, efforts on the utilization of capabilities acquired and products developed in the defence area in various sectors and accordingly in various markets have been gaining more importance in achieving sustainable growth. Similarly, adapting the capabilities developed by sectors other than defence in line with the demands of the defence industry is equally critical and valuable. Therefore, as SDT we have been working on developing capabilities that will enable these transitions, through flexibility and building cooperation. For instance, we observe that a part of the data entry system and similar products we develop for the platforms of our main sector could be easily adapted to various platforms in the civil sector. In this case, we believe that the transportation sector and its related market could be a target for us, so we have been working on this and have been following the requirements.

Despite our product-based approach, as required by our sector, we also closely follow the projects in our fields of activity and strive to take part in the projects that correspond with our capabilities. In this sense, we are following the RF jammer projects ranging from manpack-type to vehicle-type and exerting maximum effort to provide solutions and products for these projects. In addition, we are following the tender processes where we could fulfill the anti-drone requirements of defence users and non-defence users through solutions including our Electronic Warfare capabilities and we are participating in these projects as the main contractor or a solution partner.

We follow the tender processes launched to meet the requirements of Turkish Armed Forces and security forces regarding simulation systems and we endeavor to be involved in such projects. Similarly, we pursue tenders in the simulation area in our target markets abroad and place our bids on those projects. Additionally, we are conducting activities to market our SMART Shooter Training Simulator that we developed in the simulation area to position it within defence industry simulation projects. Similarly, we are engaged in the marketing activities of our Tactical Training Pod, targeting foreign countries. We developed this product for our Air Forces Command and hope to launch its serial production soon.

We collaborated with Telespazio previously and now we are negotiating with this company on a new project that entails the utilization of our satellite ground station capabilities in compliance with developing information technologies as part of an offset agreement and we are close to finalization. We have been executing activities that draw upon the experience we have accumulated regarding satellite ground stations, not only in local projects but also to serve as a solution partner in potential international projects.

Furthermore, we are following NATO's demands and tenders. We are involved in the projects in our activity field from their initial stages and take part in the tender processes with our bids. In addition to NATO, we also are involved in European Union projects and consider these projects, that launch new technologies through cooperation, as a funding source for the development of our R&D capabilities and strive to play a role in them.

Defence Turkey: What would you like to say about the future? What are your projections, targets and expectations regarding 2023 which will be the hundredth anniversary of our Republic and the 18th anniversary of the establishment of your company?

Ömer KORKUT: Without doubt, the year 2023 in which we will be celebrating the first century of the Republic of Turkey that we aim to maintain forever, will be a very special year for all of us. As SDT, we have added special goals to our plans for this crucial year. We will mobilize all our capacity and capabilities to achieve these targets within this 2.5-year- period. A group of these targets are the ones we aim to achieve in SDT's current main activity fields, and the others are those which we either already identified or will identify in areas that we plan to be active. As of today, I can say that we are planning certain surprises and you will not have to wait long to hear about some of them. In the upcoming period, as SDT, we will continue our efforts in transforming our capabilities and presenting products with new capabilities and creating products that fulfill not only the demands of the defence industry but also the requirements of other sectors. We will also work on branding and developing capabilities and products in innovative areas which we have not been active before. Both the local market and the international markets will be the focus of all these activities. In other words, increasing our export sales will always be amongst our priorities in our operational targets.

Defence Turkey: You actually revealed some clues related to those surprises and stated that certain activities on transportation might be conducted. It seems that we will be gradually seeing SDT in the civil sector in this period.

Ömer KORKUT: Yes, as I said before, we need to create new funds to support our R&D activities so that we can better serve our defence sector. We have to offer the capabilities we develop not only to the service of the defence industry but also to the other sectors in our country as the defence industry is one of the leading sectors with the highest level of added value not only in Turkey but also in all global economies. Therefore, introducing such capabilities to neighboring sectors should be our actual target. This in fact should be the target of the overall defence industry. When we take a look at the developed countries, we see a decrease in the number of companies based merely on defence. Most of the companies are taking part in horizontal sectors as well. They involve at least in cyber security. Cyber security is not merely an area of defence industry. It corresponds with the whole information technologies sector but nowadays it is mostly associated with the defence sector. Therefore, entering these areas is critical for both creating funds and for positioning our capabilities in these fields.

Defence Turkey: SDT has been focusing on developing products in areas where advanced technologies gain prominence and providing indigenous solutions via local capabilities in certain vertical competence areas focused on R&D. SDT's existing projects mainly focus on R&D based activities. Please provide some details about current R&D activities, achievements, and future targets.

Ömer KORKUT: As you have also mentioned, a substantial part of the capabilities acquired by SDT has so far been the outcome of the R&D activities conducted in vertical competence areas. The following list may be considered among our most prominent areas of expertise and activities in this regard:

- Synthetic Aperture Radar based signal and image processing capability,
- Ground station solutions for observation satellites,
- Data recorder system, platform management system and weapon management system products we design and manufacture for various platforms,
- Simulation products and capabilities, Air Tactical Training Pod (ACMI) developed particularly for our Air Forces and tested successfully in F-16s,
- Our capabilities as part of Electronic Support Measures and Electronic Counter Measures as part of Electronic Warfare and specifically our RF jammer product group developed with our business partner.

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SDT ACMI System is seen on the wing of the TuRAF's F-16 Aircraft

We will carry out activities in these areas by focusing on branding and developing derivative products in the upcoming period. Additionally, we will work on developing RF products that will enable detection, identification and tracking with new technologies in remote sensing areas. Differently from all these areas, we will be including new areas of activity that contain the technologies of the 21st century, notably the internet of things concept. These new areas to be added to our present vertical competences will integrate our electronic design capabilities with our software development capacity. To this end, we will focus on developing innovative products and solutions that could be utilized particularly in unmanned systems.

Defence Turkey: As an enterprise focusing on 'know-how' and technology, how do you achieve the balance between the research infrastructure and the manufacturing capability of SDT?

Ömer KORKUT: Actually, R&D and production are complementary capabilities. Transforming design capabilities improved through R&D into a prototype and eventually into a product and having the capacity to manufacture them is quite valuable. In this sense, SDT is among the few companies in its segment to feature all these capabilities. As you may know, at SDT we are not only manufacturing the products we designed, by using our electronic production infrastructure, but we also produce the products designed by our shareholders. Similarly, we use our test infrastructure for both the testing of our own products and to meet the requirements of our stakeholders in this area. Our production capacity enables the launch of our own designs while it provides an income through the manufacturing service we offer to our stakeholders. Then again, we have always considered SDT to be a technology company. We benefit from our strong electronic production not as an alternative to our R&D capabilities but as the complementing factor of our activities and turn it into an advantage. Correct planning is of vital essence at this point as we need to utilize the production capacity, we own to fulfill our internal demands and to complete production projects assigned by our stakeholders during the committed period.

Defence Turkey: Would you like to convey any messages to our readers?

Ömer KORKUT: I have been following the Defence Turkey Magazine since its first issue and this magazine has been filling a critical gap not only for me but also for our sector in terms of informing and directing the sector as well as relaying information on global developments and contributing to our vision. In this sense, I am very pleased to give my first interview at SDT to such a distinguished magazine. I hope to meet face to face after this normalization process and give good news on our company to your magazine and to our sector. Thank you.

Defence Turkey: Thank you very much for this interview...

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Congratulations

for the 100th issue

Cenk Şen
General Manager of
TURKSAT A.Ş

The mission of Defence Turkey Magazine in the defence industry is undoubtedly very important. I would like to express that the themes and topics determined by the Defence Turkey editors shed light on the industry and that the magazine has performed a significant task. Thanks to Defence Turkey Magazine, which keeps its finger on the pulse the Turkish defence industry, we as Türksat A.Ş. are able to track the recent developments in this sector, which we follow very closely. We see Defence Turkey as our travel companion in terms of promoting our R&D and marketing activities, and follow it with interest.
On this occasion, I congratulate the 100th issue of Defence Turkey and wish the team continued success.

Taner Düvenci
Açık Holding Board Member

I would like to express my gratitude to Defence Turkey, which is one of the most important magazines in the field of Defence and Aviation in Turkey, for reaching its 100th issue. I wish Defence Turkey continued success, which has made the Defence and Aviation Industry's voice heard at home and abroad with a professional manner since its first issue, and I congratulate all its employees and contributors.

Burhan Özgür
General Manager, İŞBİR
Elektrik Sanayi A.Ş.

I hope that Defence Turkey, which has fulfilled its mission of shedding light on the Turkish Defence Industry effectively, will successfully continue to be the voice of the sector, with the responsibility of serving the Defence Industry.

Selçuk Şentürk
General Manager, CES
Advanced Composites

I congratulate the 100th issue of Defence Turkey magazine, which is the voice of our Defence and Aviation industry and one of Turkey's prominent publications.
I wish to be together in the beautiful future where the effectiveness of our country in the global market further increases, with our domestic and national products and also with your contribution. Wish you continued success.

Congratulations

for the 100th issue

Koray Gökalp
CEO of Masttech

I wholeheartedly congratulate the Defence Turkey team, which has undertaken and successfully fulfilled an important mission in the defence industry journalism for many years, and I wish them continued success...

Selim Baybaş
Ceo of Nurol Technologies Inc

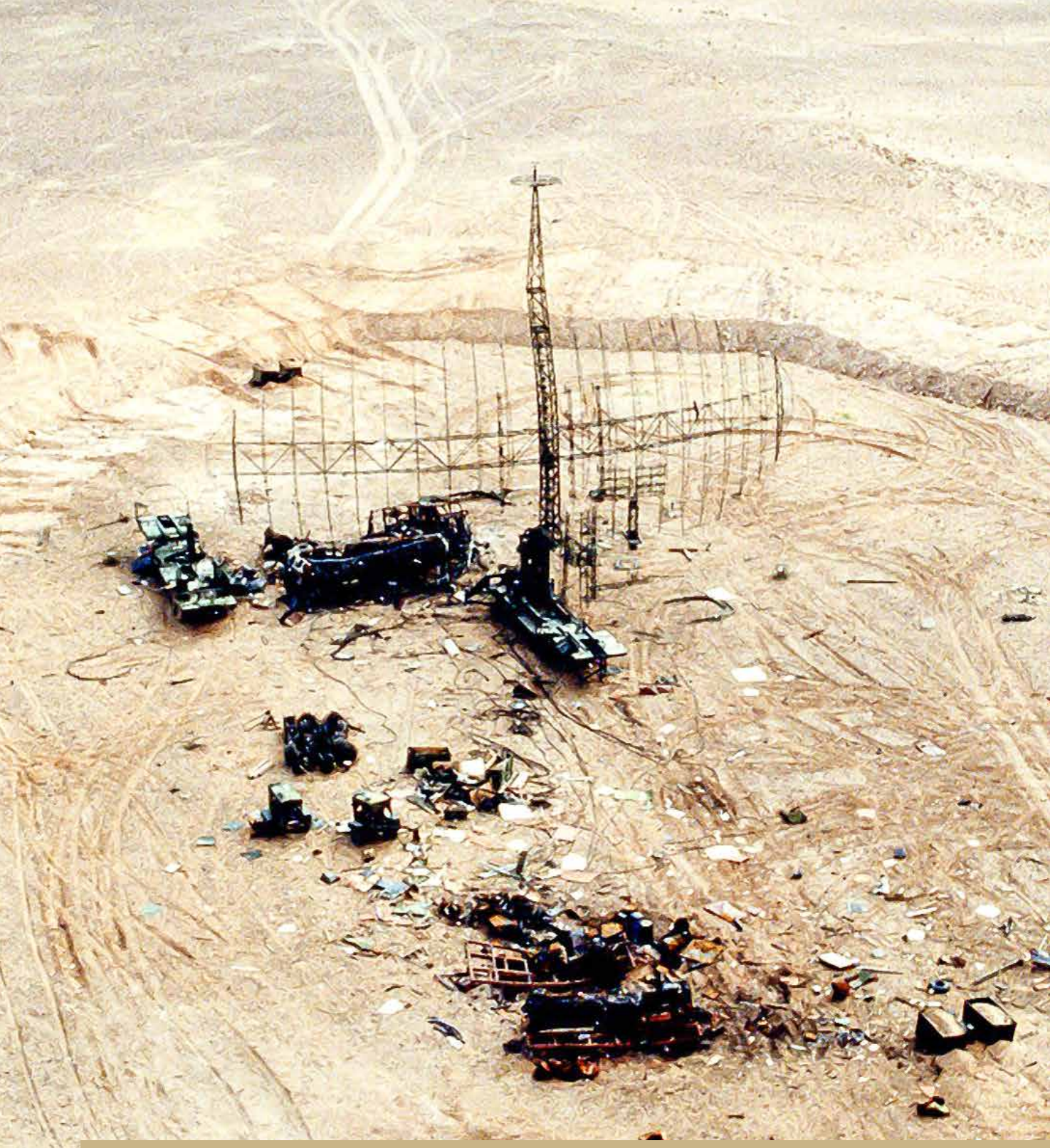
'Congratulations to all at "Defence Turkey" on your 100th issue. As 'Nurol Technologies Inc.', the only manufacturer of ballistic ceramics and ballistic protective hybrid solutions in Turkey, we are looking forward to the next hundred, keeping up the same high standard of reliability, value add and rich content.'

Orhan Muratoğlu
Vice President Business Development
TÜBİTAK BİLGEM

DEFENCE TURKEY Magazine continues to raise awareness in its long-running and stable publishing life. While providing the latest and accurate defence and security news, everyone in the industry is getting informed about the most recent developments, and thanks to the interviews about the current issues, it keeps its finger on the pulse of the industry. Wish you many more issues!

Kadir Yılmaz
General Manager,
Vaneda Ayakkabı San ve Tic. A.Ş

We sincerely congratulate the 100th issue of Defence Turkey magazine, which brings together the recent developments in the defence industry for its readers. We also congratulate the entire team, which creates value with their work, and wish them continued success.



An Analytical Perspective on the Competition Between Air Defence Systems and Guided Air-to-Ground Munitions

Dr. Feridun TAŞDAN - Western Illinois University

Introduction: Until today, conventional wars begin primarily in the air, and after the establishment of air superiority, the remaining stages of the war continue as the destruction of critical land and sea targets of the other side. According to the forecasts for the next 10-20 years, it will be extremely challenging to gain air superiority and to approach hostile targets protected by modern and integrated air defence systems using classical methods. New and improved systems are being developed that can intercept not only warplanes but also long-range cruise missiles and even short-range munitions such as JDAM before reaching their targets. For example, it has become possible to decrease the accuracy of JDAM-like bombs by jamming their GPS signals or destroy them mid-air with anti-aircraft guns using programmable air-burst smart rounds. To protect themselves and penetrate the enemy's highly protected airspace, warplanes must have certain capabilities such as stealth, electronic support, jamming, data fusion, and effective command control. Likewise, long-range cruise missiles or short-range (around 15km) laser-guided smart munitions classified as Precision Guided Munitions (OGM), will have to operate in much more challenging conditions now. Because thanks to the advancements in sensor and missile technologies, different air defence systems (low, medium, and high altitude) under the management of modern and integrated command control systems with a high hit probability, can now engage various types of air threats more effectively.

During the 1990 Gulf War and then the 2003 invasion of Iraq, the U.S. Air Force (USAF) used approximately 1.5 Precision Guided (Smart) Munitions per target, considering that the probability of PGMs reaching their target is over 95%. On the other hand, if we look at the sortie to target ratio in World War II, approximately 1,000 bombers and 9,000 unguided (dumb) bombs were used to kill a ground target. During the Vietnam War in the 1970s, about 30 sorties and 176 unguided bombs had to be used for each target. By the 1990s, the GBU-10/12 series Laser Guided Bombs (LGB) started to be widely used, thus allowing one munition/sortie to be used against one ground target. Today, in parallel with the advancements in GPS and other guidance technologies, 80 different bombs can be used against 80 different ground targets in a single sortie by the B-2 or other bomber aircraft of the U.S. Air Force. But what about the situation in 2020 and beyond? How long will short or long-range smart bombs, which use several different guidance techniques and are much more developed than in the 2000s, be able to maintain their dominant effects on targets? The answer is that combat technologies are not developed on a single axis, and similar advancements can now be observed in air defence systems and other passive interception systems.

Estimating the probability of Precision Guided Munitions (PGMs) reaching their targets without being hit in current and future air-to-ground operations is quite challenging. For example, numerous factors such as the capabilities of the hostile air defence systems (reaction time, radar, the effectiveness of E/O systems, ECM resistance, etc.), training & readiness levels of the soldiers who use these systems, and maintenance infrastructure can affect the success of the hit and the destruction of the target.

Israel, the city of Be'er Sheva. Shot a missile defence system "Iron Dome." November 15th-2012. The second day of the military operation, " Pillar of Defence"

Additionally, it would not be wrong to predict that today's developed and currently developed air defence systems will have AESA radars using advanced Gallium Nitride (GaN) semiconductor technology, R.F. signal processors with high computing capability, passive IIR guidance capability, ECM resistance, and a well-integrated layered radar network. In addition to air-breathing targets, the efficiency of air defence systems will continue to increase against guided munitions with low radar cross-section (RCS). For example, Israel's combat-proven Iron Dome system, which was actively tested in actual battlefield conditions, is stated to have a successful engagement rate of over 90%. The hit-to-kill system is designed to intercept and destroy short-range Katyusha type, or longer-range 122mm rockets and artillery shells fired by Hezbollah. It is

possible to purchase and modify a similar system by another country and use it to counter cruise missiles and other sensitive guided munitions in case of an attack on an airbase. Manufacturers of air defence systems such as Skyshield, C-RAM, and Pantsir S1 insist that their products are effective against all air-breathing targets, including precision-guided munitions. Military officials and various strategic research centers in Washington DC now state that military targets protected by these systems cannot be destroyed with only one sortie or one munition.

An Analytical Look at The Competition Between Air Defence Systems (ADS) and Precision Guided Munitions (PGM)

In recent years, during the airstrikes conducted in the Syrian territory, Israel employed different munition types such as Delilah, Spice, or JDAM against various ground targets that Israel perceived as a threat. Similarly, in April 2017, the United States launched 59 Tomahawk cruise missiles from the Mediterranean against 20 different targets at Shayrat Airbase controlled by the Syrian government. Also, in 2018, NATO countries led by the United States carried out a missile strike on another location in Syria with a total of 109 Scalp, Tomahawk, and JASSM-type cruise missiles. The common point of these attacks is the use of many cruise missiles despite the small number of targets. In September 2019, the attack carried out with a total of 20-25 drones and missiles against two different Saudi Aramco oil refineries in the west of Riyadh caused significant damage to the facilities despite the existence of a Saudi Patriot battery tasked with protecting the facilities. The attack is believed to have been carried out using a piston-powered drone named Afif, which is presumed to be the Iranian copy of Israeli-made Harpy, and a mini turbojet-powered cruise missile named Quds-1 supposedly produced in Yemen with the help of Iran.

Figure-1

Based on these examples, let us try to answer how many PGMs should be used to destroy a target/target group with analytical methods. At the first stage, the mathematical comparison of the relationship between PGM and SAM will be evaluated regardless of the time variable. Additionally, it was assumed that PGMs were launched from aircraft or ships to their targets without engaging in air-to-air combat.

Hitting/intercepting an aerial target with a Surface-to-Air Missile (SAM) system can be considered a two-result probability experiment. Based on whether the air target is destroyed or not, we can interpret the result of the experiment as the Air Defence System was successful or failed. For example, let us assume the hit/interception probability of air targets entering the airspace protected by an air defence system (it can be a single mobile system or a battery consisting of several systems) is 80% (i.e., the successful interception probability of the SAM battery is ph=0.80). In case of failure, the Air Defence System will miss its target with qh=1-ph=0.20 probability, and it will be possible for the Precision Guided Munition to reach its target with a 20% chance. In short, the Air Defence System's failure to protect the target position indicates that a certain number of smart bombs will be able to reach its target.

Let us assume that n PGMs have been launched from a fighter jet or other ground or naval systems independently of each other to reach a targeted region/point. Suppose that variable X has a binomial probability distribution as a coincidence variable and indicates the number of PGMs that has successfully reached its target. Here we can consider the parameters of the binomial probability distribution as n (total number of PGMs launched independently), ph (probability of successful SAM system interception, i.e., the probability of PGM failure), and qh=1-ph (probability of each PGM reaching their target, probability of SAM system failure) respectively. In this case, we can accept $P(X \geq 1) = 1 - P(X = 0)$ using the binomial probability distribution function. In the second stage, we can expect the $P(X \geq 1)$ value (probability of at least one PGM to reach its target successfully) to be a minimum probability value. Assuming that this minimum probability value will be the pk, the relationship between the n and the probabilities of pk and ph is $n \leq \log(1-pk)/\log(ph)$. We can explain the meaning of the n value above as at least how many PGMs should be used, if we consider the probability of at least one PGM reaching its target is pk, and the probability of SAM systems successfully intercepting PGMs is ph.

As illustrated in **Figure-1**, if we consider the probability of at least one PGM reaching its target as pk=0.97, and the likelihood of SAM systems successfully intercepting PGMs ph=0.50, at least n=5 PGMs will be required to hit the target. Again, if the Air Defence System's

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interception success is accepted as ph=0.80, n=16 PGMs should be launched to a single target so that at least one PGM can reach its target with a probability of 97% and above. This is explained in **Figure-1** shown above. As can be seen, as the successful hit probability (ph) of the SAM system increases, the number of PGMs required to destroy the target increases exponentially. It will be quite a challenge to penetrate a defence line consisting of modern Air Defence Systems that operate integrally, as can be seen in today's conventional wars.

Considering the possible pk and ph values together, the total PGM launch (n) matrix required for at least one PGM to reach its target is estimated in

In the matrix above, the probability of at least one PGM reaching its target is defined as pk, and the probability of successful interception of the air defence system is defined as ph, and the number of PGMs that must be launched to the target for at least one hit is estimated (n). For example, when an Air Defence System's probability of successful interception is considered ph=0.75 under the condition of at least pk=0.95 probability, at least n=10 PGMs will be required for at least one PGM to reach its target. If we look at the maximum limits (99% Air Defence System interception rate and 99% PGM hit rate), we can see extremely high results that approximately n=458 guided munitions must be used. The 99%

n=Total PGMs Required	Pk=Probability that at Least One PGM Reaches a Target												
	0,5	0,55	0,6	0,65	0,7	0,75	0,8	0,85	0,9	0,95	0,97	0,99
0,5 n=1	1	1	2	2	2	2	3	3	4	5	7	
0,55	1	1	2	2	2	2	3	3	4	5	6	
Phn 0,6	1	2	2	2	2	3	3	4	5	6	7	
ADS 0,65	2	2	2	2	3	3	4	4	5	7	8	11
Probability of 0,7	2	2	3	3	3	4	5	5	6	8	10	13
Intercept 0,75	2	3	3	4	4	5	6	7	8	10	12	16
0,8	3	4	4	5	5	6	7	9	10	13	16	21
0,85	4	5	6	6	7	9	10	12	14	18	22	28
0,9	7	8	9	10	11	13	15	18	22	28	33	44
0,95	14	16	18	20	23	27	31	37	45	58	68	90
0,97	23	26	30	34	40	46	53	62	76	98	115	151
0,99	69	79	91	104	120	138	160	189	229	298	349	n=458

Table-1

success rate for both sides means that the events are certain to happen, so an unusually high number of PGMs is required for at least one hit.

The number of PGMs that should be used to hit and destroy the target will also determine the number of sorties. As can be seen from **Table-1**, an Air Defence System with high ph will also require a high number of PGMs. For example, if we accept our criteria as ph=0.75 and pk=0.95, at least 10 PGMs will need to be launched so that at least one of them can reach its target. In case of using the lightest 500lb GBU-12 LGB or GBU-38 JDAM, each aircraft will need to load four bombs, and 2.5-3 sorties will be required. If we want to use a long-range cruise missile such as SOM, it means that about 5 F-16 aircraft sorties (each plane can carry 2 SOMs) need to be conducted against a single target.

This article aims to show readers the analytical relationship between Precision Guided Munitions and Air Defence Systems in a simplified form. Of course, it is almost impossible for an Air Defence System to have a 99% success rate in a real conflict. Moreover, the number of missiles ready to fire in a SAM battery will never reach numbers like 100-200. In real-life conditions, success rates of Air Defence Systems can be reduced by using different tactics such as electronic warfare, decoys, and surprise attacks.

Reviewing the Relationship Between Precision Guided Munitions and Air Defence Systems with the Queuing Theory: We can compare the launch of a Precision Guided Munition (PGM) and the process of reaching its target to a customer who walks toward the checkout at a market. On the other hand, the Air Defence System can be considered as the cashier serving its customers. Since the relationship between the PGM flying towards its target and the SAM system, which tries to engage and intercept it, is time-dependent, it will be regarded as a scholastic process (Markov Process) and will be examined using Queueing Theory.

Suppose there are s Air Defence Systems (s service stations) that protect the target area. We can assume that the average engagement rate (service rate) of each Air Defence System has the μ parameter for each system. We can accept the average arrival rate of PGMs as λ. If we accept the queue discipline as first come, first served, the SAM system will prioritize the first detected PGM and start the engagement process accordingly. Let us suppose that the

number of arrivals of PGMs matches the Poisson distribution with the λ parameter, and the SAM system engagement rate (service rate) matches the Exponential distribution with the μ parameter. Considering the arrival of PGM as birth, and the interception of the target by the SAM system as death, our queueing model, in simplified form, can be defined as Birth and Death model with s service stations described by M/M/s code. Here we will give the mathematical details of the formulas as simplified as possible.

One of the factors that determine the system's performance in Queuing Theory is the relationship between the arrival rate and the service rate. This ratio is the $\rho = \lambda/(s*\mu)$ equation called traffic density. If the traffic density (ρ) ratio is $\rho > 1$, it means that more customers come to the service station than the system can handle. In the relationship between PGM and SAM systems, $\rho > 1$ means the saturation of the SAM system with s firing units. Then the question to be asked is how many PGMs should be used against the target at the same time (Time on Target) to saturate the Air Defence System. As can be understood from the $\rho = \lambda/(s*\mu)$ formula, the system will reach saturation according to the λ, μ, and s values.

For example, let us assume that there are four air defence systems in the target area that can operate independently with 360-degree engagement capability, and the average engagement rate of each system is μ=5. In this case, to achieve $\rho > 1$, the service rate will be $\lambda/(s*\mu)>1$, and the result will be $\lambda>(s*\mu)=20$. This means that to saturate the Air Defence System, $\lambda > 20$ number of PGMs should be on the target (ToT) at the same time (within 1 minute). In short, during the planning phase of an operation, the types and number of munitions to be used, as well as the need for electronic warfare, are determined based on the information about the Air Defence System located in the operation area.

λ	μ=8	$\rho = \lambda/(s*\mu)$	Lq=E[Qq]	Wq=E[Tq]
5	8	0.156	0.000	0.006sn
10	8	0.312	0.019	0.114sn
15	8	0.468	0.127	0.510sn
20	8	0.625	0.533	1.602sn
25	8	0.781	2.011	4.824sn
30	8	0.938	12.975	25.950sn

Table-2: Number of PGMs required for a successful attack on a target position using Queue Theory

In a possible scenario (**Table-2**), let us analyze a PGM attack on a target position using Queue Theory, assuming that the area is protected by 4 Pantsir-S2 (or TOR-M2) firing units. Let us suppose that according to the fundamental rule of Queueing Theory (first come, first serve), the first PGM will be engaged without waiting. Although this point air defence system, which operates according to the CLOS (command line of sight) guidance principle, has 360-degree engagement capability and a 40km range S-band search radar, with a 30km range EHF band engagement radar, and an IR/TV guidance system has CLOS guidance capability in a 90-degree sector only. Therefore, let us assume that at least 4 Pantsir-S2 firing units protect the target area against PGM attacks (to have 360-degree engagement capability) that can come from different directions at the same time. The unit of time will be considered in minutes. As parameters, let us assume that PGM time on target ratio is $\lambda=(5,10,15,20,25,30)$, the average target engagement rate of each Pantsir unit is μ=8, the number of Pantsir units is s=4, engagement capacity (density) is $\rho=\lambda/(s*\mu)$, the number of PGMs waiting in the queue before the engagement is Lq=E[Qq], and queue time for engagement (seconds) is Wq=E[Tq]. The following table was created using the M/M/s birth-death model and the R software program by giving the estimated values to these parameters.

As it can be understood from **Table-2**, during a PGM attack on a target protected by 4 Pantsir-S2 units, if the number of PGMs required to reach the target is between $25 < \lambda < 30$, the engagement capacity (density) will be between $0.781 < \rho < 0.938$. If $\lambda=25$, then Lq=2.011, meaning the number of PGMs that have not been engaged yet (the number of PGMs waiting in the queue for engagement). If Wq=4.8 sec, it shows the expected time for engagement in the queue. Especially in the case of $\lambda=30$ PGMs, it is seen that at least Lq=12.95~13 PGMs will wait in the queue for engagement, and the average waiting time of these PGMs will be approximately Wq=25.95~26 seconds. Naturally, PGMs that have not yet been engaged (waiting in the queue) will not remain in the air, like a market customer, and the target will be destroyed in a few seconds. If $\lambda>32$ (in case of using 32 PGMs or more), the system will be completely saturated ($\rho>1$). Naturally, real war conditions are very different, and the theoretical figures described here may not reflect reality. For example, it may be possible to use decoys instead of real PGMs, or the rapid engagement capability of the Pantsir units can be abbreviated with remote electronic jamming. For example, if Pantsir's engagement rate per minute is reduced to 2-3 (such as μ=2), the system can be saturated using a much smaller number of PGMs or decoys. Using low RCS munitions such as Delilah, decoys, electronic countermeasures (ECM), and combat tactics such as surprise attacks may play a critical role in Israel's success against Pantsir systems in Syria in recent years.

Conclusion and Suggestions

In peacetime, the existence and models of air defence and other passive interception systems owned by hostile countries should be identified, and countermeasures should be developed against these systems. In short, it is necessary to have a robust intelligence network and advanced E.W. systems to decrease the effectiveness (reducing the probability of interception) of enemy Air Defence Systems. These E.W. systems include long-range electronic support and countermeasure systems for signal intelligence (SIGINT), land/ship-based electronic support/countermeasure systems, or signal blocking devices (jammers). Returning to the matrix above in Table-3, when we reduce the probability of successful interception of the air defence system from 75% to 50%, the number of PGMs required for at least one hit with a 95% success rate decreases from 10 to 4. Likewise, in addition to the E.W. systems, air-launched decoy missiles such as the ADM-160 MALD (Miniature Air-Launched Decoy/USA) and ITALD (Improved Tactical Air-Launched Decoy/Israel) can also be deployed to trick hostile Air Defence Systems into spending their missiles and ammunition on false targets instead of real targets. Thus, real munitions can be used in the second wave that will follow immediately.

Various factors such as stealth-configured specialized structure geometry and the use of RAM paint and composite materials should also be considered to reduce the radar cross-sections of cruise missiles like SOM as much as possible. Secondly, cruise missiles with advanced guidance systems such as SOM may be upgraded with new features such as swarming capability, networking, and smart flight management systems that can monitor each missile's status and automatically direct them to another nearby target that is not hit yet.

Pantsir-S1 (SA-22 Greyhound) an anti-aircraft missile artillery complex at the International military technical forum ARMY-2018, MOSCOW OBLAST, RUSSIA

While countries such as the USA and Israel are developing different sized guided munition options, they have started to prioritize small diameter guided munitions. The USAF and US NAVY are currently investing in 120kg SDB (Small Diameter Bomb) munitions that use two or three different types of guidance, such as GBU-39 (SDB-I) and GBU-53 (SDB-II). Thanks to their control surfaces and guidance systems, these bombs can reach a range of 100 km when launched at medium-high altitudes. An F-16 aircraft can carry a total of 8 SDB-I/II ammunition with two BRU-61 ejector racks, each of which can be loaded with four bombs. Similarly, Israel has developed Spice 250 munition with multiple guidance (INS/GPS and E/O guidance) from the Spice family. It weighs 250lb (122kg) and a total of eight bombs can be carried by an F-16 aircraft.

In parallel with these developments, Turkey is also developing a small-diameter/light-weight bomb with similar guidance characteristics as the US GBU-39 SDB-I munition. Co-developed by Aselsan/SAGE, this munition, which weighs around 125kg, will have a range of 100km when launched from high altitudes thanks to its diamond-shaped folded wings like the GBU-39 SDB-I bomb. Another significant advantage of using SDBs is that it allows carrying a higher amount of munition, enabling multiple target engagements in a single sortie.

Furthermore, to provide solutions at the operational level, it is necessary to carefully monitor the swarm UAVs and smart munitions that are still in the R&D process. With the introduction of this technology, air defence will no longer be possible with conventional missile/gun systems. It will be inevitable for Air Defence Systems to adapt directed-energy weapons that utilize lasers or electromagnetic (railgun) technologies to counter swarm drone attacks.

On the other hand, in peacetime, PGM stocks should be prepared in different varieties (short, medium, or long-range) and numbers according to the priority and type (such as hard targets, soft targets, or fortifications) of targets to be destroyed. For example, while stocking a large amount of LGB/JDAM type short-range (under 20km) munitions, it is also necessary to have a certain number of medium-range (20-100km) PGMs, and finally, a sufficient number of long-range (over 100km) cruise missiles (air, ground, or sea-launched) are required to hit very high-value critical targets protected by multi-layered Air Defence Systems


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Congratulations

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Öner Tekin
General Manager, Vestel Defence

Dear Defence Turkey Team,
On the occasion of its 100th issue, I congratulate Defence Turkey Magazine and the entire team who has contributed. I wish you continued success in your future endeavors.
Kind regards,

Yılmaz Güldoğan
General Manager, Alpteknik Havacılık

Dear Defence Turkey Magazine Team,
First of all, I congratulate the 100th issue of Defence Turkey Magazine, which is an important stakeholder of our Defence and Aviation Industry. I have been following every issue of Defence Turkey Magazine for 15 years since its first issue with interest. It includes recent news, research, valuable interviews and analysis and I would like to express with pleasure that it is a source of information for us. I remember the excitement of the editorial team, as well as the troubles and difficulties of the first issue. I think the 100th issue needs to be considered as a critical threshold in all respects. The Editorial Team should have the rightful pride of being able to continue this publication for such a long time and bring it to today by working day and night. I wish you continued success in your future endeavors. It's great to have you with us!

Baki Şensoy
CEO of Altay Software Defence

''As Altay Software Defence, we would like to congratulate you with our sincere wishes and share your happiness for your achievement to reach the 100th issue of Defence Turkey Magazine.
We wish you all success in your future endeavors.''

Güntekin Güntay
Chairman of the Board
ATEL Defence and Space

I congratulate the 100th issue of Defence Turkey magazine that shows the power of the Turkish Defence Industry and contributes to its promotion in national and international media, and I wish many more successful years to come.

Congratulations

for the 100th issue

Uğur Çoşkun
Bites Defence Aviation and Space Technology General Manager

"As BİTES Defence, we follow the activities of Defence Turkey closely, which has become an important information platform for defence industry activities. We believe that the platform has achieved great success and sheds light on the defence industry. We celebrate the 100th edition of Defence Turkey magazine."

Noyan Dede
General Manager, ONUR Engineering

With its reliable journalism understanding, Defence Turkey magazine that we have been following with interest for a long time has always been a guide for companies performing activities in the defence industry, which is continuously growing.
Congratulations to the Defence Turkey magazine team for reaching the 100th issue and I wish them continued success.

Yaman Tunaoğlu
Chief Technology Officer, KAREL

I congratulate the 100th issue of Defence Turkey magazine, which is an important publication in announcing the developments in our defence industry, holding increased and in-depth competencies, to the sector stakeholders and to those interested.

Kenan Özkapıcı
Vice Chairman, RST

I congratulate Defence Turkey, one of the most successful magazines in the defence industry, for reaching its 100th issue.

ARES Shipyard Navigates Global Logistics with High Level of Preparedness

In this interview Utku ALANÇ, General Manager of ARES Shipyard discusses factors in ship-building projects that have been impacted by the pandemic, especially in military project where confidentiality and information security are strictly required. How will key negotiations be conducted in a virtual environment now that face-to-face in person meetings are not a current option? The company remains at a level of preparedness that can tolerate logistic setbacks in main equipment up to nearly six months. ARES Shipyard moves forward with ongoing projects with expert management of supply chain planning and a high level of preparedness. ARES Shipyard's serial production model in the Patrol Boat Project is set to be a first in the world in terms of volume and methodology, with first deliveries expected in the second quarter of this year.

Defence Turkey: The COVID-19 pandemic has deeply affected the defence and aviation sectors as well as our daily lives. Shall we begin our interview with your brief comments on the measures that ARES Shipyard has implemented in respect to the COVID-19 pandemic, what type of changes have been adopted, how has it impacted your business operations?

Utku ALANÇ: Before the World Health Organization officially declared the outbreak as a pandemic, the issue was brought up by our executive board in February 2020 as soon as the virus emerged in China and started to breakout across the world. Within this scope, we started to plan a series of measures in our company before it was seen in our country. These planned measures are being implemented presently.

For instance, in the first stage, starting from February 2020 we decided to postpone many of our scheduled travels abroad. We kindly postponed visit requests from foreign countries. In parallel, in our shipyard we formed a team composed of a representative from the executive management, a production representative, our workplace doctor and our occupational safety specialist and prepared a COVID-19 Emergency Action Plan. We informed all our staff simultaneously on the measures and decisions we adopted. We immediately allowed our employees who are either over 65 years old or who suffer from any type of chronic diseases to take administrative leave and advised them to self-quarantine at home. Moreover, this emergency action plan contains measures that have been graded based on nearly one hundred risk factors from the hygiene of the staff and facility, working hours and breaks, to the utilization of personnel vehicles, from changes in the food service and the seating plan in the cafeteria to the utilization of personal protective equipment and disinfectants, facility entrance/exit rules as well as the measures to be implemented for employees returning from foreign countries and the rearrangement of meetings.

Defence Turkey: Just like in other areas, the COVID-19 pandemic negatively affected exports and trade took a major blow. According to the data provided by the Turkish

Exporters' Assembly (TİM), in March exports of the Turkish Defence and Aerospace/Aviation Industry fell by 49.8% compared to the previous year and decreased by 18.5% in April. What are your assessments on the first quarter of 2020 (in terms of turnover and export figures) from the perspective of ARES Shipyard? What is the current picture when we compare the current figures with the figures of the previous year?

Utku ALANÇ: Surely, the pandemic severely hit trade all over the world. Without doubt, it is not possible to immediately observe the similar negative effects caused by the pandemic that spread in the beginning of 2020 and rapidly created deep impacts over the markets in the defence industry, particularly in the ship-building industry in the first quarter of 2020. Because, in the ship-building industry, the processes such as procurement, then design, production and acceptance need to be completed for the realization of exports and these processes are usually defined in years. Therefore, an export project planned to be realized in the first quarter of 2020 was in fact signed in 2018 – 2019. As a result, I think we can observe the tangible effects of the pandemic on ship exports in the first or second quarter of the next year, with the clarification of the projects that are pending in the contract phase, suspended or canceled.

Defence Turkey: How is ARES Shipyard proceeding during this period? What would you like to say on production activities, for example, have there been any changes in working order/shifts? How are new contracts and acceptance/test processes being managed?

© Ares Shipyard

ARES 35 Fast Patrol Boat

Utku ALANÇ: Naturally, significant changes have been made in our working order. We closed all our meeting rooms within the scope of the emergency action plan I mentioned and guided our employees to use video calls/audio calls through phone and internet/intranet-based applications. As we cancelled all our international travel and meetings abroad, we transferred all our meetings with our customers and project shareholders to a virtual environment. Since we already established our server infrastructure to be compatible with potential crises, similar to this one, we did not require any additional IT related measures or investments in this regard. With respect to our manufacturing activities, in order to protect our employees, we switched to a single work order-based operation from multiple operations especially in the vessel and outfitting departments as we took the sizes of such departments conducting production activities into consideration. There has been no changes in our pace in design, engineering and administrative areas yet surely a relative slowdown has been experienced in production. Unfortunately, this outbreak is a pandemic and therefore there are certain measures implemented both for the customers and other project stakeholders. The cancellation of all meetings, information sharing through remote access or executing meetings via internet-based applications could not be possible especially in military ship-building projects where confidentiality and information security are strictly required. Such factors may cause postponements in ongoing projects and create setbacks in negotiations for potential projects. On the other hand, there has been no cancellation on the ongoing projects or the projects we expect to realize. In fact, two of the ARES 85 HERCULES Fast Patrol Boats that we continue to manufacture were launched to the sea in the past weeks. We are executing the test and acceptance processes not in the presence of the customers but with the representation of the independent classification authorities in Turkey.

Defence Turkey: The contract on the supply of 105 ARES-35 Patrol Boats within the scope of Coast Guard Command's Patrol Boat Project was signed on February 17, 2019 between the Presidency of Defence Industries and ARES Shipyard. It was stated that in order to keep up with the contract schedule, ARES Shipyard would be completing the construction within 10 days, refitting of each of the ARES-35 Patrol Boats, built with carbon reinforced composite material with a multiple mold technique. What would you like to say on the latest status of the Project and on the deliveries planned to take place in 2020? Is it true that the number of boats has been increased to 122 and that the first delivery will be made in the second quarter of 2020 and that 6 boats will be delivered once every two months?

Utku ALANÇ: The Patrol Boat Project will be breaking a world record in terms of its volume and production methodology, because the implementation of serial production techniques in boatbuilding is quite rare and the production model to be applied by ARES Shipyard will be a first in the world. We fully believe that the delivery schedule will become a success story on its own. The contract we signed to fulfill the demands of our Coast Guard Command for 105 fast patrol

boats reached a total of 122 boats with the additional 17 boats demanded by the Turkish National Police. There are no changes in the delivery schedule. As you also mentioned, we will be delivering 6 boats once every two months and this means that nearly every week the refit of a boat will have to be completed. The critical design phase of the Project is about to be completed. The schedule was suspended for a while as we were not able to hold meetings due to the pandemic. Therefore, the launch of the first-prototype boat is planned for the end of 2020. As from the successful delivery of the prototype, 6 boats will be delivered once every two months to the Coast Guard Command and to the Turkish National Police over a period of five years.

Defence Turkey: Could you please summarize the tender process and the main factors paving the way for your success in the tender? What are the reasons why ARES was selected? Is it the price or the technological superiority that motivated the procurement authority to select ARES?

Utku ALANÇ: The tenders executed by our Presidency of Defence Industries contain an order that will serve as a model to the whole world in terms of the preliminary work, the evaluation stage and the contract stage. All bidders are subject to an evaluation, considering all aspects. Surely, the technical solution we offer fulfills the requirements of the end user exceedingly. The main reason behind this is that the experiences and competence of ARES in performance boats (fast patrol boats, torpedo boats, etc.) is beyond world standards. Also, we are well aware of our costs and we correctly manage them. Therefore, for achieving long-lasting projects we offer affordable prices and also due to our considerable experience with design and production we avoid overpricing and excessive risk pricing, we achieve the capability to remain at reasonable levels when particularly the interests of our country and our national defence are in question. On the other hand, we show ultimate sensitivity to indigenousness and offset issues that are considered amongst the main evaluation criteria. We endeavor to achieve a maximum local content rate in the platform solutions that we propose, and this surely and rightfully provide a favorable score during the evaluation stage. Last, but not least, planning is one of our strong points. We are capable of introducing quite competitive delivery schedules as a result of expert planning and appropriate implementation, all of which are a result of our seasoned experience in this sector. As you may also appreciate, the capability to execute rapid delivery is an inevitably positive evaluation criterion, especially in the defence industry.

Defence Turkey: Either implicit or explicit embargos are being imposed on Turkey by EU and NATO member countries in the last period and this causes disruptions in the delivery schedules of certain defence projects. Has ARES Shipyard suffered from such problems? Have any delays been experienced in project deliveries caused by the late delivery of the power packs, electronic equipment utilized in the boats due to such embargos?

Utku ALANÇ: Even though we observe delays and even shutdowns in almost all sectors due to the pandemic, we have not experienced any disruptions so far in our ongoing projects and in the deliveries of our sub-contractors and suppliers that would affect the main project schedule. One cannot deny the importance of collaborating with the right sub-contractors and suppliers at this point and we should definitely not ignore ARES' success in planning, production and supply chain as well. We always consider the equipment that will be required for the next boat delivery when stocking our equipment and procuring our main equipment and material from foreign countries. Therefore, we remain at a level of preparedness that can tolerate logistic setbacks in main equipment up to nearly six months. In this way, we launched two more fast patrol boats to the sea in the past weeks and started the test process. And I hope to launch two new boats in the beginning of July 2020.

Defence Turkey: Do you have any additional remarks for our readers?

We would like to thank you for your interest in ARES Shipyard

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ARES 85 HERCULES Fast Patrol Craft

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Congratulations

for the 100th issue

Ayşem Sargın
Managing Director - Country Executive at Boeing Turkey

On the occasion of its 100th issue, I sincerely congratulate Defence Turkey magazine, which is an important source for the Turkish Defence and Aviation sector. Defence Turkey won the favor of all sector representatives and became the voice of our companies with its principled publishing approach. We wish to celebrate many more of your publications in which you share the successes of our rapidly growing industry.

Banu Dincer
Country Director & Board Member
BAE Systems Turkey

Dear Ayse and the Defence Turkey Team
It seems like it was just yesterday that you set up Defence Turkey and now you've completed the first 10 years journey with great success.
Congratulations on this special day and many wishes for more great days ahead.

Elif Gürdal
Dassault Systèmes Turkey Country Manager

Reaching the 100th issue in sectoral publishing in Turkey is a success story by itself. Defence Turkey, which is the reference publication of our aviation and defence industry, has managed to determine the agenda of the sector for 100 issues, and has guided all companies and business people in this field. In this success story, we congratulate everyone who has contributed from past to present. We celebrate Defence Turkey and wish many 100th issues.

Görkem Kiriş Gümüşel
Rolls-Royce Country Director

Defence Turkey is a publication that monitors the pulse of the sector and I have been following it with interest since its inception. I would like to thank you for bringing together the recent developments in the field of defence both in the world and Turkey, and the industry-leading opinions. I congratulate your 100th issue with all my sincerity and wish your publication success in making an impact for many more years.

Congratulations

for the 100th issue

Sinan Şenol
General Manager - Chairman of the Board of Leonardo Turkey

Published in a foreign language, Defence Turkey fulfills a very important mission in order to raise recognition of our Turkish Defence Industry both at home and abroad and thus support its development. I congratulate the Defence Turkey team for their success in fulfilling this task for many years and for their 100th issue. Thank you so much for your support!

Serdar Çetingül
Honeywell Aerospace Leader CEE &Turkey

I remember as if it was yesterday when I met with Mrs. Akalin about Defence Turkey's 1st issue. Since then Defence Turkey has contributed a lot to the Turkish Aerospace Industry for their news, articles and interviews. During each of my interviews with Defence Turkey I always felt that we were a family because of their professionalism and dedication. We look forward to getting the next issues.

Selami Yumurtacı
GE Aviation Military Systems Regional Sales Director, Turkey & Balkans

As GE Aviation Turkey, one of the supporters of the Turkish Defence Industry, we congratulate the 100th issue of Defence Turkey Magazine. We wish you continued success for your magazine, which allows us to follow recent news, expert interviews, and innovations, projects and technological advances in the industry with great interest.

İdris Dumlu
Managing Director Nicomatic Turkey

As Nicomatic Turkey, we celebrate the 100th issue of Defence Turkey which is a leading media forum in Turkey's defence industry. We wish success and a long publishing life to you as you are not only our media partner but also our close friends.

The Impact of COVID-19 on the Aerospace & Defence Sector and the Road Ahead

by Arda MEVLÜTOĞLU

The COVID-19 pandemic is still continuing, and it has already inflicted heavy damage on the global economy. Virtually all sectors have suffered serious damage because of the direct and indirect effects of the pandemic, aerospace and defence being no exception. Global manufacturing networks and supply chains have been disrupted, budgets have shrunk, and programs have been delayed, the aerospace and defence sector has entered a period of uncertainty and faces multiple threats. It can be said that it will take significant time for the sector to recover to pre-pandemic levels globally.

The impact of COVID-19 on the aerospace and defence industry can be assessed under three main topics: Human resources, manufacturing and supply networks, and programs and budgets.

Human Resources

First and foremost, the main threat of COVID-19 is the threat to human life. The novel coronavirus is extremely contagious, and it quickly spread throughout the globe from China in late 2019. Millions of people have been hospitalized and many cities were locked down, bringing all social and commercial life to a halt for several months.

For the sector, one direct result is the loss in workforce, due to deaths or incapacitation resulting from the effects of the virus on the infected individual. This effect has especially been significant on small to medium sized enterprises which usually have a small number of employees.

Another impact stems from lockdowns, quarantine, and furloughs. Companies have not been able to continue normal operations due to necessary measures to protect employees and the working environment. This has especially affected companies that have manufacturing operations. In some cases, manufacturing plants and serial production lines came to complete stop.

Another critical issue has been related to information security. The aerospace and defence industry deals with extremely sensitive information regarding national security and advanced technology. Data and information about these projects must be stored and processed in a controlled, classified environment. While it has been possible for some sectors to shift employees to home-office conditions, it has not been possible for all aerospace and defence companies to make the same changes.

Manufacturing and Supply Networks

Many aerospace and defence projects involve global supply chains where contractors procure countless sub systems, components and parts from suppliers all over the world. This has been the standard mode of operation especially for the aerospace and defence sector in Western countries. The impact of COVID-19 on defence supply chains has been noteworthy. Especially many multinational development projects and production activities have been either slowed down or have come to a complete halt due to delays caused by supply chain, logistics and related disruptions.

There is also another important issue, which is that of companies not being able to meet their contractual obligations as a result of COVID-19. This includes clients being able to vary, suspend or even terminate these contracts under either certain clauses (e.g. force majeure or frustration) or statutory protections, depending on the governing law (for more on the implications of COVID-19 on commercial contracts, see our briefing). This issue has been especially critical for countries running long term projects involving technology transfers and / or support of services, such as maintenance.

Another important issue is related to the epicentre of the pandemic, China itself. For many products, China is directly or indirectly at the heart of global supply chains. While this is not always the case for the defence sector, due to information security concerns, Chinese subsystems and parts are found in many aerospace products and programs. China also produces many intermediate inputs and is responsible for processing and assembly operations. The disruption of supply chains coming out of China is a major risk factor for global manufacturing networks. Furthermore, it is expected that US – Chinese relations will be further strained in the post COVID-19 era, multiplying the risk factor for programs and products that involve Chinese suppliers.

Programs and Budgets

One immediate and direct impact of the pandemic has been on defence budgets worldwide. The COVID-19 pandemic has forced governments to focus their spending on healthcare and safeguarding the economy, which could possibly result in shifting priorities away from defence. Some Asian countries have already announced cuts to their defence budget for 2020.

Global defence spending exceeded $1.9 trillion in 2019 marking the highest since 1988, according to research conducted by the Stockholm International Peace Research Institute (SIPRI). India and Thailand are some of the first countries to have announced a reduction in defence expenditures amid the COVID-19 crisis.

The pandemic and its aftermath will pose a significant challenge to NATO. Even if NATO members continue to aim for the 2% of GDP target for defence spending, holding present budget lines will be difficult as projected national GDP growth is affected by the economic impact of the pandemic. This could even result in more NATO states reaching the 2% target while actually spending less in real terms on defence if overall GDP falls. In the near term, acquisition programs face being disrupted by enforced change within defence industries, which have their own pandemic challenges. Underlining this risk, NATO Secretary General Jens Stoltenberg has recently highlighted the need to keep up defence expenditure despite the uncertain economic conditions.

Development programs, procurement budgets and military roles will probably be re-defined. The role of armed forces and their ability to respond to humanitarian crises as well as disasters will move to the forefront. Consequently, development and procurement programs under health, humanitarian support, logistics topics will likely have higher priorities. Another aspect of this shift in priorities could be adverse public opinion to high profile, high cost projects, especially in European countries where public oversight and control on defence spending is extremely strict. Government and armed forces performance during the early stages of the pandemic, especially in European countries, will likely shape defence spending and thus the structure and focus of the sector in the coming years.

The Future: Post-Pandemic

In the longer term, companies will likely face cash-flow shortages and production challenges throughout the supply chain that may weaken the industrial base that supports complex manufacturing. Defence contractors will likely experience slowing demand due to shrinking budgets and procurement priorities and a flattening of the growth curve over the long term as national governments seek to reduce deficits and control expenses. It can be assessed that:

Companies may lose market share if they fail to deliver or if they are unable to invest in new products during the downturn.

The risk of critical program failure, significant delays in delivery times and project cancellations is likely to rise.

Key suppliers and specialized providers may become financially stressed and require government incentives and support.

One major question for defence companies will be the safety of employees and conducting a safe mode of work while preserving continuous operations in a secure, classified information environment. As such, maintaining and supporting critical workforce, especially highly skilled and experienced managers, team leaders and executives will be a top priority, which will require extra financial resources.

Sustaining production in a constrained environment involving social distancing will require additional, unforeseen investment in terms of physical and IT infrastructure. This requirement will put an extra burden on already stressed budgets and will also require a transformation period. Those companies that demonstrate the ability to adopt this "new normal" will have more of an advantage in the post-pandemic market environment.

Design and development procedures will need to be re-defined, which means full endorsement of advanced information and communication technology protocols, infrastructure, and capabilities. A new mode of global supply and a manufacturing network will be defined but this will only be possible through close coordination between governments and the sector.

Procedures and criteria for selecting sub-contractors and suppliers will likely be changed. Large companies will be forced to consider creating alternative supply chains and will develop new manufacturing strategies.

Capability to develop and manufacture dual-use technology and products will be a critical advantage for companies to sustain cash flow. Companies that are specialized in a limited number of fields applicable only to military solutions will face higher financial risks in the post COVID-19 era ■

Congratulations

for the 100th issue

A.Vedat Yakupoğlu
YAKUPOĞLU A.Ş. Chairman of the Board

Defence Turkey magazine, which we have been closely following and with which we have been working for a long time, has always been a guide for the defence industry companies about our continuously developing defence industry, with its pioneering and reliable journalism understanding. Congratulations to the Defence Turkey magazine team for reaching the 100th issue and I wish you continued success.

Tolga Güngen
MILMAST Lifting Systems International Business Development Manager

As MILMAST, we can't quite explain how rewarding it is to congratulate Defence Turkey magazine for its 100th issue. So many in our community are achievers, givers, leaders and motivators. I think that's why Defence Turkey is great: It reflects the cross-section of everything we share in common and those who provide this reflection should all be applauded. Thank you for continuing to inform the defence community!

Dr. Davut Yılmaz
General Manager – Advanced Technologies
BMC OTOMOTİV SANAYİ ve TİCARET A.Ş.

On the occasion of its 100th issue, I congratulate Defence Turkey, which is one of the prominent publications of our defence industry and has undertaken an important mission in promoting the success of our industry, especially abroad, and also congratulate the team, especially Ms. Ayşe Akalın. To many more 100th issues…

Ayhan Sunar
General Manager of AsisGuard

Dear Ayşe Akalın and Cem Akalın,
I am happy to witness the 100th issue of Defence Turkey Magazine, which plays an important role in increasing recognition and awareness in the defence industry both in Turkey and abroad by publishing sectoral developments and innovations. I congratulate you, as the publisher and editor, and the Defence Turkey team on behalf of Asisguard.
I wish for the continuation of Defence Turkey Magazine with rich and up-to-date content, from which the actors in the defence industry ecosystem will continue to benefit.
Sincerely yours,

Congratulations

for the 100th issue

Bilal Aktaş
General Manager, TRtest

From the moment of its first publication date, Defence Turkey magazine has been informing the public about national and international important developments and the activities related to the promotion and modernization of the defence industry products with its principled, neutral and enlightening approach, and we hope that the success of Defence Turkey magazine and contributions to the defence industry will continue increasingly and we extend our thanks for their devoted efforts.

Zeynep Öktem
Co Founder & CEO of Nanobiz

We congratulate the 100th issue of Defence Turkey magazine. We hope the refined, reliable and impartial publishing approach and the valuable contributions they provide to the defence industry will continue increasingly with the same understanding and principles.

Dr. Cüneyd Fırat
General Manager, Ctech

Defence Turkey Magazine, which I closely follow with great admiration, has been continuing to convey the issues related to the defence industry to its readers with a broad perspective for 100 issues. With its layout, visual material and news it contains, it offers us quite valuable information to stay informed of the defence industry. I wish continued success to Defence Turkey, which fills a huge gap in its field and which is prepared with great effort and care.

Murat Şahin
General Manager of Aselsan Sivas

It is with much pride that we celebrate the 100th issue for Defence Turkey Magazine in such a way that it also means to celebrate the dynamism of Turkish Defence industry in last decade.
We as Aselsan Sivas, actively played a role in the Turkish Defence industry in the last five years. We have been observing that all Turkish Defence Magazines play an important role in spreading useful information among all participants. Defence Turkey Magazine-one of distinction-has maintained its objective and dynamic publication policy during its 100 issues. We belive that as the Turkish Defence Industry grows, we as defence companies will be growing and Defence Turkey Magazine will be with us to support our development challanges and achievements.

Double Dutch Anniversary Heavy Rotary

by Carlo KUIT & Paul KIEVIT/ Bronco Aviation

Since September 2018 Niels van den BERG has been the Commander of 298 squadron. He started with the Squadron during 2011 when he transferred from sister squadron 300, operating the AS532 'Cougar'. One of the most important tasks the Commander has is the introduction of the new CH-47F MYII CAAS.

April the 16th of 2020 marked the 75th Anniversary of The Royal Netherlands Air Force (RNLAF) 298 Squadron which is currently operating a force of ten CH-47D 'Chinooks' and is awaiting delivery of twenty CH-47F MY II CAAS Chinooks (US Army Multi Year II program, Common Avionics Architecture System) as replacement. Due to the COVID-19 crisis the planned 75th Anniversary was postponed to a later moment. Especially COVID-19 and the introduction of the new Chinook fleet is on top of the mind of Lt Col. Niels van den BERG, the current Commander of 298 squadron. Niels transitioned from 300 Squadron during 2011 and has been 298 Squadron's Commander since September 2018. "My primary focus is to have stability in the squadron. We have worked incredibly hard over the last seven years implementing new procedures, quality assurance and improved operations which has shown to be successful. There is no need to change". Niels continues "The big challenge for the squadron is implementing the new CH-47F fleet and remaining open for business to support international missions. The moment that we have both the new CH-47F and legacy CH-47Ds in use with the squadron this will be a turning point in potentially briefly impacting availability for operations. We expect under the current COVID-19 situation to have the conversion completed by 2022". The first new CH-47Fs are expected to arrive in The Netherlands during December 2020. As Boeing Philadelphia has been identified as Critical Infrastructure, the impact by COVID-19 has been minimal. The total number of new CH-47F MYII CAAS Chinooks within the Royal Netherlands Air Force will be twenty. Fifteen will be assigned to 298 Squadron at Gilze-Rijen Air Base while five will remain with 302 Squadron at Fort Hood in the United States."

COVID-19 Crisis Impact

"After the announcement by Dutch Prime Minister Mark RUTTE on the 16th of March, in which the intelligent lockdown was announced in the Netherlands, we took a week and a half to rethink how we as a squadron would move forward" according to Niels. "We decided to focus on crew checks, flight currencies and certification flights to safeguard our basic skillset and readiness status as we are not able to set up complex exercises with our sister squadrons (300 and 301 Squadron) and the 11 Air Mobile Brigade. We have about half of the squadron working from home and rotate personnel every couple of days to avoid risks of virus infection. Luckily, 2019 has been a very good year for us in terms of training and flight hours. Therefore, we can absorb a bit before we are negatively impacted" Niels adds. The Helicopter Weapons Instructor Course (HWIC) which had been taking place at that moment in Germany was cancelled mid-March. "Currently we only allow four persons for planning and the execution of flights. Therefore, we work in solitude as a squadron".


KONINKLIJKE LUCHTMACHT

Defence Helicopter Command (DHC)

The Heavy Rotary Squadron is one of four flying squadrons which is part of the Defence Helicopter Command (DHC). Since the establishment of the DHC in July 2008, 298 Squadron transferred to Gilze-Rijen Air Base from SoesterBERG Air Base. The purpose of the DHC is to integrate all the Helicopter Units of the Royal Netherlands Air Force (AH-64Ds, AS532U2s, CH-47D/Fs and NH90s) under one Central Command structure across two airbases and save costs. Only the NH-90 fleet of 860 Squadron is based at Naval Air Station De Kooy in the Northern part of The Netherlands. The other three units reside at Gilze-Rijen Air Base.

History of the 298 Squadron

The squadron has its heritage dating back to April the 16th, 1945 when the squadron was operating at Gilze-Rijen Air Base as 'No. 6 Dutch Auster Squadron' with six Auster's. Soon after the end of World War 2 the Squadron was transferred to the Dutch West Indies. On March 1st, 1950, 298 AOP (Air Observation Post) was established. Over the years, '298' has flown various types of aircraft and helicopters. The Auster's were replaced by L-18C 'Piper Cubs' and L-21B 'Super Cubs' to support the role of artillery spotters. The first Helicopter arrived in 1955 (H-23B 'Raven'). The Alouette II followed in 1959 for 'Search and Rescue' (SAR) missions. These were replaced by Alouette IIIs from 1964 onwards. Twelve Bo-105C 'Bolköw' helicopters were also part of the 298 Squadron from 1975 to 1979.

The CH-47 fleet is equipped and available to support Dutch Special Forces like the Commando Force (KCT/ Korps Commando Troepen) and MARNS (Dutch Marines) where needed. To train and hone procedures regular exercises take place. These mostly take place on undisclosed locations across The Netherlands. In April 2018 Commando's and MARNS trained in embarkation of a ship supported by a CH-47D and an AS532 'Cougar'. Till 2014 the 298 Squadron had a dedicated flight to support Special Operations, no. 5 flight.

To mark the 75th Anniversary of 298 Squadron CH-47D 'D-666' received a special paint job, with a dragonfly on one side which is part of the squadron insignia. The right side of the helicopter is adorned by a Grizzly; it refers to the callsign which was chosen 15 years ago. Air traffic control, among others, makes use of this callsign. And for the people of 298 squadron, the Grizzly is a kind of mascot.

Purchase of New CH-47D's

In early 1993 the Dutch Government signed an agreement with the Canadian Government to acquire seven Boeing CH-147 C-models that were in use by the Canadian Armed Forces between 1974 and 1991. In December 1993, a contract was signed with Boeing for the purchase of thirteen modern CH-47D Chinooks with a digital Honeywell Avionics Control and Management System (ACMS) cockpit and improved T55-L-714 engines. Seven being remanufactured ex-Canadian C-models and six were brand new with a "one-piece machined" airframe structure as a novelty. Boeing delivered the remanufactured CH-47D Chinooks to the Royal Netherlands Air Force (RNLAF) in 1995-1996 marking the 25th Anniversary of operations with the 'Chinook' fleet during that year. The six new CH-47Ds were delivered during 1998-1999.

Currently ten CH-47D's are still on strength, with two 'Chinooks' lost in accidents in 2005 during operations in Afghanistan and the oldest CH-47D (D-661) being withdrawn from service during late 2019. Captain Roël BOEZEN "Booze", 298 squadron Liaison Officer, adds "The accidents in Afghanistan made us realize we had to further improve and hone the training and capabilities of our crews. Both lost helicopters suffered from a hazardous mountainous and brownout landing during reduced visibility operations where wind and loss of engine power due to the thin air

conditions had an impact on the performance of the Chinook. Circumstances we do not encounter when operating in The Netherlands. As a result, a new Training Program has been implemented consisting of 'High Blaze' exercises for dedicated mountain flying, and 'Hot Blaze' to allow crews to practice operations in a hot, high and dusty environment. Captain BOEZEN continues 'one of the most challenging conditions to fly in are in snow in which you can easily lose your reference orientation. Therefore, we have cold weather operations in snowy conditions in the Nordics trained during 'Cold Blaze'. Last, but not least, the fourth training is 'TAC Blaze' with a focus on tactical maneuvers and electronic warfare.

Captain BOEZEN posing in front of the right side of CH-47D '666' showing the Grizzly bear. This CH-47D has as nickname 'The Beast'. All individual CH-47s have been given a nickname.

On the 8th of October 2012 the first new CH-47F was delivered to 298 squadron at Gilze-Rijen Air Base. A total of three CH-47Fs would be operated with 298 Squadron in the Netherlands with the other three being delivered directly to 302 Squadron at Fort Rucker Air Base. During late 2015 D-891 was transferred to 302 Squadron.

New CH-47F's

To cater for the loss of the two CH-47Ds and for the additional demand for Heavy Rotary Capacity, the Dutch Ministry of Defence signed a new contract with manufacturer Boeing in 2007 for the delivery of six CH-47Fs. The CH-47Fs were equipped with updated ACMS cockpits (Block6 with partly color displays), improved self-protection kits, CHASE (Chinook Aircraft Survivability Equipment). The main purpose of the CH-47F fleet was to serve as a platform for Special Forces Operations. The configuration included Fast Rope Capabilities, new attachment points for on-board weapons, a long-distance communication radio and a Forward-Looking Infrared System (FLIR) under the nose. With the latter system, the pilot has good situational awareness of the surroundings under very poor visibility conditions. The 'F' had GPS navigation connected to a radar altimeter. Initially 298 squadron had three CH-47Fs (D-890/891/892). To complement 302 squadron in Ford Hood, CH-47F 'D-891' was transferred to the US during 2015. The remaining two F's have been shipped back to Boeing in March 2019 in support of the current Renew Program. Two of the CH-47Fs (D-894/895) assigned to 302 Squadron were ferried to Boeing in April 2020, with the last two (D-891/893) to follow early June 2020. In anticipation of the arrival of the new CH-47F fleet, 300 hours of Base Maintenance inspections are diminishing for the existing CH-47D fleet but will continue until the Initial Operation Capability (IOC) of the new CH-47F fleet. It is currently uncertain what the fate will be for the remaining CH-47Ds. Two are foreseen to be used as instructional airframes and one is planned to be delivered to the National Military Museum (NMM) at SoesterBERG.

The New CH-47 MY II CAAS Chinook

In the period between 2010-2015, The Netherlands prepared for the replacement of the ageing 11 D-models as well as the expansion of the Chinook fleet with three helicopters. After extensive deliberations, the standard US Army MYII CAAS configuration was considered as the most efficient choice for a successor. The Netherlands was able to utilize options in the existing MYII production contract between the US Army and Boeing. For that, the Letter of Offer and Acceptance (LOA) with the US Army for fourteen new CH-47F MYII CAAS Chinooks was signed on November the 12th, 2015. On April the 14th, 2016 the US Department of Defence awarded Boeing a contract to build 12 CH-47Fs followed by an additional order on April the 28th, 2017 for the remaining two new CH-47F's. To prevent a "mixed fleet" of CAAS and ACMS Chinooks, which would have been costly during the sustainment of the fleet, it was then decided upon to renew and modernize the six ACMS F-models. On December the 14th, 2017

The Netherlands and Boeing signed the Direct Commercial Sales contract for the Renew Program, converting the six ACMS F-models into the exact same configuration as the 14 new Chinooks.

Operating the standard MYII CAAS Chinook will allow for further optimization of operations, training and maintenance. "We have had a lot of contact with the US Army and the Australian MOD being existing operators, to understand potential challenges we might encounter when fielding the new Chinooks. When we deliver them to the RNLAF, we want to make sure that there are no obstacles and that they will be able to operate and sustain the helicopters during the first three years. This period will allow the RNLAF to become self-supporting when it comes to in-service support" according to Colonel Koen van GOGH, Senior Project Manager Defence Material Organization (DMO) who is responsible for the Replacement and Modernization program Chinook.

"At around 2,500 parts of the legacy CH-47Fs will be reused. These parts will be overhauled (zero hours status) before being installed on brand-new MYII CAAS airframes. This option turned out to be more efficient and affordable than modifying the legacy CH-47F fleet. The first idea was to just replace the ACMS cockpit of the legacy Fs by a MYII CAAS Cockpit. We concluded the risk was too big in terms of certification and costs" according to Colonel van GOGH. "The legacy CH-47Fs are now sent to 'Summit Aviation' who are tasked by Boeing under the Renew contract to remove the usable parts from the helicopters and have them delivered into the overhaul process." Summit Aviation is an Industry Leader in Aircraft Maintenance, Repair, Avionics upgrades, Mission System Integration, Modifications and Aircraft sales.

During March 2019 the first two CH-47Fs (procured in 2008) left for Boeing Philadelphia to be rebuilt to MYII CAAS standard. The airframes involved were D-890 and D-892 which were on strength with 298 squadron. After the rebuild to MY II CAAS the airframes will remain with 302 squadron in the US.

The new CH-47F MY II CAAS Chinook comes with the short nose, which differs from the current 'F' version in appearance. This meant there is no room for our current Weather Radar. Also, the FLIR system under the nose will not be implemented. Another striking difference is the Woodland Desert Sage Color Scheme, instead of the current grey scheme.

"Although the main goal was to stay common with the US Army, Dutch operating intent and national legislation led to the addition of some unique modifications. Fortunately, there is no need to integrate these into CAAS, so commonality will not be affected." The additional Dutch requirements include elements such as: Crashworthy Crew Seats with ballistic protection, leading to modified MFCUs (Multifunctional Control Units), a LH Removable escape Hatch, a Hook Load Measuring System, an Ice Detection System, a Pitot Heater Failure Indicator, FRIES (Fast Rope Ingress and Egress System), including external hardpoints, and a minor change to the electrical system, all of which can be implemented during production. A Fall Protection System to protect maintainers, and an Emergency Locator Transmitter are implemented by 'SES-I' (Science and Engineering Services) in Huntsville, Alabama as 'Post-Production Modifications'. "We selected 'SES-I' because they did similar work for the US Army and we wanted to make sure we do not interfere with the work performed on the Boeing production line" explains Colonel van GOGH.

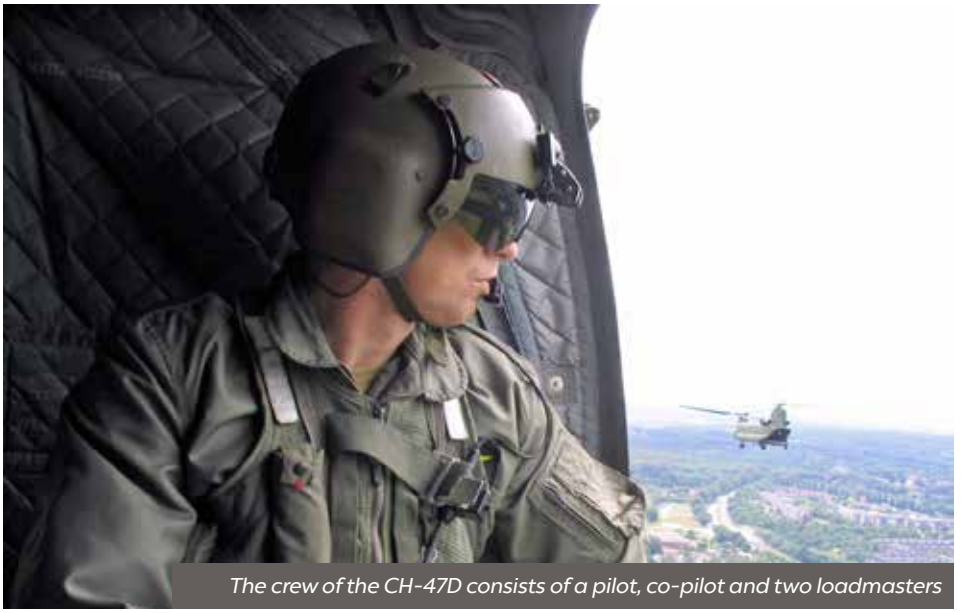
On March the 20th 2020, the first RNLAF CH-47Fs made their maiden flight during acceptance at Boeing Philadelphia (registration D-472 and D-473). These two helicopters left Boeing Ridley Park to be ferried to Huntsville, Alabama on the 5th of May 2020 for validation and verification by the US Army and the Postproduction Modifications by 'SES-I'. "These two helicopters are planned to be the first CH-47s to be send to The Netherlands by December 2020. After arrival in the Port of Antwerp, Belgium, the helicopters will be transported to Woensdrecht Air Base in The Netherlands where

Lt. Colonel Wil Van RIJEN (System Integrator, wearing Camo) and Colonel Koen van GOGH (Blue) doing a walkaround of a CH-47D

they will be prepared to be transferred to 298 Squadron with an expected arrival at Gilze-Rijen around mid-January 2021" according to Colonel van GOGH. These two CH-47Fs will have all our additional requirements implemented and will have the Digital Automated Flight Control System (DAFCS) 3.5 software and CAAS 9.4 installed. The Colonel continues "In order to support a tight conversion schedule of our flight crew to the MYII CAAS Chinook, we decided that the next six CH-47Fs coming from the production line will not undergo the Post Modification until a later date. These six Chinooks will go to Fort Hood, TX (USA) directly to be used for conversion training. The next batch of CH-47Fs will be delivered after the Post Modification. The earlier unmodified CH-47s will then rotate through 'SES-I' to complete the process of modification as well. During January-February 2021 we planned the arrival of another two CH-47s to the Netherlands, these will be airframes built with retrofitted parts of the legacy CH-47Fs" concludes the Colonel.

To support the transition and difference training, a Transportable Flight Proficiency Simulator (TFPS) was procured from the NAVAIR (Naval Air Systems) Manned Flight Simulator Enterprise Team which is stationed at NAS Patuxent River (US). "The procurement of a TFPS, stationed at Gilze-Rijen, will be more efficient for the Squadron as there will no longer be a need to train in the simulator at the Royal Air Force at RAF Benson Air Base" continues Koen van GOGH. "The TFPS has already arrived at Gilze-Rijen Air Base and we are awaiting a team from NAVAIR to do the final acceptance testing of the Simulator. The TFPS will need to be ready before the first group Instructor Pilots is scheduled to receive their Conversion Training at Fort Hood, since the TFPS will be used for the crew's Ground School/ Academics training at Gilze-Rijen Air Base before they head to Ft. Hood for the flight training. Each Aviator will undergo a three-week training on the Simulator before attending a three-week course with 302 Squadron in the US and participating in an American Falcon exercise, held four times a year. Upon return to the Netherlands the Aviators will be Fully Qualified Pilots on the MYII CAAS Chinook.

Lt Colonel van den BERG adds "We had planned to send a so-called Class 0 to Fort Hood in the US during the June-July 2020 period for the Instructor Course on the MY II CAAS variant. As we have five flights with five crews, we have fifty pilots and fifty loadmasters to train, resulting in five training classes at Fort Hood. This Transition Training is planned to be executed over an eighteen-month period. We will have a team from the US Army to support the Conversion, a so-called NETT Team (New Equipment Training Team)", both locally at Gilze-Rijen as in Ft. Hood. The expectation is to achieve Full Operational Capability (FOC) status by mid-2022 with the Initial Operational Capability (IOC) by October 2021".



The crew of the CH-47D consists of a pilot, co-pilot and two loadmasters

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2LT 'Frank' is one of the student pilots who was planned to be training with 302 squadron in the US till the breakout of covid-19. Currently 'Frank' is trained by instructor pilots within 298 squadron in order to continue the education.

Missions of the Past

'Nihil Nobis Nimium' or 'Nothing is too much" is the motto of the 298 Squadron. The Squadron has been involved in many missions and oversea deployments since it has been operating with the CH-47D/F. Kosovo (KFOR, 1999), Allied Harbor in Albania and a year later for UNMEE (United Nations Mission in Ethiopia and Eritrea). From January 2001 till May 2004, the Royal Netherlands Air Force detachments contributed to NATO's Stabilization Force (SFOR) in Bosnia. From July 2003 to November 2005 they served in Iraq. The detachment provided transport for the Stabilization Force in Iraq (SFIR) for the Dutch military personnel from the Security Forces. From May 2005 to June 2006, three Chinooks were deployed for the Dutch Special Forces deployment for Operation Enduring Freedom (OEF). Two Chinooks were lost due to accidents in 2005 during these operations. As of 2007 to October 2010, 298 Squadron was regularly active from Kandahar Airfield in Afghanistan in support of NATO Operation ISAF (International Security Assistance Force). And lastly from April 2014 to April 2017, three Chinooks participated in the 'Minusma' Mission. This UN Mission was designed to restore Peace and Stability in Mali.

Training in the US

"The initial training for new crews is conducted at Fort Rucker Air Base (US) as part of the Chinook Aircraft Qualification Course. After completing the course new crews continue their training with the Squadron at Gilze-Rijen Air Base. 2ndLT 'Frank' explains. "We planned to travel to Fort Hood to have a ten-week training period with 302 Squadron as part of the Mission Qualification Training (MQT)". This squadron provides Joint Air Assault Training for Helicopter Crews of the Defence Helicopter Command (DHC) and ground units of 11 Airmobile Brigade, this takes place four times a year with the 'American Falcon' exercise to conclude the training. In addition, Pilots and Load Masters follow the Initial Mission Qualification Training twice a year. The squadron is staffed with personnel from the Royal Netherlands Air Force, Army, and the US Army. Frank continues "our group consists of a mixture of a CH-47 loadmaster, Pilot, but also AH-64 pilots. Just before we would travel it became clear that we would not go to the US. Due to the Covid-19 situation the original schedule will require revision as currently 302 Squadron stood down with no training activities. We are now being trained within the Squadron here in The Netherlands. This means that we all must be flexible to cater to further Education as Training is conducted alongside daily operations". Captain Booze details further "The Defence Helicopter Command' is a more complex organization

In preparation of the firefighting season 298 squadron trained between February-April 2020. The third week of April saw the start of the largest nature fires in the last 40 years in The Netherlands. Four CH-47s and an AS532 were involved a full week of dropping 3.2 MIO Liters of water in 540 drops. The AS532 can carry 2,500L of water in a Bambi Bucket where the CH-47D takes 8,000L of water. To support the crews a dedicated fire fighter observer joined the flights in order to guide the water drops.

The Defence Helicopter Command (DHC) and MAOT (Mobile Air Operations Team) always work closely together in the transportation of under sling loads, FBO operations. Twice a year a big exercise is held in a training area called Ederheide (GLV4/Eder Heath).

to cater to this ad-hoc additional training. Luckily, we managed to be flexible and had a fast resolution in place. The focus for training is now on Tactical Exercises, Navigational Skills and Planning of Flights. In order to provide the best possible training, we need to have Instructor Pilots and Ground Forces to act as Enemy Forces. As we cannot fully focus on the MQT training because the duration will be longer than the 10-week period at Fort Hood".

Firefighting

The Netherlands was been confronted with the largest wildfires in 40 years in the Southern part of the Netherlands, Deurnsche Peel and Herkenbosch, during the third week of April 2020. Starting off with one supporting Chinook it resulted in a combined FBO (Fire Bucket Operations) effort of four Chinooks, a AS 532 Cougar, Mobile Air Operations Teams (MAOT) and the Local Fire Brigades. 'In case we are asked to support Firefighting Operations the Tasking Order is provided by the NASOC (National Air and Space Operations Center) to the Staff of DHC' adds Niels. "The week before the fires started, we already had been asked to have one helicopter on standby". Christiaan Velthausz, on-scene Commander and part of the Fire Department: "Under normal circumstances, the Ministry of Defence generally supplies Helicopter Capacity within 24 hours of the request. Although in practice this is a lot faster, usually about 3 to 4 hours. In the event of an increased risk of wildfires, FBO and therefore the Helicopters can be put at a 2 hours' notice to move". "During the Firefighting we had on average five to ten MAOT (Mobile Air Operations Team) personnel to support the FBO operations". The main lessons learned have been to work on a large-scale bases for a long period in a complex setting' according to Sergeant-Major Rob van Mierlo, Commander MAOT. From the 1st of April 2020 onwards MAOT has a team on standby continuously, ready to set off within 2 hours".

"In the event of a very large, or difficult-to-combat fires, the (Civil) Heli-Team Fire Team with Helicopters and the Mobile Air Operations Team (MAOT) of DHC form the so-called "Fire Bucket Operations (FBO) Team". This team works together with the Local Fire Brigade on site. "About 10 years ago, the Defence Organization requested a single Point of Contact for extinguishing operations; that became the Heli-Team Fire Brigade", according to Christiaan Velthausz, the on-scene Commander.

"We have a total of 10 Bambi Buckets which can hold in theory 10,000L of water. "During FBO operations we only drop 8,000L each time as with full capacity to prevent engine over torque as we demand all power available with full fuel load so it is safer to carry less without a risk having to return due to potential over torque" adds Captain Boezen. One of the loadmasters, who was involved in the firefighting 'Jimmy' explains "We had an observer of the Fire Department joining our flights who had a map showing coordinates where to drop the water. My task was to inform the Pilots on the coordinates of where to drop water. After each drop, we received direct feedback by Local Observers on the ground if our drop was successful. This worked out perfectly". Over a 5-day period more than 3,2MIO Liters of water was dropped during 540 individual drops ■

Congratulations

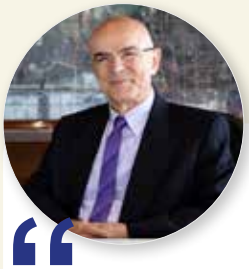
for the 100th issue

Latif Aral Aliş
Chairman of the Board
SARSILMAZ SİLAH SAN. A.Ş.

I congratulate the Defence Turkey team for their successful efforts up until today and hard work to share the developments in our defence industry with all those concerned, and I wish them to be with us in many more issues. Good luck with the 100th issue of Defence Turkey magazine!

Yüksel Yamak
General Manager
Crypttech Savunma Siber Güvenlik Sistemleri ve Bilişim Teknolojileri A.Ş.

You have been sharing the innovations regarding the rapidly developing and growing defence industry, sectoral events, and developments in the Turkish Defence Industry in terms of capabilities and technologies to all sector representatives with great effort.
I would like to congratulate the entire Defence Turkey team for its efforts to contribute to the growth of the defence industry and to develop this culture in every issue, and I express our thanks as Crypttech.



Can Gür
Chairman of the Board,
Canovate Group

I congratulate the 100th issue of Defence Turkey Magazine, which has been published in English for 15 years covering defence, aviation, aerospace and security issues. I wholeheartedly congratulate your team for conveying the recent developments and latest news in the defence industry of our country to the world and wish you to reach many more 100th issues successfully.

Alican Ökçün
Chairman of the Board, NERO Endüstri Savunma Sanayi A.Ş.

Remembering the words of Gazi Mustafa Kemal Atatürk, “Press is the common voice of the nation”, I, on behalf of Nero Industry, congratulate those who have made contributions in reaching the 100th issue of Defence Turkey Magazine, playing a significant role in increasing interest in the Turkish Defence Industry and which is our voice in national and international circles with its accurate and impartial reporting approach.

Congratulations

for the 100th issue

Ahmet Hamdi Atalay
Chairman of the Board, Cyber Security Association

I would like to thank the Defence Turkey team for their contribution to the development and recognition of the Turkish defence industry, and I sincerely congratulate the 100th issue wishing that their efforts to promote the activities of our sector will continue to increase.

Tamer Özmen

First of all, I wholeheartedly congratulate "Defence Turkey" in reaching its100th issue. It is the defense and aerospace industry that involves technology all over the world, leads to innovative ideas, and provides unwavering support to R&D. At this point, it has always been the main goal to reach deterrent technology that will maintain survivability and to be self-sufficient without being subject to embargoes. In Turkey's path to reach "the level of contemporary civilization", in order to reduce foreign dependency in defense industry in Turkey, the existence and foundation stories of "Turkish Navy Association" in 1965, "Turkish Air Forces Foundation" in 1970, "Turkish Aircraft Industries, Inc. (TAI)" in 1973, "Turkish Land Forces Foundation" in 1974, followed by Aselsan (1975), Havelsan (1982), Undersecretariat for Defense Industries (1985 - today SSB), Turkish Armed Forces Foundation (1987) and Roketsan (1988) should not be forgotten and those who think , those who contributed to their foundation should always be remembered with gratitude. The independent defense industry is a treasure with the technology and experienced manpower, but it should not be ignored that there will always be "internal and external malicious people who wish to deprive us of this treasure". At this point, the efforts and solidarity of defense journalists, who are a part of the family on this challenging path and indispensable elements of the promotion of the Turkish defense industry at home and abroad, are also praiseworthy. I congratulate "Defence Turkey" in reaching its 100th issue without sacrificing its loyalty and honorable stance, all the team that contributed to this success and especially my dear friends, Akalın Family. Wish you all the best!

Dr. Mustafa Hatipoğlu
President, Bursa Aerospace and Defence Cluster (BASDEC)

As Bursa Aerospace and Defence Cluster (BASDEC), we have been following and benefiting from Defence Turkey magazine for years.
Keeping its finger on the pulse of the industry with its latest news and providing important vision to all of us, Defence Turkey always informs its readers about our activities supporting our national technology move in the defence, aviation and aerospace industry.
On the occasion of its 100th issue, I sincerely congratulate Defence Turkey, which we see as an important stakeholder of our industry, and I wish them continued success.

Aerospace Cluster Association

Dear Defence Turkey Team,
On the occasion of the 100th issue, we wholeheartedly congratulate the entire team of Defence Turkey magazine, which has been sharing the latest and strategic developments in the national and global Defence and Aviation Industry with us, and wish you continued success in your future endeavors.
Kind regards,

Top 50 Emerging Technologies to Generate Multi-Billion Dollar Markets and Transform Our World

by Saffet UYANIK

In a web conference held in June 2020, entitled "Top 50 Emerging Technologies & Growth Opportunities," Vice President of Frost & Sullivan's TechVision, Anand S, presented TechVision's annual Top 50 Emerging Technologies research and delivered cutting-edge insights about some of the most prominent disruptive technologies poised to impact the world in the near future. The Top 50 technologies were selected from a pool of 3,000 using a proprietary methodology based on several criteria including industry adoption rates, IP activity, funding, and market potential and scored the highest on Frost & Sullivan's global technology innovation index.

As of today, virtually all companies across industries are going through a cycle of disruption, collapse, and transformation. Emerging technologies are enabling powerful innovations by converging with other advanced innovative solutions to generate multibillion-dollar markets and growth opportunities across our world. At the core, technology convergence involves overlaying two or more emerging or existing technologies to create unique value propositions that could be commercialized. While each emerging technology on its own represents an area of intensified R&D, heightened investments, increased IP activity, and tremendous market potential, the possible convergence of several technologies opens up unprecedented opportunities for new revenue models and the next generation of innovative products and solutions.

Latest Technology Trends and How They Give Rise to Futuristic Ideas

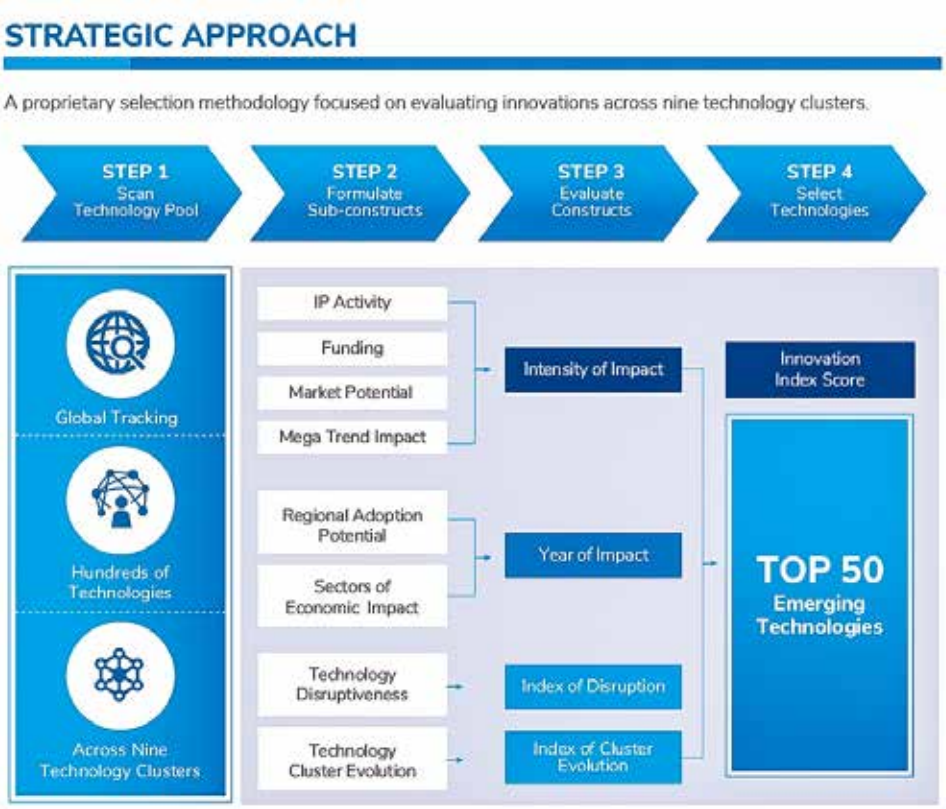
Mr. Anand outlined that, in 2011, the TechVision team launched a unique research initiative called the Top 50 Emerging Technologies & Convergence Opportunities, focusing on two primary fields. The first was to apply a specific methodology to an extensive base of technologies and innovations to the top 50 technologies that are likely to impact humanity in the near term significantly. The second objective was to look for possible technology convergence scenarios where two or more of the chosen Top 50 technologies and beyond are likely to create an innovative or disruptive market for new products, services, or solutions. The TechVision group is the technology IP, innovation and convergence focus, research, and consulting practice of Frost & Sullivan. TechVision organizes the universe of technologies into nine different technology clusters, such as Information and communications technology (ICT), sensors and instrumentation, chemicals, and advanced materials. TechVision believes that more than 90% of all technologies and innovations in the world can be mapped in these nine unique clusters giving us a comprehensive view of the entire technologies of the world.

Mr. Anand noted that these technology clusters cut across several verticals. The meaning of a technology developed in one cluster usually had applications

across several vertical industries. For instance, advanced material technology used in the automotive sector is also providing to the aerospace industry in packaging and infrastructure. Similarly, AI technologies have been horizontally applied to manufacturing, education, financial sector, and agriculture. There is no doubt that technologies have rapidly evolved in time, and the world has witnessed much dynamism in the global R&D landscape. The rate of innovation and launch of new technologies and ideas are getting faster and faster every year and every month for intriguing products and business models globally. Every organization, regardless of size or industry, is keenly focused on innovation. Mr. Anand underlined that we are living and craving in an era of "XTech." We can add the word "Tech" to pretty much any industry. For example, "FinTech" is a common word for the financial industry, EdTech, for the education industry, AgTech, for the agriculture industry, AdTech, for the advertisement industry. In other words, whether innovation is for products or services or business model or operations, it seems to be almost always driven by emerging technologies.

Technologies that Will Change the Direction and Landscape of Multiple Industries

According to Mr. Anand, we live in a fascinating world at a very intriguing time of our life, and it is going to get a lot more exciting in the coming years. Referring to the fast-changing innovation-driven

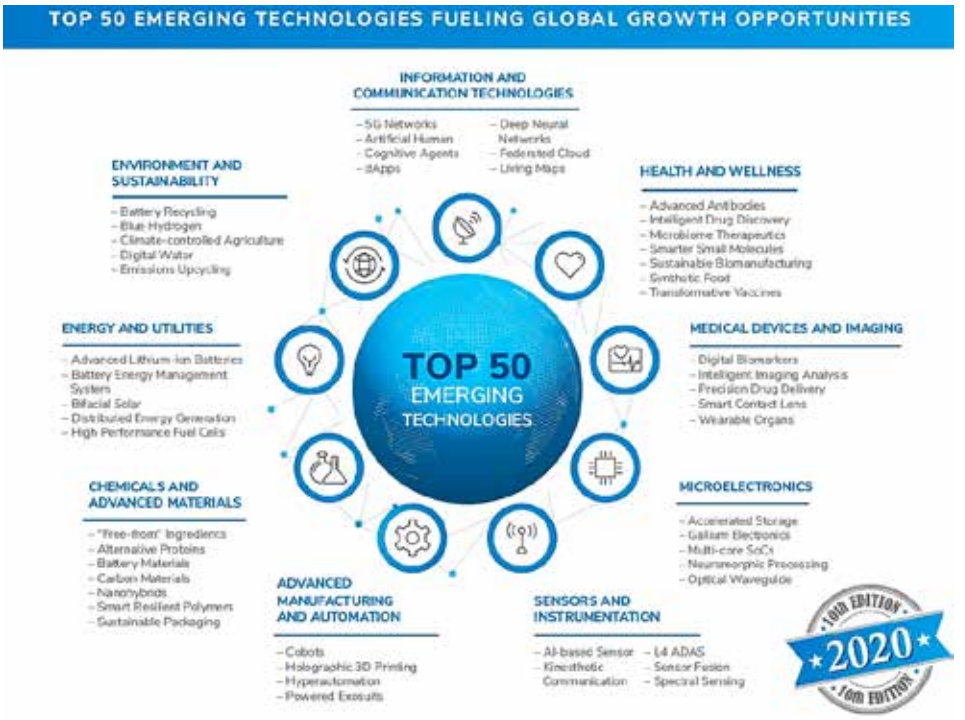


future world, He emphasized that all the new business models have been only possible after three things; deep penetration of global Internet connectivity, the speed at which data can be transmitted today by fiber optics as well as wirelessly and wide-scale adoption of handheld, personalized devices. These business models are driving new growth opportunities that will shape the industries and the markets.

For instance, the drones are, of course, no longer the strategic weapons of war. They are being utilized for all sorts of peaceful activities such as monitoring, farming, photography, gaming, weather mapping, and other practical applications and soon enough for delivery and logistics business models for all sorts of packages, food, medicine, clean water, and so on so forth. The Wing, Alphabet-owned startup, is the first company to secure FAA approval of flying their drones for the delivery of commercial items up to 1.5 kilograms, Amazon is developing a similar approach with up to five pounds of delivery weight. Wing has done thousands of experiments, and they are starting to deliver in Australia, Finland later this year and soon in the US.

Similarly, autonomous cars are perhaps the most exciting and most talked field of innovation. According to TechVision, in April of 2015, only three car companies had the approval to test self-driving cars in the state of California. As of the first of January 2019, that number has mushroomed to 62 and of the 62 permit holders; there are only about 15 or so companies that are traditional automotive makers, the remaining are all sorts of electronics, AI and software companies such as Samsung, Intel, Apple, Google, and Dyson. This is a clear sign of things to come. Autonomous driving technology opens a whole new potential for a range of disruptions in the design and manufacturing in sales and marketing of such cars. Frost & Sullivan predict that over 500,000 autonomous cars are likely to be added every year globally by 2025, and one in every four vehicles will be self-driving by the year 2030. There are several other examples of disruptive innovations like AI and Machine Learning based Data Analytics as a service model. Augmented and VR (Virtual Reality) combinations of various applications and several other examples of collaborative business models like Uber and Airbnb promote pay-for-use vs. pay-for-possession type of circular economy business models.

Another example is Augmented Analytics technology, which can be summarized as Business Intelligence meeting Artificial Intelligence.



The enterprises need to incorporate data analytics into their daily processes to streamline operations and reduce operating costs. More importantly, they need to use advanced analytics to maximize business agility and remain competitive in a dynamic business environment. Generating data insights on its own without intervention by a team of data scientists, and expensive IT infrastructure is a significant concern today. Despite substantial investment in Big Data analytics and machine learning and cognitive computing, businesses are still struggling with some critical problems, such as having too much data volume and very little insight. There is an inefficient connection between insight and discovery and actual business decisions and actions taken based on those insights. Augmented analytics enable systems to learn more, adapt very quickly, and improve their performance. It leverages machine learning in any AI platform and transforms business processes by connecting and interlinking diverse data sources, processing, and analyzing the gathered data and then building data-rich applications.

Impacts of Disruptive Technologies on Businesses that Pursues Convergence Strategies

Companies involved in businesses are seeing a steady flow of investments, especially for marketing and geographic expansion. TechVision estimates that close to US$4billion were invested in areas of computer vision, machine learning, and advanced analytics just last year, and nearly 20,000 patents were published in this area in the previous three years. Enterprises can use augmented analytics to rapidly transform and streamline their operations by deploying self-learning and self-assuring business processes in various industry sectors. Frost & Sullivan considers that augmented analytics offer a tremendous range of opportunities where minute analytics could be applied to solve existing business challenges.

Frost & Sullivan indicates some very promising signals from the universe of 50 technologies. According to the TechVision group, these technologies' total market potential is nearly US$3 trillion over the next five years. Between US$100-120 billion were invested in R&D of these technologies in the last two years, and there are over 275,000 patents granted in these areas in the past three years. Each technology area has its own ecosystem or network of scientists and developers and funding sources, aid organizations, and patent holders. There are incredible, groundbreaking developments taking place in each area, and that is very valuable. However, Mr. Anand believes that the whitespace in between these technologies is even more powerful, with a lot of collaboration and convergence happening or could potentially happening. Random but practical combinations of multiple technologies to create a valuable solution will be a significant game-changer trend in the future.

Conclusion

TechVision deems that what new solutions can be created by combining different technologies is the more exciting part of this research. While each of the top 50 technologies represents an area of intensified research & development, top-tier investments, and tremendous market potential, the possible convergence of several of these technologies opens up unprecedented opportunities for new revenue models and the next generation of innovative products and solutions. Most importantly, it depends on specific industries and applications as well as innovative and collaborative minds to create something unique and valuable. By taking advantage of this perspective and making extraordinary growth partnerships and leveraging the point of convergence, organizations with multiple sub-studies might find several potential collaboration partners willing to leverage the same aspects of convergence and waves of innovation to co-create an exciting future ■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Congratulations

for the 100th issue

Özgün Utku Alanç
CEO of ARES Shipyard

We have always seen Defence Turkey right beside us: as a friend in an event, as a partner in an exhibition and as a global representative…
Thanking you for the value created in publishing sector, I look forward to the next 100 issues and wish you many more years of achievements.

Mehmet R. Kitiş
YALTES General Manager

I congratulate the 100th issue of the DEFENCE TURKEY magazine, which has been contributing greatly to the promotion of the Turkish Defence industry both at home and abroad, and I thank the entire team for contributing to the magazine's success.

Dr. S. Akın Tuzcuoğlu
Sefine Shipyard General Manager

Dear Defence Turkey Team,
We have been following the contributions you make to the defence industry, which is of critical importance for our country and requires superior professionalism, with great excitement and pleasure. Defence Turkey magazine's reaching the 100th issue is an indicator of your efforts and determination in this regard. On this occasion, I sincerely congratulate you for adding significant value to the Turkish Defence Industry.

Alper Alpay
General Manager International Armored Group
Managing Partner BCS Savunma Sistemleri A.Ş.

Defence Turkey Magazine, which has undertaken the task of publishing the innovations and sector achievements in the defence and aviation industry in our country and abroad, continues its publication with its 100th issue. I sincerely believe this magazine, which adds value to the Turkish Defence Industry and is closely followed by the leading players in the sector, will grow rapidly and achieve more success on behalf of our country. I congratulate the whole team, especially Dear Ayşe, for their achievement.

Congratulations

for the 100th issue

Murad Bayar
Former Undersecretary of SSM

Defence Turkey magazine was launched in the defence industry to fill a very significant gap in the field of English broadcasting. We know that making these initiatives sustainable is much more difficult than launching them. I happily see that Defence Turkey magazine has reached its 100th issue with the excitement it started and with much richer and deeper content. I congratulate the Defence Turkey team for reaching the 100th issue and I wish them success in their future endeavors.

Muharrem Dörtkaşlı
Quattro Engineering
Consultancy Inc.

Having witnessed its first issue, I sincerely congratulate the Defence Turkey team, especially Dear Ayşe, for reaching their 100th issue. They have not only successfully announced the developments in our country's defence and aviation sector to domestic and foreign stakeholders, but also have increasingly continued their domain and quality in each issue. Together with specialized magazine publishing, one of the most important activities of the sectoral ecosystem, they had the opportunity to follow the developments closely and archive them. I wish you great success and to achieve more 100th issues...
With warmest regards,

Faruk Yarman
Savronik
Chairman of the Board

We grow together in the Turkish Defence Industry.

Özcan Ertem

Defence Turkey is a magazine that is prepared by domain experts and clearly conveys messages to its readers, leaving no doubt. It is not easy to reach the 100th issue. I congratulate the entire Defence Turkey team, especially Ayşe Akalın. To many more issues...

ARAB-ISRAELI AIR WARS

by Cem DOĞUT

The partition of Palestine and Israel's war of independence

On November 29, 1947 Resolution 181 of the United Nations General Assembly recommended a plan to partition Palestine into two sections as the Arab state and the Jewish state. Thus, the endless dispute started between the two nations, and conflicts between Arabs and Jews began to grow worse. In this article, we will mention briefly the air battles of these two nations. In the beginning, the Israelis started to utilize lightweight civil aircraft which were mainly used for reconnaissance. During the clashes in the Nevatim region, the first Israeli air strike took place on December 17, 1947 with the firing of Bren machine guns and hand grenades dropped from the dismantled door of the R.W.D.13 plane to support the Jewish troops on the ground. On May 10, 1948, the Israelis lost their first airplane when the bomber Norseman crashed. Meanwhile, the first attack of the Arabs was the raid of Egypt's Spitfires to Tel Aviv on May 15, 1948 upon the declaration of Israel's independence. During this raid, most Israeli aircraft at the Sde Dov air base were either damaged or destroyed on the ground. One Egyptian Spitfire was shot down by anti-aircraft guns. At the outset, the Egyptians launched a military exercise with the Spitfires and C-47s modified for bombardment. Syria's T-6 and Iraqi Avro Anson aircraft were located in Jordan and operations were conducted from there. Israel immediately started the process for the procurement of fighter planes as it did not have any in those days and eventually bought 25 Avia S-199s from Czechoslovakia. The first fighter plane arrived in Israel on May 20th. On May 29th, the Egyptian army was only 30 km away from Tel Aviv and Egyptian troops were attacked with four S-199s which had recently been received. Even the test flights had not yet been executed with these aircraft. Israel lost a pilot during the operation but managed to halt the Egyptian attack. The next day, one of the two S-199s that attacked the Iraqi troops in Natanya crashed. On June 3rd, Israel won its first air victory. One of the S-199s shot down two C-47s that had intended to bomb Tel Aviv. The following day, an Israeli Argus was shot down by an Egyptian Spitfire and thus Egypt gained its first air victory. The conflicts escalated and forces of both parties started to pit against each other more frequently. On June 8th, fighter planes of both sides fought for the first time in the air. The Israeli S-199 confronted the Egyptian Spitfire on the south of Tel Aviv. The Avia S-199 was in fact a Messerchmitt Bf-109 with a Jumo engine. In this way, history repeated itself three years after the end of World War II and Messerchmitt and Spitfire confronted each other in the air once again, and the S-199s won the battle. As a

An Egyptian Spitfire shot down over Tel Aviv on 15 May 1948

Israeli B-17s

result, both parties strived to buy new air vehicles and increase their inventory as much as possible. Aircraft remaining from World War II were bought and launched to the frontier again.

The second phase of air combat took place on July 8 - 18, 1948. During this conflict, also known as "the 10-day Battles", Israel engaged a new air combat player. Three B-17s arrived in Israel on July 15th and immediately joined the operations. During the first six and a half days, Israeli Air Forces carried out 82 sorties and dropped 9 tons of bombs and in the remaining three days and upon the inclusion of the B-17s again, 82 sorties were conducted, and 48 tons of bombs were dropped. In the last days of 1948, the British Royal Air Forces (RAF) started to conduct operations with the Egyptian Air Forces. This cooperation was initially launched with the execution of reconnaissance missions yet later evolved into joint attacks. On June 7, 1949, four British Spitfire FR18s conducting reconnaissance missions were shot down by Israeli anti-aircraft guns and airplanes. Later the same day, the RAF and Israel Air Forces confronted each other once again. This time a British Tempest was shot down. On February 24, 1949, Egypt was the first country to sign a ceasefire agreement with Israel. Egypt was followed by Lebanon on March 23rd, Jordan on April 3rd and Syria on July 20th. Only Iraq withdrew its troops from the region without signing an agreement. Thus, the conflicts throughout the partition of Palestine and the foundation of the state of Israel ended. Without doubt, the controversial issues amid the parties were not resolved with these cease-fire agreements. The tension remained and the outbreak of another conflict was only a matter of time.

The American Pilot enlistee is seen infront of İsraeli S-199 Aircraft

NASSER Became a hero after Suez Canal

Suez Crisis of 1956

During the intervening years, the parties raced to increase their armament and the era of fighter jets began for the armed forces of both parties. The first air combat between the parties took place on September 1, 1955. Israel's Gloster Meteor destroyed Egypt's De Havilland Vampire. On October 19, 1956, Israeli forces launched an attack to invade the Sinai Peninsula. Both air forces were intensively used to support the land forces. Israel's operations were at first conducted by jet fighters, however, as they failed to suffice, the existing aircraft with piston engines were also involved. Israel's superiority was maintained in the air-to-air battles yet the aircraft with piston engines were severely damaged by Egypt's anti-aircraft guns On October 31st, British and French forces launched an air raid against Egypt and Egyptian Air Force bases and aircraft were destroyed. Consequently, on November 1st, control of the airspace over the Sinai Peninsula fell completely under the control of the Israelis. The air operation was followed by a land assault. British, French and Israeli units fully maintained control of the Suez Canal and the operation lasted until November 6th, but the successful operation in the battlefield was finalized with total diplomatic failure. In March 1957, the Canal Zone was evacuated upon pressure from America and Russia. Sinai became a demilitarized zone and troops of the United Nations were deployed to the zone.

The Six-Day War in 1967

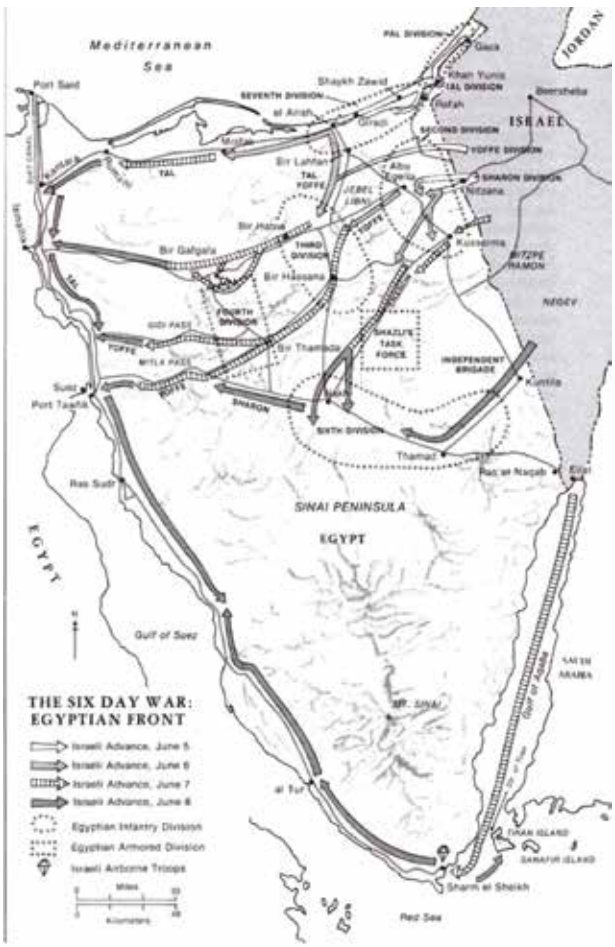
The aircraft equipped with air-to-air missiles, capable of reaching a speed of Mach 2 were included in the inventory of both parties during the period between 1956 and 1967. Surface-to-Air Missiles (SAM) were deployed in the region and air combat between Arab aircraft and Israeli Aircraft occurred from time to time. On July 14th, 1966 Israel's Mirage-III aircraft shot down Syria's Mig-21 for the first time and tension between Syria and Israel escalated. Egypt received intelligence from Russia that Israel was building up its military on the Syrian border and on May 15th, Egyptian President NASSER ordered the United Nations forces to retreat from Sinai and for Egyptian troops to enter the demilitarized zone. Israel felt quite threatened as Jordan and Syria had joined Egypt's offensive approach. Instead of waiting for the Arabs to strike, Israel made the decision to launch a pre-emptive strike against them. In the beginning of June, Israeli Air Forces received an order to conduct Operation Focus (Moked). The main strategy of this operation was to destroy the enemy's air forces on the ground through a surprise attack. The runways were to be hit initially, in this way, the hostile aircraft would not be able to scramble to intercept the Israeli aircraft and would then be destroyed on the ground.

Israeli Mirage-III is seen during preparation for the operation

Israel's attack took place on June 5, 1967 at 07:45 Israeli time (08:45 in Egypt local time). There was a specific reason why Israel selected that particular time. The Egyptian troops were in alarm position and as they anticipated a surprise attack to occur at dawn, they were ready with the Mig-21 aircraft that were deployed on the runway for the scramble as well as in the air for combat air patrol. This could not be kept up the whole day and the Israelis estimated that the aircraft on patrol would be landing at 07:30 (at 08:30 in Egypt) as they would be out of gas by then. The second reason

was that in case the attack took place at dawn; the pilots would have to start flight by midnight. So, they would not be able to get adequate sleep the night before the operation and as the operation would continue throughout the day, they would not sleep the following night as well. As the operation time of the first attack was set at 07:45 Israeli pilots were able to rest until 04:00 a.m. Other criteria for the selection of 07:45 was that frequently there was mist at this time in the morning in this region. The mist normally continued until 07:30 in the morning, so by the time of the attack the air would be clear. Last but not the least, was the fact that the Egyptian Air Forces started their shift at 09:00 a.m. When the attack took place at 08:45, a large number of staff and especially the teams that would manage air defence, such as the General or the Staff Officer, would be on their way and therefore away from their place of duty. Thus, 160 Israeli jets took off from their bases at the appointed time. They attacked 10 air bases; Egypt's Mig-21 bases were the first targets. 9 out of these 10 offensives were shot simultaneously. During the first wave of the operation, Israel lost 9 aircraft while over 180 of Egypt's aircraft were destroyed on the ground. The attack was planned in waves with 10-minute intervals and the second wave was launched and still targeted Egypt's Air Forces and nine more air bases were attacked in the following hours. Only the runway of the air base of El Arish was not attacked because Israel intended to utilize this base as a point for forward supply and casualty evacuation operation. In the evening of June 6th, the base was occupied as planned and started to be utilized by the Israelis.

That morning, Egypt lifted off only 4 Mig-21s from its attacked bases and before they were shot down, they managed to shoot down two Israeli aircraft. A land assault was launched simultaneously with the air combat operation and Israeli troops then entered the Sinai Peninsula. Close air support to ground troops was provided by a few helicopters and Fouga Magisters and Israel's Air Forces combined all of its power to the destruction of Egypt's Air Forces.



War in the Sinai, June 1967: Dispositions and Battles

The operation lasted throughout the day with the third and fourth waves and by the end of the day, and a major part of the Air Forces of Syria and Jordan and particularly of Egypt were destroyed on the ground. The Israeli Air Forces lost 24 aircraft by the end of the first day. The last five days of combat advanced with Israel's air superiority and on June 6th, Egypt attempted a counterattack. Five Egyptian Su-7s were intercepted and shot down by Israeli Mirages. An Iraqi Tu-16 attacked the city of Netanya located 32 km north of Tel Aviv and this air vehicle was shot down on its way back. The Israelis who had launched an unsuccessful assault to the H-3 air base in Iraq on June 7th lost two Vautours and a Mirage. These aircraft were shot down by Iraqi Hunters and on the same day, Egypt's Mig-17s shot down four more Israeli aircraft. A Mirage that had conducted an air interception at midnight was shot down by Egypt's SA-2s. This was the first victory using SAMs in the Middle East, and in this way a new era dawned in air combat. On June 8th, Israeli aircraft assaulted the American intelligence ship USS Liberty, allegedly by accidentally. 34 American marines were killed while 171 marines were wounded. At the end of the day, Israeli Air Forces

CGI of an İsraeli F-4 Phantom

then focused priority on the Syrian battlefront. The battle on June 9th was mostly fought between Israel and Syria and Israel lost two squadron commands on that same day. On June 10th, the parties compromised on a ceasefire. At the end of the war, Israel acquired the control of Sinai and the west side of the Suez Canal. Moreover, the Gaza Strip and Golan Heights were captured. In addition to the Egyptian Air Forces took a major blow and lost their air bases near Sinai and the Suez Canal and thus lost their potential to conduct a surprise attack on Israel. The aircraft that took off from these bases prior to the battle managed to hit Israeli targets within a few minutes but in the wake of the war they had to fly for hundreds of kilometers in hostile airspace. This was a major loss for Egypt with short-range aircraft such as the Su-7, Mig-17 and Mig-21. Utilizing fighter bombers such as Il-28 and TU-16's for deeper attacks in Israel without fighter aircraft cover also became more difficult.

1969-1970 War of Attrition

On March 8, 1969, Egypt launched heavy artillery fire along the Suez Canal. The War of Attrition was launched with this assault. The first stage of the war lasted until July 1969 in which the parties strived to measure each other's capacity through the assaults they conducted. Frightened that the conflicts would escalate, Israel refrained from conducting too many operations against Egypt. On June 17, 1969, four Israeli Mirages flew over Cairo at low altitude at hypersonic speed and caused sonic booms and in response commanders of the Egyptian Air Forces and the Egyptian Air Defence Forces were dismissed. On July 7th, Israeli Mirages violated Egyptian air space and pressured Egyptian aircraft to take off and intercept and shoot down ten Mig-21s. A similar operation was executed in Syria the next day and seven Mig-21s were shot down. On July 12th, 29 Israeli soldiers were killed during the commando raid conducted by Egypt at the Suez Canal. Thus, Israel launched a major air operation on July 20, 1969 in which two Mirages, one Mig-21 and two Mig-17s were shot down. In September 1969, F-4E Phantom IIs commenced service into the Israeli Air Force. On October 22nd, the Phantoms executed their first operations in the SA-2 battery in Abu Suweir. On December 26, 1969, three Israeli Super Frelon helicopters dropped the commandos near Egypt's P-12 radar station. After the station was captured by the commandos, two CH-53s landed and transfer the captured radar to Israel. In early 1970, Israel increased its assaults deep into Egyptian territory. When Israel turned up the pressure, Egypt made another move; NASSER visited Moscow on January 24-25, 1970 and requested military support from the Russia. Russia built up its existence in Egypt. Russian military specialists had already been employed in Egypt. There had been casualties during former operations, so new radars, command control equipment and air defence systems were dispatched in Egypt with the newly assigned Russian staff. The SA-3 batteries were among the systems being deployed in the region for the first time and the Soviet and Egyptians pilots conducted formation flights together.

On July 18th, Two F-4 Phantoms fitted with ECM pods of the Israeli Air Force targeted both the Egyptian SAM batteries (SA-3) and ancillary infrastructure and two F-4 Phantoms (Squadron commanders) had fallen to SAMs. These aircraft were the first victims of the SA-3 batteries. Soviet pilots fought in air combat as well yet failed to achieve the success they had aimed for; however the Soviet SAM batteries did manage to severely hurt the Israelis. In August a ceasefire between the parties was declared as a result of the pressure imposed by America.

1973 Yom Kippur War

On October 6, 1973 at 14:00 p.m., Egyptian and Syrian forces launched a surprise attack to Israel on Yom Kippur (Redemption Day) which is a religious holiday for the Jews. So, as it was a day of rest and prayer, life came to a standstill in Israel. People were either in their homes or in synagogues. Egypt had executed intensive military exercises prior to the war and using these exercises as an excuse, Egypt had deployed a great amount of personnel and equipment to the Suez Canal region. Israeli intelligence suspected Egypt's battle readiness. The former Egyptian President's son-in-law Ashraf MARWAN, who was also a senior Mossad agent,

leaked information to Israeli intelligence that Egypt was going to launch an attack at dawn that day. However, as he had relayed inconsistent information previously, Israelis approached this new information quite suspiciously. Since the attack did not start on October 6th, the Israelis considered it a deception tactic. Still, the Israeli Armed Forces wished to launch a pre-emptive strike in the morning of October 6th but the government refused. Israel's then Prime Minister Golda MEIR did not want to be the party that initiated a new battle in the Middle East, and this decision played a key role in what was to come. Golda MEIR also did not want to lose the existing and potential military aid from the United States.

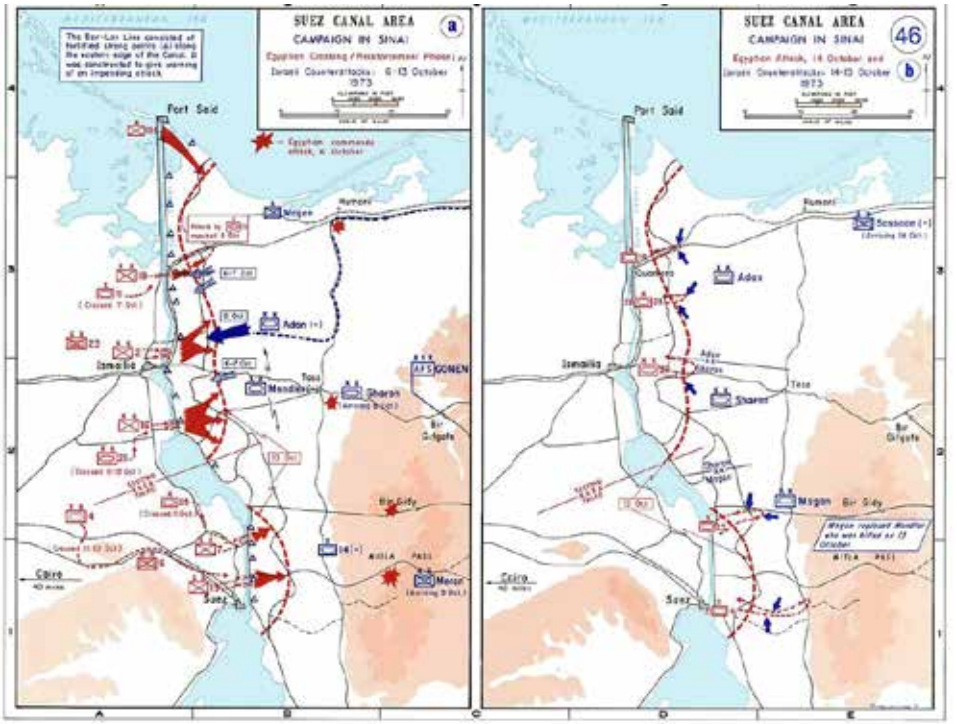
The air superiority strategy of the Arabs was mainly based on the SAMs (Surface-to-Air Missiles) and the aircraft remained in the background. The aircraft of the Egyptian and Syrian Air Forces initially attacked targets in the Sinai Peninsula and in the Golan Heights. They did not proceed towards the targets in the deeper regions of Israel. Their most crucial purpose here was that both land and air forces wished to run the operation under the SAM umbrella. Moreover, the Arab officers were aware that they had no capacity to conduct operations in terms of equipment in the deeper regions of Israel.

When the assault started, most of the aircraft had already been switched to air-to-air payload from air-to-ground payload as the pre-emptive strike had been aborted. An attack to Israeli air bases was expected and the aircraft in air-to-ground configuration dropped their bombs to the sea and started to execute the air interception mission. When most of these aircraft arrived in the Sina or Golan regions, Arab aircraft had already hit the Israeli targets in these regions and on the way back they confronted some enemy aircraft. The Egyptian Aircraft performed their duties under both the fixed and mobile air defence systems umbrella as they passed through the canal. The Israeli aircraft faced severe losses during the attacks due to these air defence systems, with the mobile SA-6 systems having performed quite effectively in particular. As Egyptians activated their air force against Israel, Israel became effective against Syria's air force. In the following days, Israel intensified the SEAD (Suppression of Enemy Air Defences) operations against the SAM systems located to the west of the canal and as it started to breach the air defence, Israel launched more operations in deeper regions of Egypt. Moreover, Israel gained the opportunity to provide more and effective air support to its ground troops. On October 12th, Israel accepted America's recommendation of a ceasefire due to increasing casualties, but the offer was declined by Egypt.

Israeli soldier is seen in front of the captured SAM batteries

America started to support Israel in terms of equipment and ammunition while similarly Russia backed Egypt and Syria. On October 14th, F-4Es from America started to arrive in Israel, and they were immediately sent to the frontlines without even changing their camouflage. On October 15th, having turned the situation in the Syrian frontier to its advantage, Israel reinforced the Sinai frontier with a new armored division and launched a counterattack. Israel's mechanized units passing through the canal and advancing in Egypt attacked the Egyptian air defence missile units. By adding the aircraft that were shifted from the Syrian frontier in order to cover the vulnerability in air defence, air supremacy was achieved over the Egyptian forces and on October 18th, Israel started to control air combat. On that day 11 Egyptian aircraft and 3 Mirage aircraft from Libya sent for support were shot down while 3 Israeli aircraft crashed during their return. Since the beginning of the combat, Israel did not lose a single aircraft for the first time as of October 19th. On October 21st, Israel launched an air - mobile operation to Mount Hermon. This region in the Golan Heights with strategic importance had been seized by Syrian commandos on October 6th. 2 Syrian Mig-21s crashed during the conflicts in the region while Israel lost 3 aircraft. On October 22nd, the United Nations Security Council passed Resolution 338 calling for a ceasefire, but the conflicts lasted until October 24th. On October 24th the last air combat took place on the Sinai frontier where 12 Israeli Mirages encountered 20 Egyptian Mig-21s. During this combat, Giora Epstein

shot down four Mig-21s, increasing the total score to 17. By the end of the combat, almost 90% of Israel's losses had occurred due to either air defence missiles or anti-aircraft guns. A great lesson was learned from Yom Kippur: the destruction or electronic jamming of the enemy's air defence had been essential to win the war. This lesson paved the way for stipulating the investments in electronic warfare while underlining the requirement for precision-guided ammunition. The race between the hunter and the prey continued with new tactics developed in line with new weapons. A new era started for Israel, with the F-15A/Bs arriving in 1976, E-2Cs bought in 1978 and with the F-16A/Bs that arrived in 1980. Technological and tactical sovereignty was once again established over the Arabs and Israel continued to resort to pre-emptive strikes in the upcoming periods and conducted joint operations which resulted in significant impact. The first attacks were carried out in Lebanon, then to the Osiraq Nuclear Reactor in Iraq and to the Palestine Liberation Organization's camps in Tunisia. These attacks still continue to take place and due the importance they place on intelligence (either manned or unmanned), new tactics and high technology, they maintain their superiority over the Arab Air Forces



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Congratulations

for the 100th issue

Ali Kalıpçı
Member of Defence Turkey
Advisory Board

Dear Ayşe, Yeşim and other team members,
Congratulations on carrying Defence Turkey Magazine to its 100th issue. In our world where the easiest thing is war and the hardest is peace, Defence Turkey has been doing a good job in peacekeeping.
I wish for the continuation of the success of Defence Turkey in its mission of bringing peace to our world without war, in a world where we are surrounded by fire at all times.

Dr. Altan Özkil
Member of Defence Turkey
Advisory Board

Dear Defence Turkey Team,
I congratulate all of you for offering satisfying news and information as based on qualified studies in the field of the defence industry and for providing us with the opportunity to get to know our sector closely. I wish for you to publish many more 100th issues, with enjoyment as you keep your finger on the pulse of the industry.
Warm regards,

Cem Koç
Member of Defence Turkey
Advisory Board

Defence Turkey Magazine has been a natural stakeholder of the Turkish Defence Industry with its professional and sincere approach, creating value for the industry since the first issue.
I would like to congratulate Defence Turkey Magazine team for their hard work that led to 100th issue and also for being a gateway to the Turkish Defence Companies.

Kaya Yazgan
Member of Defence Turkey
Advisory Board

I believe that Defence Turkey magazine has made significant contributions to our defence industry. I sincerely congratulate all those who contributed in reaching its 100th issue.

Congratulations

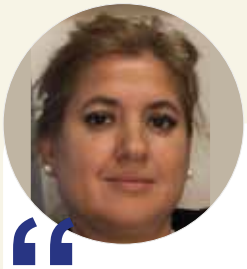
for the 100th issue

Prof. Dr. Nafiz Alemdaroğlu
Member of Defence Turkey Advisory Board

I sincerely congratulate you on your 100th issue. Defence Turkey magazine presents the outlook of the Turkish defence industry with its objective and impartial observations. With its articles, interviews and news, it has made a breakthrough in Turkish journalism. Defence Turkey magazine, of which I still remember the first issue as if it was yesterday, has achieved great success in the course of time. I wish many more 100th issues!

Fahir Altan
Member of Defence Turkey Advisory Board

I would like to congratulate the Defence Turkey team, which has played an important role in the promotion of the Turkish Defense Industry and the development of bilateral relations with the efforts they have made both in the country and abroad since the day it was founded, and I wish them continued success.



Zeynep Karel
Member of Defence Turkey Advisory Board

Dear Ayşe and the Defence Turkey Team,
I remember the excitement of the first issue as if it happened yesterday, our meetings and interviews we held… Really good memories and years later, the happiness of the 100th issue… Congratulations!
I believe the success of Defence Turkey Magazine will continue to grow in the coming years. To many hundreds of issues that will add value to the sector…

A. Zafer Betoner
Member of Defence Turkey Advisory Board

Dear Defence Turkey Team,
As an Advisory Board Member for 14 years, I am honored and happy to work with you. I remember it as the first local magazine published in English when it started publishing. You have been providing a very significant advantage to our Turkish Defence Industry at the international level with your publications prepared with passion and devotion under the direction of Ms. Ayşe Akalın.
On the occasion of the celebration of this special issue, I wish all of our teammates, who have always been working with great devotion and putting their souls in their articles, great success in the upcoming years and I hope to be together in the future issues.

Egyptian Navy & Mistral-Class Amphibious Assault Ships

by Cem Devrim YAYLALI

On December 24, 2010, the Russian President of the time Dmitry MEDVEDEV announced that two Mistral Class warships would be purchased from France for a total of €1.37 Billion. This was the first and the most significant arms procurement of the Russian Federation from the West and a NATO country to date.

Some of the vessels' features were redesigned to meet the Russian Navy's operational demands in cold weather and icy waters and to enable compatibility with Russian KA-52 and KA-27 helicopters. Unlike French ships, Russian vessels have a modified bridge structure, reinforced hull to operate in arctic zones, runway de-icing system, and an extended stern gate that completely closes the well-deck. Additionally, compared to the French ships, the height of the helicopter hangar was increased to accommodate the coaxial-rotor KAMOV helicopters, which have become the company's trademark.

Following the design process, the construction of the ships started in 2012. The main contractor, STX shipyard in Saint-Nazaire, France, was responsible for the construction and final assembly of most of the blocks that constitute the ships, while the subcontractor Russian OSK shipyard was responsible for building a total of 12 blocks. Russia's total share was around 40% of the contract price.

The first ship, Vladivostok, was launched in October 2013, and the second ship, Sevastopol, was launched in November 2014.

The Russian Federation annexed Ukraine's Crimean Peninsula while the construction of the ships was about to be completed, and the installation of Russian systems and the training of Russian sailors continued. Following this occupation, Europe decided to impose a series of political and economic sanctions against the Russian Federation. As a result of this decision, France announced that the Mistral Class ships would not be delivered to Russia. In August 2015, France announced that it had canceled the Mistral contract with the Russian Federation and reimbursed the money already paid under the contract.

The DCNS shipyard, which France holds a majority share, had to find new buyers for these ships in order not to sink financially. It did not take long before a new customer for the ships appeared. In August 2015, the French President of the time Francois Hollande announced that the Arab Republic of Egypt was seriously interested in these two ships. The sale of the vessels was finalized in September. The first 180-man team of the Egyptian Navy went to France in January 2016 and started orientation training on the ship.

The ship named Vladivostok by the Russians was named Gamal Abdel Nasser on June 2, 2016, and the second ship, Sevastopol, was commissioned by the Egyptian Navy on September 6, 2016 under the name Anwar El Sadat. It is estimated that Egypt paid €950 Million to France for these two ships.

Having purchased two multi-purpose amphibious assault ships in addition to one FREMM Class frigate

ENS Anwar El Sadat (L1020)

and 4 GOWIND Class corvettes from France in 2014-2015, Egypt became the first country to use these types of vessels in the African Continent and the Middle East.

The Mistral Class ships are 199 meters long and 32 meters wide. The draft of the vessel is 6.3 meters. The height of the vessels from the waterline to the top of the mast is 64.3 meters. Their displacement is 21,300 tons when fully loaded.

One of the most important features of Mistral-class vessels is the 885.5-square-meter well-deck at the stern of the ship. This 57.5 m long, 15.4 m wide, and 8.2 m high area can accommodate 4 medium-sized landing craft, 2 Landing Craft Air Cushion (LCAC), or 2 EDA-R type Shore-to-Shore Landing Catamaran Fast Landing Craft (L-CAT). The well-deck allows for the transportation of these landing craft and also enables the quick transfer of military vehicles and soldiers so that they land safely from the main ship to the smaller landing craft in an environment protected from adverse weather and sea conditions.

Spread over two decks inside the ship, the lower level of the vehicle garage offers direct access to the well-deck. In this 2,650-square-meter area, it is possible to park up to 1,200 tons of military vehicles in various combinations, such as 40 Leclerc main battle tanks or 13 Leclerc MBT and 46 other military vehicles.

The size of the flight deck on the ships is 5,200-square-meters and it has six helicopter landing spots, one of which can support a 33-ton helicopter. However, the elevators carrying aircraft between the hangar and the runway have a maximum carrying capacity of 13 tons; therefore, heavier helicopters cannot be transported via the hangar. The flight deck is not suitable to operate short take-off/vertical landing aircraft (STOVL) such as the F-35B or Harrier.

As a standard, French ships carry 8 transport (NH-90, Puma or Cougar) and 8 Tiger attack helicopters. However, it has been stated that nearly thirty light helicopters can fit inside the 1,800-square-meter hangar of the ship.

Egypt purchased the KA-52K KATRAN attack helicopters and KA-27P ASW and KA-29TB transport/utility helicopters from Russia to use on these ships. Although European companies participated in Egypt's helicopter tender, it was logically the best decision to purchase Russian-made helicopters as the ships were modified for Russian helicopters. The KA-52K

KA-52K KATRAN Attack Helicopters

KATRAN is the ship-based version of the KA-52 ALLIGATOR helicopter. Its fuselage is covered with resilient anti-corrosion coating and has folding rotor blades and wings. Additionally, the landing gears of the KATRAN have been strengthened to withstand hard landings on the ship, and the length of the wings have been shortened for easier shipborne operations and parking inside the hangar. The Egyptian Armed Forces also used CH-47 Chinook and AH-64 Apache helicopters on the Mistral Class ships during the exercises.

These ships can carry 450 soldiers in addition to military vehicles and helicopters. It is also possible to double this number for short expeditions.

Mistral Class LHDs have a wide range of medical facilities. Ships in the French Navy have NATO Echelon 3 hospital-level diagnosis and treatment facilities. Spread over three decks, the 750-square-meter hospital has 69 beds, 50 of which are reserved for intensive care, a CBNR decontamination facility, two fully equipped surgery rooms, and a fully equipped dental treatment unit. Thanks to the x-ray, ultrasound, and CT scanning devices on board, doctors can treat their patients as soon as possible.

After commissioning the Mistral-class LHDs Gamal Abdel Nasser and Anwar El Sadat, the Egyptian Navy experienced a quantum jump in its operational capacities and gained capabilities it did not have before.

The amphibious ships owned by the Egyptian Navy before acquiring the Mistral-class LHDs are tank landing ships with a displacement of 600 - 800 tons, produced by the Soviet Union and given to Egypt between 1968-1974. Moreover, the Egyptian Navy ships allow only one helicopter to land and take off from the platforms.

The Egyptian Navy, which does not have previous experience in large-scale amphibious operations, must undergo an intensive learning process to use a large, capable, and sophisticated platform such as Mistral effectively and efficiently. It is debatable how sufficient the Egyptian Navy's knowledge is on critical issues such as forming a naval task force and integrating multi-purpose amphibious ships into it, protecting them against enemy threats, and carrying out joint maritime operations (air, surface, and underwater) with all platforms.

Shortly after the explosion that took place in the Port of Beirut in early August and caused severe damage to the city and the country, French President Macron stated during his visit to Beirut that the French Navy Mistral-class LHD FS Tonnerre will be sent to Lebanon for humanitarian aid. However, Egypt, which has the same ships and can be considered Lebanon's neighbor, did not carry out such an action. Even this simple example is striking.

Because, before purchasing a weapon system and adding it to the inventory, it is much more important and vital to analyze how capable the existing systems are, where they are lacking, and what capabilities should be acquired in the future, as well as how to use the weapon system in the most efficient way ■

Boeing AN/TWQ-1 Avenger (fitted with Raytheon FIM-92 Stinger missiles) on the flight deck of the Mistral-Class LHD Anwar El-Sadat (L 1020) and The French Navy LHD Mistral during the joint French-Egyptian Naval Exercise "Cleopatra 2017"

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Congratulations

for the 100th issue

Hakan Mirgün
Assistant General Manager
TÜYAP İstanbul Fairs

Thank you for your contribution to the defence and aviation industry since 2006.
Despite all the difficulties encountered in sectoral publishing, it is a great success to reach the 100th issue.
We wish you continued success in your future endeavors.

Levent Metinoğlu
TÜYAP

Defence Turkey 100th Issue
Some numbers are important in our lives.
100 is a special number. The 100th issue, in particular, is another special thing.
I met Defence Turkey and its team, especially my dear friend Ayşe Akalın, after starting to reorganize IDEF, one of the world's leading defence industry fairs, in 2005 as Tüyap. We always come across the Defence Turkey team during the world's important defence industry fairs. I really like this team, giving me confidence with their smiling faces, respectful and warm human relationships, and for their sophisticated and targeted articles, to be honest.
What's more, I also like their love and loyalty to each other and to the country.
To many more 100th issues Defence Turkey!

Hakan Kurt
CEO of Capital Fuarcılık

I wish Defence Turkey manty many more very successful issues. Defence Turkey always brings a wealth of sectoral information to readers across the globe, and I am a fan of Defence Turkey as well.

Hilal Unal
SEDEC, Head of Organization Committee
GÖKSER MAKİNA, Deputy Director General

Dear Defence Turkey Team,
We would like to congratulate you on your 100th issue and thank you for your contributions and support to our industry. In an era where information and communication are very important, it is valuable to share sectoral news and content with us meticulously, and also to announce them abroad in English.
We wish you continued success.

Congratulations

for the 100th issue

Burak Akbaş
International Sales, Marketing and Corporate Reputation Director Meteksan Savunma Sanayii A.Ş.

Defence Turkey magazine, which I follow with great pleasure, continues to meet its readers and to inform them about recent developments, innovations and latest news related to the industry at a national and international level for 100 issues. Reaching the 100th issue in publishing is a great success. Beyond a magazine, Defence Turkey has become a reference book for us with its stable publishing life of many years, and it has always been with us with its rich content that adds value to the sector, informs the public on our achievements and takes a leading role in promotion activities abroad. I proudly congratulate the 100th issue of Defence Turkey, which is the voice of the Turkish defence industry and ensures that the developments in our sector are conveyed with a reliable and impartial approach, and I thank the team for their contributions to the magazine. I sincerely wish that Defence Turkey will put its signature under many more successes also to address our future generations by continuing to grow and develop.

Cem Altınışık
FNSS SAVUNMA SİSTEMLERİ A.Ş Corporate Communications Manager

I sincerely congratulate the 100th issue of DEFENCE TURKEY Magazine, the foundation of which was laid in 2006, and also congratulate the entire team for their valuable contribution to the promotion of our industry. I wish you continued success.

Melek Akdoğan
Communications Leader of Alp Aviation

Dear Defence Turkey Magazine Family,
It has always been very enjoyable for me to be a part of this friendly team in providing content & news about my company, Alp Aviation for so many years.
I congratulate you for your 100th issue and I strongly believe that your success will continue.
Best Regards,

Selçuk Şandan
Honeywell Corporate Communications Manager, Turkey & Central Asia

I think that “Defence Turkey” is a brand in terms of sectoral publishing due to its technical expertise, the professionalism of the publishing team, and its dignity among the readers. “Defence Turkey” has always been an indispensable medium for us to follow the developments in the aviation industry and to convey our own message to the sector. I sincerely congratulate the entire “Defence Turkey” family and wish many more successful 100 editions.

SUNGUR Low Level Air Defence System is Ready to Enter Service!

by İbrahim SUNNETÇİ

Roketsan developed and produced a National Man-Portable Air Defence System (MANPADS/ PORSAV) through national resources to replace the Stinger POST (FIM-92B) and Stinger RMP (FIM-92C) MANPADS in the inventory of the Turkish Armed Forces (TAF). Dubbed as PORSAV, the National ManPADS is a fully autonomous 'fire and forget' missile equipped with a two-stage (booster motor and sustainer motor) solid propellant rocket motor and features Aselsan's cooled Imaging Infrared (IIR) type seeker head (believed to operate in the three to five-micron waveband). The PORSAV is expected to be effective up to the altitude of 4km and a range of 6km+. The missile is believed to be armed with a 3kg high-explosive warhead (as in the case with the Stinger missile) loaded with tungsten ball projectiles.

As the lowest level unit of Turkey's layered air and missile defence capability the PORSAV has been undergoing development since 2013. According to the Turkish Minsitry of National Defence (MoND)'s 2016 Activity Report in order to meet the Turkish Land Forces Command (TLFC)'s requirements the Portable Air Defence Missile System (PHSFS) Project Contract was signed between the MoND and Roketsan on September 10, 2013. The PHSFS Project covers the design, development and production phases and according to the project schedule the first delivery would take place in September 2020 and deliveries would be completed in September 2022. The PHSFS Project was handed over to the SSB on November 28, 2016. According to sources within the scope of the PHSFS Project the first firing tests with Ballistic Test Missiles, Controlled Test Missiles and unarmed Seeker Guided Test Missiles took place in 2018 and 2019 at the Sinop test range and guided firing tests with armed Seeker Guided Test Missiles (with a live warhead) took place during the second half of June 2020. A short

video footage shared by the President of Defence Industries Prof. Ismail DEMIR on July 1, 2020, also included sections from live firing tests that were conducted on June 17, 2020 against a fixed target lifted some 20m from ground level and while simulating a static air target. During the test at least two live PORSAV missiles fired against a fixed target.

On July 1, 2020 President of Defence Industries Prof. Ismail DEMIR announced with a tweet that Turkey's new Mobile Low-Level Short-Range Air Defence System 'SUNGUR's tests were successfully completed and the brand-new weapon is ready to be added to the TAF inventory. According to SSB's DEMIR, the SUNGUR is able to engage its target while moving (shoot-on-the-move capability) and is able to detect, identify and track its targets both in day and night conditions with a 360-degree range.

The SUNGUR self-propelled surface-to-air missile system which provides mobile, short-range air defence protection for ground units against cruise missiles, unmanned aerial vehicles, low-flying fixed-wing aircraft, and helicopters is armed with PORSAV. According to a short video footage shared by Prof. DEMIR on his official twitter account the SUNGUR features a 360-degree rotating gyro-stabilized (allowing the missile pod to maintain aiming direction regardless of vehicle motion) air defence turret mounted atop a BMC's VURAN 4x4 Armored Vehicle. The electrically controlled turret has two PORSAV missile launcher pods, each capable of firing 2 fire-and-forget IIR guided missiles in rapid succession and is

fitted with a Star SAFIRE 380 HLD FLIR System for target detection and tracking purpose. Contrary to ZIPKIN and ATILGAN PMS Systems in the TLFC inventory the SUNGUR is not equipped with a .50-calibre automatic machine gun to cover the missile dead zone and engage ground targets. The SUNGUR is expected to be able communicate with the TLFC's Air Defence Early Warning and Command Control System (HERIKKS/Skywatcher), which permits external radar tracks and messages to be passed to the fire unit to alert and cue the gunner.

According to the same footage SUNGUR is manned by a gunner, who operates inside the vehicle under armour protection. The gunner uses a control and display panel that features a multifunction color display and two joysticks. Targets are acquired by using the STAR SAFIRE 380 HLD FLIR (forward-looking infrared), which features a laser range finder and a video auto tracker. The FLIR sensor provides SUNGUR with a target acquisition capability in obscured battlefields, at night, and in adverse weather.

The SUNGUR Low Level Air Defence System and PORSAV National MANPADS are expected to enter service with the TAF in late 2020. As pointed out by the SSB's Prof. DEMIR, the SUNGUR/PORSAV will also be integrated with Land, Air and Sea platforms in the inventory of the TAF in the near future.

National Satellite İMECE Final Assembly Completed

Final assembly of Turkey's first indigenous and national high-resolution earth observation satellite İMECE has been conducted by the Minister of Defence Hulusi AKAR, Minister of Industry and Technology Mustafa VARANK and Minister of Transport and Infrastructure Adil KARAİSMAİLOĞLU. The final production stage of Turkey's first indigenous and national high-resolution earth observation satellite will be initiated upon the successful completion of tests and the satellite is planned to be launched into space next year. The assembly and integration activities of the Structural - Thermal Qualification Model of the İMECE Satellite were successfully accomplished within 4 months despite the ongoing pandemic conditions. The objective of this project was to develop an observation satellite with less than one meter resolution to fulfill Turkey's military and civil high-resolution image requirements.


© Turkish Aerospace

Indigenous and National Satellites on the Way

In addition to Ministers, President of Defence Industries İsmail DEMİR, Deputy Minister of National Defence Yunus Emre KARAOSMANOĞLU, President of the Digital Transformation Office of the Presidency Ali Taha KOÇ, President of Turkish Space Agency Serdar Hüseyin YILDIRIM, President of TÜBİTAK Hasan MANDAL, President and CEO of Turkish Aerospace Industries Temel KOTİL, Chairman and CEO of Aselsan Haluk GÜNGÖR, Türksat General Manager Cenk ŞEN and representatives of other institutions and organizations attended the meeting held at Turkish Aerospace (TUSAŞ).

Final Assembly by the Ministers

At the meeting the recent status of the production activities for Turkey's first indigenous and national communication satellite Türksat 6A and Turkey's first indigenous and national high-resolution earth observation satellite İMECE was evaluated. Following the meeting the participants moved on to tour the TUSAŞ Space Systems Integration and Test Center.

Minister of National Defence Hulusi AKAR, Minister of Industry and Technology VARANK and Minister of Transport and Infrastructure KARAİSMAİLOĞLU examined the area where the Structural-Thermal Qualification Model assembly and integration activities of the İMECE Satellite are being carried out and where the final assembly was executed for Turkey's first indigenous and national high resolution earth observation satellite. Ministers at the meeting rendered İMECE available for the tests to be conducted, while they were also informed on the processes remaining until its launch into space. Contributing to the assembly of the final parts of the satellite, Ministers immortalized this historical moment at TUSAŞ with a commemorative photograph.


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Minister AKAR: A Great Contribution to the TAF

In his remark Minister AKAR said, "Great progress is being achieved in our indigenous and national defence industry in line with the instructions of our Dear President Recep Tayyip ERDOĞAN and with the incentives and support he has granted." Underlining the critical activities accomplished in the areas of both software and hardware, Minister AKAR added:

"The needs of our Armed Forces are being fulfilled

through indigenous and national resources to a great extent and the fact that the local content rate has reached the level of 70% is a source of pride for us. I would like to state that the outputs of these activities will make major contributions to the functional operations of our Armed Forces in the upcoming days. The developments in this area will continue in various areas, in various forms and dimensions in the near term and we will enjoy and take pride and comfort in knowing that our Armed Forces' needs are fulfilled independently, in terms of the security and defence of our country and nation."

Minister VARANK: We will be launching Structural - Thermal Qualification Tests

Minister of Industry and Technology VARANK expressed that they were informed on the recent status of the indigenous and national projects Turkey has been designing and developing and observed the activities on site. Stating that the activities were being executed in line with the plans, Minister VARANK continued:

"We will be launching the structural - thermal qualification tests of the İMECE satellite developed by TÜBİTAK Uzay with our other stakeholders in an indigenous and national framework in line with the needs of our Ministry of National Defence. We accompanied the final assembly with our colleagues from other Ministries and made a minor contribution. If the tests executed can be finalized by September, then we will


© Turkish Aerospace

be able to move onto the final production stage of the İMECE observation satellite to render it available for its launch into space in 2021. We hopefully aim to launch the satellite into space in 2021. Besides, the Ministry of Transport and Infrastructure is our stakeholder within the scope of the project on our communication satellite Türksat 6A which was conducted through national and indigenous resources from its design to production. We were informed by our colleagues that they achieved initiating a stage that will enable the launch of this communication satellite into space in 2022."

Underlining that the activities in space were quite critical and valuable, Minister VARANK added, "The capabilities acquired in space could be extended to various areas of industry and technology. Turkey's present capability of manufacturing its own satellites is quite valuable indeed. We hope to see our satellites in space one day and we will successfully use them for our country."

To be Tested in Space Conditions

İMECE Satellite Project Manager Emir Serdar ARAS mentioned that the final assembly of the satellite was completed and continued, "In the next stage, the İMECE satellite will be tested in a space environment simulation. First, its resistance to thermal conditions will be tested in a vacuum chamber. Then, the vibration over the space vehicle will be tested. Thus, the structural - thermal tests will be completed by September 2020. Afterwards, we will launch the assembly activities of the flight model of the İMECE satellite. At this moment, we are in front of the thermal vacuum chamber. Final assembly activities of the İMECE satellite in the thermal vacuum chamber were completed with the participation of our Ministers. Behind us is the thermal vacuum chamber. Hot and cold cycles will be realized in the vacuum environment in simulated space conditions and the satellite's resistance to the environment of space in terms of thermal conditions will be tested." Following structural - thermal qualification tests, the assembly of the flight model will be conducted.

Successfully Accomplished Despite Pandemic Conditions

The Structural - Thermal Qualification Model assembly and integration activities of the İMECE Satellite developed by TÜBİTAK Space Technologies Research Institute were launched in January 2020. Activities were successfully completed within a brief period of 4 months despite the pandemic conditions. The Structural - Thermal Qualification Model will be subject to challenging environmental tests for 3 months after this stage and its compatibility with space conditions will be tested.

Civil and Military Requirements to be Fulfilled

The İMECE Project was initiated in January 2017 and the project aimed to develop a less than one meter resolution İMECE Earth Observation Satellite to fulfill Turkey's military and civil requirements for high-resolution images. A major step has been taken towards fulfilling civil and military needs for high resolution images through indigenous resources in Turkey through the maximum employment of national and indigenous facilities in the development of the satellite platform. In addition to the High-Resolution Electro-Optical Camera, critical equipment, software and related technologies are being developed with national facilities within the scope of the Project.

Congratulations

for the 100th issue

Ümit Bayraktar
Publisher & Executive Editor,
MSI Turkish Defence Review

Dear Defence Turkey Team,
Defence Turkey magazine, with which we have been serving the Turkish defence and aviation industry for nearly 15 years, has managed to become one of the most important brands in Turkey in the field of defence broadcasting. The 100th issue is the best evidence of this. It is also valuable that Defence Turkey is among the few players that managed to maintain both printed and digital publishing without disruption in our industry, which prefers to rely on a publication physically printed on paper.
On behalf of the MSI Turkish Defence Review team, we celebrate your 100th issue and wish you success on your journey in the aftermath of this phase, which is an important milestone in terms of a periodical publication.
With warmest regards,

Özgür Ekşi
Editor in Chief, C4 Defence

Happy 100th issue to Defence Turkey magazine... Established to be the voice of companies operating in the Turkish defence industry, Defence Turkey has been successfully fulfilling this mission for a long time both in our country and abroad. Continuously expanding its product range, the team recently took a step in the field of civil aviation and filled the gap in the sector. I sincerely congratulate the Defence Turkey team and wish them continued success.

Teoman Korkmaz
Chief Editor, Savunmasanayi.org

Defence industry in Turkey is a large family with the Presidency of Defence Industries, security forces, companies, employees and the media.
Defence Turkey magazine, the first defence industry magazine published in English in Turkey, has been successfully performing its mission as a pioneer in the promotion of the sector abroad for years.
We have been in close cooperation with Defence Turkey, that is, Ayşe, Cem, Yeşim and İbrahim for the last 15 years; we took part in fairs, domestic and overseas sectoral visits. We communicated the industry news, shared our sufferings, joys and hopes. We strained to support each other as much as we can in almost every respect.
Defence Turkey is now publishing its 100th issue. I am sure this team will publish at least 100 more issues because they are full of energy, have determination and most importantly for me, their close friendship does not change according to the conjuncture and interests, which I have observed for the last 15 years.
I sincerely congratulate the 100th issue of Defence Turkey magazine. Hope to read the 200th issue and also convey my message on that issue...

Mehmet Kaya
Journalist
Dünya Daily Newspaper / dunya.com

Defence Turkey magazine is one of Turkey's most prestigious media outlets. Defence Turkey has gained a very important place as an industry reference journal through its articles and news. I would like to congratulate all members for the 100th issue. I wish you more 100th editions.

Congratulations

for the 100th issue

Jennifer Miel
Executive Director, U.S.-Turkey Business Council, U.S. Chamber of Commerce

"U.S. Chamber of Commerce's U.S.-Turkey Business Council is pleased to congratulate Defence Turkey on this important milestone. The 100th issue achievement shows the continuous growth and development of the Turkish defense industry. We had the privilege to work together for more than 20 years through the American-Turkish Council, and will continue this strong cooperation in-line with U.S.-Turkey defense interests."

Vittorio Rossi Prudente
Managing Director, Global Business Press Pte. Ltd.

"Congratulations for reaching such a prestigious goal at a time of difficulties for the entire sector. Through the years your magazine has become a standard reference for and about the defence industry in Turkey."

Göksel Yıldırım
Anadolu Agency Correspondent

As in many other fields, sustainability is one of the most important aspects in defence industry publishing. This means maintaining and improving the level and quality achieved during the journey. Defence Turkey has successfully fulfilled these two elements on its journey which extends now to the 100th issue. It contributes to the follow-up and understanding of sector developments with successful and harmonious teamwork. I believe Defence Turkey will progress forward on this path, contributing to the sector for many years to come.

Arda Mevlütoğlu
Vice President of ODC

Defence Turkey has been a perfect example of success through persistence. I am very glad to have observed the utmost care by the team to detail and quality of the information as well as outlook of the magazine throughout the years. I congratulate the Defence Turkey team for their splendid work in defence journalism and wish to read many 100's of issues in the coming years!

TEI-TJ300 Turbojet Engine Ignited!

by Cem AKALIN

Turkey's first Medium Range Anti-Ship Missile Engine TEI-TJ300 was tested at TEI – TUSAŞ Engine Industries Inc. premises in Eskişehir with the participation of the Minister of Industry and Technology Mustafa VARANK. Governor of Eskişehir Erol AYYILDIZ, President of the Digital Transformation Office of the Presidency of the Republic of Turkey Ali Taha KOÇ, MPs of Eskişehir Harun KARACAN, Prof. Dr. Emine Nur GÜNAY, Metin Nurullah SAZAK, President of TÜBİTAK Hasan MANDAL and Director of TÜBİTAK SAGE Gürcan OKUMUŞ attended the ceremony as well.

Designed and manufactured completely through indigenous and national facilities, the engine weighs less than 30 kilograms. It is the first turbojet in the world that is capable of generating a thrust of 1,300 Newton in its own thrust category and TEI Chairman & CEO Prof. Dr. Mahmut F.AKŞİT informed Minister VARANK on the engine prior to the test. Briefed shortly before the test, Minister VARANK ran the ignition system and fueled and revved up the engine. Starting with 4,500rpm (revolutions per minute), the engine's number of revolutions was increased to 26,000rpm under control during the ignition test, with the injection of the main fuel.

Minister VARANK made a brief statement following the test and underlined the importance of the engine developed by the engineers of TEI for the defence industry. VARANK: "Today we ignited the TEI-TJ300 engine developed with the support of TÜBİTAK. These engines were designed to be employed in medium range anti-ship missiles and they could be utilized in many other platforms as well. I also witnessed the first powering of the core engine of our GÖKBEY TS1400 turboshaft engine. The chairman of TEI promised that they would be delivering the engine this year to TUSAŞ. Following the delivery, TUSAŞ will be launching the engine integration activities.

This engine, at the same time, is the symbol of a critical development as it displays the progress of our defence industry. Despite its physical size, the TEI-TJ300 engine generates a thrust of 1,300 Newton and produces nearly 400 horsepower. The most critical infrastructure regarding the power systems of air vehicles, in particular, has already been established at TEI in our country and this infrastructure is producing products rapidly. And because of this, which we are proud of, we are capable of independently developing many products of foreign restrictions." Stating that all software, equipment and test systems of the engine test infrastructure were also developed by TEI through indigenous and national facilities, Minister VARANK added, "A country may manufacture a product, but if the testing environment needs to be supplied from a foreign

country and in the event that no country makes this technology available, then even the test of the product could not be achieved."

VARANK and the accompanying delegation posed for photographs in front of the engine and the big poster of the new medium range anti-ship missile.

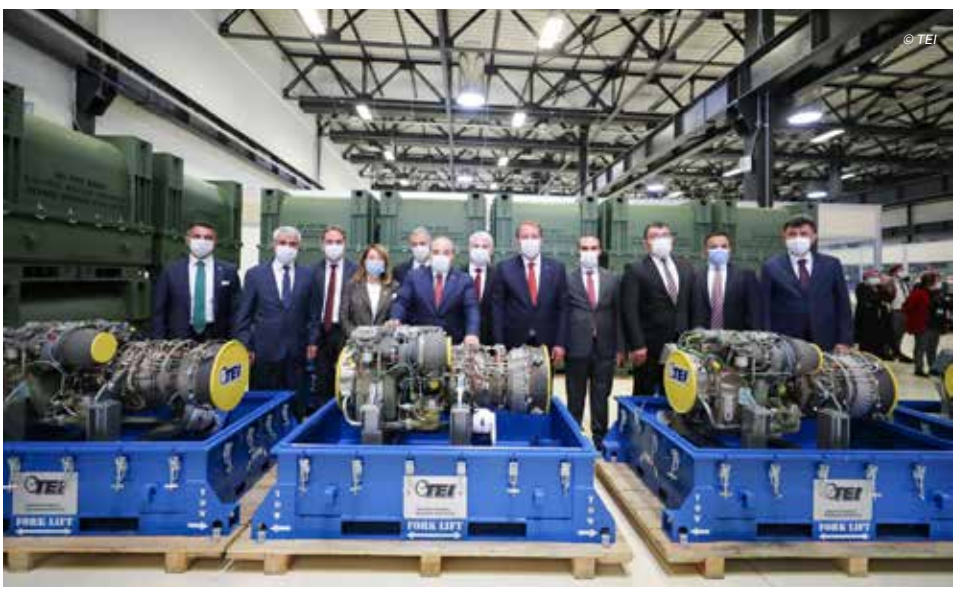
Giving brief information on the development process of the engine, Prof. Dr. AKŞİT said, "The engine which we are standing in front of is in fact the first engine that we manufactured and powered, the engine that we powered today at the test cell is the second engine we manufactured. We ran the first engine in February, yet could not hold this ceremony due to the measures adopted as part of COVID-19 pandemic. We will be manufacturing five engines for testing purposes this year. This is an engine completely designed by the engineers of TEI and it is comprised of only off-the-shelf components that could be procured anywhere. These are standard cables, spark plugs, etc. We are indigenously manufacturing most of the parts in Turkey. Gür Metal supported us significantly in casting. We had certain additive manufacturing parts produced at the R&D center of Sabancı University. All remaining parts were manufactured here."

Minister of Industry and Technology VARANK then powered the engine

of GÖKBEY Helicopter TS1400 in the testing environment. The core of this engine had been successfully powered previously. T700-TEI-701D engines will be powering T-70 helicopters and TEI conducts the indigenous and serial production of the engines (two engines per month). Minister VARANK closely examined 6 of these engines that are ready for delivery and was informed on the developments by TEI Chairman & CEO AKŞİT. AKŞİT said, "We have already delivered eight of these serial production engines. We have six left and two engines are about to be completed. Current local content rate of these engines is around 50%. The local content rate decreases to this level because we procure the gearbox from the supplier. Even the combustion cell and the core engine are being manufactured by TEI."

Minister VARANK was informed again by TEI Chairman & CEO Prof. Dr. Mahmut F.AKŞİT on 5 TEI-PD170 engines that were manufactured by TEI through serial production for the ANKA and AKSUNGUR platforms which are ready for delivery, and the engine block which has been produced indigenously for this engine for the first time.

VARANK then successfully conducted the final control test of a TF33 engine which is maintained by TEI that powers the NATO AWACS aircraft and concluded his visit at TEI's Eskişehir premises.



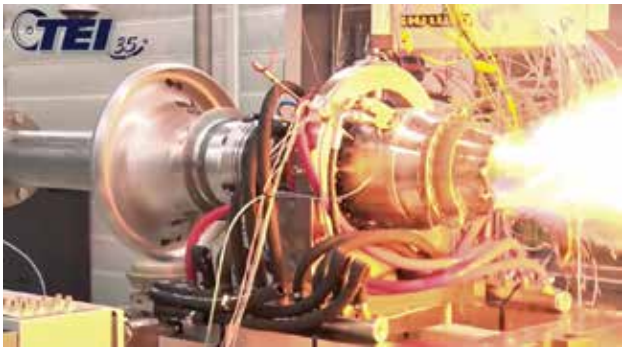
TEI's TJ-300 Engine to Power Roketsan's Medium Range Anti-Ship Guided Munition!

by İbrahim SUNNETÇİ

The TJ-300 Turbojet Engine, of which first ignition was realized at the Miniature Jet Engine Test Rig at TEI's premises on June 19, 2020 with the participation of the Minister of Industry and Technology Mustafa VARANK, will power Turkey's first Medium Range Anti-Ship Guided Munition (G/M). With a power output of 1.300N (around 400hp) the TJ-300 Turbojet Engine is able to reach Mach 0.9 at 5.000ft altitude and thanks to its compact design has an outer diameter of 240mm and weighs less than 30kg. According to TEI, the TJ-300 is the first turbojet engine able to generate a thrust of 1300N and weight less than 30kg. TEI has been working on the TJ-300 engine for the last 28 months.

Totally designed and developed locally with national means in cooperation with TUBITAK, TEI and Roketsan the TJ-300 engine is a single-shaft axial-flow type turbojet engine consisting of a 4-stage axial compressor and a fixed outlet nozzle. According to information disclosed during the ceremony the TJ-300 Turbojet Engine also has the capacity of powering a high-speed jet-powered UAV weighing 1.300kg.

On the other hand, TEI also carries out its activities on the more powerful TJ-400 Turbojet Engine, which according to our assessments will have a capacity of 1.500N, as confirmed in the images



displayed during the video of the TJ-300 ignition ceremony. As also underlined by TEI Chairman and CEO Mahmut F. AKŞİT, five TJ-300 Turbojet Engines will be manufactured this year for testing purposes. These engines will be developed fully indigenously from the scratch by TEI engineers and without any foreign dependency. The TJ-300 Turbojet Engine was a surprise in the public opinion and ranked first rank on the news on social media as well as the mainstream media.

Following these developments, the focus was shifted towards the National Medium Range Anti-Ship G/M, which is under development at Roketsan facilities.

So, what is a Medium Range Anti-Ship G/M? Which capabilities will be acquired by the Turkish Naval Forces with this missile?

The **Medium Range Anti-Ship Guided Munition Project** has been launched for the replacement of the Penguin Mk2 Mod7 Anti-Ship Guided Munitions(G/M) in the inventory of Turkish Naval Forces, which are about to reach the end of their service life in 2020s, with a new generation and indigenously designed G/M in line with the demands of the end-user authority.

According to the image displayed in the background of the official delegation during the briefing in the ignition ceremony, the new Medium Range Anti-Ship G/M, which will be powered by the TJ-300 turbojet engine developed by TEI appears as a scaled version (approximately 50%) of ATMACA Anti-Ship G/M of Roketsan. The new Medium Range Anti-Ship G/M has a smaller diameter compared to ATMACA. This new missile features a booster and a foldable wing design, and

the air intake of the turbojet engine is also mounted under the rear section of the fuselage (just behind the folding wings) similar to ATMACA.

According to the information relayed in the ceremony, the new Medium Range Anti-Ship G/M is 3.2m long and weighs 300kg. It is probably capable of reaching a range of around 100-150km depending launch speed and altitude.

A very large seeker head is mounted at the tip of the missile. This seeker perhaps features a "Dual Mode". In addition to the IIR Seeker, an active RF Seeker (ATMACA B2) or Passive RF Seeker (AKBABA ARGM) or a Semi - Active Laser (SAL) Seeker may have been used.

Similar to ATMACA, the New Medium Range Anti-Ship Guided Munition will feature a two-way encrypted data link, INS/GPS and a Radar Altimeter. New Medium Range Anti-Ship G/M is expected to be deployed at air and surface platforms of the Naval Forces Command such as Helicopters, Maritime Patrol Aircraft and Fast Patrol Boats. The New Medium Range Anti-Ship G/M is expected to feature air-to-surface, air-to-ground, surface-to-surface and surface-to-ground firing capabilities. The new Medium Range Anti-Ship G/M will be replacing the Penguin Mk2 Mod 7 G/Ms in the inventory of the Naval Forces Command.

Fixed-Wing Loitering Munition ALPAGU to be in the Inventory of the Turkish Armed Forces by the End of 2020!

The Turkish Armed Forces has initiated the active use of "kamikaze drones" on the battlefield and these drones are becoming diversified. While STM continues the delivery of rotary wing kamikaze drones also dubbed KARGU, activities on the fixed-wing loitering munition ALPAGU have come to an end. The ALPAGU will become available for use by security forces towards the end of the year.

The ALPAGU is categorized as a fixed wing tube-launched loitering munition that can be deployed and operated by one personnel and has been specifically engineered for asymmetric or conventional warfare. This system consists of a fixed wing Kamikaze drone, a launcher tube and ground control units.

Deliveries of Autonomous Rotary Wing Attack UAV KARGU to the Turkish Armed Forces (TAF) continue. This drone system features the functions of the acquisition of potential targets in urbanized terrain and in-flight abort if required, while with its lightweight structure, diving speed, low radar cross section and speed ALPAGU, presently under final test phase, is capable of precisely hitting critical or high value targets. Weighing less than 2 kg, and despite its relatively small size and lightweight, the ALPAGU is able to carry explosives that could neutralize its targets. There are only two platforms in the world (Israel and US) at this size and with similar features.

Moreover, on account of the embedded artificial intelligence and image processing algorithms, its silent operation, capability of delivering the explosives it carries to the target and loitering munition capability, the ALPAGU will play a crucial part in the execution of invasions and surprise attacks in the operational field against as well.

According to the information that was presented during IDEF'19, the ALPAGU can be deployed by single personnel and rapidly fired from a launcher on the site. Launched from a tube and capable of operating at an altitude of 400 m and a range of 5 km, with its 10 minutes' endurance and loitering capabilities, the ALPAGU can destroy the target by diving towards the target at a speed of 140 km and airburst on the target over a distance of 8m.

ALPAGU are planned to be utilized in blocks (Block-I-II-III-IV) in due course. The ALPAGU also has larger versions with longer ranges and higher speeds, capable of engaging greater targets over 10 kg and carrying more explosives as well. On account of the capability of developing small sized platforms weighing less than 2 kg, activities are being conducted to render these drones into larger platforms in the near future. In addition to the version that could be launched through a launch tube by single personnel, various configurations are being developed that could be launched from armored vehicles or ship-based multiple launchers and that are planned to be integrated to unmanned air platforms such as AKINCI & ANKA.

ALPAGU and KARGU team up as Swarm Drones!

Furthermore, the ALPAGU will also be able to perform tasks integrated to Surveillance UAV platforms such as TOGAN with remote sensing, image processing and tracking capabilities. Developing swarm operation capability over the KARGUs, STM aims to launch a utilization concept enabling ALPAGU and KARGU to perform in the same swarm for different types of missions in the upcoming period.

Congratulations

for the 100th issue

Hakan Saraçoğlu
General Manager
AMPHENOL WORLD HEADQUARTERS
Turkey & Middle East

Congratulations for the 100th issue of your magazine. As the Amphenol Turkey and Middle East office, we follow your publications with great interest. I believe your magazine has contributed and inspired the Military and Aviation industry.
Wishing you many years of effective and successful publishing.
Best Regards

Nilgün Aladağlı
ALA

Defence Turkey Magazine fulfills a significant mission by informing its readers about all innovations in the industry. I wish them a very long-lasting publishing life. To the 1000th issue…

Gözde Özacar & Rüya Kip
Servo Savunma

The 100th issue in the publishing world is like the age of 100 years. It is very valuable to prepare and distribute a "centenarian" publication with high quality without interruption and to be able to handle a new topic in every issue. We believe Defence Turkey Magazine, having a pioneering role, will march with the sector as a media organ that adds value to the industry.
To many more issues...

Edip Sabahattin Mete
President
DELTA ELECTRONICS TRADING AND INDUSTRY CO. LTD.

I am very pleased to learn that Defence Turkey Magazine is going to publish its 100th issue this month. As the founder of Delta Electronics, which has been in the defence sector for thirty-five years, I have been following the news regarding present and future developments via Defence Turkey Magazine as well.
As I have noticed, Defence Turkey Magazine is one of the prominent publishing agencies functioning bilaterally to provide all the recent information for the decision makers, for Turkish military, for defence officials, for procurement executives, for defence industry members and for private companies. They are profoundly motivated to gather information concerning developments and activities in industry, science, projects and programs not only in Turkey, but also all over the world by visiting related shows and keeping future opportunies for Turkey on their agenda. I believe that Defence Turkey Magazine makes a great contribution to Turkey with its meticulously working personnel who obtain the news first hand.
I congratulate Defence Turkey Magazine on their publication of the 100th issue and I would like to express the pleasure of seeing them succesful.

Congratulations

for the 100th issue

Ezgi Kesler Erten
General Manager
İLTEK TEKNOLOJİ

Defence Turkey magazine is one of the most fruitful sources, which provides accurate and reliable information to the defence industry with its honest, impartial and responsible publishing approach, and has maintained this for many years with sincerity. I thank the entire team for their contribution to our industry. To many 100th issues…

Vacit Şar
Şarko Ltd. General Manager, Aerospace Cluster Association Vice President

I would like to congratulate all of your employees for reaching the 100th issue of Defence Turkey magazine, which I have been following closely for many years and recommend to the companies to which I have been providing consultancy services. Thank you for your contribution to the promotion of our defence industry in our country and abroad.

Yasemin Ok
General Manager of Voytes

As Voytes, we would like to thank Defence Turkey, which shares recent developments in the defence and aviation industry, sheds light on the sector, and exerts diligent efforts, and congratulate its 100th issue with our warmest wishes.

Semiha Yaşar
Owner, Sempro

Defence Turkey Magazine, which we follow with interest, makes great efforts to bring its readers together with all the developments in the Turkish Defence Industry and the development of ongoing projects.
Now the magazine has published its 100th issue.
As the Sempro Family, we wish Defence Turkey Magazine's continued success with many new issues and we congratulate everyone who has contributed.

Teknopark Istanbul's R&D Center Cultivating Creativity and Innovation

Bilal TOPÇU Teknopark Istanbul General Manager

© Teknopark Istanbul

As Teknopark Istanbul, we function as the innovation center of the Turkish defence industry. At the same time, on account of this position, we integrate the experience of a variety of sources through a range of collaborative activities. Universities, research centers, the qualified workforce in Istanbul and its surroundings, as well as the experience of industrialists of the region, all of our talented and dedicated individuals come together here at Teknopark Istanbul to focus on specific areas of technology, particularly in the defence industry.

We started our journey with the aim of becoming Turkey's R&D base and now we host 311 companies such as Aselsan, TUSAŞ, TEI, Roketsan, STM, BMC Power, Aspilsan, Vestel Defence, Yaltes, C-Tech, Altınay Havacılık, Pavotek, Femsan, Armelsan, Kale Aerospace and Figes.

There are currently 5,674 qualified R&D engineers employed at these companies in our compound. We support the development of R&D engineers with training courses that we organize with our stakeholders in line with our mission of becoming a scientific and technological innovation hub that will contribute to humanity. Teknopark Istanbul supports the development of creative ideas and we conduct our activities with a focus on becoming the R&D Center of Excellence where critical technologies are developed for our country. We embrace the vision of making our mark through activities that build a new model for innovation and economic progress, to create an international business and trade center that will contribute to our country, becoming a center where ideas are rapidly turned into products and brands.

The companies under the auspices of our Teknopark reach a potential where they can run their business smoothly in terms of affordable rental costs, the extensive infrastructure and the location of our facilities. In addition to many major companies in our defence industry, sub-contractors that develop sub-products for the defence industry are also located within our Teknopark in order to find buyers for their products more rapidly and to seize the opportunity to have their say in critical projects.

1,929 R&D projects are currently being conducted at our Teknopark which provide crucial support towards our country's national technology movement. Leading defence industry R&D projects such as MİLGEM Corvette, Altay Main Battle Tank, Anka UAV and LHD Amphibious Assault Ship are amongst these projects. As Teknopark Istanbul, we are proud to have supported these types of projects for ten years now, and these projects will continue to reduce our country's technological dependency especially within the scope of the defence industry.

"We Contribute to our Country's National Security by Engaging in Critical Cyber Security Activities"

We have a holistic approach to defence as Teknopark Istanbul and cyber security also plays a major

role within this context. According to research run by the University of Maryland, a cyber-attack takes place once every 35 seconds worldwide, this adds up to 2,244 different cyber-attacks daily. As our President of Defence Industries Prof. Dr. İsmail DEMİR also underlined, "Turkey is at the top of the list of countries most exposed to cyber-attacks. Being aware of this reality and taking into consideration the various threats and attacks our country has been subjected to in this new conjuncture, we clearly see the fact that this area should not be left open." We contribute to our technology development capacity in this area. There is great potential for our local technology companies here.

As a matter of fact, this issue is being handled particularly by our Presidency of Defence Industries in a critical manner. We have a Cyber Security Cluster established to this end. The activities of this cluster formed by companies that develop new products in the cyber security area are quite valuable for us. In fact, we are also conducting activities that support new ideas regarding cyber security. We enabled our youth to share their ideas through the Cyber Security Idea Competition. We have held this competition for the last two years, and through this organization we get informed on quite valuable projects, while being a part of the enthusiasm of our young people who will shape the future of our country. We are genuinely pleased with this and very proud of our youth. This year we realized our competition under the auspices of the Presidency of Defence Industries and Digital Transformation Office of the Presidency and with the partnership of Turkey's Cyber Security Cluster by using HAVELSAN's 'Diyalog' program. The finalists of the competition were entitled to conduct R&D studies at our incubation center in addition to a monetary reward.


© Teknopark Istanbul

Launching our country's first cyber security incubation center is also among our plans for 2020. Within this scope, we will be offering the opportunity to nearly 30 thousand entrepreneurs who are focused on cyber security ideas to collaborate in an area of 2 thousand square meters which will be Europe's greatest incubation center. This center will be established as part of our 3rd stage buildings.

At this center, we will host entrepreneurs with brand new ideas, launching indigenous and national projects that will contribute to our country's protection against cyber-attacks. We will offer our entrepreneurs training and mentorship opportunities without charge in areas such as business plan preparation, tips for effective presentation, marketing and finance. Moreover, our entrepreneurs will be offered free consultancy services with access to financial support and they will be informed on how to grow their business by benefiting from guidance at investor meet ups.

Cyber Security Experts Rising through the Ranks with the Cyber Security Vocational High School

Turkey's first Cyber Security Vocational High School is just about to open. Teknopark Istanbul has taken a critical step in terms of promoting cyber security education and development with the support of the Ministry of National Education and relevant institutions. This new high school will start admitting students in the upcoming academic year. In the first stage, the students will attend classes in an office that we will select and then they will continue their education in the new building which will be built on land we will allocate. The demand for qualified R&D engineers in the sector is increasing in Turkey and worldwide. We believe this Cyber Security Vocational High School will be essential in fulfilling this demand. In addition to the theoretical studies, our students will be receiving hands-on training at this school and thus will stand out with their indigenous and national cyber security projects which will create a difference in the sector. We will also closely support the bright ideas of our young entrepreneurs, cultivating creativity and innovation with the Cyber Security Incubation Center that we will launch in 2021.

"We will provide an Employment Opportunity for Nearly 9 thousand People as soon as our 3rd stage Buildings are Fully Activated "

Teknopark Istanbul will continue to add value to the Turkish Defence Industry. When construction is completed on all 3rd stage buildings we will be able to reach an employment figure of nearly 9,000 and 400 companies.

Turkey's First Virtual Defence Exhibition; SAHA EXPO

Organized by SAHA Istanbul, Turkey's largest industrial cluster and the biggest supporter of the National Technology Movement launched to increase the localization rates in Defence & aerospace industry, the SAHA EXPO will be held between November 04-07, 2020, at the Istanbul Expo Center in coordination with SAHA EXPO Virtual Exhibition offering the visitors the opportunity to make a 3D virtual tour of the exhibition.

In a period when fairs were canceled due to the coronavirus (Covid-19) pandemic that affected the whole world, SAHA EXPO Virtual Exhibition, which will be held by SAHA Istanbul, which quickly and successfully carried its work to the digital world, will be the first exhibition to bring the Turkish Defence industry power to the virtual world. The virtual exhibition, which will be held for the first time to become a global brand, will be open to the whole world and be visited 24/7. SAHA EXPO Virtual Exhibition will promote the products and capabilities of 493 companies and 16 universities operating in the Defence and aerospace industry with high technology production potential. The virtual exhibition will be opened to visit with the XperEXPO software prepared by SAHA Istanbul member ASELSAN affiliate BİTES.

AKINCI UCAV, T-129 ATAK, and Altay MBT at SAHA EXPO Virtual Exhibition

In the virtual exhibition, it will be possible to examine the products and systems developed by hundreds of Defence industry companies, especially the Bayraktar Akıncı UCAV, Altay MBT, T-129 ATAK Helicopter, TB2 UCAV, and various missile systems, and get detailed information. Developed by Turkish engineers with domestic and national capabilities, SAHA EXPO Virtual Exhibition allows exhibitors to introduce their newest products, systems, and designs and establish international collaborations during B2B meetings with purchasing delegations who cannot come from abroad via video conferences.

AI Booth Attendants Will Take Part in the Virtual Exhibition

Using the latest technology, SAHA EXPO will give visitors new opportunities to experience the exhibition with virtual demonstrations, which are not possible in real fairs. Company officials who wear augmented reality glasses will explain how their product works to the visitors via the video conference application. It will also be possible to answer the visitors' questions with the artificial intelligence-supported booth staff to be added to the virtual exhibition in the upcoming period. All data and content of the highly strategic Defence industry exhibition will be securely kept on the infrastructures in Turkey.

Defence Industry Will Meet with the World

With three new halls and four times larger area compared to the previous exhibition in 2018, SAHA EXPO 2020 will be held with the participation of over 300 companies and will be a major Defence & Aerospace exhibition in Turkey where thousands of professionals from various countries of the world and Turkey meet. Participating companies will hold B2B meetings with international professionals and procurement committees, and they will host their guests at SAHA EXPO 2020. Visitors will be able to examine all the companies and products participating in the exhibition starting from the exhibition area's entrance, and they will be able to view the direction, floor, or company they want. With the application, visitors will be offered the opportunity to make a 3D virtual tour of the exhibition halls and booths. They will also be able to connect to live support and get answers to all their questions.

Face-to-face Communication at the Virtual Exhibition

Face-to-face communication will also be possible at the SAHA EXPO virtual exhibition, so the participants will not feel the absence of mutual interaction. Face-to-face communication between visitors and representatives of participating companies will be provided through the "BizBize" application. Thanks to the "BizBize" application developed by BİTES, a member of SAHA Istanbul, users will be able to connect to the company representative with a single click and receive information about the topic of their choice.

Visitors from all over the world

SAHA EXPO Virtual Exhibition can be accessed via a PC web browser, mobile browser, or SAHA EXPO mobile application without downloading any apps. Users will be able to log into the system from anywhere in the world. Entries into the system will be in 3 different categories: Exhibitor, Delegation, and Visitor. While visitors and delegations are visiting the booths in 3D, they will be able to examine the products of companies in detail with Virtual Reality technologies, watch company and product-based video demonstrations, download product catalogs, and will be able to establish live online video meetings with the relevant people from the companies. The delegation will also be able to request bilateral video meetings from the participating companies and determine the meeting time on the system. Within the scope of the SAHA EXPO Virtual Exhibition platform, there will be features such as survey, analysis and reporting, various language support, and integration with social media accounts. Information such as which users visited the booth of which company, how many times, how long they stayed, whether they downloaded the files or not, can be accessed from the platform. Thus, participating companies will be able to reach their target audiences more easily and interact according to the analysis.

Umbria Aerospace Systems Focus on Turkish Market

Umbria Aerospace Systems is an Italian aerospace company founded in 2014 joining two previously established companies: Umbria Aerospace Technologies specialized in hydraulic and mechanical actuation and Umbria Electronic Systems, specialized in electronics and software. The integration of their respective knowledge in the field of oleo-dynamics, precision mechanics and electronics has allowed the development of a new young and dynamic reality capable of developing implementation systems applied to aerospace.

Beginning with only one customer in 2012 based in the Far East, UAS soon after gained other clients in the same area. After almost eight operating years, the company has already gained a relevant position in the niche aerospace market relevant to small and medium civil aircraft, helicopter, military trainer and unmanned vehicle. Within this scenario European, Asian and National customers have already engaged UAS.

All the above has been possible thanks to a strong and efficient team capable to accomplish the company objects.

UAS aims to continuous offering its capabilities, investments, heritage and expertise, pursuing a constant development of skills and anticipating the market demands and needs working close to our customers in order to integrate our solutions into their programs.

About Turkey market, since 2018 UAS started its activity with a strong and aggressive engineering and design proposal activity on several programs, such as T625, HURJET, HURKUS, ATAK II and TF-X. Up today, the huge engineering work done has already brought some solid results on Hurjet project in which UAS have already been committed to several system and subsystems such as:

- Hydraulic System (Filter Modules, Isolation Valves, Accumulators, Thermal Bypass Valve; Discharge Valve)
- Landing Gear Control System
- Wheel & Brake Control System
- Wheel & Brake
- Nose Wheel Steering System

www.uas-group.com

Congratulations

for the 100th issue

Çağan Irmak
Consultant

Reaching the 100th issue of Defence Turkey magazine, one of the effectual publications of our industry, crowns the great success of our colleagues working with devotion and diligence. I wish that the effective content that I have been following closely since the first issue with news and analysis as well as interviews continue for many more 100 issues.

Umit Ayan
Ankara Branch Manager,
Makina Optik

My sincere congratulations on this significant milestone - one that marks 100 editions of profound knowledge about the Defence Industry.

Budak Mursaloğlu
General Manager, BSM
Innovative Technologies

Congratulations on the 100th issue of your magazine. You have been doing such a great job of delivering rich and right content of information regarding the Turkish Defence Industry. We wish you continued success in future editions.

Sena Akman
Austal Ships
Authorized Sales Consultant Cis
& Turkey

100th issue: another benchmark showing success is no accident. It is hard work, perseverance, learning, studying, sacrifice, and most of all love of what you are doing.
Congratulations

DEFENCE TURKEY MAGAZINE

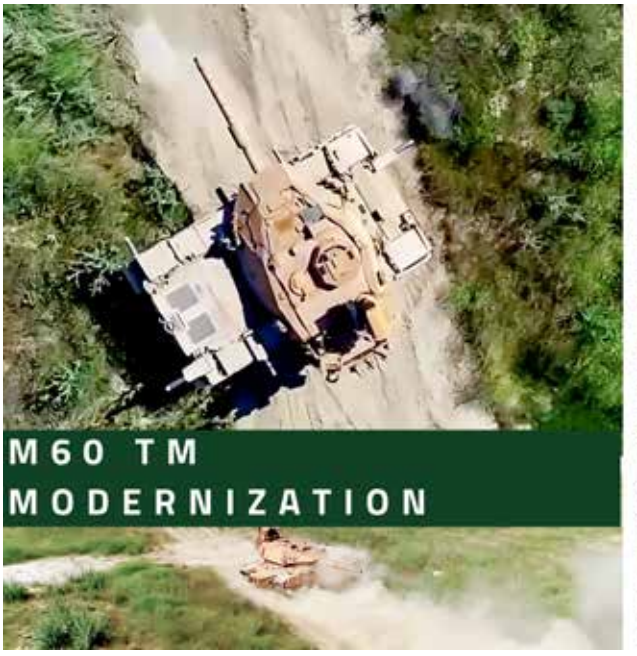
15 YEARS

100 TH ISSUE

THANK YOU VERY MUCH
FOR YOUR VALUABLE CONTRIBUTIONS!

Modernized M60TM MBTs will be a Force Multiplier in Theatre

by Cem AKALIN



On July 12, 2020 Presidency of Defence Industries (SSB), the procurement authority under the Turkish Presidency, disclosed that they have modernized all of the M60T Main Battle Tanks (MBTs) in Turkish Armed Forces (TAF) inventory and upgraded them to M60TM configuration. President of Defence Industries (SSB) Prof. İsmail DEMİR examined the modernization activities on site and said, "By modernizing our tanks with an Active Protection System (APS), we have become one of three countries in the world that have this capability."

President of Defence Industries Prof. İsmail DEMİR examined the cutting-edge technologies and capabilities integrated into an M60TM MBT that modernized within the scope of the FIRAT-M60T Program. During his visit to Aselsan, SSB President Prof. DEMİR received detailed information from Aselsan's Chairman of the Board & CEO Prof. Haluk GÖRGÜN and other officials.

SSB Prof. DEMİR made a detailed statement on the subject and underlined that the tank had to be modernized (M60T) in Israel in times where there was a foreign dependency in the defence industry and added that many more components were presently integrated into the tank far beyond that modernization process. Mentioning that threat detection systems, alarm systems, warning systems, various imaging systems, and countermeasure systems have been integrated to the tank with the activities conducted by Aselsan, Prof. DEMİR continued, "More importantly, the Active Protection Systems that are owned by only three countries in the world have already been integrated to this tank, and this is a great demonstrator of the level achieved by our defence industry. With all its features, this tank was upgraded to increase survivability and these tanks are amongst the tanks of highest capabilities in the world."

SSB Prof. DEMİR continued: "With the protection and warning systems, the fire control system and particularly the Active Protection System employed which is beyond armor, presently we are standing in front of a modern tank. As a country, we are going through a process where the tanks with outdated technology in Turkey's inventory are equipped with multiple capabilities through modernization. The modernization of the Leopard MBTs in our inventory is in progress parallel with the modernization of the M60s. During this modernization, certain improvements were achieved far ahead of the schedule that was determined for the procurement of certain components, for instance, regarding the procurement of the armor, and these components were applied to the tanks. In this way, while we continue to conduct the serial production activities of our ALTAY MBT, the modernization of our Leopard tanks will be completed, and they will enter the league of tanks with the highest capabilities in the world. I would like to thank Aselsan, TÜBİTAK- Sage, Roketsan, and other defence industry companies, platform manufacturers, and the companies producing armored vehicles and tanks."

FIRAT-M60T Modernization Project

The SSB launched the FIRAT-M60T Project on September 26, 2016 in order to equip the main battle tanks in the inventory of Turkish Land Forces with Active Protection Systems against anti-tank threats and to provide the existing systems with new outstanding capabilities.

The feedback received from Operation Euphrates Shield paved the way for the development of a solution

by Aselsan to improve the self-protection system of the existing tanks. Within the scope of the FIRAT-M60T Project, a contract worth €109.245 million + TRY 25 million was signed on May 11, 2017, between the SSB and Aselsan during IDEF '17. It was declared that the Laser Warning System, Remote Controlled Weapon Systems, Close-Range Surveillance System, Robust Spall Liner, Air Conditioning System would be integrated. In the aftermath, as part of other urgent requirements defined by the procurement authority, Contract Amendment No 1, valued at €96.7 million + TRY 25 million, was prepared and signed on July 24, 2018. With Contract Amendment No 1, the total amount of the Project contract reached € 206 Million + TL 50 Million. In accordance with the amendment to the contract, the AKKOR PULAT Active Protection System (APS) will be integrated on 40 of the 169 M60TM MBTs. Out of the 169 tanks dubbed M60TM that were designated for modernization as part of the FIRAT-M60T Project, would integrated the Telescopic Periscope System (TEPES) on 73 of these tanks. Moreover, 90 40mm automatic grenade launchers were procured in 2018 to be used on the M60TM MBTs.

A system solution was prepared with the subsystems designed as part of the ALTAY project within this project that was launched to enhance the survivability of the M60T tanks, which were used intensely during Operation Euphrates Shield in particular. In light of the detailed information shared in the 105th edition of Aselsan magazine published in May 2020, the project was launched immediately during the operations. As a result of devoted efforts, the very first system was integrated into the prototype tank in a very brief amount of time, such as 20 days, and was rendered available for Ballistic Qualification Tests. Following the first tank integration completed at the Base Zone at the center of Operation Euphrates Shield, the tank went through Ballistic Qualification Tests at the border zone with the participation of the SSB, Land Forces Command, and Aselsan staff. The terrorist groups were located 2 kilometers away from the area where the Ballistic Qualification Tests took place, and the tests were completed successfully despite the firing of numerous harassing ammunition nearby. The modernized tank was immediately deployed to the front line, and serial production activities gained momentum with the effective utilization of particularly the SARP Stabilized Advanced Remote Weapon Platform and Tank Laser Warning Systems at the front line, the extension of the lifecycle of the tank engine and thermal system with the Auxiliary Power System and the Telescopic Periscope System and verification of the systems' reliability by the tank staff. Serial production was launched after a short time, about three months after the accomplishment of the required verifications, the systems started to be integrated into the tanks. In the Aselsan presentation "FIRAT-M60T Project: Force Multiplier in Cross-Border Operations" given on the 2nd day of the 4th Land Systems Seminar held on November 5-6, 2018, it was stated that the system integration activities were started at the military bases inside the region of Operation Euphrates Shield approximately eight months in advance of the signing of the main contract and more than ten tanks were upgraded by the time the main contract was signed at IDEF '17.

M60 TM Main Battle Tank

With the written statement made by the SSB on July 12, 2020, completion of the modernization of 169 M60T MBTs by Aselsan was announced. In this way, all M60T MBTs in the inventory were upgraded to the M60TM configuration which ensured a high level of close and medium-range firing capability, as well as short and long-distance survivability and defence capability, and also enhaced the capacities regarding tank maintenance and staff efficiency through technological advances.

Thanks to the integration of the Telescopic Periscope System (TEPES) the M60TM MBTs gained the capability to conduct secure surveillance and target acquisition while in the defilade position. With Aselsan's TEPES mast-mounted sighting system, which is to be integrated into a total of 73 M60TM MBTs, the tanks gain superior target acquisition and surveillance capabilities with high precision under all types of weather and geographical conditions.

The capabilities of TEPES, such as motion detection, target tracking, sectoral scanning, integrated operation with other systems (Laser Warning System, Remote Controlled Weapon System, etc.), acquisition of the target coordinates and video/image recording will dramatically increase the survivability of the M60TM. The system is capable of capturing thermal images and TV images via its E/O sensors and is capable of conducting laser distance measuring up to 20 kilometers. TEPES can reach a height of 2.5 meters with the telescopic elevation system (mast) over the M60TM turret and is capable of calculating the coordinates of the target detected through INS integration and then submits them to the operator. Survivability of the Turkish Armed Forces has reached the highest levels due to the integration of critical systems such as the telescopic periscope and audio laser warning to these tanks for the first time.

The AKKOR PULAT APS is capable of physical destruction, and it can cope with multiple threats simultaneously while providing 360-degree protection capability. The system detects RPGs and ATGMs directed towards the M60TM MBT in the air with the help of the high technology radar it features and destroys them at an optimum distance before they hit the tank. Only 6 countermeasure modules (2 on each of the sides, 1 on the front and 1 at the rear) exist on the M60TM. The system can be switched on and off with the help of the Control Panel in the driver's compartment, and the countermeasure modules can be activated upon request only towards the direction of the threat while other Modules can be deactivated. When the module is activated, the countermeasure munitions over it, in the form of a cylindrical stick, emerges out of its socket and remains outside the hull at a distance of 30-40cm. The sensor of the Triggering Radar remains on the tip of the cylindrical countermeasure munitions. The Triggering Radar can scan up to 180 degrees in azimuth and 35 degrees in elevation and is said to be capable of detecting an approaching threat up to 50m and calculates its angle of approach. After the estimation of the optimum intercept point, when the threat is within range, the warhead located at the back of the millimeter-wave Triggering Radar is activated for the interception. When the cylindrical countermeasure munitions system is activated, it neutralizes the threat using a dense cloud of fast-moving splinters (small fragments scatter around in the shape of a ring due to the cylindrical form of the munition). The fast-moving splinters directly shoot the warhead of the ATGM that constitutes a threat. After a physical impact, either the warhead on the threat is disabled, or the formation of the gel effect (in the HEAT type warhead) is prevented. According to an Aselsan official, as the high-speed fragments move 35 degrees upwards after the activation, it can, technically, also intercept ATGMs with a top attack capability to a certain extent.

AKKOR PULAT APS

Besides these two critical systems that increase the survivability of the Main Battle Tanks, the following system integrations have also been accomplished during the modernization of M60T tanks to the M60TM configuration: Laser Warning Receiver (LWR), Remote Controlled Weapon Station (RCWS), Position and Orientation Detection System, Close-Range Surveillance System, Tank Driver Vision System, Robust Spall Liner, Air Conditioning System, and Auxiliary Power Unit.

According to the feedback received by the tank crew who participated in Operations Peace Spring, Olive Branch, and Euphrates Shield, the tanks modernized by Aselsan were quite successful against Anti-Tank Guided Missiles (ATGM). It was also declared that the operational capabilities of the tanks in urbanized terrain were enhanced.

Moreover, as part of the FIRAT-M60T project, the product support strategy was identified by the procurement contract under the title of Integrated Logistic Support Service. Within the scope of the FIRAT-M60T project, the MTTR (mean time to respond) is 4-6 hours on average, and the system is guaranteed to be repaired and reactivated within a maximum of 3 days. Spares will be used for the activation of systems during both the guarantee period and the performance guarantee period. The Integrated Logistic Support personnel of Aselsan will support the Turkish Armed Forces as part of the system support activities during cross-border operations

BNA Tiltrotor UAV is Flight Ready

The new tiltrotor Unmanned Aerial Vehicle (UAV) Alesta, developed by BNA - Nurol BAE Systems Air Systems, will make its first flight in the coming days.

Nurol BAE Systems Air Systems (BNA), which has been working on a different UAV concept under the coordination of the Presidency of Defence Industries (SSB), has introduced the Alesta Unmanned Aircraft solution with vertical take-off and landing (VTOL) capability for the use of security forces.

Alesta's configuration is unique compared to other UAVs. The vehicle can take-off and land with its wings in the vertical position and fly like a fixed-wing aircraft when switched to horizontal flight by rotating its wings. Combining the advantages of fixed-wing planes and helicopters, Alesta doesn't need a runway that fixed-wing aircraft require thanks to VTOL capable tilting-wings. When transitioned to horizontal flight mode, the UAV can take advantage of the lift created by the fixed wing to fly longer distances than helicopters. Alesta, which has an environmentally friendly electric motor and propulsion system, is designed to perform all tasks in a fully autonomous manner. Electric motor propulsion units distributed on every wing brings increased flight safety through fault tolerance. Autonomous mission execution capability beyond-line-of-sight (BLOS) is a key requirement for integration into regulated air space in the future.

The ground tests of Alesta are expected to be completed within 1-2 weeks, and the flight tests are being arranged to be carried out in August at the UAV Testing and Evaluation Center in Kalecik according to the BNA officials. Alesta is designed as a proof-of-concept to introduce the concept to potential users and to develop larger aircraft based on this configuration. By integrating various payloads and sensors, Alesta will be able to perform different tasks such as reconnaissance, surveillance, intelligence, disaster relief, and firefighting. Potential use cases for BNA's Alesta UAVs include cargo transport in rural areas for both military and civilian purposes, reconnaissance in suburbs, rural areas, or near cities subject to local civil aviation regulation restrictions, search & rescue operations and OPV (Optionally Piloted Aircraft) long-term targeting. The Alesta CV (Concept Version) is a fully electric tilt-wing VTOL UAV built from carbon composite materials. The vehicle has two identical sized tilting wings and eight independent propulsion units.

The conceptual properties of the Alesta family members to come are unique with higher performance & payload capacities (50+Kg). The aircraft has a bay in the front for installing camera payloads. It is 1.6 m in length, 1.6 m in height, and has a 1.8 m wingspan. The vehicle has a range of 20-35 km (depending on cargo weight) and a maximum speed of 120 km/h. Alesta has a payload capacity of 5-8 kg, flight endurance of 20-30 minutes, and a maximum weight of 25 kg. The next configuration of Alesta will be able to be controlled by using virtual reality, and it will be capable of automatically detecting an undefined obstacle and perform avoidance maneuvers accordingly.

The serial production of Alesta is expected to begin at the beginning of 2021.

Colonel Thomas Rapatz
MA, MSD Defence Attache `

Serving as the Defenceattachè of Austria in Turkey since one year it is my duty to perform and establish on the expert level good relations, in order to strengthen our bilateral cooperation. In terms of achievements some small projects on military historical academic side have been initiated and they are currently ongoing.

Above all, it is excellent to know that DEFENCE TURKEY, the Strategic Defense Magazine of Turkey will publish it's 100th issue, congratulation for that. The achievements of the Defense Sector of Turkey is well known worldwide and the cooperation between our two countries is anchored on a foundation of shared values and visions, aspirations and common interests in terms of strategic security policy interests.

It is my privilege to wish you success and congratulate DEFENCE TURKEY to that important improvement and finally it gives hope that after the Covid-19 pandemic situation in future all related activities will focus on a win-win partnership between our countries in order to save peace in the world. At the end, I would like to say words of thanks for the interest you have shown to my country, Austria.

Attilio Gattia
Italian Navy Captain
Defence Attaché to Turkey

As Italian Defence Attaché in Turkey, I would like to convey to you my best wishes for the 100th issue of the Defence Turkey Magazine.

Since my arrival here, I have followed with deep interest this magazine, whose articles have always provided me important support and help for my tasks in Turkey, by bringing to my attention the strong capabilities of the Turkish National Defence Industry.

I would also like to take advantage of this opportunity to extend my warmest congratulations to the professionalism of its editors and on the ability to best represent all topics relating to industry and beyond.

Finally, I would like to wish you many more years of success and prosperity and, as we use to wish in Italy, "Many happy returns of this such important achievement!".

Colonel Juha P. Makela
Defence Attaché of Finland

I have now been Defence Attache in Turkey for one year and I found the Defence Turkey magazine as an excellent source for my work. The articles are well written and provide readers a good understanding about the latest developments in the Turkish defence sector. I also find the conference pre-info/advertisements useful for planning my own attendance in these events. Thank you for the entire team for your excellent work!

Marcio Martins Vilara - Navy Captain
Defence and Armed Forces Attaché
Embassy of Brazil in Turkey

Defence Attaché Office of Brazil to Turkey presents congratulations to DEFENCE TURKEY MAGAZINE on the publication of the 100th issue. It is surely beyond doubt that this magazine has always been full of fruitful information as a guiding light for us. We wish all of your team who had contributions to go on in this successful way in the future, with all our sincerity.

Colonel Piers Strudwick
Defence Attaché, British Embassy Ankara.

Fantastic to see Defence Turkey publish its 100th issue. Defence Turkey is most definitely a 'go-to' publication for relevant and meaningful articles about emerging technology and concepts within the Turkish Defence industry. BZ Editorial Team - we all look forward to reading many more informative articles and reviews over the forthcoming years.

Colonel J. Todd Braithwaite
Canadian Defence Attaché – Turkey,
Georgia, Azerbaijan and Turkmenistan

"The office of the Canadian Defence Attaché accredited to Turkey congratulates Defence Turkey on the publication of its 100th issue. Providing up-to-date information on developments in Turkish Defence Industries and the broader defence equipment market, Defence Turkey is an informative, interesting publication that is appreciated by the international Defence Diplomatic community based in Turkey. We look forward to continuing to receive future issues of Defence Turkey and wish the publishers the very best for their next 100 issues and beyond."

Office of the Canadian Defence Attaché.

Capt.(Navy) Ryo Kumai

Defense Attaché, Embassy of Japan in Turkey

The symphony No.100 in G major was written by Joseph Haydn in 1794. It is popularly known as the Military Symphony. Achievement of reaching the 100th issue in sectoral publishing in Turkey, itself is also a very successful art.

Defence Turkey, which is the reference publication of our military equipment and defense industry, has managed to determine the agenda of the sector for 100 issues, and has guided all the companies and business people in this field.

In these symphony, we congratulate everyone who has contributed and orchestrated the whole melody from past to present.

Defence Turkey is a publication that monitors the pulse of the sector. I have been following it with interest as my predecessors did since its inception. I would like to thank you for bringing together the recent developments in the field of defense both in the world and Turkey, and the industry-leading opinions.

I congratulate your 100th issue with all my sincerity and wish your publication success in making impacts and inspirations for further years.

Abdul Akbar

First Secretary (Press)
Embassy of Pakistan
Ankara

Message for Defence Turkey's 100th Issue

Our heartfelt felicitations to the management and staff of the esteemed "Defence Turkey" for consecutively publishing the 100th issue of this prestigious magazine which is indeed a milestone achievement for any such publication. Defence Turkey has always been a source of informed analysis and thoughtful commentary, and invaluable information in the global defence sector in general and Turkish defence sector in particular. Defence Turkey has been our valued partner in many defence exhibitions in Pakistan and helped bring the brotherly countries Pakistan and Turkey further closer through its in-depth coverage of our bilateral defence collaboration. Wishing the all best to Defence Turkey.

Ho Sung Hwang

Defense Attaché
Embassy of the Republic of Korea

The Defense Attache Office of the Republic of Korea at the Republic of Turkey celebrate publishing 100th issue of Defense Turkey.

Your efforts have helped to better understand Turkish Defense and Defense Industry section. Additionally believe that your efforts will contribut to the development of the Turkish Armed Forces and Defense Industry.

Colonel Zharko Risteski

Defense Attaché of the Republic of North Macedonia

"Congratulations to the editorial office on the occasion of the 100th issue of Defence Turkey magazine. Your magazine has managed to attract the attention of a wide audience of readers from the military-diplomatic corps and the diplomatic corps in Ankara. Also, the magazine Defence Turkey, through our distribution in our countries, has been read with great interest outside the Republic of Turkey. "I wish you continued to be successful and to attract the attention and interest of an even larger number of Defense Turkey readers, because you deserve it."

Ivan Kmet

Defence Attache
Embassy of the Slovak Republic

"I congratulate Defense Turkey magazine on reaching its 100th issue. It has always been the reference source for us in following innovations and developments in the sector. I would like to thank everyone who contributed and wish them continued success."

Colonel Albert Truter

Republic Of South Africa , Defence Attaché to Turkey

With the 100th publication of Defence Turkey, you have indeed reached a milestone to be proud of. The South African Defence Attaché Office has, since its establishment in 2013, benefited immensely from the numerous articles on defence related matters that was published in your magazine. Defence Turkey has established itself as a world-class publication and can be proud of its achievements!

Criminal Investigation Vehicle 'KIRAÇ' Introduced to the Minister of Interior

Attending the launch ceremony held by the Criminal Department of Turkish National Police, Minister SOYLU underlined that new capabilities continue to join the Turkish National Police with high technology products such as KIRAÇ.

June 17, 2020. The introductory meeting of the New Generation Criminal Investigation Vehicle (KIRAÇ) developed by Katmerciler, one of the leading companies of the Turkish Defence Industry, was held at a ceremony with the participation of the Minister of Interior Süleyman SOYLU.

Minister of Interior Süleyman SOYLU delivered a speech at the ceremony organized by the Criminal Department of Turkish National Police. President of Defence Industries İsmail DEMİR and Chairman of the Executive Board of Katmerciler İsmail KATMERCİ also attended the ceremony where Minister of Interior SOYLU made critical comments. Minister SOYLU said, "Peace, public security and safety are essential for everyone" and added that the capability of the Security Forces was improved with high technology products such as KIRAÇ, as he expressed his gratitude to the manufacturer Katmerciler.

Taking the floor with Minister of Interior SOYLU at the ceremony and delivering the key to an attendant, İsmail KATMERCİ, in his statement after the ceremony, noted that they were proud to facilitate the operations of the Turkish National Police with the indigenous vehicle they developed and underlined that KIRAÇ is a world class vehicle.

Presidency of Defence Industries assumed a critical role in the launch of numerous projects in the defence area and KIRAÇ was developed as part of these projects. KIRAÇ is an indigenous mission vehicle designed and manufactured by Katmerciler to enable the Criminal Department of the Turkish National Police for rapid and effective performance of its activities.

KIRAÇ was developed to enable the effective investigation of crime scenes by National Police teams and for

the secure and fast collection of evidence. The vehicle is being manufactured in three different configurations: Unarmored Crime Scene Investigation Vehicle, Crime Scene Investigation Vehicle and Unarmored Criminal Laboratory Investigation Vehicle.

A total of 60 KIRAÇ vehicles will be manufactured and 20 of them will be armored vehicles, while the remaining 40 will be unarmored. Moreover, 385 panel van type Crime Scene Investigation Vehicles with all equipment to be utilized during criminal investigations will be manufactured by Katmerciler and will be delivered by mid-2021. The first batch of six KIRAÇ vehicles were demonstrated and their keys were delivered during the ceremony. These vehicles were delivered in April 2020.

KIRAÇ: Completely Indigenous Product

KIRAÇ was developed as a completely indigenous project in order to meet the requirements of the Criminal Department of the Turkish National Police. This crime scene investigation and mobile criminal investigation vehicle has much more superior features than the previously manufactured criminal investigation vehicles. It contains various units such as an office compartment, evidence protection unit and a laboratory unit. This vehicle will be utilized in crime scene investigations and criminal laboratory investigations. KIRAÇ features various systems from range and direction detection systems to evidence analysis devices, automated finger and palm print identification system (APFIS), chemical analysis and evidence protection system and internet and satellite systems.

KIRAÇ, with rotation speeds of 4x4 and 4x2, is able to climb a 30-degree slope. KIRAÇ features wide area lighting kits and contains compartments of an office, laboratory and an evidence protection unit. With the help of its fully independent suspension system and automatic transmission 4x4 characteristics, the vehicle offers excellent maneuver capability in all weather and road conditions. The extra load capacity of the vehicle enables different levels of ballistic protection and use of versatile equipment.

KIRAÇ is capable of climbing a 20-degree side slope. Independent suspension systems of the vehicle provide high comfort on both asphalt and field conditions, in addition to the superiority rendered in the adaptation of precision instruments to the vehicle. The vehicle controls the region it is located in by the use of a 360-degree camera system. KIRAÇ contains an intercommunication system and a GPS. All vehicles as part of the KIRAÇ Project were designed to perform under all weather conditions.

TUSAŞ- TR Airworthiness Services Inc. Commences Operations

June 7, 2020. TR Airworthiness Services Inc., the subsidiary of Turkish Aerospace (TUSAŞ), commenced its activities with the aim of getting certified by local and international civil aviation authorities and becoming an authorized audit organization in the field of airworthiness and certification. TR Airworthiness Services Inc. will provide certification/ consultancy services regarding Structural Systems and Strength, Safety and Continuing Airworthiness, Air Vehicle Systems, Flight, Propulsion and Dynamic Systems, Avionics, Software, Hardware and Electrical Systems as part of its activities.

TR Airworthiness Services Inc. will provide consultancy services in airworthiness and certification processes in both civil and military aviation. The company will also take part in military certification of the Turkish Fighter Jet (MMU/TF-X), which is Turkey's largest aviation project and will provide technical support to TUSAŞ in military certification activities for HüRJeT, Multirole Heavy Combat Helicopter and HüRKuş-B New Generation Trainer Aircraft.

With this new investment, TUSAŞ, Turkey's leading company in the defence industry, will continue its pioneering activities in Turkey the field of engineering, consultancy and certification services. The company will perform its activities in accordance with the standards of international civil aviation authorities, such as the European Aviation Safety Agency - EASA and the Federal Aviation Administration - FAA.

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Elektroland Prepares to Launch an Explosive Ordnance Disposal Robot Production and Training Center

June 26, 2020. Bringing critical capabilities to the Turkish Armed Forces and Security General Directorate with the Explosive Ordnance Disposal Robots it has been producing for nearly 25 years, Elektroland Defence is getting ready to launch the construction activities for the Explosive Ordnance Disposal Robot Production, Test, Training and R&D Center in Gölbaşı/Ankara. The center to be built on the Ankara-Konya road will have a total area of 6,500 m^2, and the construction of the center, which will be established with a 30-year right of easement on the land allocated by the state, is expected to start in July this year and will be completed in four months.

A Test Unit will also be Available for Robots

The new factory will contain a design workshop, production line with state-of-the-art CNC machines, and administrative offices. Tests of the produced robots and related systems will also be conducted in the Test Center to be established at the factory. An R&D center will also be available at the facility.

With a high level of field experience coupled with the feedback, requirements and experience of security forces, Elektroland Defence's Explosive Ordnance Disposal Robots are still being used actively in the field by the EOD teams of the Turkish Armed Forces and Security General Directorate. Explosive Ordnance Disposal Robots have become one of the greatest supporters of many soldiers and security officers, especially in metropolitan areas and in the counter-terrorism zone within the country, and in cross-border operations in Iraq and Syria. The EOD Robots also undertake critical tasks in many countries where they are exported.

Elektroland EOD Robots Currently Serve in Libya!

TMR-I Dinçer and TMR-II Çetin EOD robots, developed and produced by Elektroland Defence, have recently appeared in the press together with Turkish soldiers in Libya. The names of all the EOD robots produced by the company with different features bear the names of martyred soldiers and police officers.

Rotary Wing Kamikaze Drone KARGU Close to Overseas Sales!

STM's kamikaze drone KARGU has successfully passed the test campaign performed under tropical, desert and tundra climate conditions. Result-oriented for the export of KARGU are being conducted within this scope and according to the statement made by STM, KARGU is quite close to making its mark on its first overseas sales as negotiations with three countries have already been accelerated.

June 15, 2020. Receiving heavy demands from foreign markets with the performance it demonstrated in the theatre while being utilized by the Turkish Armed Forces, KARGU was also admired with its performance during the tests conducted in different countries under various conditions. Attending challenging test campaigns in various conditions such as tropical, desert and tundra climates, KARGU successfully accomplished the assigned tasks.

Three countries show close interest in the procurement of the system and high level negotiations on the sales of the system conducted with friendly and allied countries have matured to a great extent while the countdown towards the first export of KARGU has started.

KARGU's New Production Base: OSTIM Teknopark

STM has received an order of total 500 KARGUs so far to be made available for the utilization of security forces and it has started to deliver the drones in batches. The production activities of the KARGU rotary wing unmanned air vehicles (UAV) developed by STM and also known as 'kamikaze drones' are being conducted at the company's facilities at OSTIM Teknopark.

KARGU Drone Attains Swarm Capability!

KARGU is capable of operating independently on account of its advanced computer vision system and the first applications for the use of KARGU in drone swarms were accomplished last year, tested with swarms of up to twenty KARGU drones.

The efforts to improve the swarm algorithms and the execution of different tasks continue at a fast pace. Additionally, the KERKES project is being conducted for the seamless operation of the drone swarm under all conditions. Following the completion of this project, within a period of 1 – 1.5 years, KARGU Kamikaze Drones with full swarming capabilities will be made available for the utilization of the Turkish Armed Forces.

Meanwhile, activities continue toward solutions where the KARGU system could be employed and integrated with armored land vehicles, particularly on naval platforms.

In our recent interview on 23 June, FNSS General Manager & CEO Nail KURT noted that they have established successful cooperation on the integration of STM's drone systems as part of the Shadow Rider Project (developed through the company's own resources) where M113 tracked armored combat vehicles (ACV) were transformed into a remote controlled unmanned system, yet did not declare the name of the drone systems. In light of these statements, most likely KARGU system, one of the drone systems, would be a critical part of this project.

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Meteksan Defence's Second Export of Damage Control Simulator to the Korean Republic

With this new contract, Meteksan Defence will provide design and consultancy services for the second damage control simulator supply project, aiming to cover the requirements of the Korean Republic's Naval Forces.

July 5, 2020. The Damage Control Simulator is the most advanced and up to date solution of its kind and has been developed for the needs of navies worldwide. Meteksan Defence previously added the Republic of Korea in its customer portfolio after Turkey and Oman, with the contract signed in 2017. Following the first Damage Control Simulator that was completed in 2019 together with a company based in the Republic of Korea, the second Damage Control Simulator project was launched as part of the needs of the Naval Forces of the Republic of Korea. Meteksan Defence signed a design and consultancy contract for the simulator, the construction activities of which will also be conducted in the Republic of Korea.

4 Navies of the countries in the world (Turkey, Oman, Korea Republic and undisclosed one of the Gulf Countries) have preferred Meteksan Defence for their Damage Control Simulator needs so far and Meteksan Defence's knowhow and experience this and its success in all global tenders as a successful bidder position the company as a leader in this field.

Damage Control Simulator

The aim of Damage Control is to control and repair the damage that may occur in vessels due to various reasons at times of peace, crisis and warfare within the shortest time while enabling the ship's transfer to the nearest port for maintenance and repair by enabling ship's mobility. The Damage Control Simulator also provides training in compliance with international and maritime standards on a true to life platform for the timely and full execution of response to damage occurring on board involved in accidents and those for water disposal and isolation activities. The system offers an adaptable difficulty level and automated controlled staff training options at all different levels ranging from a basic level to an advanced level with its contemporary technological design. It will

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also include evaluation, comparison and reporting capabilities. As a part of ship's availability for sailing, Damage Control capability is highly critical in terms of maintaining the integrity, stability and maneuverability of the ship. The most crucial indicator of having such capabilities is the damage control training that is provided to the crew of the ship which is conducted in a realistic training environment and in line with high standards. For the realistic execution of the training, three decks (one open deck) and four compartments composed of an engine room, a pump room, a dining hall and a life space for staff are located within the simulator. The simulator is actualized completely through domestic design with 15 degrees of roll to both sides through the hydraulic system simulating potential situations in real sea environments. Limited sight and free water levels at various sea states can be simulated while training involving actual limitations in mobile and wet compartments are conducted. Similar to that of the Fire Training Simulator, in order to support such training, products with advanced levels of design are utilized and communications, safety, alarms, sound and light effects, artificial smoke and camera monitoring systems are included as well.

For the implementation of a realistic incident similar to that of boats taking on water, training in rising water levels in a compartment up to 140 cm can be simulated. As part of the simulator in the compartments there are 41 low pressure, 13 high pressure damage simulations, 4 flange simulations, and various types of damage isolation techniques are conducted such as shoring, driving a quoin and wedge, patching etc. At the same time, damage control organization, casualty power cable laying, smoke exhausting and water discharging, plotting and training for carrying injured staff and operation of mobile fire engines are available in the various compartments of the simulator.

Both the damage control and fire training simulator enable the execution of training which are difficult to perform at sea and on the platforms, providing a realistic environment located on shore while allowing the personnel employed at seas, platforms and coastal facilities to maintain the highest level of damage control capabilities.

The Damage Control Simulator of the Korean Republic's Naval Forces contains certain differences from the other end-users (Turkey, Oman). This simulator is nearly 35 percent bigger yet the deck and the compartment numbers are the same. The size enables the training of multiple damage control teams at the same time in line with the preferred usage concept. The simulator has certain electronic system simulations such as the IPMS which is used in modern ships, which is another distinction. The Integrated Platform Control and Management System (IPMS\EPKIS) allows the processing of ship damage via an electronic board in a way to contain the automation and monitoring with this platform.

FNSS Ramps up PARS 6x6 Mine-Resistant Vehicles

President of Defence Industries Prof. Dr. İsmail DEMİR: "We will deliver the Pars 6x6 Mine-Resistant Vehicle, which will be the first in the world, to the Turkish Armed Forces in 2021."

© FNSS

July 19, 2020. The first assembly was completed of the Pars 6x6 Mine-Resistant Vehicle, developed within the scope of the project launched by the Presidency of Defence Industries in line with the requirements of the Turkish Armed Forces (TAF).

The introductory meeting for the 6x6 Mine-Resistant Vehicle Project, in which FNSS is the main contractor, was held at FNSS Gölbaşı facilities with the participation of the President of Defence Industries Prof. Dr. İsmail DEMİR, Ministry of National Defence, Turkish Armed Forces, General Directorate of Security and defence industry representatives.

Speaking at the ceremony, President of Defence Industries Prof. Ismail DEMİR emphasized that the vehicle is able to eliminate attacks that may occur during its mission both in residential areas and in the field with its remote-controlled weapon system. The vehicle is designed with new generation high protection capabilities that ensure the safe transfer of personnel. Expressing that the vehicle can operate in all kinds of terrain with its 6x6 mobility, Prof. DEMİR said, "After the qualification tests that will continue until the end of the year, all of our

vehicles will enter the inventory in 2021 and will be offered to the use of the TAF for the first time. This vehicle has several features that we call the firsts in the world and has high export potential. I hope this qualified vehicle will be beneficial to our Security Forces and the Turkish Armed Forces (TAF). Initially, we will start with 12 platforms and hope there will be more platforms in the future."

Prof. DEMİR: "During this period we have been going through, we see that various restrictions and embargoes continue increasingly. The company that developed this vehicle has also faced such restrictions and embargos, but has moved on by overcoming all kinds of restrictions and hindrances with domestic production. We would like to thank both FNSS and all our defence industry companies and ecosystem, which continue the indigenization process despite such hindrances and are taking the National Technology Move to the next level. We no longer worry about other countries shaking their finger at us and we keep moving forward on our defined path with determination. Every threat, every restriction is a warning sign for us. We have seen various elements of this warning sign in this vehicle, and we have made localizations accordingly, and we continue to do so."

FNSS General Manager and CEO Nail KURT pointed out that the vehicles to be produced within the scope of the PARS 6x6 MRAP Project have reached the assembly stage in a short period of 15 months from the effective date of the contract, adding that when the vehicles enter the inventory of the Armed Forces, more strength will be acquired especially with the durability and survivability of the vehicles.

Within the scope of the project, efforts exerted together with local and national organizations, especially with Aselsan and TÜBİTAK, will continue effectively as well in the logistics support period after the deliveries. The project stands out as it fulfills the technical and tactical requirements of the new generation vehicles that the Turkish Armed Forces and world armies may aim to acquire for their inventories in the future, and it also meets technological needs in terms of implementing modern Integrated Logistics Support (ELD) approaches.

In light of the presentation made to the President of the Defence Industries Prof. DEMİR, the Ballistic tests of the PARS 6x6 MRAP vehicle, developed by FNSS to meet the requirements of the Special Forces Command, are planned to be conducted in July-August of this year, the IED and Mine tests in August-September 2020 and the Mobility and Durability tests in August-December 2020. In the images shared for the PARS 6×6 MRAP, it was seen that the vehicle was equipped with two FNSS Remote Control Weapon Systems, Aselsan's YAMGÖZ Close Range Surveillance System, Aselsan's GERGEDAN Jammer System against Remote-Controlled Improvised Explosives and Aselsan's SEDA Gunshot Detection System.

Aselsan - Integration of AKKOR PULAT to Unmanned ACV!

Critical information was shared about the Modernization Project of Armored Combat Vehicles (ACV) in an article published in Issue 105 of Aselsan Magazine. The article includes information that Aselsan is also carrying out technology demonstration activities, through its own resources, on unmanned ground vehicle application and integration of the AKKOR PULAT Active Protection System (APS), within the scope of the Modernization Project of Armored Combat Vehicles which was launched recently, in addition to its Main Contractor role in the Project. Related images were also shared in the magazine.

May 21, 2020. Aselsan, assigned as the Main Contractor in the Project launched for the Modernization of Armored Combat Vehicles (ACV) in the TAF inventory, will be responsible for the modernization of the NEFER 25mm Weapon System it developed indigenously for the armored combat vehicles, Laser Warning System, Close Range Surveillance System, Driver's Vision System, Direction Finding and Navigation Systems. As the main contractor and accountable for the entire system, Aselsan will also be responsible for the integration of the 3rd party sub-systems to the vehicles, such as armor, lining, mine protection, Automatic Fire Extinguishing System, CBRN (Chemical-Biological-Radiological-Nuclear) System, Air Conditioning System. Within the scope of the ZMA Platform Modernization Subcontracting Contract signed between FNSS and Aselsan on December 31, 2019, a separate contract was also included in the project for prototyping, qualification activities, integration of all mission equipment including the turret, serial production and logistics support activities regarding the platform, in addition to all modernization and improvement activities to be carried out for the platform.

According to the images shared in the magazine, an autonomous control unit, radar systems, ultrasonic sensors and Lidars (Laser Imaging Detection and Ranging) will be integrated to the ZMA within the scope of technology demonstration activities, and the vehicle will be transformed into an autonomous vehicle. On the other hand, AKKOR PULAT APS is also planned to be integrated into the unmanned (ACV) in order to increase its active protection in the combat environment. Considering that AKKOR PULAT APS intercepts projectiles 2-3m away from the vehicle, It doesn't know for the time being in the light of the information shared whether a robust armor option is planned to prevent the effect of the Jet (remaining part of shrapnel) ATGM or RPG ammunition in pursuit of interception.

UAV Test and Development Center Opens in Kalecik

In collaboration with TRtest, Kalecik Municipality, and Teknopark Ankara, Permanently Allocated Airspace was opened for Unmanned Aerial Vehicles (UAV) and drone test flights.

As a result of the increase in the use of UAVs and drones in the civil sector as well as in the defence industry in recent years, a test center has been established in Kalecik for the development of unmanned aerial systems (UAS). The Drone Test, Training and Development Center, which is a first in Turkey, has a width of 3.7 kilometers and spans 48 kilometers in length. The area, which is 60 kilometers away from Ankara city center, will be open to the Turkish defence industry and civil aviation. In the first phase of the project, which will be carried out in 2 stages, a facility will be built on 2.5 decares (2,500 square meters).

This one of a kind center in Turkey aims to meet the defence and aviation sector's testing needs. Technology companies, public institutions, or individual citizens will be able to benefit from the center. Permission to use unmanned aerial vehicles will be obtained from the Directorate General of Civil Aviation (DGCA).

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Export Sale of Aselsan's Electronic Warfare Protected Handheld


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With the project launched by the Presidency of Defence Industries, a new radio was developed for the Turkish Armed Forces. President of Defence Industries Prof. İsmail DEMİR stated that the Electronic Warfare Protected Handheld Radio (EHKET), the delivery of which was made to the Turkish Armed Forces (TAF), was also started to be exported.

Within the scope of the TAF Multi-Band Digital Joint Radio Agreement (ÇBSMT) signed between the Presidency of Defence Industries and Aselsan, the tactical and strategic communication needs of land, sea and air elements are met with software-based radios developed indigenously.


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A new model has been added to the radio family consisting of man-pack, vehicle and fixed station configurations. The Electronic Warfare Protected Handheld Radio-EHKET was developed as a new radio model within the scope of the project.

DEMİR stated that EHKET, a small, lightweight, multi-band, multi-functional tactical handheld radio that can meet the most challenging voice, data, video communication needs, was designed to adapt to even the most difficult environmental conditions. "EHKET radios can transmit high resolution images and videos which are needed in today's modern battlefields by using the broadband waveform feature even beyond line of sight. High level electronic warfare protection methods provide EHKET with high survivability. The first deliveries of the radios with national crypto communication were made to the TAF and have started to be exported. Turkey, having been obliged to use radios of foreign countries during the Cyprus Peace Operation, is now among the few countries in the world that is able to design, develop and produce its own indigenous communication systems for its all land, air and naval platforms."

The Electronic Warfare Protected Radio EHKET stands out with its high speed voice-data-video communication, electronic warfare protection, national crypto, high resolution built-in camera, lightweight magnesium alloy casing, network supported structure that enables communication from terminals to command centers with full IP compatibility.

"ECDIS" Innovative Technological Solution from STM for the Maritime Industry

STM is the first company in Turkey that has obtained the EU Marine Equipment Directive (MED)'s Wheelmark certificate, which is globally recognized, with its "STMDENGİZ ECDIS" (Electronic Chart Display and Information System) developed by indigenous software for both naval and merchant ships.

With its computer-based infrastructure that offers interfaces for auxiliary systems such as Log, Gyro, Inertial Navigation System, Echo Sounder, GPS, AIS and etc. available on the platform, and which is compatible with the radar overlay, STMDENGİZ ECDIS is in compliance with International Maritime Organization (IMO) regulations and provides navigational safety to its users with various electronic navigation charts (ENC) (S-57, S-63, etc.).

STMDENGİZ ECDIS increases navigational awareness by integrating other auxiliary navigation systems, which increases the efficiency of the navigational plan by reducing the time to be used in the cruise plan and its evaluation. The system has a positive effect on the efficiency of map corrections by reducing the burden on navigation personnel with automatic map corrections that are made by the electronic map producers and uploaded to the system, which eliminates the need for manual map corrections and long navigational plans. STMDENGİZ ECDIS, contains user-friendly software, offers easy-to-use display functions and high operating performance. The system has various screen sizes, detailed route planning/editing options, and safety control functions.

Katmerciler Makes a US$ 20.7 Million HIZIR Sale to African Country

The first batch of the HIZIR Armored Combat Vehicles (ACV), ordered from an African country last year, is on the way. As per the US$ 20.7 million agreement which is Katmerciler's first export in this segment, all HIZIR vehicles will be delivered by the end of 2020.

The first batch of HIZIR ACVs was off to Africa. HIZIR ACVs were unveiled for the first time during the 2016 Hightech Port Fair and mass production was launched with an order from an African country last year. The first export agreement of $ 20.7 million was signed in July 2019. Within the scope of the agreement, deliveries will be completed by the end of this year. Following this sale, Katmerciler has accelerated its negotiations for other international sales and it forecasts around US$ 45 million in export revenue by the end of the year.

Making a statement after the transfer of the first batch of HIZIR, Katmerciler Vice President of the Executive Board Furkan KATMERCİ said, "With HIZIR, we have conducted our first Armored Combat Vehicle export. We would like to repeat the export success we have achieved with our civilian on-vehicle equipment for many years in the field of defence as well. We have opened a new door with HIZIR. We will continue this success

with HIZIR and our other qualified vehicles that we have developed according to different requirements."

Emphasizing that Katmerciler places great importance on overseas sales and has set a strategic target to obtain more than half of its total sales from exports, KATMERCİ said, "2020 will be one of the highest export years with US$ 40-45 million. With the support of our defence vehicles, we aim to maintain this export performance and increase its share in our total revenue."

Underwater Security of Strategic Coastal Facilities is Provided by Echorium Diver Detection Sonar!

June 18, 2020. The Echorium Diver Detection Sonar, developed indigenously by Koç Bilgi ve Savunma Teknolojileri, was introduced for use by strategically important civil and military facilities.

The Echorium Diver Detection Sonar enables the automatic detection of possible underwater threats remotely without the need for an operator. With 24/7 operation capability, it consists of a Central Imaging and Control Station and a High-Power Underwater Sound Signaling System.

The High-Power Underwater Sound Signaling System principally makes a sound signaling that an intruder, such as a diver is approaching the prohibited zone. If the diver does not leave the prohibited zone, it forces the diver to come to the surface by disturbing him with high-power sound signals at an audible frequency.

One of the main features of the system is its easy use by security teams without requiring computer skills through its map-based user screens. Thanks to this feature, short user/operator training enables the efficient use of the system. In addition, sonar screens can be selectively displayed when the system is used by the domain expert.

The system's field integration and acceptance activities were completed and has started to be used on a 24-hour basis. Furthermore, the performance of the system has started to be demonstrated with live demos to other companies in the sector.

Main features of the system are given below:

- High Threat Detection Range and Long Reaction Time
- Automated Threat Detection, Tracking and Classification Capability
- Low False Alarm Rate
- User Friendly, Graphical Software Interface not requiring Sonar Expertise
- Operator Friendly with Automatic Alarm Capability
- Real-Time Mobile Tracking Capability for Field Support for Security Teams
- Remote Tracking Capability
- Fast Production and Installation (less than 12 months)
- Remote Maintenance / Repair / Technical Support
- Onsite Maintenance / Repair / Technical Support
- Low Error Recovery Time
- 24/7 Working Ability
- Over 70% local content rate
- Ship Protection with Portable Version
- Diver Countermeasure Capability with High Power Sound Source

TEBER-82 Laser Guidance Kit was Delivered to The Turkish Armed Forces

On August 03, 2020, the President of Defence Industries, İsmail Demir made a statement on his social media account stating a new batch of TEBER-82 Laser Guidance Kit was delivered to the Turkish Armed Forces. Demir said: "We completed the new delivery of our Roketsan TEBER-82 guidance kits to our security forces."

TEBER Laser Guidance Kit

TEBER is a low-cost laser guidance kit attached to MK-81(250lb) and MK-82 (500lb) general-purpose bombs. TEBER converts the bombs into precision-guided munition (PGM) using the Inertial Navigation System (INS), Global Positioning System (GPS), and Semi-Active Laser (SAL) Seeker.

TEBER's modular design offers affordable options. The add-on SAL Seeker, mounted on the front section, provides a precise hit capability against moving targets and maritime targets even if the target is maneuvering at high speeds. The guidance kit has a range of 28km and a 3-meter CEP (Circular error probable) accuracy. The Laser Seeker may be equipped with a proximity sensor (2-15m).

The TEBER tail section contains the GPS and INS for precise guidance and can be installed quickly in the field with laser seeker. The additional control surfaces on the laser seeker also provide extra lift and stability, increasing the weapon's maneuverability.

TEBER guidance kit was developed under the design studies initiated by Roketsan with its own resources in 2014 to develop indigenous guidance kits by converting the MK series (MK-82, MK-81) general-purpose bombs into precision-guided munitions. The TEBER guidance kit's ground tests were completed within the scope of the protocol signed between the Turkish Air Force and Roketsan, under the coordination of the 1st Air Supply and Maintenance Center (1st ASMC).

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- C4ISTAR Systems
- Exoskeleton Technology
- CBRN
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New Appointment at STM

Following the appointment of STM General Manager Murat İKİNCİ to Roketsan President and CEO, the company has appointed Özgür GÜLERYÜZ as the new General Manager, who was the Deputy General Manager responsible for engineering and consultancy activities involving the naval projects.

Graduated from Bilkent University, Department of Electrical and Electronics Engineering, GÜLERYÜZ worked at Nokia and Aselsan respectively. Özgür GÜLERYÜZ previously worked as the Project Manager, System Engineering Manager and Quality Assurance Manager within STM.

Murat IKINCI Appointed as Roketsan's New President & CEO

At the Roketsan Ordinary General Assembly Meeting held on June 11, 2020, Deputy Defence Minister Yunus Emre KARAOSMANOĞLU and Ahmet TÜRKMEN were appointed as Board Members in place of the preceding Board Members Muhsin DERE and Mustafa AYSAN. Musa ŞAHİN, who was a Board Member, was appointed as the Acting Chairman of the Board at the board meeting held following the General Assembly.

In the written statement made after the Board Meeting, it was announced that Selçuk YAŞAR, who has been serving Roketsan for 32 years since its establishment and lastly as the President & CEO since February 2012, applied for retirement at his own request, and his request was approved by the Board.

Following the retirement of Selçuk YAŞAR, it was announced that Murat İKİNCİ, who was the General Manager of STM, was appointed as the President & CEO of Roketsan.

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New Appointment at HAVELSAN

Ahmet Hamdi ATALAY, who started working as the General Manager of HAVELSAN on August 11, 2015, left his post after almost 5 years of term of office.

With the decision of the HAVELSAN Board of Directors, Assistant General Manager of Training and Simulation Technologies Dr. Mehmet Akif NACAR was appointed as the Acting General Manager.

A ceremony was held at HAVELSAN Headquarters due to the change of duty. Speaking at the ceremony, ATALAY thanked the employees for the added value they created on behalf of the company. Stating that he left with the contentment of many accomplishments targeted in the last 5 years, ATALAY said, "I believe HAVELSAN will be in a much better position from now on. Mehmet Akif NACAR has been at HAVELSAN for 3 years. It is an opportunity for HAVELSAN that a colleague who knows the company and with whom we have made many plans takes over the flag."

NACAR, who took over the duty from ATALAY, stated that Ahmet Hamdi ATALAY made extremely valuable contributions and provided guidance during the 3 years they worked together and said, "We will be aiming to raise the bar higher than where ATALAY had placed it. We will work together, and we will bring HAVELSAN to a better position with the support of our employees. This is a flag change and we have a great deal of duties and responsibilities. We would like to thank ATALAY for his efforts and contributions. HAVELSAN will always remember him."

Mehmet Naki NACAR was assigned to officialy the General Manager by the decision of Board of Directory on 21 July, 2020.

© TEI

Test Infrastructure Agreement for TS1400 Turboshaft Engine

June 24, 2020. TEKFEN Engineering and TUSAŞ Engine Industries Inc. (TEI) signed a cooperation agreement for the test infrastructures to be established within the scope of the Turboshaft Engine Development Project (TEDP) carried out by TEI in order to meet the engine requirements of the GÖKBEY 5 Ton-Light Utility Helicopter, which is being developed by Turkish Aerospace under the auspices of the Presidency of Defence Industries (SSB).

TEI Chairman & CEO Prof. Mahmut F. AKŞİT and TEKFEN Engineering President Fatih CAN as well as senior executives of both companies attended the signing ceremony held at TEI Eskişehir premises.

For the test facilities to be established within the scope of the signed agreement, TEKFEN Engineering will provide supervision services for the detailed design of the test systems, technical management of supply processes, assembly, testing and commissioning.

With the test infrastructure to be established as part of the project, compressor, combustion chamber and turbine module tests of aviation engines will be performed cost efficiently and with minimum modification. In module tests, the objective is to obtain aerothermal performance characteristics of the modules, and the validation of the design and analysis tools will be checked by the test results and improvements will be provided for the analysis models.

Coastal Surveillance Radar System – Maritime Information System Components Delivered

June 7, 2020. The Coast Surveillance Radar System (dubbed SGRS/CSRS) Project was launched by the Presidency of Defence Industries (SSB) in line with the requirements of the Turkish Coast Guard Command. With this project, the objective is to create a surface image with adequate radar coverage of the Turkish Territorial Waters and Exclusive Economic Zones under the responsibility of the Coast Guard Command and create a defined maritime picture supported by data received from automatic identification systems, electro-optical sensors and from the systems of other public institutions. Within the scope of the CSRS Project, the Coast Surveillance Data System (CSDS) and Maritime Information System (MIS) networks will also established in order to ensure the effective use of the data obtained through the sensors and the data obtained from public institutions and organizations. The CSDS is to be used for the information exchange between the centers and the Coastal Surveillance Stations to be established. The MIS aims to exchange information between civil/military public institutions. The first software components, which will provide primary operational functions to the Coast Surveillance Radar System, were successfully delivered to the Coast Guard Command in May 2020. The delivered Group-1 package mainly includes Radar and Camera Sensor Control, Video Distribution and Recording capabilities. Additional capabilities are planned to be introduced with Group-2 and Group-3. In the CSRS Project, software components were developed indigenously and nationally by HAVELSAN, while radar and electro-optical systems were produced by Aselsan.

The Steel-Cutting Ceremony for 3rd PN MILGEM

The steel-cutting or the ground-breaking ceremony to begin construction of the 3rd PN MILGEM ADA class corvette (known as JINNAH-Class) by Turkey for Pakistan was held in the southern port city of Karachi on 9th June 2020.

The ceremony of steel-cutting at the Karachi Shipyard and Engineering Works (KS&EW) -- Pakistan Navy's specialized shipbuilding division -- was attended by officials of Pakistan Navy, and Pakistan representatives of ASFAT company, Managing Director of KS&EW- Rear Admiral Ather SALEEM and the General Manager Ship building- Commodore Muhammad Jahanzeb AHASN.

Speaking at the occasion, the General Manager Ship building, Commodore Muhammad Jahanzeb AHASN highlighted that the technical support for the indigenous mega project is provided by ASFAT Inc. He underscored the deep-rooted friendship with brotherly country Turkey for joint collaboration in field of indigenous warship construction with Pakistan Navy other defence sectors.

The vessel will be one of four MILGEM corvettes slated for the Pakistan Navy and will be the first of two in its class to be built in Karachi, Pakistan. The remaining two corvettes will be built in Istanbul Shipyard, Turkey by the responsibility of ASFAT company. PN MİLGEM Corvette agreement was effective in 11 March 2019 and the termination schedule is set that the first vessel is expected to be delivered the procurement agency within August 2023, the second ship on the 60th month, the third ship on the 66th month and the last ship on the 72nd month. The last corvette will be delivered for Pakistan Navy's inventory in Karachi in 2025.

The keel-laying or the formal recognition of the start of the construction ceremony of the first PN MILGEM ADA Class corvette was held in Istanbul Naval Shipyard Command with the participation of ASFAT General Manager Esad AKGÜN, Minister of Defence Shipyard General Manager Emre DİNÇER, İstanbul Naval Shipyard Commander Rear Admiral Recep Erdinç YETKİN and Pakistan's Chief Naval Overseas (Turkey), Commodore Syed Rizwan KHALID on 3th June 2020.

STM & ASFAT Signed an Agreement for Main Propulsion System Procurement & Integration to PN MILGEM

June 16, 2020. Within the scope of the export of MILGEM Corvettes to Pakistan, STM and Military Factory and Shipyard Management Inc. (ASFAT) signed an agreement on engineering solutions for the supply and integration of the Main Propulsion System.

ASFAT will be the main contractor and the construction of the PN MILGEM Corvettes (JINNAH Class) to be manufactured for the Pakistan Navy will be carried out at the Istanbul Shipyard Command and at the Karachi Shipyard. STM has previously made significant contributions toward indigenization by undertaking critical tasks in the development and production processes of ADA Class MILGEM Corvettes, with its engineering experience and ensuring the maximum participation of the Turkish industry.

As for the details of the main propulsion systems to be supplied under the agreement, no official statement has been made by STM and ASFAT so far.

The ISTIF-Class Frigate is powered by two MTU 20V4000 M93L diesel engines (driving two shafts), dry weight 12,900kg, and a LM2500 gas turbine (in CODAG configuration. Unlike the ISTIF Class, the ADA Class MILGEM Corvette is powered by a single 596 series MTU 16V 595TE90 diesel engine but serial production line of this 596 series diesel engine was closed by the manufacturer almost 3-4 years ago. If end-users procure and request this engine in the future, MTU will produce this engine series as part of upcoming orders.

RETINAR FAR-AD Anti-Drone Radar System Delivered to the Turkish Armed Forces

The Presidency of Defence Industries announced from its official social media account that the RETINAR FAR-AD Drone Detection Radar developed by Meteksan Defence were delivered to the Turkish Armed Forces under the "Mini/Micro UAV Detection Radar System" contract signed in 2019. The system will be the primary sensor of security forces against drones thanks to its automatic scanning capability of large areas.

Meteksan Defence also made an announcement regarding this development, stating that the fixed and rotary wing mini/micro drones or drone systems have become a severe threat to our security forces in recent years, mainly as they can be easily supplied and used by terrorist organizations. Although various jamming systems act as a precaution against drone threats, the drones must be detected first to be disabled and neutralized. Visual detection of drones can be difficult due to the small size of the threat and sometimes the weather conditions. Furthermore, because of the very short visibility distance of the drones, it can be too late to prevent the danger. Therefore, the radar systems stand out as the most critical system for long-range remote detection of mini/micro UAVs.

Meteksan Defence completed the RETINAR FAR-AD Anti-Drone Radar within a short period of 8 months under the "Mini/Micro UAV Detection Radar System Contract" signed with the Presidency of Defence Industries in 2019 and successfully delivered the RETINAR FAR-AD Systems, which completed multiple different tests such as distinguishing drones from birds, identifying and tracking different drones such as DJI Phantom, TALON. Indigenously Developed by Meteksan Defence, the RETINAR FAR-AD Drone Detection Radar is designed to counter mini/micro unmanned aerial vehicles and threats from the land. The RETINAR FAR-AD will automatically scan large areas and serve as the security forces' primary sensor against drones.


© Meteksan Defence

Meteksan Defence is the manufacturer of well-known high technology RETINAR Perimeter Surveillance Radar Family used for border security and security of critical infrastructures. RETINAR Perimeter Surveillance Radars are currently operated by the Turkish Land Forces Command, Gendarmerie General Command, State Airports Administration, and two more countries, one of which is in Asia and the other in Europe.

Airbus Signs Contract for Integration of 115 New Eurofighter E-SCAN Radars

Airbus has been awarded a contract for the development, supply and integration of 115 Eurofighter E-SCAN Radars for the German and Spanish Eurofighter fleet. It marks the largest order so far for the world's most modern electronically scanned array radar, the Captor-E. The contract signature followed the approval by both governments in recent weeks. The contract foresees the delivery and integration of 110 Captor-E radars for Germany and an initial batch of 5 radars for Spain to be delivered by 2023. The new sensor will equip Tranche 2 and Tranche 3 Eurofighters as well as new aircraft. Whereas the Airbus sites in Manching, Germany and Getafe, Spain will act as overall integration Hubs, the development and building of the radar will be subcontracted to a consortium under the leadership of Hensoldt and Indra and by participation of further Eurofighter partner companies. "The contract for the Captor-E radar is a main achievement to equip Eurofighter with sensors that ensure todays dominance of the aircraft also in the threat scenarios of tomorrow", said Dirk Hoke, CEO of Airbus Defence and Space. "With Eurofighter, Germany and Spain are investing in a strong backbone of European air defence and in the leading project of the European defence industry."


© Airbus

KMW, Nexter and Rheinmetall Get the Go-ahead for Initial MGCS Architecture Study

20 May 2020 – Standing for Main Ground Combat System, MGCS is a joint Franco-German Defence project. The program, to be implemented under German political leadership, is tasked with developing a main combat system to succeed the Bundeswehr's Leopard 2 and the French Army's Leclerc starting in 2035.

Making the start of the MGCS procurement program Krauss-Maffei Wegmann (KMW), Nexter Systems and Rheinmetall AG established an ARGE in December 2019. Now, the partners and the German Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw), acting in the name of Germany and France, have signed a contract for the "System Architecture Definition Study - Part 1"(SADS Part 1). This contract sounds the industrial starting gun for a MGCS Demonstration Phase.

At the Franco-German Ministerial Council meeting in Toulouse on 16 October 2019, the Defence ministers of both nations, Florence Parly and Annegret Kramp-Karrenbauer, emphasized their commitment to developing the MGCS.

The ARGE is a German acronym standing for Arbeitsgemeinschaft, or "working group". Under German law, the ARGE serves as the contractual partner of the procurement authority (BAAINBw) during the first phase of the program. Officials of the three companies represent the ARGE vis-à-vis third parties.

The aim of the study is to harmonize the final MGCS concepts of the previous phase, to analyze further details, and to propose a common multi-platform architecture. The three contractual partners will assess various aspects of different concepts: technical feasibility in the projected timeframe allotted for the program; ability to fulfil the operational needs of both armies; efficiency and compatibility with national "systems of systems" (SCORPION for France and Digitization of Land-Based Operations (D-LBO) for Germany). Workshares in the SADS Part 1 are to be distributed equally between France and Germany on a fifty-fifty basis. The first phase of architecture work is expected to last 18 months.

The New General Management Structure of Leonardo

Leonardo announces that the Board of Directors meeting held today deliberated the establishment of a General Management structure (Direzione Generale) reporting directly to the Chief Executive Officer. With this reorganization, Leonardo aims to simultaneously respond to the new market environment characterized by the impacts of COVID-19 and leverage the opportunities offered by the dual use of technologies generated by this emergency. With this organizational structure, Leonardo intends to accelerate the implementation of the strategic plan's next phase thus enhancing its flexibility and agility to be even more competitive in facing future challenges.

In order to reach these objectives, the General Management will be led by Lucio Valerio CIOFFI (General Manager), currently head of the Aircraft Division, who will have the responsibility to manage and coordinate the activities of the following organizational structures:

- • Aircraft Division assigned to **Marco ZOFF**
- • Aerostructure Division assigned to Giancarlo **SCHISANO**
- • Chief Procurement & Supply Chain Officer whose assignment will be defined in due course
- • Chief Commercial Officer (CCO) assigned to **Pasquale DI BARTOLOMEO**
- • Customer Support, Services & Training (previously under the responsibility of the CCO) whose assignment will be defined in due course
- • Unmanned Systems assigned to **Laurent SISSMANN**
- • Production Optimization & Program Management assigned to **Fabio BARSOTTI**

The company Leonardo Global Solutions S.p.A. will report to the new General Management structure. Additionally, reporting to the General Manager, a new organizational structure denominated New Business Development & Country Support has been established with the objective of developing and managing the strategic plan's new initiatives, bringing together the different company initiatives under a unitary and transversal vision. This new structure will guarantee consistency between Leonardo's activities and Italy's program "Progettiamo il Rilancio".

The new General Management structure will be effective starting from 1 September 2020.

Lorenzo MARIANI will take the responsibility of Managing Director of MBDA Italia and Executive Group Director Sales & Business Development of MBDA starting from September 1st.

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United States Navy Receives First Fleet CMV-22B

First CMV-22B for fleet operations arrives at Naval Air Station North Island

Bell Textron Inc. have delivered the first CMV-22B for fleet operations to the U.S. Navy on June 22. The V-22 is based at Fleet Logistics Multi-Mission Squadron (VRM) 30 at Naval Air Station North Island in San Diego.

"We are thrilled to bring the Osprey's capabilities as a warfighting enabler and its ability to provide time-sensitive logistics to the men and women deployed around the world in support of U.S. Navy operations," said Kurt Fuller, Bell V-22 vice president and Bell Boeing program director.

This aircraft is the third overall delivery to the U.S. Navy. Bell Boeing delivered the first CMV-22B to the Navy at Naval Air Station Patuxent River in February for developmental testing, followed by a second in May. The Navy variant V-22 will take over the Carrier Onboard Delivery Mission for the U.S. Navy, replacing the C-2A Greyhound.

"This first fleet delivery marks a new chapter of the V-22 Tiltrotor program providing enhanced capabilities and increased flexibility to the U.S. Navy as they conduct important operational missions around the globe," said Shane Openshaw, Boeing vice president of Tiltrotor Programs and deputy director of the Bell Boeing team.

The CMV-22B and C-2A greyhound conducted a symbolic passing of the torch flight in April.

"The CMV-22B will be a game-changing enabler to the high end fight supporting the sustainment of combat lethality to the carrier strike group," said U.S. Navy Capt. Dewon Chaney, Commodore, Fleet Logistics Multi-Mission Wing. "The multi-mission capabilities of the CMV-22B, already recognized, will be realized in Naval Aviation's Air Wing of the future. The arrival of this aircraft is the first of many steps to that becoming reality."


© Bell Textron

The CMV-22B carries up to 6,000 pounds of cargo and combines the vertical takeoff, hover and landing (VTOL) qualities of a helicopter with the long-range, fuel efficiency and speed characteristics of a turboprop aircraft.

Bell Boeing designed the Navy variant to have the expanded range needed for fleet operations. Two additional 60-gallon tanks and redesigned forward sponson tanks can cover more than 1,150 nautical miles. The CMV-22B also has the unique ability to provide roll-on/roll-off delivery of the F135 engine power module, enhancing the Navy's readiness.

UK Defence Secretary: "Turkey's Use of UAVs & Electronic Warfare in Syria & Libya are Game-Changing"

by Saffet Uyanık

Speaking at the Air and Space Power Conference, the U.K.'s Defence Secretary Ben WALLACE drew attention to Turkey's recent use of domestically made unmanned aerial vehicles (UAV) in Syria and Libya, along with electronic warfare (EW) systems.

On the 15th of July, WALLACE gave a speech at the Air and Space Power Conference, highlighting the importance of air and space power to the future combat environment in an age of constant competition.

Referring to Turkey's involvement in Syria and Libya, WALLACE outlined that the U.K. needs to look at others' lessons. "Look how Turkey has been operating in Libya where it has used BAYRAKTAR TB2 UAVs since mid-2019.

Those UAVs have conducted intelligence, surveillance, and reconnaissance and targeting operations against frontlines, supply lines, and logistics bases."

Stressing that the U.K. needs to think carefully about the role of air and space forces in a world of constant competition, Defence Secretary Ben WALLACE pointed out that they should evaluate the use of such technologies by other exemplary countries.

"In July of last year, they struck the Libyan National Army controlled Jufrah airfield destroying several command and control nodes and two transport aircraft.

Or consider Turkey's involvement in Syria and its use of Electronic Warfare (EW), lightly armed drones and smart ammunition to stop tanks, armored cars, and air defence systems in their tracks."

WALLACE also emphasized, "According to reports the Assad regime suffered heavy losses "3,000 soldiers, 151 tanks, eight helicopters, three drones, three fighter jets, vehicles and trucks, eight aerial defence systems and one headquarters among other military equipment and facilities. Even if only half of these claims are true, the implications are game-changing."

The New Military Doctrine: Is it Game-Changer?

Turkish drones in Syria have played a significant role in cross-border operations, providing ISR (Intelligence, surveillance, and reconnaissance) and Close Air Support (CAS).

In February 2020, provoked by an Assad regime attack that martyred 36 Turkish soldiers in the Idlib de-escalation zone in northwestern Syria, these domestic drones, BAYRAKTAR TB2, developed by Turkey's leading unmanned aerial platform developer Baykar Makina, and ANKA-S, produced by Turkish Aerospace Industries (TUSAŞ), ended up causing significant damage to Assad regime elements, hitting and destroying everything from tanks and air missile defence systems to howitzers as well as military bases and chemical warfare depots and clearly demonstrated the efficiency of such devices.

Turkey's extensive use of armed drones during Operation Spring Shield (OSS) to fight against Syrian regime forces put forward a new military doctrine regarding the deployment of UAV in contested air space in conventional warfare. The OSS constituted the largest ever deployment of ANKA-S and BAYRAKTAR TB2 drones in terms of scale and intensity. Ankara introduced a new military doctrine that prescribes drones as an air force in a conventional battle taking advantage of the drones to dominate the skies without the need for a traditional air force and inflict massive damage on the enemy from above without ground engagement.

Turkey's electronic warfare systems have also played a vital role in the OSS, allowing Turkish armed drones to destroy the Russian-made Syrian Panstir S-1 air defence systems deployed inside Idlib. During the OSS, Turkish drones had two significant advantages that enhanced their performance. One was the weapons, smart micro-munitions MAM-L and MAM-C developed and produced by Turkey's Roketsan, and the other was the electronic warfare (EW) system, known as the KORAL which is to a large extent an integral part of the success of the OSS campaign.

The multi-functional KORAL system can carry out sophisticated tasks such as locating, intercepting, analyzing, classifying, and determining the direction of multiple types of radar signals, including complex ones. It can also jam, deceive, and paralyze hostile radar systems. The domestic EW system also likely contributed to blinding the Syrian regime's Russian radar network.

Over the past ten years, Turkey has quickly developed its national UAV industry and emerged as a drone power. The country has designed and produced its indigenous unmanned platforms that have proved to be very effective in counter-terrorism efforts inside Turkey and cross-border operations, mainly in Syria and Iraq, and more recently in Libya, where the TAF deployed drones in 2019 to support the UN-recognized Government of National Accord.

These systems have become a symbol of national pride as Turkey seeks to eliminate its dependence on foreign suppliers and become a leading defence exporter.

UK MoD Signs £65 Million Contract for the Protector UAV

According to the UK Minister of Defence statement, a £65 million contract to build the UK's first three Protector UAVs has been signed.

July 15, 2020, after a successful development phase Protector UAVs are set to enter service by mid-2024, meaning that the Remotely Piloted Air System (RPAS) will deliver a step-change in capability for the RAF.

The contract was announced by Defence Secretary Ben WALLACE at the virtual 2020 Air and Space Power Conference. Defence Secretary Ben WALLACE said: "The UK is proving once again that we are a world leader in defence technology. Protector will provide the RAF with vast global reach, meeting the UK's defence and security needs for decades to come, and provides another increase to the unmanned inventory for the Armed Forces. This aircraft will upgrade a whole range of lethal capabilities allowing us to control, protect and manage the battlespace from the air for hours on end."

The cutting-edge aircraft, which will replace US Based Reaper RPAS force, will be deployed in wide-ranging Intelligence, Surveillance, Targeting and Reconnaissance (ISTAR) operations from its base at RAF Waddington, Lincolnshire. Its ability to fly consistently for up to 40 hours will offer the RAF vastly improved armed intelligence and reconnaissance sorties.

The innovative fleet will also have advanced anti-icing and lightning protection, providing the RAF with unprecedented flexibility to operate in extreme weather conditions. Protector also comes with enhanced data links and will carry next-generation, low collateral, precision strike weapons – the UK-made Brimstone missile (MBDA) and Paveway IV Laser Guided Bomb (Raytheon UK).

The contract follows a successful development phase by manufacturers General Atomics Aeronautical Systems Inc. which will build the first three Protector aircraft, plus three ground control stations and other associated support equipment. It also includes an option to build 13 more aircraft and four ground control stations, which will complete the current planned fleet of 16 aircraft, more than doubling the capability currently provided by Reaper. Sir Simon BOLLOM, CEO of Defence Equipment and Support said: "I am delighted to announce that we have got Protector production on contract. The DE&S team have demonstrated their remarkable resilience and have overcome considerable challenges to ensure this significant program remained on track. Their efforts and the collaborative commitment from industry means that the RAF can still look forward to the delivery of the cutting-edge Protector and the step-change in capability that it brings."

Meeting stringent NATO and UK safety certification standards, the aircraft could, if requested, operate in civilian airspace to support civilian agencies in the UK, for example, in search and rescue and disaster response missions.

Airbus Helicopters' VSR700 Prototype Performs Its First Autonomous Free Flight

Airbus Helicopters issued a press release on July 28, 2020, stating that the VSR700 unmanned aerial system (UAS) prototype has performed its first autonomous free flight. Lasting for ten minutes, the flight took place at a drone test center near Aix-en-Provence in the south of France and represents a significant advance from its maiden flight, during which the UAS was tethered to comply with regulatory requirements.

Derived from Hélicoptères Guimbal's Cabri G2, the VSR700 is an unmanned aerial system in the 500-1000 kg maximum take-off weight range. The system is designed to fulfill the demanding requirements of global navies and those of armies in the 21st century's contested and highly agile battlefields and seas. VSR700's performance enables it to carry full-size, high capability naval sensors equal in quality to those carried by naval helicopters, with the ability to target contacts if needed or survey them for extended periods. It can operate from existing ships with a low logistical footprint while providing multiple options for its assets (i.e., ASW helicopter plus several VSR700s) stationed onboard frigates and destroyers.

The VSR700 can carry and positioning anti-submarine warfare (ASW) barrier to complement a ship's ASW activity or that of a helicopter with Manned Unmanned Teaming (MUMT). Sonobuoy data can be relayed through the UAS to ensure an unbroken data stream, no matter what the system is doing. The VSR700 can also conduct radar and electro-optical identification of periscopes using its long-range onboard sensors, providing a formidable deterrence capability when coupled with its low noise signature and a high degree of persistence.

Moreover, in maritime security missions, the VSR700 brings to ships a significant advantage in missions such as anti-terrorism, anti-pollution, counter-smuggling, fishery protection, monitoring, and assisting refugees or illegal immigrants, coastal watch and more. The VSR700 can carry high-performance, long-range sensors that remain undetected while monitoring events and providing high-quality data to authorities. The program also implements a geofencing function and a Flight Termination System, allowing the mission to be ended if necessary.

Airbus Helicopters states that the free flight achieved by the VSR700 is a major step leading up to the sea trials that will be performed at the end of 2021 as part of the de-risking studies for the French Navy's future drone. Thanks to the French PlanAero, the program will make full use of two demonstrators and an optionally piloted vehicle to develop and mature the technical and operational aspects for successful UAS operations in a maritime environment.

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Rheinmetall Unveils the Advanced Technology Demonstrator with The Next-Generation 130mm Cannon

On July 31, 2020, German defence company Rheinmetall has released a video on the company's official twitter account showing a new 130mm smoothbore gun. The news release said, "Rheinmetall's 130mm smoothbore technology for MBTs embodies a significant lethality leap in times of increasing threats. Combined with a state-of-the-art auto-loader, this system is the latest evolvement in Rheinmetall's MBT Advanced Technologies competence."

Rheinmetall unveiled the first prototype of its next-generation 130mm L/51 gun at Eurosatory 2016 in Paris, stating that the development of the 130mm technical demonstrator (TD) launched in 2015 by the Group's Weapons and Ammunition division to address the emerging necessity of gaining significant performance enhancements against modern armored vehicles.

According to the German company, the 130mm live-fire demonstrator showcased superior energy and output performance compared to the standard 120mm L/55 cannon in a direct live-fire test with modern targets. Rheinmetall states that the new weapon provides a 50% improvement in

performance over the current 120mm cannon thanks to the increase of 8% in caliber. Financed entirely by the Rheinmetall, the new 130mm L/51 smoothbore gun weighs around 3,000 kilograms without mounting components and has a barrel length of 6.63 meters. It uses a brand new 130mm armor-piercing fin-stabilized discarding sabot (APFSDS) round with elongated rod penetrator made of a new tungsten alloy, which presumably requires an autoloader. The new APFSDS round also features a semi-combustible cartridge case and a new propellant. Designed for integration in new main battle tanks, the L/51 has a vertical sliding breech mechanism with a chrome-lined smoothbore barrel, increased chamber volume, and a muzzle reference system (MRS).

Moreover, the demo tank unveiled in the video is a British Challenger 2 MBT fitted with a modified turret based on Rheinmetall's advanced technology demonstrator for the British Army's Challenger 2 Life Extension Project (LEP). In addition to the new 130mm gun, the modified turret has extra (possibly spaced) armor at the front, and sides that is flatter compared to the Challenger 2 LEP demonstrator displayed at DSEI 2019.

According to the company's statement, the system will be compatible with the European Main Ground Combat System (MGCS) project and can serve as a combat performance upgrade to all Leopard 2 user nations. Rheinmetall also plans to offer the 130mm L/51 to the US Army Next-Generation Combat Vehicle (NGCV) program.

Navantia launches the first Corvette for Saudi Arabia

22 July 2020, Navantia successfully carried out the launching of AL-JUBAIL, the first of five corvettes built for the Royal Saudi Naval Forces (RSNF). The ceremony was held in slipway number 2 at the San Fernando shipyard, and was chaired by the Commander of RSNF, H. E. Vice Admiral Fahad Bin Abdullah AL-GHOFAILY; by the Chairwoman of Navantia, Susana de SARRIÁ; by the Acting CEO of SAMI, Eng. Walid ABUKHALED; and by the Admiral of Logistics Support Bay of Cadiz of Spanish Navy, Vice Admiral Ricardo A. Hernández LÓPEZ (Alardiz).

The ceremony started with a Quran recitation made by RSNF officer. Then a video about the Al-Jubail city (which the vessel has been named after) was played, and a time-lapse video was shown in which several months of construction have been summarized and can be seen in Navantia's website.

The Commander of RSNF highlighted the importance of ALSARAWAT Project, contracted to Navantia, as one of the largest capability-acquisition programs for the RSNF which reflects a strong strategic relation between Kingdom of Saudi Arabia and Kingdom of Spain and enlarges the cooperation between the RSNF and Spanish Navy in shipbuilding, education and training. The Commander of RSNF also indicated that the success of this project is a key factor for ambitious future projects and an enduring partnership.

The Acting CEO of SAMI, Eng. Walid ABUKHALED, expressed his pride in the strong relationship between SAMI, RSNF, and Navantia, as well as the valuable partnership that was reflected in the launch of the first Saudi Combat Management System that is fully developed by SAMINavantia. He pointed out that taking delivery of the first corvette and the Avante 2200 project, in general, represents a key pillar of the Saudi defence ecosystem, which will enhance local capabilities in line with the goals set forth in the Kingdom's Vision 2030. This achievement will lead to the building of solid foundations for original manufacturing and enhancing the local content."

He also stated that this step comes within the framework of SAMI's strategy to support the development of the military industries in the Kingdom, as well as enhancing its strategic independence and military readiness."

The Chairwoman of Navantia highlighted Navantia's commitment to the RSNF to replicate the successful model implemented throughout many years with the Spanish Navy, and during recent years with other navies such as the Royal Australian Navy, and provide a high capability level both to the RNSF and to the military industries sector of the Kingdom of

© Navantia

Saudi Arabia (KSA) in the corvette program and also for future projects.

Next, the ship's Sponsor, the Commander of RSNF, ordered Capt. Abdullah ALSHEHRI, director of RSNF PMO ALSARAWAT to cut the ribbon on his behalf, and the corvette AL-JUBAIL slid down the slipway and touched the water for the first time.

The AL-JUBAIL has a length of 104 meters, a beam of 14 meters and will be able to accommodate 102 people (crew and additional personnel). It will reach a maximum speed of 27 knots and, among other aspects, it has the capacity to carry 21 days' supplies on board.

The corvettes are the latest generation of successful Navantia-designed combatants, and incorporate state-of-the-art Navantia products, such as the CATIZ Combat System, DORNA Gun Fire Control System, NAVCOMS/HERMESYS Integrated External and Internal Communications System, MINERVA Integrated Navigation and Bridge System, or COMPLEX-SIMPLEX Integrated Platform Management Platform together with equipment manufactured by Navantia under license such as the Leonardo SUPER RAPID 76mm main gun, Rheinmetall Air Defence MILLENNIUM 35mm close-in weapon system, MTU propulsion engines and diesel generators, and RENK gearboxes.


© Navantia

Since the first steel cutting was made, in January 2019, all the workshops of Navantia, in San Fernando and also in Puerto Real, have been working tirelessly. AL-JUBAIL, hull number 828, has been successfully built despite the slowdown in activity caused by the COVID-19 pandemic. In fact, the safety protocols for the launching ceremony required all attendees to have their temperature taken, wear a face mask and maintain the required safety distance.

For the follow-on sister ships, the objective is to recover time and meet the initial milestones, so that the second corvette can be launched in November 2020. After the launching ceremony, Capt. Abdullah ALSHEHRI, director of RSNF PMO ALSARAWAT, witnessed the progress in the construction of ship 830 ALDIRIYAH in slipway number 3.

The corvette program, which entered into force in November 2018, strengthens the immediate future of Navantia and benefits all the company's shipyards and its auxiliary industry, especially the entire Bay of Cádiz.

Specifically, it will suppose a global workload of around seven million hours that, translated into employment, will reach the figure of 6,000 jobs annually during the next 5 years. From these, more than 1,100 will be direct employees, more than 1,800 employees of the auxiliary industry Navantia and more than 3,000 indirect employees generated by other suppliers. There will be more than 100 auxiliary companies that collaborate in it.

The program, whose last ship should be delivered in 2024, includes, in addition to construction, Life Cycle Support for five years, from the delivery of the first ship, with the option of another five additional years.

On the other hand, the contract also includes the supply of various services such as integrated logistical support, operational and maintenance training, supply of training and training Centers for the Combat System and Platform Control System for ships, Support to the Life Cycle, previously mentioned, and the systems for the maintenance of ships in the RNSF Jeddah Naval Base.

First Contract £2.3bn in the UK MoD Boxer MIV Program awarded to WFEL

On the16th of July 2020 the first official sub-contract for a UK company involved in the production of the MoD's new Boxer Mechanized Infantry Vehicles program, was awarded to a member of the ARTEC consortium to WFEL, a nominated Tier One supplier in the project.

The contract covers the transfer of manufacturing technology from Germany to the UK for the Drive Modules for the Boxer Infantry Carrier, Special Carrier and Ambulance variants and marks a significant milestone after many months of planning, preparation and consultation following the signing late in 2019 of the £2.3bn contract between the UK Ministry of Defence and the ARTEC consortium, for the delivery of over 500 Boxer vehicles to the British Army.

The Boxer is a state-of-the-art wheeled armoured vehicle that offers outstanding mobility and protection. The Boxer will form an integral part of the British Army's new Strike Brigade capabilities and will have a service life of over 30 years. Battle-proven, it is in service across NATO and was recently selected by Australia.

WFEL will play a significant role in delivering the completed Boxer vehicles to the British Army and is undergoing substantial investment in an advanced manufacturing facility at its North West base, to ensure compliance with the stringent manufacturing requirements of these vehicles.

WFEL's Managing Director, Ian ANDERTON, commented, "Our teams have been liaising closely with members of the ARTEC consortium, particularly KMW personnel, culminating in the awarding of this contract, which we are delighted to receive. We can now move further forward with developing our own supply chain partnerships around the UK, creating and sustaining high levels of employment and we're looking forward to eventually seeing these superb vehicles in use with the British Army."

The UK MoD is already a long-standing customer of WFEL, having been a user of its rapidly deployable MGB Medium Girder Bridge systems for many years.

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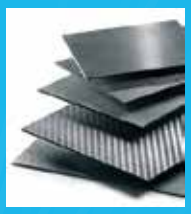
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