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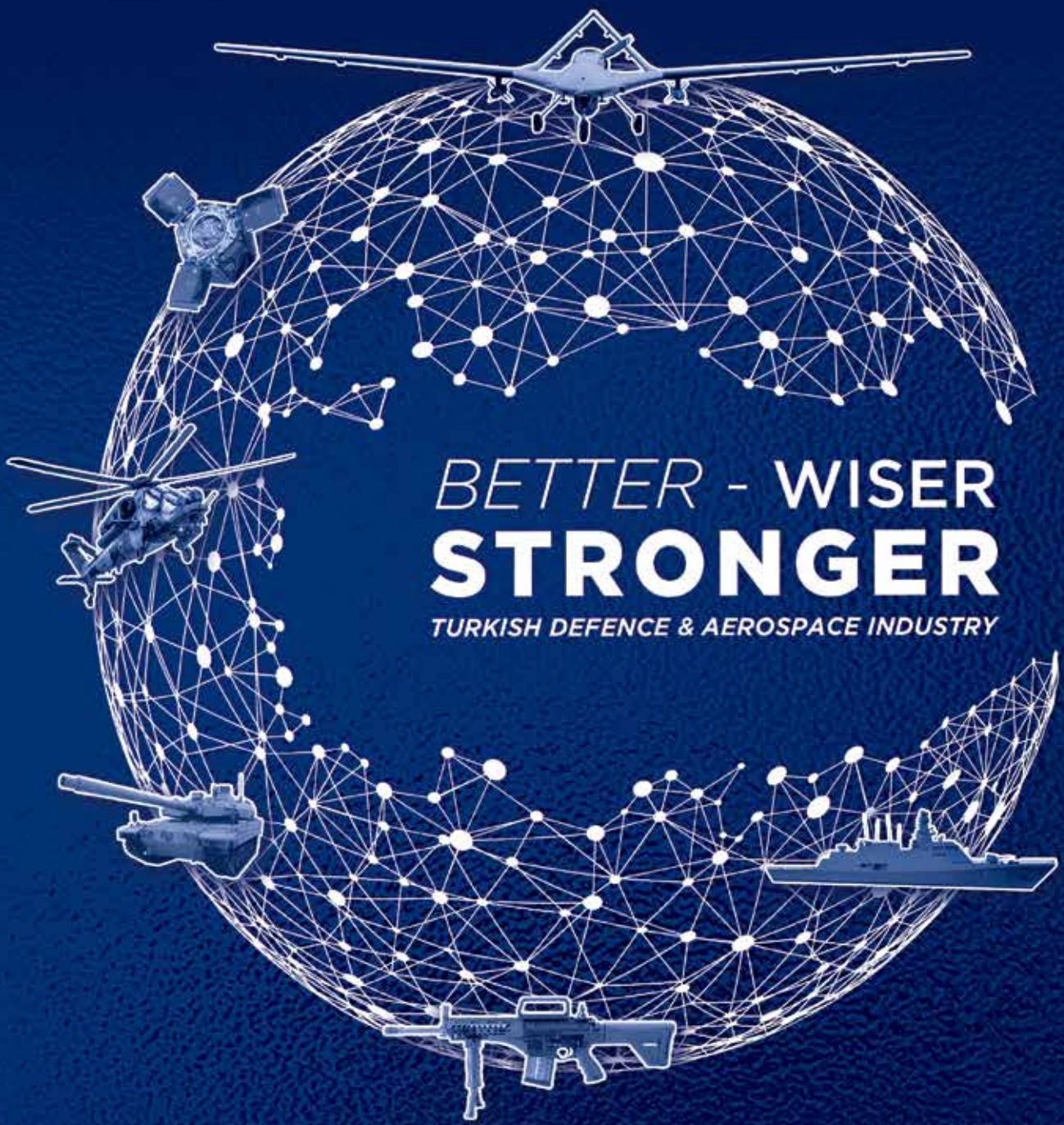
S-400 TRIUMPH AIR & MISSILE DEFENCE SYSTEM AND TURKEY'S AIR & MISSILE DEFENCE CAPABILITY

NAVANTIA - AMBITIOUS PROJECTS WHERE EXPERIENCE MATTERS

A LOOK AT THE TURKISH LAND PLATFORMS SECTOR AND ITS NATO STANDARD INDIGENOUS SOLUTIONS

BEHIND THE CROSSHAIRS: ARMORING UP WITH REMOTE WEAPON SYSTEMS AS THE NEW GAME CHANGERS OF TODAY'S BATTLEFIELD

SEEN AND HEARD AT THE INTERNATIONAL PARIS AIR SHOW 2019



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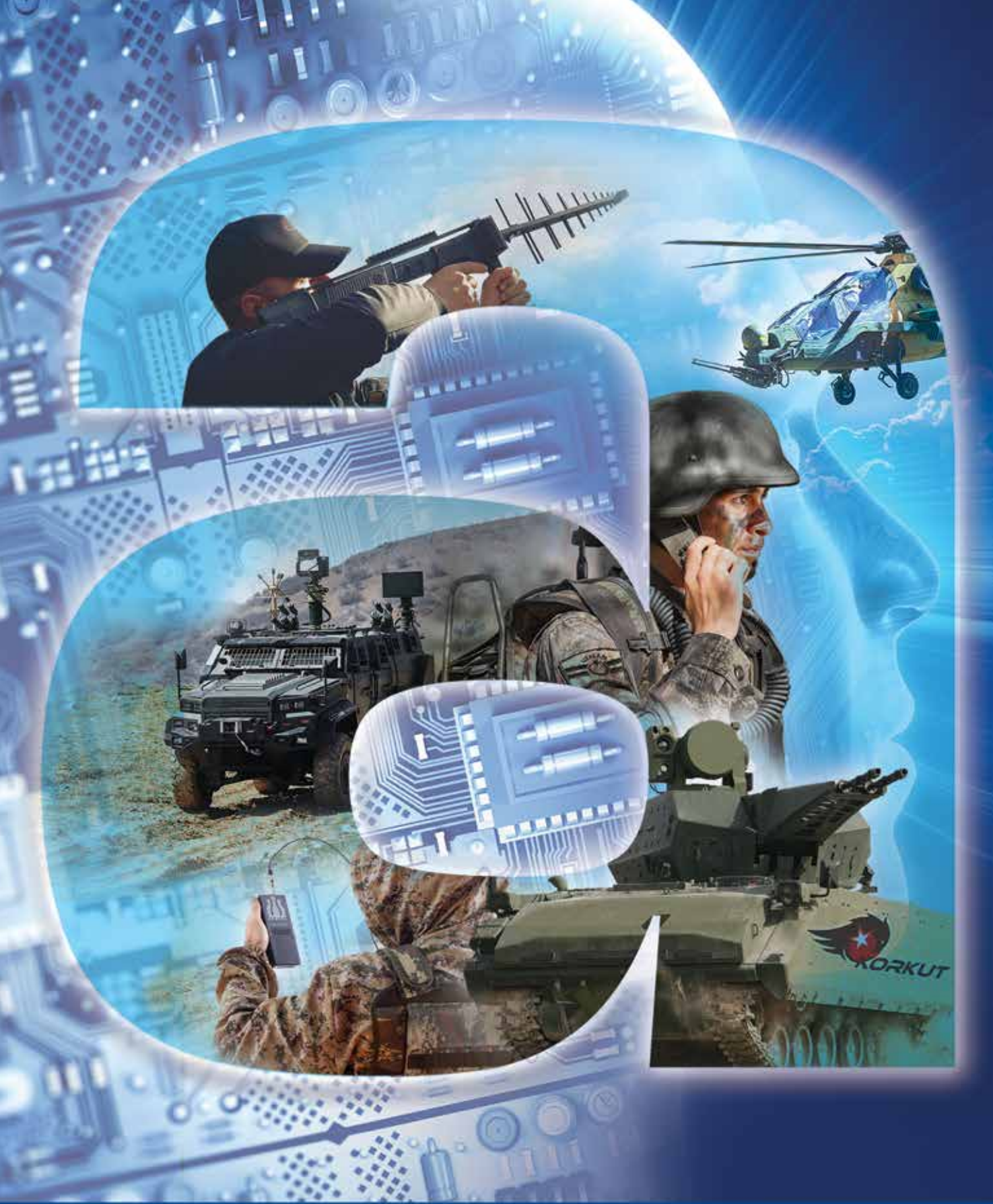

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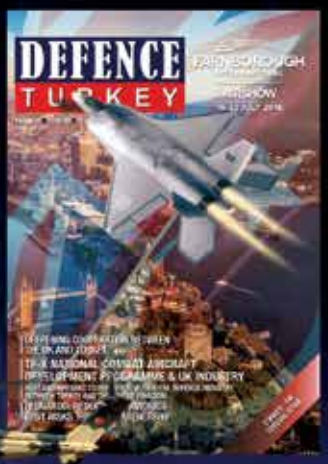

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The Greatest Participation by Turkish Defence Industries at DSEI'19

Ayşe AKALIN EVERS
Publisher & Editor in Chief

Defence & Security Equipment International (DSEI) is the world's largest land, sea and air defence and security exhibition, bringing together senior international trade and military experts from across the entire supply chain in an optimal business environment. DSEI is a biennial event held in London and will take place from 10-13 September 2019.

With an area dedicated to manufacturing excellence, DSEI 2019 will provide an opportunity for suppliers to penetrate the defence sector and strengthen their relationships within industry, including with the prime contractors that rely on their skills and technology to deliver complex equipment programmes. The Hub will be sponsored by the Manufacturing Technology Centre, a UK organisation established to bridge the gap between university-based research and the development of innovative manufacturing solutions, in line with the Government's manufacturing strategy. The MTC is part the High Value Manufacturing Catapult, supported by Innovate UK.

A conference on Transforming Land Power to Deliver Competitive Advantage will take place at the event where the trends in threats at a strategic level, before exploring what capabilities are required for the British Army to best operate with its partners, allies, and industry will discuss at. It will conclude by setting out a vision for bi-lateral engagement with industry over the coming decade, with the British Army and industry working in coalition during the acquisition process, through to the lifetime of programs and beyond.

Turkish defence industry with its annually growing production power and export capacity ,participates to DSEI 2019 with 40 companies covering Artron, Aselsan, Aselsan Sivas, Asfat, Ata Silah, AYESAŞ, Desan Shipyard, Femsan, FNSS, Garanti Giyim, GES Engineering, Gökser, Havelsan, Kolt, Menatek, MKEK, Norm Technologies, Nurol Makina, Nurol Technology, Ortem, Otokar, Öztek, Papilon, Profen, Repkon, Roketsan, SAHA Istanbul, Samsun Yurt Savunma, SSB, SSI, STM, Stroeger, Suprobox, TAIS, Tekcan (Aksa Runflat), TİMSAN, TİSAŞ, Transvaro, TTAF, TÜBİTAK Bilgem,Turaç, Turmaks, Vestel Savunma, Volt Defence, Yakupoğlu and ZED. B2B meetings between Turkish and British companies will be organised by SaSaD and ADS will also take in the event.

Enjoy this issue… ■

S-400 Triumph Air and Missile Defence System and Turkey's Air and Missile Defence Capability

On July 12, 2019 the An-124/100 and IL-76TD EMERCOM transport aircraft carrying the first batch of equipment for the Turkish Air Force (TurAF)'s First S-400 System (Squadron) finally landed, one after another, on the Mürted Airfield Command in Ankara. How many batteries is the S-400 System composed of? What are the components of the System? Will they be able to be integrated to the national air defence network? Many other questions were examined for our readers, by our Editor İbrahim SÜNNETÇİ

The main air and missile defence capabilities of the Turkish Air Force (TurAF) are currently composed of over 30 fixed and transportable 3D air surveillance radar sensors that provide a real-time air picture of Turkey's Airspace. They are deployed under the Air Control Group Command, 7 Control Warning Centers/Posts (KIM/KIP), 4 E-7T Airborne Early Warning and Control (AEW&C) aircraft serving under Airborne Warning Control Group Command and accepted as force multiplier, ground based air defence missile systems (MIM-14 Nike Hercules Missile Systems operating under four active Nike Hercules Squadron Commands and four HAWK XXI System Batteries) under the 15th Missile Base Command and Tactical Data Link Systems that provide the command and control between such systems. Currently, the TurAF - which does not have a new generation long-range air and missile defence system capable of intercepting ballistic missiles, is one of the few countries in the world and the only member of NATO meeting its air defence requirements with the F-16 Fighting Falcon fighters.

As part of the announcement dated November 17, 2015 made by the Turkish Ministry of National Defence (MoND) on the cancellation of the T-LoRAMiDS Project, it was underlined that activities for fulfilling the related demands with national resources would be continued. To this end, in 2016, the Presidency of Defence Industries (SSB) launched the Indigenous Long-Range Air Defence System (GUMS/HİSAR-U) Project later named as SİPER. The contract regarding the SİPER Project was signed by an Aselsan, Roketsan and TÜBİTAK SAGE Partnership on January 15, 2018 and within the scope of the Project, being executed with national facilities, Aselsan is responsible for the development of the Long-Range Search Radar, Multi-Functional Fire Control Radar and Radar (RF) Seeker. The system design specifications of the Project were completed in 2018 and the activities on System and Sub-System Design are being executed. With a range over 100km, the SİPER Missile is planned to function against only air breathing targets in the first stage, but Anti-Ballistic Missile


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capability is expected to be gained during the second stage. The first delivery as part of the Project is aimed to be conducted at the end of 2021. Within the scope of the Long-Range Air and Missile Defence System Project, being executed by Aselsan-Roketsan-EuroSam in parallel with the SİPER/GUMS Project, the Contract on the 'Concept Identification' Project with a schedule of 18 months was signed on January 5, 2018. In line with the contract, the related ongoing system concept identification study is planned to be completed by October/November 2019. In the press bulletin published on July 19, 2017 by the EuroSam Consortium, it was stressed that the Long Range Air and Missile Defence System would be built based on the technologies and expertise acquired by EuroSam's ASTER Missile Family in land and naval systems in a period of 25 years and with an investment of EUR 11 Billion. Based on the aforementioned statement, it could be assessed that a naval version (for TF-2000 AWDs) of the Long-Range Air and Missile Defence System will be developed as well.

While the activities towards the SİPER/GUMS and the Long Range Air and Missile Defence System Projects continued, the SAMP/T, Patriot PAC-3 and MEADS Systems came up on the agenda to fulfil urgent requirements and bilateral negotiations were accomplished in various circles in Turkey and abroad by the manufacturer companies and officials of the SSB/MSB. In respect of the urgent requirements, the negotiations on the 4th Generation S-400 Triumph (SA-21 Growler) Air and Missile Defence System was launched with Russia as of October 2016 and the public was informed with the signing of the agreement in April 2017 and the accomplishment of the advance payment in September 2017. The US$2,5 Billion deal covers the purchase of two S-400 Triumph Systems with four Batteries. Instead of U.S. Dollars, Turkey borrowed the loan in the Russian currency (Rubles). Turkey finalized a credit deal with Russia to purchase the S-400 Triumph Air and Missile Defence Systems. The credit deal was signed by Ankara on December 29, 2017. According to President ERDOĞAN, with purchasing on ruble, Turkey will save up to 3% of the total debt. In April 2018 following the ERDOĞAN and PUTIN meeting in Ankara, Turkey, the delivery of the S-400 Batteries had been brought forward from the first quarter of 2020 to July 2019.

TurAF's First S-400 Triumph Squadron ZAFER (Triumph) Will Be Fully Operational by April 2020!

The Republic of Turkey's Ministry of National Defence announced via its official Twitter account on July 12, 2019 that the transfer of the first batch of equipment for the S-400 Triumph Long Range Air and Missile Defence System procured in accordance with the contract signed on April 11, 2017 for fulfilling Turkey's air and missile defence requirements, was initiated on July 12, 2019 at the Mürted Airfield Command in Ankara. Deliveries of the vehicles and equipment of the Turkish Air Force (TurAF)'s 1st S-400 Battery to be operated under Mürted Airfield based 1st S-400 Squadron, dubbed ZAFER (Triumph) continued until July 25, 2019. During July 12-25 a total of 30 flights were carried out from Russia to Mürted Airfield Command by An-124/100s

and IL-76TD EMERCOM transport aircraft to deliver components of the TurAF's. 1st S-400 Battery. The 22T6-2/22T6E2 Transloader (Missile Loader) based on Ural 532361-1012 tactical vehicle chassis, the Polyana D4M1 Mobile Command Control System, the 40V6M Universal Mobile Mast with MAZ-79100 tractor (it elevates the 92N6E and 96L6E radar antennas to the heights of 24m in order to increase the detection performance of the radar, as the world is round, however according to open sources for the S-400 Triumph and S-500 Prometheus Russia developed a revised mast design dubbed 40V6MT to replace the legacy 40V6M/MD series. It appears to be an entirely new design with a different outrigger arrangement, and revised elevating mechanism. It is towed by a BAZ-6403.01 tractor), 91N6E Big Bird Target Acquisition and Combat Management Radar, 92N6E Grave Stone Engagement and Fire Control Radar, 96L6E Surveillance and Tracking Radar, missile canisters and the 5P85TE3 Launchers based on BAZ-64022 tactical vehicle chassis were among the vehicles carried. The 5P85TE3 Transporter Erector Launcher (TEL) with the full-load weight of 41,5 tons is being utilized in the transport and launching of the 48N6E3, 48N6E2 and 48N6E missiles each with a 250km range and 2.6 ton weight (including the canister) and the 40N6E missile could be loaded over this TEL as well. The 40N6E missiles with a 400km range are generally carried over the 51P6E Launcher. About 20 TurAF personnel trained in the Russian Federation in May and June 2019, also take part the acceptance of the equipment and components for the 1st S-400 Battery. Soon after the acceptance certificate is signed, the 1st S-400 Battery will become the property of Turkey and at the same time, the warranty provided by the contract for the S-400 Triumph System by the Russian side will begin to operate within a year and a half.

The emblem of the TurAF's 1st S-400 Squadron, dubbed ZAFER (Triumph), was publicized on July 22, 2019. The badge, crafted by Turkish graphic designer Ömer ERKMEN, features a Seljuk Empire horseman shooting a bow and


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arrow. Turkey's national flag is seen waving in the background of the emblem, which the artist says was inspired by the legacy of the ancient TurksThedelivery of the 2nd S-400 Battery to be operated under the Mürted Airfield based 1st S-400 Squadron, dubbed ZAFER (Triumph) has been launched on August 27, 2019 and expected to last several weeks. The Russian Defence Ministry's transport planes will make several dozen flights during the second phase of the delivery of air Defence missile systems S-400 to Turkey, the Director of the Federal Service for Military-Technical Cooperation, Dmitry SHUGAYEV, told the media on the sidelines of the 14th International Aerospace Show MAKS 2019. According to SHUGAYEV several dozen flights will be carried out by Defence Minsitry planes to deliver TurAF's 2nd S-400 Battery components to Turkey. Furthermore, delivery of the third party that contains over 120 missiles (a total of 64 missiles are required to load 16 launchers to be operated by the 1st S-400 Squadron) in various types will be transferred to Derince Port in Turkey from the Russian Federation by sea. The deliveries regarding the TurAF's 1st S-400 Triumph System/Squadron are planned to be completed in November 2019 and the Initial Operation Capability (IOC) with the 1st S-400 Triumph System/Squadron is expected to be declared by the end of the year. Meanwhile, the 5-month long training of the nearly 100 TurAF staff who went to the Russian Federation started at the end of May in St. Petersburg is expected to be completed in October. In his statement to the Anatolian Agency dated July 12, 2019, Turkish MoND Hulusi AKAR said, "In parallel to our planned activities regarding S-400, the training of our staff in terms of both installation and operation continue in Turkey and Russia".

On July 14, 2019 while talking to a group of journalists at Vahdettin


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Mansion in Istanbul, President ERDOĞAN underlined that the establishment and full deployment of the 1st S-400 Squadron will be completed by April 2020 and the System will become fully operational in the same month. "The emerging picture suggests that Turkey's procurement of the S-400 air defence system is completely for peace keeping purposes in Turkey's own land and within the region. By procuring the S-400s, we are not getting ready for a war; instead we are trying to maintain the peace and our own national security. The aim of all our other attempts towards developing our defence industry is the same as well. The full process of the S-400 air defence system will be completed by April 2020. I hope some part of the installation of the S-400 will be completed by the end of the year, and everything will be fully completed by April 2020. And after that, we will continue to follow our path with greater confidence… the full control of the S-400s belongs to us. Our Armed Forces will be fully in charge of the control. The software is a process related with joint production. Steps will be taken as part of this process regarding joint production," he said. According to ERDOĞAN, the 1st S-400 Squadron will contain 2 Batteries and each Battery will have 8 Launchers. ERDOĞAN also disclosed that Turkey will procure the 3rd S-400 System/Squadron and in this context negotiations with the Russian side for the inclusion of local production, technology transfer and technology share are currently ongoing. "We will be following these developments in the upcoming days," ERDOĞAN stated. President ERDOĞAN also stressed that more TurAF specialists/staff may be sent to Russia to undergo a training course to operate the S-400 Systems. "Their current number is not enough. Now there are 100 specialists, but this number may be increased ten-fold," he said. On July 26, 2019 while addressing a gathering of his Justice and Development Party (AKP) in Ankara, President ERDOĞAN said that the plan is to start using the Russian made S-400 missile defence system - a bone of contention with the U.S. - in April 2020. "In the coming spring, God willing in April

2020, we will be able to start using this (S-400) system," he stated. Meanwhile speaking to IHLAS News Agency on July 31, 2019 the SSB's İsmail DEMİR underlined that the shipment of the Second S-400 System/Squadron might start at the end of 2020. "In the Second System, there is a series of steps including co-production, technology transfer and software integration, and the achievements of the First System should be integrated with the Second System, too," he added. SSB DEMİR also stressed that control over the S-400 Systems will "absolutely" be carried out by Turnkey. The necessary "processes" to ensure Turkey's full control over the S-400 Systems will take place in the first months of 2020, he added. The 2nd S-400 Squadron will reportedly be placed in a strategically important location in the eastern and southeastern region of Turkey, yet the reports have not been confirmed.

Russia airlifted the TurAF's 1st S-400 Battery in July following a long-running spat between Turkey and the U.S., which strongly opposes the deal, claiming the purchase of advanced Russian-made weapons undermines the security of NATO and goes against U.S. interests. As a consequence of the start of the S-400 deliveries to Turkey on July 16, 2019, US President Donald TRUMP announced that the U.S. would not sell F-35 fighter jets to Turkey. With this announcement Turkey's participation in the F-35 Lightning II Joint Strike Fighter (JSF) Program was suspended indefinitely and Turkish companies have been removed from the F-35 JSF production chain. According to US officials the Russian S-400 Triumph System is not compatible with NATO defence systems and could jeopardize sensitive information about F-35 technologies. It is feared that the F-35's performance data could be exposed by S-400 tracking. Meanwhile, according to CNN (reported on August 22, 2019) as a retaliation against Turkey's receipt of the first Russian-made S-400 Triumph System Battery, the Trump administration has formally withdrawn its offer for Turkey to purchase a Patriot PAC-3 IAMDS. While the S-400 Triumph Air and Missile Systems procurement efforts are ongoing, the U.S. Department of State had approved the Foreign Military Sale (FMS) of the Patriot PAC-3 Configuration 3+ Integrated Air and Missile Defence System (IAMDS) with an estimated cost of US$3.5 Billion to Turkey on December 19, 2018. Turkey's Patriot Air and Missile Defence System request covered a single Patriot PAC-3 Configuration 3+ IAMDS to serve under a Battalion (Squadron) structure. The PAC-3+ System would consist of 4 Patriot PAC-3 Fire Units, each with 5 Launchers and each Fire Unit would be able to operate autonomously. The Package also included; 80 Patriot MIM-104E Guidance Enhanced Missiles (PAC-2 GEM-T, enough for 20 launchers, and does not include spare missiles), 60 PAC-3 Missile Segment Enhancement (MSE, normally requires 240 MSE missiles in total for 20 launchers, with the acquisition of 60 MSE missiles, we assume a mixed-use with the GEM-T in the Launchers is planned) missiles, and related equipment. The formal Letter of Request (LoR) for the Patriot system


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was submitted by the Turkish Government in September 2017.

In another development in May 2019, Turkish MoND Hulusi AKAR announced that France has proposed to temporarily deploy the SAMP/T air and missile defence systems in Turkey. The SAMP/T Battery of the French Air Force is said to be deployed on Turkey's southern border. As part of NATO's Operation Active Fence, which started in January 2013 in response to Turkey's request to reinforce country's border against a possible Syrian missile threat, two ASTER-30 SAMP/T Firing Units from the 4th Air Defence Artillery Regiment of the Italian Army have been stationed at Gazi Barracks in Kahramanmaraş since June 6, 2016. Their deployment period has been recently extended (the extension was approved by the Italian Parliament on July 4, 2019) until December 31, 2019.

The Configuration of S-400 Triumph Batteries and Their Deployment Location

According to the information available on open news sources, the S-400 System is composed of four critical components; 30K6E Combat Management System, 98J6E Firing Unit, Surface to Air Missiles (SAM) in various types and the 30TS6E Logistics Support System. The 30K6E Combat Management System contains the 55K6E Mobile Command Center (based on 8x8 Ural 532301 tactical wheeled vehicle) and 91N6E Big Bird Target Acquisition and the Combat Management Radar (based on MZKT-7930 towing vehicle). And in each 98J6E Firing Unit there is a 92N6E Grave Stone Engagement and Fire Control Radar (based on the 8 x 8 MZKT-7930 tactical wheeled vehicle) and up to 12 Launcher Vehicles (Transporter, Erector and Launcher/TEL, 6 x 6 BAZ-64022 towing vehicle or MAZ-79100 series tactical wheeled vehicles; such as 5P85TE3, 5P85SE3 and 51P6E). The threats identified by the 91N6E Big Bird Radar tracked by the 92N6E Engagement and Fire Control Radar. Every S-400 Transporter Erector Launcher (TEL) is capable of carrying four

big missiles or 16 small missiles. Within this scope, for instance, eight 9M96E Missiles and two 40N6E Missiles could be loaded over a Launcher. The missiles are launched from the Launcher vertically with the cold launch technique. The 30TS6E Logistics Support System is composed of spare missile transport and loading vehicles (based on the 8 x 8 Ural 532301 tactical wheeled vehicle), missile depots and test and maintenance/ repair equipment.

8 Launchers will exist in the S-400 Triumph Batteries to be procured for the Turkish Air Force within the scope of the S-400 Triumph (SA-21 Growler) Air and Missile Defence System Procurement Project valued at US$ 2.5 Billion (US$ 1.5 Billion of this amount is funded through Russian Federation credit) and the 2 S-400 Systems/Squadrons will be composed of a total of 32 Launchers. According to the press, on January 4, 2018, the S-400 Battalion and batteries would be organized under the auspices of the S-400 Regimental Command. Within such framework, 2 Battalions/Systems will remain under the auspices of the Command, 2 Companies/Batteries will exist in every Battalion, and 8 Launchers will remain in every Company/Battery. As a result, a total of 32 Launchers will remain in 4 Companies/Batteries. In the aforementioned organization, with the help of the 4 Batteries/ Companies composed of 32 Launchers the S-400 Regimental Command of the Turkish Air Forces (the regimental headquarters is expected to be established in Mürted/Ankara) will be able to engage with a minimum of 64 different targets with 128 missiles within a range of 400 km (on account of the 40N6 Missiles) at the same time. Two missiles are launched to every ballistic missile target for guaranteeing 100% destruction as part of the air engagement doctrine and in respect to air breathing targets, the System offers a destruction guarantee with a single missile of around 80%. According to the information reflected in the press, the TurAF accomplished the assignment of a Commander for the first System and a Colonel from the Air Defence Class was assigned to the task.

The S-400 Triumph Batteries procured through the Direct Procurement method were initially planned to be deployed at the Mürted Airfield Command designed as the 'S-400 Training and Support Base' in Ankara. As you will recall, after the July 15th coup attempt, the status of the Akıncı 4th Main Jet Base in Kahramankazan province was reduced to the level of 'Airfield Command', three F-16 Fleets located at the Base were closed and around 60 F-16C/D Jets under the service of 141st (including the SoloTürk Acrobatics Team), 142nd and 143rd Fleet Commands were dispatch to the 1st, 3rd and 5th Main Jet Base Commands. It has been disclosed that Mürted Airfield Command was preferred for the maintenance of Ankara's air defence, featuring very convenient conditions for the S-400 Triumph System such as the existing hangars of the evacuated Base, long runways (in this way, the S-400 Batteries could be easily transferred to Turkey from Russia with heavy air freighters such as An-124) as

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Potential engagement (with 48N6E3 missile) radious of S-400 Triumph Systems to be deployed at bases in Ankara, Bandırma, Aksaz/Marmaris and Gaziantep

well as its broad space. Since all the components are formed over tactical wheeled vehicles, the S-400 Triumph Batteries, with high maneuver capability, will be able to be transferred to Turkey's other regions in times of crisis via land (transferred at 60 km/h on an asphalted road, 25 km/h in field conditions) or by air (by leasing An-124 Heavy Air Freighters) when required.

The S-400 Triumph Systems exported by Russia are expected naturally to own weaker capabilities than the S-400s under the service of the Air – Space Forces of the Russian Federation. Since Russia will be launching the S-500 Prometheus System (stated to have Ballistic Missile Defence – BMD purposes and has interception capability against Intercontinental Ballistic Missiles - ICBMs within a range of 600km and an altitude of 200km), the transfer of a part of the S-400 technology to Turkey at an affordable price seems probable. In contrast with Turkey, as an adequate comparison of Chinas' existing technology and human resources in engineering cannot be made, Russia is expected to be more generous than China in the sharing of technology.

It seems that the TurAF's S-400 Batteries will be operated under two (if the contract for the third S-400 System/Squadron is awarded then a third Squadron can be established) Battalion/ Squadron Commands. For more effective utilization of the TurAF S-400 Triumph Batteries, which will be the export version of S-400, two different Fire Units should exist in each (similar to Russia's deployment in Russia) Battery and for their autonomous execution of operations, in addition to the Launchers (4 Launchers/TELs) and related support vehicles, each Fire Unit should have at least an X-Band 92N6E Grave Stone Engagement and Fire Control Radar (with a tracking capability within a 120 degree sector and an engagement capability within a sector of 90 degrees and stated to have a range of 390km and able to guide 20 missiles to 10 different targets simultaneously while controlling a maximum of12 Launchers) and a C-Band 3B 96L6E Surveillance and Tracking Radar (features a 5-300km range and target acquisition capability of a maximum of 100 targets simultaneously, in case the RadNet integration of the S-400 Triumph Systems are actualized the 96L6E radar demand may be removed). Both 92N6E and 96L6E radar vehicles are operated by three staff and three different operator consoles are contained in the vehicles. The 55K6E Mobile Command Center (five operator consoles with 18 inch twin LCD monitors are included and it is stated to be able to conduct the command and control functions of a maximum of six Batteries) and the 91N6E Big Bird Target Acquisition and Combat Management Radar will exist in a Battalion/Fleet structure (the fully digital 3 Dimensional PESA type radar is operated by four staff, which is stated to be able to get ready to start in five minutes and is capable of reflecting 300 targets on the displays at the same time). According to open news sources, while the Big Bird radar and 55K6E Mobile Command Center could be located 1km away from each other, the Launchers could be deployed 30km to 100km away from the 55K6E Mobile Command Center.

Since the acquisition of Ballistic Missile Defence (BMD) against the threat of short and medium range ballistic missile has arisen from neighboring countries, one of the operational requirements identified for the Long Range Air and Missile Defence System, it is essential to equip every battery with the S-Band 91N6E Big Bird Radar with 600km+ acquisition range and Ballistic Missile identification and tracking capability (3,500km range and up to 4,8km/h (Mach 14,1) speed) with PESA antenna structure to include the BMD capability to the S-400 Batteries. In this way, when required, every S-400 Battery will be able to be sent to any region of Turkey and autonomously perform air and missile defence tasks there. Even if this provides a significant BMD capability to the Turkish Air Force (considering the fact that the S-400 Batteries would not be integrated to NATO's Air Defence Radar Network and NATO Integrated Air and Missile Defence System) and operational flexibility, the 91N6E is an expensive radar system and it will substantially increase the procurement costs of the S-400 System.

Depending on the characteristics of the threats and targets, the S-400 Triumph System could be equipped with 9M96, 9M96E, 9M96E2, 48N6DM, 48N6E2, 48N6E3 and 40N6E Surface to Air Missiles (SAM). According to open resources, utilized against ballistic missiles, the 9M96E missile weighing 333kg and 9M96E2 missile (active radar guided) weighing 420kg have ranges of 40km (interception altitude of 20km) and 120km (30km interception altitude). Four of these missiles could be installed within every launcher similar to the PAC-3 Missiles. The 9M96E Missile Group is known to be based on the principle 'hit-to-kill' where the target is destroyed by physical impact. While the ranges of the 48N6E and 48N6E2 Missiles with an interception range of 27 km are indicated respectively as 5-150km and 5-200km, the 48N6E3 Missile which is a more developed

S-400 Triumph Missiles and Canisters

version of 48N6E2, with a range of 3,500km and speed of 4.8km/sec (Mach 14,1) is stated to be capable of intercepting the Ballistic Missiles at an altitude of 2km – 27km and a range of 5km – 60km. Weighing 1,835kg, the 48N6E3 Missile is able to reach an altitude of 250km. The 48N6E3 Missile with semi active radar guidance could be utilized at the altitudes of 10m – 30km against air breathing targets. The 40N6 Missile, with the longest range used in the S-400 Triumph System, has active radar guidance capability and weighs 2 tons with a reported effective range of approximately 400km.

How Effective and How Lethal is S-400?

Although the S-400 Triumph System is recognized as one of the most sophisticated SAM Systems in use in technical terms, it has not yet proven itself in a combat. Russia presently has two separate S-400 Fire Units located at the Hmeymim Air Base near Latakia in Syria (80 km South of the Hatay border) and at Masyaf. According to the satellite images, there is one S-400 Fire Unit composed of 4 Launchers located at each station. While there is a long range 91N6E Big Bird Radar in addition to the ESM and ECM systems of various types with the 92N6 and 96L6 Radars in Hmeymim, there are only 92N6 and 96L6 Radars at the emplacement in the mountainous area in Masyaf. Moreover, there is an S-300 Battery located at the Tartus Port. However, due to various reasons, the aforementioned air and missile defence systems were not able to prevent air attacks executed by the U.S. and Israel in November 2015. This case corroborates the claim suggesting that Russia deployed the S-400 and S-300 Systems in Syria in order to protect its interests, therefore in order to prevent a severe conflict with the U.S. and Israel, it tolerated the air attacks that did not damage Russia's interests and its military staff in Syria in line with the agreements reached between the two countries.

According to the information provided in open sources, the 91N6E Big Bird Target Acquisition and Combat Management Radar is capable of identifying an air target with a 1m2 RKA value (depending on its altitude) from a distance of 338km, a ballistic missile with a 0.4m2 RKA value and 4,800 m/sec speed from a distance of 230km, an air target with a 4m2 RKA value from 390km and a strategic bomber aircraft from 570km. With the 92N6E Grave Stone PESA Radar, the acquisition range of a target with a 3m2 RKA value is estimated to be nearly 277km (150nm), and the acquisition range of a target with a 1m2 RKA value is calculated to be 250km (135nm). It is assessed that the UGM/BGM-109 Tomahawk Cruise Missile with a 0.5m2 RKA value can be identified from a distance of 157km (85 nm). The Grave Stone Radar is claimed to be capable of tracking 100 different air targets simultaneously under the TWS (Tracking While Scanning) mode.

However, due to the round shape of the earth, the maximum range of a radar system decreases as the altitude decreases. The Radar Horizon Line Visibility Range also known as the 'Radar Horizon' (the range where the first RF signal is transmitted by the radar depending on the radar and target altitude, this range should not be confused with the acquisition range) depends on how high the radar antenna is located, the altitude of the target, the roughness of the field surrounding it and the performance of the radar (the output power of the signals transmitted from the antenna). According to this, for a target approaching from an altitude of 20m, the Radar Horizon Line Visibility Range of a radar located at an altitude of 20m is 37km, for a target at an altitude of 50m it is 48km, for a target at 100m altitude the Radar Horizon is 60km and for a target at 500m altitude it is 111 km. In respect to a radar positioned at a height of 2,000m, the Radar Horizon Line Visibility Ranges for targets approaching from an altitude of 20m, 50m, 100m and 500m, will be 203km, 214km, 226km and 223km respectively.

91N6E Big Bird Radar

Integration of S-400 Triumph Systems

The integration of S-400 Triumph Systems with the existing air defence network of the TurAF and with the other air defence systems related to the C4ISTAR components will be the most complicated aspect of the Project.

The 4+ generation S-400 Triumph Air and Missile Defence System with a mobile structure and expansion potential has an improved ECCM capability enabling it to perform its tasks in an environment of intensive radars and communication and its target classification is maintained via the IFF system integrated to the radars in a combined way. Capable of identifying and tracking multiple targets simultaneously and engaging with them, the 92N6E, 96L6E and 91N6E Radars used in the S-400 System are able to execute the source inquiry of the identified targets via the internal IFF systems simultaneously from quite far distances. The control of the aforementioned radars is fulfilled fully automatically by the 55K6E Mobile Command Center. In addition to the 55K6E Mobile Command Center (for capturing and forwarding the air picture), a data link exists in the Launchers and 92N6E Grave Stone Radars (for mid-course support to the 9M96 Missiles).

The layered air defence architecture is composed of various sensors, command control systems and weapon systems of different types. The continuous intercommunication of the systems forms the basis of this architecture. To enable the aforementioned communication, filtering methods and security measures to be used in various communication protocols and security of the transferred data have been identified and transformed into a standard document. For the existence of the S-400 Triumph Batteries in the national air defence architecture and their efficient performance of tasks, the required integration activities have to be launched in line with the aforementioned standard document.

The S-400 Triumph Batteries can be integrated to the TMRC (Turkish Mobile Radar Complexes) radars engaged to each other over the national Radar Network (RadNet) via the interfaces to be prepared when the required source codes are supplied from Russia. TMRCs are capable of tactical image transfers with the NATO E-3A AWACS, E-7T Air Supply Command and components of the Naval Forces Command via the Link 11B capability they feature, they are able to transfer tactical images with the HERİKKS systems of the Land Forces Command via Link-1 and with the help of the ATDL-1 capability, they can be integrated to the missile systems for the transfer of tactical images and transmission of weapon control commands.

S-400 Triumph Radar Systems, 55K6E Mobile Command Systems and Launchers

We are receiving different comments on the integration of the S-400 Batteries which will be included in the inventory of the Air Forces Command, with the national systems and with NATO's Integrated Air and Missile Defence System. Two critical points stand out within this scope; the options besides the digital interface (Man Machine Interface) utilization and full integration. Whether or not they are procured from different sources, digital interface utilization enables the integration of the systems to one another technically. Since NATO's radar systems and command control systems have an integrated structure, though it is technically possible to integrate a system outside NATO is technically possible, it is not really preferred due to the concerns about security problems. 'Security walls' can be formed in order to overcome such concerns and all these integration and security operations can be conducted by a technical staff with NATO security certification. However, as mentioned previously, the S-400 Batteries will not be integrated to the NATO Integrated Air and Missile Defence System network and will be used merely as national systems. The integration of

TMRC - Turkish Mobile Radar Complexes

Air Combat Training Systems

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the S-400 Batteries to the national systems (air defence early warning radars/ RadNet, TAFICS, HvBS and HERİKKS) could be accomplished by digital interfaces. In the case that it is prepared with indigenous facilities, a digital data interface with the 'plug and fight' capability will enable the smooth and cost-efficient integration of the S-400 Batteries to network based defence command and control systems (both existing ones and the ones to be manufactured in the future). In order to achieve this, the Russian Federation has to share the source codes of the S-400 with Turkey to a certain extent. Even if the main goal of the integration activities is the establishment of full integration, if it could not be achieved (if the S-400 source codes are not shared with Turkey) then the S-400 Batteries can be used autonomously without being integrated to the existing radar and command – control systems as well. However, in that case the S-400 Batteries would not be used in full efficiency.

The integration activities in the Project should be conducted by the Turkish Defence Industry companies in Turkey in a way to protect trade secrets and avoid any confidentiality violations, and the test and verification activities regarding the integration should be performed with the utilization of generic data by the nationally authorized staff in a simulation environment. Following the completion of the test and verification activities of the S-400 Triumph Batteries, the absolute data (national threat data bank) should be installed to task computers and IFF Systems (the existing IFF Systems operate both with national algorithms and NATO algorithms) by the TurAF staff and after that they should be assigned for operation task. If the NATO communication algorithm is not installed with the national algorithms, the S-400 Batteries may identify the NATO aircraft as the enemy and for instance may be engaged to a NATO aircraft operating in the Syrian Air Space.

The news on the written and visual media suggests that a national software would be developed by Turkish Defence Industry Companies to be used in the S-400 Triumph Systems to be procured from the Russian Federation and that the Identification Friend or Foe (IFF) System in the S-400 System would be reprogrammed according to Turkey's own threat perception. Within this scope, the threat perception (Turkey's own threat data bank) regarding all air vehicles including missiles, fighter jets, bomber aircraft with high altitude and Unmanned Air Vehicles (UAV) prepared by the Turkish Armed Forces (TAF) will be installed to the IFF System of the S-400s to be procured from Russia, prior to delivery. Then again, as mentioned previously, for the installation of national software to the S-400's task computer and the IFF System and to update the threat data bank when required, the Russia Federation will have to share the S-400 source codes and Interface Control Documents with Turkey to a certain extent. In this way, the System will feature the capability of operating both with the task data bank identified by the Russian Federation and the task data bank identified by the TurAF. Together we will witness if this will be possible or to what extent it will be successful. It is possible to equip the S-400 Batteries with an indigenous IFF System, but the source codes will again be required for the preparation of the interfaces necessary for the integration of this indigenous IFF System to the S-400 task computer. Regarding this issue, on October 7, 2018, President of Defence Industries Prof. İsmail DEMİR announced that the indigenous IFF System will be integrated to the S-400s.

The IFF Mode 4, Mode 5 and Mode 5/S Systems (Transponder and short/medium range Interrogator) both imported and manufactured under license, based on Mk XII/Mk XIIA(S) and compatible with the national NATO STANAG 4193 are being utilized in the air, land and naval platforms of the Turkish Armed Forces. On the other hand, as part of the contract signed between Aselsan and MoND, the National Mode 5/S IFF Transponder and Interrogator (the studies on the Long Range IFF Transponder continue) devices are being developed with national resources in Turkey and will be launched into service. The IFF Mode 5 Interrogator and Transponder device planned to be manufactured indigenously and with NATO encryption during the serial production and development stage and then to be integrated to the various platforms of the Turkish Armed Forces in line with the IFF Mode 5 Serial Production and Development Project executed under the coordination of the MoND.

The Mode 5/S Long Range Interrogator device manufactured by Aselsan is capable of interrogation up to a range of 400+ kilometers. With the IFF System with the non-rotating type cylindrical Active Phased Array antenna structure developed by Aselsan for the TF-2000 Air Warfare Destroyers are stated to be capable of interrogation up to the range of 400km+ as well. On the other hand, with the IFF Reverse System R&D Project executed again under the coordination of MoND, fulfilling the air-to-ground friend-or-foe identification and situational awareness requirements and enabling all types of air platforms, the aim is the identification of the friendly components in the task zone from a distance compatible with the range of the weapon systems.

On account of the good dialogue between Russian President

The President of Turkey, Recep Tayyip ERDOĞAN and the President of Russia, Vladimir PUTIN at MAKS 2019 International Air Show

PUTIN and President ERDOĞAN, we believe that the issue of reprogramming of the IFF Systems of the S-400 Batteries in line with Turkey's own threat perception will be resolved in the upcoming months. If the IFF Systems are not updated with the national threat data bank and the source codes required for the preparation of the interface software and hardware (that will allow the communication between the systems and transfer of the threat data to the command control centers in a common communication language) required for the communication protocols and algorithms, could not be procured from Russia, the full integration would not be achieved. And in that case the target acquisition will be conducted manually by the operators assigned at the 55K6E Mobile Command Center within the S-400 Batteries resulting in limiting the operational efficiency of the system.

In the event of a failure in the indigenization of the IFF communication protocol and algorithms utilized by the S-400 System, then a vulnerability in the communication and friend-or-foe identification between the fixed and rotary wing air vehicles under the service of the TAF and S-400 Batteries will emerge and the friend-or-foe identification performed in Turkish Air Space, simultaneously by hundreds, and even sometimes thousands of air vehicles, will become more difficult.

Conclusion

Considering the fact that the TurAF has dismissed over 750 experienced pilots (most of them were fighter pilots and according to reports before 15 July 2016 FETO coup attempt there were 1,301 pilot in TurAF service but as of January 2019 the number of pilots was around 730. According to current estimations the ratio of pilots per aircraft has reduced to 0,35 level) and over 500 aircraft maintenance officers/NCOs since FETO's failed coup attempt in July 2016, the importance of establishing a deterrent air and missile defence system network becomes more understandable. Since the TurAF currently does not have any new generation long range air and missile defence system able to intercept TBM and SRBM threats, Turkey is one of few countries in the world and the only NATO member country that meeting its air defence requirements with the F-16C/D Fighting Falcon jets. With the deployment of the 1st S-400 Squadron in 2019, 2nd S-400 Squadron in 2020 and the indigenous HİSAR-A, HİSAR-O, HİSAR-RF and SİPER Air Defence Missile Systems 2020 onwards the mission load on the F-16C/D Fighting Falcons and TurAF fighter squadrons that currently are enduring pilot shortage issues would decrease to a certain degree by 2023 ■

Navantia - Ambitious Projects Where Experience Matters

Sofia HONRUBIA Commercial and Business Development Vice President Navantia talks with Defence Turkey Magazine about the company's twenty-year presence in Turkey.

Navantia confirmed its commitment by opening Navantia Turkey in 2013. In addition to the partnership with SEDEF for the construction of Turkish LHD ships and the partnership with AYESAŞ for the supply of the IPMS, Navantia has also been working with DELTAMARINE, an engineering company involved in ship design. With these partnerships Turkey's local contribution to the LHD ships has increased, also opening up global export opportunities through product quality improvement and innovation

Defence Turkey: How would you best describe the state-owned Spanish naval shipbuilder Navantia today? Even though its main line of activity is in the naval field, Navantia also designs and manufactures systems for the Army and the Air Force. Could you please provide some key facts about the company for our readers?

Sofia HONRUBIA: Navantia is a state-owned naval shipbuilding company that provides the industrial and technological response to the Spanish Government to build the essential naval capabilities for National Defence and Security. The company has their own technological capacity to deliver solutions end to end in the shipbuilding and also in the Systems domain, providing sovereignty to the Ministry of Defence.

Navantia has an international projection offering global solutions to clients and partners around the world, exporting 10,000 million euros in the last 10 years, internationally reinforcing the Spanish Brand and boosting Spanish exports and direct foreign investment. Its presence stands out in countries such as Australia, Norway, Saudi Arabia, United States, Turkey and India.

It is a technology company focused on innovation, investing a significant amount in R&D projects, which makes it have its own technological capacity which is the basis for their products and services which are efficient, competitive and exportable. Navantia is involved in a digital transformation that involves the products, services, processes and people, that is the most important challenge of the company.

In addition, Navantia generates a great effect tractor of economic growth and job creation in the countries where it operates, providing jobs of high quality and technological sophistication.

Our experience as a main contractor and systems integrator is also a clear advantage that we are providing for the land forces and to other defence institutions.

The close relationship with the Spanish Navy and the Ministry of Defence has allowed us to build excellent products like the F100 frigate or the Juan Carlos I LHD, for example, products that had a great impact on the international market. Now, we aim to introduce new ones like the F110, the S80 submarine or the light frigates like the Alfa class.


© Navantia

Our experience has demonstrated that we are also good as a transfer of tecnhology partner, having proven our value in very different industrial scenarios.

Defence Turkey: How would you describe the current position of Navantia, in both technological and commercial terms, in the global maritime sector?

Sofia HONRUBIA: The intensification of international competition, new technologies, the demand for new products and services and new business models are inevitably leading shipyards to focus more and more now and in the future to improve competitiveness with digitization of facilities, and the sophistication and technological differentiation of products and processes.

In order to be competitive in that market , Navantia is currently implementing a Strategic Plan that led the company to maintain its excellent position in the international market.

New programs that are already in place like the new frigate for the Spanish Navy, F-110, and other international programs, will boost the transformation. The new model of industry 4.0 and its associated technology, a great part which is already at our disposal, provides the ability to simulate in the field in real time virtual design, product, and processes of manufacturing and maintenance, and then transfer and continuously compare the virtual product with the real world. Looking through this connected capability, we progress towards the concept of intelligent manufacturing.

Navantia is making a great effort in offering the highest technology to improve its position as a key provider in the global maritime sector.

Defence Turkey: How much time, effort and money has Navantia allocated for R&D annually?

Sofia HONRUBIA: For the recent years, Navantia has spent more than 10% annually on R&D of the total income of the company.

In the present context of competitivity, to remain in a good position implies to spend effort in R&D. The main focus of our R&D projects is the use of emerging digital technologies to provide solutions to new market demands both in capabilities and business models. We also work to improve process efficiency through digital transformation, this is what we have named “the Shipyard 4.0.”

We are currently developing projects within the 13 Key Enabling Technologies (KETs) that Navantia is focusing on. As an example, Navantia is implementing projects related with new technologies and digital transformation such as Drones, no-cable vessel and the Digital Twin for the last generation of frigates for the Spanish Navy.

Defence Turkey: Can you provide an analysis of 2018 from Navantia’s point of view and could you elaborate on your targets for 2019?

Sofia HONRUBIA: 2018 was an extraordinary year for us. First of all, a very ambitious Strategic Plan for the company has been initiated that will allow the company to be ready for the future.

Furthermore, very important contracts were signed, 5 corvettes for the Saudi Navy, the most important export contract for Navantia, and the

contract for 5 frigates F110 for the Spanish Navy, the most advanced frigate class ever built. The program for the new submarine S80 for the Spanish Navy has successfully passed important milestones and soon will be ready for delivery .The current programs that we are carrying out in Turkey, Australia and India are also going on track.

Navantia continues to focus on strategic markets in Australia, Saudia Arabia and USA. Turkey is also a priority.

Some important tenders are now in place, such as the FFGX frigates program in the United States and in the FSS program for a supply ship for the Royal Navy.

Defence Turkey: The naval shipbuilding market is very cyclical; global economic crisis usually punishes all the naval industry players, big and small, with great cuts on defence expenditure over the world, reaching their domestic and export clients, with naval programs sliding to the right and even being cancelled. As a world class naval industry player Navantia also underwent a rough patch at that time. How did you manage to overcome that challenge?

Sofia HONRUBIA: In 300 years of history, the company has proven its strength several times. At this moment Navantia has undertaken a Startegic Plan to get through this situation. The plan, supported by the Spanish Government and the Unions has a triple target. First, to be focused in the market needs to secure more contracts. Navantia will continue its international strategy to better assess client needs. Secondly, Navantia is boosting Digital Transformation, increased significantly its effort in R&D to improve productivity and to be able to better deliver on time and budget. The third target that has just started is focused on people. The staff of the company should be skilled according to the new needs derived from transformation.

Defence Turkey: Navantia recently secured a number of contracts that have improved the company's situation significantly, such as the contract for the construction of five corvettes based on the AVANTE 2200 model for the Government of Saudi Arabia and a contract signed with the Spanish Ministry of Defence for the construction of five F-110 multi-mission frigates. Can you briefly introduce our readers to the major programs, local and international, that are keeping Navantia busy these days? What key geographical markets are your next targets?

The Computer Generated İmage of F-100 Frigate

Sofia HONRUBIA: Our international commercial strategy includes Europe, America, South America, Middle East, Asia and North of Africa. We have many solutions that suit programs of navies in these regions. Our portfolio incorporates new products after our recent contracts, like the F110 frigate, S80 submarine or the corvette Alfa 4000, but ships based on the F100, LPD and AOR are still demanded.

The F110 is the most modern frigate in the world. It involves a high technological development. This is a dramatical change with in the conception of a ship, because it will have a digital twin. This will allow the client to anticipate any operations of upgrading, maintenance or repair. The F110 contract was signed in February 2019 and it represents the new reference in the market. From this perspective we believe Navantia´s F110 will be a good competitor in major programs around the world.

The S80 was secured also in December 2018 and this means that in 2022 there will be a new advanced conventional submarine fully made in Spain. Navantia will become one of the few shipyards in the world able to design and build submarines. This product opens new opportunities for exports.

The contract with KSA for five corvettes introducing Catiz Navantia´s combat management system and including training and Through Life Support together with the joint venture with SAMI, named Saudi Navantia Naval Industries, gives Navantia a strategic position in the Middle East market for corvettes based on the KSA model and also for other ships. KSA remains a focus of interest for the short and middle term.

Defence Turkey: Can you elaborate on the status of the Saudi Arabia's AVANTE 2200 Corvette Program? Did the contract become effective and has the construction of the first corvette started? According to the original schedule, the program should have started at the end of 2018 and the last ship would be commissioned in 2022.

The cut steel of KSA Corvette Program

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Sofia HONRUBIA: On July 2018, Navantia signed a contract with the Government of Saudi Arabia for the construction of five corvettes. The program started at the end of 2018, and the keel laying for the first vessel will be celebrated in September at Navantia's Shipyard in San Fernando, Bay of Cadiz. The last ship will be commissioned in 2022. In addition, NAVANTIA will be responsible for the Life Cycle Support.

Besides the contract of corvettes, Navantia has already incorporated a Joint Venture with SAMI, SAMI Navantia Naval Industries with the objective to create local capabilities in the Naval Systems domain that will create high quality jobs in Saudi Arabia and will allow them to provide their products in country and on the export market.

Defence Turkey: Can you elaborate on the current status of the much delayed (due to weight and balance problems) AIP powered S-80 Plus (Isaac Peral Class) Submarine Program, covering the construction of 4 submarines for the Spanish Navy? Construction of the submarines was suspended in early 2013, when it was discovered that the first submarine in the series, the Isaac Peral, was 75 to 100 tons too heavy relative to its length. How did you solve the weight and balance problem? According to reports the S-80's per unit cost increased from the originally projected €439 Million to €978 ($1.14 Billion) and delivery has been delayed nearly a decade from 2013 to 2022.

Sofia HONRUBIA: Currently, in the first submarine it's planned to weld the last section junction at the end of the year. This junction will be carried out after the main platforms embarking and outfitting of the two fore sections (weapons and control room). The setting afloat will be performed during 2020 and the delivery is planned for 2022. The second submarine is in progress, working on the construction of the internal assemblies and the steel outfitting of supports and foundations.The third one is in the process of its lengthening. The program is on track, fully compliant with the new contractual milestones.

The weight issue was solved using a System Engineering approach which led the shipyard to increase the displacement of the submarine by increasing its length. A complete re-design of the submarine has been carried out taking profit of the lengthening of the submarine and the opportunities it led. The main issues related with possible obsolescence have also been catered to. An FMS cooperation agreement has been established between the Spanish Navy and the US Navy, in this frame, a Safety Certification Process has been developed for the program based on the US Navy Subsafe certification. Under the FMS case the Spanish Navy has the back-up of the US Navy/General Dynamics Electric Boat for Safety issues.

The figures shown are not totally correct because there are non-recurrent costs for the program that have to be considered and there are also some R+D costs running in parallel in the program. It's true that the total cost of the program has been increased, Navantia has taken the opportunity to perform a whole review of the design and the quality of the project with the back-up of the US Navy/General Dynamics Electric Boat.

Defence Turkey: The S-80 plus Submarines will be equipped with the 300kW AIP system using bio-ethanol fuel cells and an Ethanol Reformer, that generates the required hydrogen from ethanol through a reformer. However, according to reports, the AIP system will not arrive in time for its installation in the first two submarines of the S-80 Plus series, but in the next two and the first two will receive AIP drives for their 2032 refit. Can we hear your comment on this issue?

Sofia HONRUBIA: The system will not be in time in the two first submarines, it has been decided to include the first AIP system in the third one. The first and second submarines will receive their systems in the first overhaul, planned for 2028 for the S-81.

Navantia has run AIP equipment for thousands of hours and in 2018 demonstrated technology integration through full power endurance tests (> 300 kW gross power) using prototypes (full scale, naval qualified equipment). This success in the full power production milestone enabled Navantia to move forward to the System Verification Review scheduled in July 2021, as critical risks to meet the S-80 Program deadline for system installation onboard the S-83 submarine were properly mitigated. Currently the AIP is accumulating 'flight hours'

Defence Turkey: Can you elaborate on the status of the F-110 Frigate Program for the Spanish Navy? The Spanish MoD signed a €4,3 Billion contract with Navantia on 23 April 2019 for the construction of five F-110 Class Frigates. When do you plan to start construction on the first frigate?

Sofia HONRUBIA: After the shipbuilding contract for the frigates, the Detail Engineering Phase (including functional and construction ship design) is running at Navantia Ferrol Shipyard and it is expected to start the Ship Construction Phase in December 2021.

S-80 Class Submarine

The first frigate will be delivered at the end of the year 2026.

Defence Turkey: What can you tell us about the importance of this contract for Navantia and the technological advances that the F-110 design will incorporate compared to existing frigate designs?

Sofia HONRUBIA: The F-110 frigates program is a strategic program. It is key for Navantia in the 21st century and it will mean continuing with the successful story of the F-100 program, both nationally and internationally. This program is one of the fundamental pillars of Navantia's strategic plan, being a key engine to assure a stable workload for the next ten years, it will benefit all the shipyards of Navantia with an impact on the employment of approximately 7,000 jobs annually, between direct and induced jobs. In addition to the workload for the Navantia Ferrol Shipyard, it will also generate activity in the Bay of Cadiz, through Navantia Sistemas with the development of the frigate's combat system.

The design of this new frigate will incorporate remarkable technological advances, such as the new integrated mast configured with different solutions of sensors and antennas, the incorporation of a multi-space mission that expands the capabilities of the ship in all the segments of defence and a new hybrid propulsion plant that is more efficient and silent providing the ship with great versatility. In addition, it will integrate unmanned vehicles on board and will have the capacity for the future installation of directed energy weapons.

The frigates will be equipped with a Spanish combat system, SCOMBA, developed by Navantia. This system acts as the vessel's brain and integrates all the frigate's sensors and weapons, such as surface sensors, antisubmarine warfare systems and the navigation and communications systems from Navantia Sistemas.

It should be noted that the frigate F-110 will be the first major Spanish naval program developed within the framework of "Astillero 4.0" which will involve the most advanced integrated control and simulation systems, with the digital twin, which will be complemented by an intelligent management and communication nervous system (Integrated Services System), which will permanently connect the crew to each other, and the crew to the ship's systems. In addition, it will incorporate processes and components with additive fabrication or 3D printing and will be the first ships in the fleet to have an integrated cybersecurity system that shields ships against increasing threats.

L-61 Juan Carlos was anchored at Topkapı, İstanbul, 2011

Defence Turkey: Can you elaborate on the capabilities and experiences of Navantia in the field of LPD/LHD ships? How has the ATHLAS 26.000/Juan Carlos I LHD design evolved and how would you compare this system with others of similar nature in the market today?

Sofia HONRUBIA: What we can say is that, in accordance to what we see, looking to the Royal Australian Navy and the Spanish Navy, is that there is no other design as capable as the Juan Carlos I Class. This type of ship is the type of aspiration for any navy that wants to have projection capabilities but, at the same time, wants to execute significant multi-missions and amphibious missions. These ships allow our navies to move faster and project their force in a very efficient way. The LHDs needs to be seen as a whole with the landing craft embarked in them, which are also Navantia's design. These crafts are key in these missions. Z

Defence Turkey: Can you elaborate on the current status of the Royal Australian Navy (RAN)'s LHD Program? Both HMAS Canberra and HMAS Adelaide have experienced problems with their large azimuth propulsion pod systems and thus were in dry dock from March 2017 until June 2017. Has this problem been completely overcome?

Sofia HONRUBIA: The LHDs are recognized by the Commonwealth of Australia as one of their main assets. These ships are performing well, they have recently been jointly deployed in the SEA EXPLORER 2019 exercise, which is the best proof that the ships are working out fine. Hopefully the Turkish Navy will be enjoying these capabilities pretty soon. In this sense, having Navantia and SEDEF working together is another good example of what we can achieve with the right partners. We are extremely proud of how SEDEF is developing the work and the results of the ship are demonstrating to be very good.

Defence Turkey: Focusing on Turkey now, can you elaborate on the current status of the TCG Anadolu LHD Program? What can you tell us about the program schedule?

Sofia HONRUBIA: First of all, I would like to congratulate Defence Turkey for its magazine and the job it does for the promotion of the Turkish Defence Industry.

Regarding the TCG Anadolu Program status, it has already been set afloat and now it is back in dry-dock to continue the construction process. This means that the current status of the Anadolu LHD Program is quite good and as per schedule. This proves that the partnership between Navantia and SEDEF is a success. Usually in Transfer of Technology contracts there are some delays that mostly affect the first unit of a series of ships, but this is not the case with SEDEF, everything is going as planned. This means that the second ship, TCG Trakya, could be built even faster, reducing the delivery time compared with the first one.

Defence Turkey: What can you tell us about the services and components, including the diesel engines and IPMS, being provided by Navantia under the contract?

Sofia HONRUBIA: As you are very well mentioning in addition to the IPMS, diesel engines and the design of the ship, Navantia is also providing technical assistance to SEDEF shipyard with a Resident Team.

Since April 2016 we have located a team of experts at SEDEF shipyard. This team consists of engineers and experienced technicians that are assisting SEDEF in anything they need to ensure a smooth transfer of information and also to solve, as soon as possible, any issues that could arise during the construction of the ships.

Defence Turkey: Can you elaborate on Navantia's approach to the Turkish Navy's TF-2000 Air Defence Warfare Destroyer and MILGEM Programs?

Sofia HONRUBIA: Navantia is a worldwide leader in Anti-Air Warfare Frigates. I think Turkey could benefit from the experience Navantia has gained with the TCG Anadolu Program. Let's not forget that in addition to supplying ships to the Spanish Navy, Navantia has also been working with foreign navies such as the Norwegian Navy and Australian Navy in AAW Frigates. We have been recently selected for the concept design phase of USA's FFG(X) Program as well.

Right now, Navantia and Turkey know each other very well and this cooperation should turn out in developing the most complex of navy ships, such an AAW vessel. The TF2000 Program is a very ambitious project where experience matters. In the past, Navantia built ships with the engineering provided by others, mostly from North American shipyards. Nowadays, we are the ones providing the design to other shipyards, including North American ones and everything started with our successful AAW frigate, the F100 series. This experience could be of great value for Turkey in the TF 2000 Program to follow the same path as Navantia did in the past.

Regarding MILGEM, since this Program is already ongoing, Navantia, with its local partner AYESAŞ, is offering its solution for the Integrated Platform Management System, IPMS. The TCG Anadolu is equipped with Navantia-AYESAŞ IPMS and we are of the opinion that the Navy would benefit from having this system installed in their most technologically developed ships, the LHD, the MILGEM, and in the future, the TF2000 frigates as well. This will bring commonality to the Navy and an easier transition from one ship to another for the crews.

Defence Turkey: What are the aspirations of Navantia towards a long-term presence in Turkey through cooperation? How does Navantia see long-term exclusive partnerships? Could you give us an overview of Military/ Naval programs that Navantia is interested in Turkey in the short to medium term?

Sofia HONRUBIA: Navantia has been present in Turkey for almost twenty years, confirming its commitment with the country with the opening of Navantia Turkey in 2013.

We have been working with our partner SEDEF not only for the LHD Program but also for other opportunities that may arise in the international market that could be supplied from Turkey. This is the next step for Navantia in Turkey, to increase the supply of Navantia products from this country, therefore increasing exports from Turkey.

In the short term, I see the TCG Trakya as the second LHD ship. Turkey is a big country, with a big coastline and surrounded by two seas. Having two Multi-Purpose Amphibious Assault Ships not only makes sense but it will also provide a huge capability to the Turkish Navy and therefore to the country and its population.

After that, and as I mentioned before, Navantia would like to play an important role on the TF 2000 Project.

Defence Turkey: How would you assess the current level of cooperation between Navantia and Turkish Industry?

Sofia HONRUBIA: In addition to the partnership with SEDEF for the construction of Turkish LHD ships and the partnership with AYESAŞ for the supply of the IPMS, we have also been involved DELTAMARINE, an engineering company, in the design of the ship.

With these partnerships, not only Turkey's local value of supply for the LHD ships has been increased, but in addition, Navantia has become stronger, being able to improve the quality of our products and therefore, providing better value to our clients.

Defence Turkey: How do you asses the Turkish Defence Industry in terms of its overall capabilities and suitability for international partnership?

Sofia HONRUBIA: This a good question and I would like to provide an answer from the perspective of the foreign market. The Turkish defence industry has increased its capabilities incredibly in the last twenty years. The country, through the President of Defence Industries, the SSB has made an incredible effort developing indigenous projects that now can be exported and compete on the global market. Now, you can see Turkish companies, from system developers to product manufacturers competing everywhere on the international market. This couldn't have been possible without the big investment the country has made in its Defence Industry in the past two decades, so it is a good example of how things have to be done to go from local to global.

Thank you very much for the chance to speak on behalf of Navantia to Defence Turkey Magazine.

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

Sofia HONRUBIA met with Ayşe EVERS, Editor in Chief of Defence Turkey Magazine at FEINDEF, 2019

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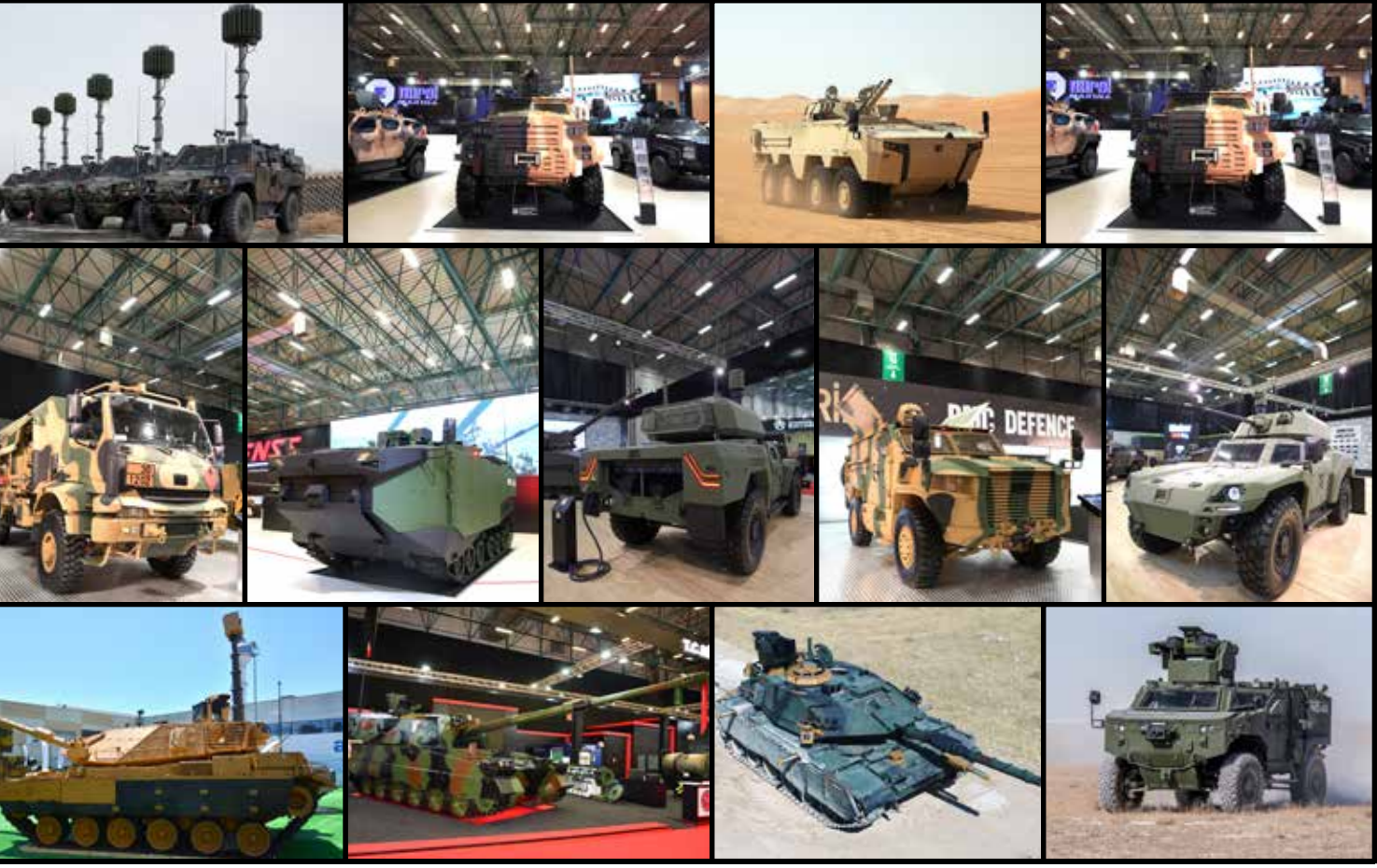
THE SKIES AND BEYOND



by İbrahim SÜNNETÇİ

A Look at the Turkish Land Platforms Sector and Its NATO-Standard Indigenous Solutions

During recent years Turkey's domestic defence industry has reached such a level of capability that it can nowadays meet around 70% of the military system requirements of the Turkish Armed Forces (TAF). Turkey's defence and security procurement agency the Presidency of Defence Industries (SSB), has been meeting the TAF's wheeled armored vehicles requirement from local sources since late 1980s. As one of the strongest sectors of the Turkish Defence and Aerospace Industry, the Land Platforms Sector is now able to meet almost all of the Turkish Land Forces (TLF), Gendarmerie General Command (GGC) and Security General Directorate (SGD/ Turkish National Police)'s requirements for tracked and wheeled armored vehicles with indigenous solutions. The next target in this field is the design, development and manufacture of a 3+ Generation Main Battle Tank (MBT) and New Generation Armored Wheeled Vehicles with an indigenous, locally manufactured power pack and armor steel

Turkey has traditionally looked to its domestic suppliers to meet the TAF's Land Platforms requirements, which has enabled the Sector to develop a comprehensive range of products, ranging from tactical wheeled vehicles (4x4, 6x6, 8x8 and 6x4), tactical wheeled armored vehicles (4x4, 6x6 and 8x8), armored reconnaissance vehicles (tracked and wheeled), armored internal security vehicles, mine protected vehicles, mobile floating assault bridges, riot control vehicles, amphibious armored combat earthmovers, armored combat vehicles and the ALTAY MBT, as well as modernization and upgrade solutions for APCs, ACVs and MBTs. Locally produced wheeled armored vehicles (WAVs) especially the Otokar's 4x4 COBRA-I and COBRA-II, FNSS' ACV-15 and KUNDUZ Amphibious Armored Combat Earthmover, Nurol Makina ve Sanayi (NMS)'s EJDER YALÇIN-I/II/III and BMC's KIRPI MRAPs have been playing important role in Turkey's war against the terrorist organization PKK and thanks to their high protection they saved the lives of many soldiers during recent operations by withstanding several roadside and IED bomb attacks.

The backbone of the Turkish Land Platforms/Systems sector is formed by private companies such as Otokar, FNSS, BMC, Nurol Makina ve Sanayi (NMS), Anadolu Isuzu & Anadolu Savunma, Katmerciler and Tümosan. Military Factories, which have played a key role in Main Battle Tank Modernization projects such as the Leopard 1T and M60T programs and are now providing maintenance services to the tracked and wheeled vehicles of the Turkish Land Forces (TLF) have been affiliated under the Turkish Ministry of National Defence (MoND) as of November 9, 2016. The 1st Main Maintenance Factory Directorate (formerly known as 1st Main Maintenance Centre) in Adapazarı and the 2nd Main

Maintenance Factory Directorate (former 2nd Main Maintenance Center Command) in Kayseri are now operated by the MoND General Directorate of Military Factories (AFGM). Established with State of Emergency Decree Law No. 696 issued on December 24, 2017 Military Factory and Shipyard Management Incorporated Company (ASFAT Inc.) is authorized to utilize 27 Military Factories and 3 Military Shipyards and labor capacity of nearly 20,000 people. According to State of Emergency Decree Law No. 696, ASFAT will be able to submit offers to foreign and domestic tenders taking advantage of military factory and military shipyard capabilities. ASFAT is completely owned by the Undersecretariat of Treasury and will be monitored by the Turkish MoND. ASFAT Inc. will be able the use all military infrastructure, platform, ammunition, subsystems and test facilities by the approval of MoND.

Turkey's top Main Battle Tank (MBT) maintenance and modernization factory the 1st Main Maintenance Factory Directorate, also known as "Arifiye Tank Tracks Factory" in Arifiye, Adapazarı had been included in the scope of privatization program for the 25 year operational period with a Presidential Decree (Decree No: 481) issued in the Official Gazette on December 21, 2018 as part of the ALTAY MBT Serial Production Project. The decree requires the finalization of privatization of the factory until December 31, 2019. According to original plan, the 1st Main Maintenance Factory Directorate would be leased to BMC, a joint Turkish-Qatari venture that manufactures armored vehicles and Prime Contractor of the ALTAY MBT Serial Production Project, for a period of 25 years and Serial production activities would take place at this factory. Under the deal, BMC would make an initial investment of US$ 40 to US$ 50 Million to modernize the MBT assembly and production unit at the 1st Main Maintenance Factory Directorate. BMC plans to convert the military factory into a serial production unit for the ALTAY MBT, Turkey's first indigenous, new-generation MBT. Speaking at the groundbreaking ceremony of the BMC's Sakarya Karasu Factory, also known as the "BMC Production and Technology Base" on January 13, 2019 President Recep Tayyip ERDOĞAN stressed that the decision about the 1st Main Maintenance Factory Directorate in Arifiye is not "privatization" but rather the transfer of management rights to BMC within certain conditions, periods, and restrictions. However, the Turkish Government's decision to privatize and lease of the 1st Main Maintenance Factory Directorate operated under the MoND-controlled General Directorate of Military Factories (AFGM) to the private company BMC drew strong criticism in Turkish public opinion and in the end it was decided to transfer the 1st Main Maintenance Factory Directorate to ASFAT Inc. According to the Turkish media, a transfer procedure should take place on August 21, 2019 and the workers' wages will be paid by ASFAT Inc. as of September 14th. It is stated that ASFAT, which undertakes the transfer, will either directly rent the factory to BMC or will let BMC run it within certain conditions, periods, and restrictions. Since its purchase by Turkish and Qatari partners for US$ 360 Million following a tender held in early 2014, BMC has been working as part of the strategic partnership between Turkey and Qatar.

According to the Turkish Defence and Aerospace Industry 2018 Performance Report, prepared by the Defence Industrial Manufacturers Association (SaSaD) through the evaluation of figures obtained from 87-member companies and issued during the first half of 2019, the total employment of the Turkish Defence and Aerospace Sector was 67,239 people (44,740 in 2017). The Turkish Defence and Aerospace Sector achieved a turnover of nearly US$ 8,761 Billion, imports of US$ 2,449 Billion (approximately 36% of the turnover), almost US$ 2,189 Billion in exports and a rate of US$130,304 turnover per employee in 2018. It is useful to underline that THY Technic and ASFAT Inc. data was included in the 2018 figures, for the first time, unlike previous years. According to the data provided by the Turkish Exporters' Assembly (TIM), the Turkish Defence and Aerospace Sector realized exports of US$ 1,516.142 Billion between 1 January 2019 and 31 July 2019, in other words, during the first seven months of the year. This figure represents an increase of 37.3% compared with the same period of 2018 (US$ 1,104.334 Billion). The Turkish Defence & Aerospace Sector's total arms exports amounted to US$ 207,861 Million in June and US$ 234,202 Million in July 2019. According to data released by the TIM, the total weight of products exported by the Turkish Defence & Aerospace Industry between 1 January 2019 and 31 July 2019 was around 23,632 tons. It was 3,441 tons in April, 5,024 tons in May, 2,891 tons in June and 3,859 tons in July 2019. So as of July 2019, the average price of Turkish Defence & Aerospace export products has reached US$64,15 per kilogram. The average price of Turkish Defence & Aerospace export products reached US$57,16 per kilogram in December 2018. The exports of the Turkish Defence and Aerospace Sector is expected to reach US$3 Billion by the end of 2019. According to TIM data, the list of the top 15 countries that imported defence and aerospace products from Turkey during January 1st – July 31st of 2019 is composed of; the U.S. (US$ 465,513 Million), Oman (around US$ 158,405 Million, mainly stemming from FNSS PARS III ACV deliveries to the Royal Omani Army), Germany (around US$ 151,764 Million), Qatar (around US$ 134,640 Million to stem from Nurol Makina and BMC wheeled armored vehicles and fast intervention boats sales/ deliveries to the Qatar Emiri Armed Forces), UAE (US$ 63,323 Million mainly stemming from Otokar's RABDAN 8x8 III ACV deliveries to the UAE Army), the Netherlands (US$ 49,468 Million), India (around US$ 40,434 Million), the UK (US$ 34,138 Million), Poland (US$ 29,236 Million), Saudi Arabia (around US$ 21,997 Million), Azerbaijan (around US$ 19,869 Million), France (around US$ 20,169 Million), Switzerland (US$ 17,898 Million) and Italy (around US$ 17,5 Million).

Some Figures on the Turkish Land Platforms Sector

Realizing around 36% of the turnover, around 40% of the exports, and 33.1% of imports, the Land Platforms sector is likely the strongest sector of the Turkish Defence & Aerospace Industry. The Land Platforms Sector takes the lion's share in the Turkish Defence & Aerospace Industry's revenue and is placed second in terms of export rate (after Military Aviation with US$ 693 Million) and imports (after Civil Aviation with US$ 853 Million). All estimates show that the revenue and export figures of the Turkish Land Platforms Sector will grow further in 2019. The Turkish Land Platforms Sector's revenue has increased sharply during last four years. According to SSB data, the Land Platforms Sector realized US$ 315 Million in revenue in 2010, US$ 394 Million in 2011, US$ 439 Million in 2012 and US$ 518 Million in 2013. According to the Defence Industry Assembly 2017 Annual Report prepared by the Union of Chambers and Commodity Exchanges of Turkey (TOBB), the Turkish Land Platforms Sector realized around US$ 521 Million in revenue in 2014, US$ around 1,606 Million in 2015, US$ 1,702 Million in 2016 and US$ 2,362 in 2017. According to SASAD data the Turkish Land Platforms Sector's revenue reached US$ 2,428 Billion in 2018. The Land Platforms Sector's exports have increased steadily during last six years. According to the Defence Industry Assembly 2017 Annual Report the Land Platforms Sector realized US$ 220,497 Million worth of exports in 2013, US$280,285 Million in 2014, US$ 733,205 Million in 2015, US$ 487,661 Million in 2016 and US$522,091 Million in 2017. According to the Turkish Defence and Aerospace Industry 2018 Performance Report, the Turkish Land Platforms Sector has realized a total of US$540,6 Million in exports of which US$528 Million went to Other Countries, US$12 Million to Europe and US$ 0,6 Million in exports to the U.S. According to SASAD data the Turkish Land Platforms Sector has realized a total of US$739 Million in imports of which US$447 Million came from Europe, US$ 180 Million came from the U.S. and US$112 Million came from the Other Countries.

The 560hp diesel engine of Tümosan was exhibited at FNSS booth during the IDEF '19

Indigenization activities continue in order to further increase the domestic participation ratio within the indigenous Land Platforms Sector products. Since the critical components of the land platforms, either tracked or wheeled, such as ballistic armor, diesel engines and transmissions are procured from foreign sources (imported) the local content rate on indigenous military land platforms usually stay at around 55% (could increase to 65% with the use of indigenous turret systems) level. But critical progress has been achieved within the scope of the development of an indigenous power pack and armor steel. For instance, the 560hp diesel engine manufactured by Tümosan will be used in the SPTWAV (Special Purpose Tactical Wheeled Armored Vehicles) to be produced by FNSS. Tümosan is also developing an indigenous automatic transmission with 6 forward gears to couple with its 560hp, 6-cylinders diesel engine and also offers its automatic transmission solution for the FNSS PARS 6x6 and 8x8 İZCİ SPTWAVs but as of May 2019 no decision had yet been made for the utilization of Tümosan's transmission on the vehicles. Moreover, a crucial step was taken towards the local production of the armor steel used in the tactical wheeled armored vehicles. According to the information received, the production of indigenous armor steel with an annual capacity of 13,000 tons will be launched at the new factory/facility named as MİLUX OY, which will start its activities in Manisa as part of Erdemir. The production capacity is planned to be increased to 20,000 tons annually after the year 2020. The raw material of the flat steel to be manufactured and processed at MİLUX OY facilities will be supplied from Erdemir and the production technology will be transferred from the MİLUX Company purchased from Finland by OYAK. The initial armor steel sheet metal samples were displayed at the company's stand during IDEF '19 Fair.

Remarkable Programs and Products of the Turkish Land Platforms Sector

Speaking on the second day of 4th Land Systems Seminar, held at the METU Culture and Congress Center in Ankara November 5-6, 2018, Security Vehicles and Special Vehicle Projects Director T. Cenk ERBAY from the SSB Land Platforms Department disclosed that it has planned to procure up to 5,872 vehicles in various configurations under 10 ongoing land platforms projects to meet the requirements of Turkish end users (TAF, Security General Directorate [SGD, Turkish National Police], Gendarmerie General Command and Turkish Coast Guard Command). The SSB Land Platforms Department currently is carrying out 10 land platforms projects namely;

› **New Generation Light Armored Vehicles (NGLAV) Project**

This project covers the procurement of a total of 2,962 light armored tracked (1,800 vehicles both in amphibious and non-amphibious configurations) and wheeled (1,1162 vehicles in 6x6 and 8x8 versions) vehicles in 52 different configurations for the Turkish land Forces Command (TLFC). Since the number of the

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procured vehicles is high, the Project is planned to be realized in phases. The First Phase will cover 3 different vehicle-types in 6x6 and 8x8 configurations. The RFP document for the First Phase was issued in August 2019 to potential local bidders.

Located at Teknopark Istanbul, BMC Power was selected under the New Generation Light Armored Combat Vehicle Power Pack Development Program by the DIEC on October 28, 2016 and a contract was signed between the company and the SSB on October 13, 2017. Under the program BMC Power will design, develop, test, qualify and deliver a power pack in 'T' configuration dubbed UTKU and incorporating a 675kW (917hp), V8 type 18-litter diesel engine coupling with an automatic transmission under a 68-month schedule. The contract become effective on January 4, 2018 and 'To' started. According to a BMC official, over 200 engineers including 70 foreign ones are working on the power pack. According to the SSB the 675kw UTKU engine is able to power armored vehicles with a combat weight of 40 tons.

› **Special Purpose Tactical Wheeled Armored Vehicles (SPTWAV) Project**

This project covers the procurement of a total of 100 SPTWAVs from FNSS both in 6x6 and 8x8 configurations for the TLFC and Gendarmerie General Command (GGC). TLFC will receive 95 PARS 6x6 İZCİ (SCOOTER) and PARS 8x8 İZCİ SPTWAVs of which 30 will be in Command Vehicle, 45 in Reconnaissance (with EO/IR optics), 15 in Surveillance (with radar) and 5 in CBRN Reconnaissance configurations. The GGC will receive 5 vehicles in Armored Combat Vehicle configuration.

› **8x8, 10x10, 12x12 Wheeled Tank Transporter, Container Transporter and Recovery Vehicle Project**

Within the scope of the Project, a total of 476 vehicles, including 134 Tank Transporter Vehicles (TTVs), 65 DROPS Container Transporter Vehicles and 277 Recovery Vehicles, will be procured to meet TLFC requirements.

As one of the local companies competing in the Project tender, BMC submitted its proposal to the SSB in the first half of 2018. The first contract regarding the demand for Tank Transporter Vehicles in 8x8 configuration was signed between the SSB and BMC, and the delivery of the 72 TUĞRA TTVs is planned to be launched in August 2019. According to BMC, the local content rate for the BMC TUĞRA TTV is at 70-75% level. At IDEF '19, BMC displayed the ALTAY T1 Technology Demonstrator on a TUĞRA TTV powered with 620hp engine and with a towing capacity of 120 tons. The other local bidder competing for the 8x8, 10x10 and 12x12 Wheeled Tank Transporter, Container Transporter and Recovery Vehicle Project, Anadolu Isuzu placed its proposal to the SSB on 16 April 2018. Within the scope of the Project, Anadolu Isuzu signed a Sub Contractor Contract with a total value of US$ 4,580 Million (VAT excluded) with the MPG Makina İmalat San. ve Tic. A.Ş. as part of the Partially Mine-Protected Recovery Vehicles Project and on 10 May 2019 the company notified the Public Disclosure Platform of the fact that the contract value reached US$ 13,312 Million (VAT excluded) as a result of the additional firm orders it received. According to the aforementioned contract, the deliveries of the SEYİT 8x8 Partially Mine-Protected Recovery Vehicles will be made in lots until the end of 2019. This vehicle is capable of successfully performing the tasks under tough land and road conditions and was manufactured in a way to be able to recover malfunctioned large tonnage vehicles and armored vehicles. Weighing 43,000 kg, the Partially Mine Resistant Recovery Vehicle features a climbing ability of 60% inclination, and it is capable of passing through 1,100 mm deep water as well. Featuring a 14.9 liter volume with the Cummins X15 99EPA 600 engine, the 8x8 partially mine resistant recovery vehicle has 600hp and it can reach a speed of 80 km/h. With a range over 500 km, the aforementioned vehicle will be included in the inventory soon and will start to operate in the TAF.

PARS 6x6 İZCİ was displayed at IDEF '19

› **Weapon Carrier Vehicle (STA/WCV) Project**

Under the Weapon Carrier/Anti-Tank Vehicle (WCV) Program, a total of 260 (184 in tracked and 76 in wheeled configurations) anti-tank vehicles to be integrated with a Remotely Operated Anti-Tank Turret, will be procured from FNSS in order to carry the new generation KORNET-E Anti-Tank Guided Missile Systems (ATGM) currently in service of the TLFC and also for those to be acquired by the SSB from Roketsan under the MIZRAK-O/OMTAS Project. On 27 June 2016 the SSB awarded a contract to FNSS to deliver 186 WCVs based on the KAPLAN-10 tracked armored vehicle and 76 WCVs based on the PARS 4x4 Wheeled Armored Vehicle (WAV). The contract became effective on October 14, 2016. 80 of the KAPLAN-10 WCVs will be equipped with KORNET-E ATGMs and remaining 104 will be equipped

with Roketsan's MIZRAK-O/OMTAS ATGMs. All 76 PARS 4x4 WCVs will be equipped with Roketsan's MIZRAK-O/OMTAS ATGMs. Under the contract, design development and prototype qualification efforts for KAPLAN-10 and PARS 4x4 WCVs were completed in 2018. Under the Project qualification tests for both vehicles are still on going. As part of the qualification tests on 13 February 2019 at the Karapinar live firing range in Konya, FNSS successfully conducted the first firing test of the OMTAS missile from the Kaplan WCV. Deliveries for KAPLAN-10 WCVs was scheduled to be launched in the first of 2019 and PARS 4x4 WCVs during the second half of 2019. Serial Production and the delivery of 260 WCVs to the TLFC are to be completed by the first quarter of 2021. Both the KAPLAN-10 and PARS 4x4 WCVs will have amphibious capabilities and will be fitted with an unmanned, Anti-Tank Remote Controlled Turret (ARCT) carrying just two (four were planned in the beginning) KORNET-E or MIZRAK-O/OMTAS ATGMs and a 7,62x51mm machine gun.

› **Tactical Wheeled Armored Vehicles (TTZA/WAVs) Project**

Within the scope of the Project, a total of 713 VURAN 4x4 Tactical WAVs vehicles will be procured from BMC for the TLFC (512), GGC (200, including an undisclosed number of 120mm Automatic Mortar Vehicles dubbed as FATİH) and Coast Guard Command (CGC, 1). The FATİH Automatic Mortar Vehicle is equipped with Aselsan's ALKAR AKS-120 automatic mortar system. In the context of the fight against terrorism and border security missions; VURAN WAVs will perform tasks such as sensitive point or facility protection, patrols between military outposts, convoy protection, responsibility area, point and road reckon and physical border security. The deliveries of VURAN 4x4 Tactical WAVs to the TLFC started in July 2019 and according to news published by the Anatolian Agency website as of 19 August 2019 the number of delivered vehicles has reached 90. The VURAN WAV features a monocoque-type armored design for the crew compartment that reduces weight for a given amount of armor compared to vehicles to which armor has been attached to an underlying frame. The V-shaped hull is made of all-welded steel armor construction that provides the occupants with protection against 5.56 × 45 mm small arms fire, although protection against 7.62 × 51 mm armor-piercing small arms fire is also available. The basic layout of the VURAN is similar to the BMC AMAZON with the engine at the front, the crew in the middle and the troop's compartment at the rear. The vehicle can carry a total of nine soldiers. Some of the VURAN WAVs will be fitted with the SARP Remote-Controlled Weapon Station (RCWS) designed and manufactures by Aselsan. BMC has also developed and displayed the remote-controlled version of the AMAZON WAV. BMC also secured a contract to deliver 50 KIRPI-II MRAPs and 35 AMAZON 4x4 Multipurpose WAVs to Qatar during the Doha International Maritime Defence Exhibition and Conference (DIMDEX 2018), which was held at the Qatar National Convention Center in Qatar's capital Doha March 12-14, 2018.

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BMC Defence's VURAN 4x4 was displayed with ALKAR AKS-120mm Automatic Mortar System at IDEF '19

› **Tactical Wheeled Vehicles-2 (TTA-2) Project**

The SSB awarded a contract to BMC under the Tactical Wheeled Vehicle-2 (TTA-2) Project on August 8, 2017 for the procurement of 529 New Generation KIRPI (KIRPI-II) MRAPs. Deliveries of the KIRPI-II (HEDGEHOG-II) MRAPs commenced in 2017. Under the contract the TLFC will receive 329 KIRPI-II 4x4 MRAPS and GGC will receive 200 KIRPI-II MRAPS. As of December 2018, over 290 KIRPI-II MRAP and over 30 KIRPI-II Ambulance vehicles were delivered. Under the Tactical Wheeled Vehicle-1 (TTA-1) Project the TLFC received over 610 KIRPI-Is and the GGC received over 300 KIRPI-Is. The SGD also procured over 100 KIRPI-I vehicles. The total number of KIRPI-I MRAPS in TLFC, GGC and SGD inventory has reached 1,028 as of October 2017. Some of the KIRPI-I and KIRPI-II MRAPS in TLFC, GGC and SGD (operates over 200 KIRPI) services are integrated with Aselsan's SARP 12.7mm and Dual SARP (can be armed with 7.62mm and 12.7mm machine guns and a 40mm automatic grenade launcher) RCWSs. Compared to KIRPI-I (fitted with leaf spring suspension system), KIRPI-II has an independent suspension system and also features composite armor, manufactured by a local company.

KIRPI-II 4x4 with Independent Suspension stands out with its unibody armored cabin and special armored windshields, shock-absorber seats, weapon-station and the emergency exit hatch. Powered by an 8.9 liter, 375hp (previous batch vehicles in TLFC, GGC and Tunisian Army services are powered by 350hp version of the same engine) Cummins ISL9E3 turbo diesel engine KIRPI has a 13 troop capacity including the three-man crew (driver, commander and

gunner). With an empty weight of 19,050kg and combat weight of 20,825kg KIRPI-II 4x4 features STANAG 4569 Level 4 mine and Level 3 ballistic protections as well as a spall liner. The KIRPI-II can travel through 80cm (120cm optional) of water, negotiating 30° side slopes and a 60% gradient. Having a length of 7,375m, width of 2,865m and height of 3,81m the KIRPI-II MRAP can attain a maximum speed of 100km/h and a cruising range of 750km.

› **Battlefield Fuel Tanker (AKTAN) Project**

Within the scope of the Project, a total of 84 Battlefield Fuel Tankers (AKTAN, 17 of them for helicopter fuel supply and 67 of them for land vehicles fuel supply) have been procured from BMC to meet both the TLFC and the Turkish Naval Forces Command's requirements. Under a contract awarded by the SSB on June 28, 2015 BMC completed deliveries in 2018. 83 AKTAN BMC 440 6x6 vehicles have been delivered to the TLFC and 1 AKTAN BMC 440 6x6 has been delivered to TNFC. It can be air transported onboard an A400M military transport aircraft. The AKTAN BMC 440 6x6 vehicle can simultaneously support fuel oil for four air/land vehicles and is designed and engineered to maximize the operational power of the Armed Forces. BMC previously delivered a total of 46 Water Tankers in 8x2 configuration to the TLFC.

© Defence Turkey
AKTAN BMC - Battlefield Fuel Tanker

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Nurol Makina's EJDER YALÇIN Block III was displayed at IDEF '19

› **New Generation Criminal Investigation Vehicle (KIRAÇ) Project**

Under the New Generation Criminal Investigation Vehicle (KIRAÇ) Project, Katmerciler secured a contract from the SSB in June 2017. The contract calls for the design, development and delivery of 110 Criminal Investigation Vehicles and 10 Laboratory Vehicles to the SGD Criminal Department within a two-year schedule. Katmerciler completed the manufacture of prototype vehicles in 2018, following the completion of qualification tests Serial production of the KIRAÇ vehicles was initiated in early 2019. Katmerciler displayed one of the KIRAÇ vehicles at its stand during the IDEF '19 Fair. Manufactured in 4x4 configuration the KIRAC vehicle features an independent suspension system, hub reduction differential lock, diesel turbo intercooler, fully automatic transmission with torque convertor and ballistic and mine protection. The KIRAÇ New Generation Criminal Investigation Vehicle has a unique design, which can be configured as an armored personnel carrier, command control vehicle and an internal security vehicle. Based on the configuration, it can carry up to 27+1+1 personnel. The fully independent suspension system and 4x4 characteristics with automatic transmission gives excellent mobility on all terrain and weather conditions.

› **SGD Armored Tactical Vehicle-1 (EGM ZTA-1) Project**

Within the scope of the Project, a total of 280 EJDER YALÇIN Block III 4x4 Tactical Wheeled Armored Vehicles have been procured from Nurol Makina to meet SGD (180) and GGC (100) requirements. Deliveries to the SGD were completed during the first half of 2017 and all of the vehicles were integrated with Aselsan SARP RCWS armed with a 7,62mm machine gun. The first batch of 30 EJDER YALÇIN Block III was delivered to GGC in May 2017.

EJDER YALÇIN, a new member of the EJDER Family of wheeled armored vehicles, is a 4x4 tactical armored combat vehicle designed and manufactured by Nurol Makina. Design studies on the vehicle were initiated in the last quarter of 2012 and a pre-prototype of the base vehicle was exhibited at IDEF '13. Mass production of the vehicle began in May 2014. Featuring a V-shaped hull design, integrating floating floor plates and blast mitigation seats to provide protection against mines and improvised explosive devices (IED) the vehicle accommodates up to 11 personnel. The vehicle features easy-to-enter and exit door configurations for the crew. Other optional equipment includes a rescue winch, day and night-vision systems, rear ramp, and a fire extinguish and explosion suppression system for the crew compartment. The base vehicle has a length of 5,42m, width of 2,48m and a height of 23m. Its gross weight ranges between 12,000kg and 14,000kg, and payload carrying capacity is up to 4t. The Block I and Block II versions of EJDER YALÇIN are fitted with a Cummins engine, which produces a maximum power of 300hp at 2,100rpm. The engine is coupled to fully automatic transmission with a hydrodynamic torque converter. But in Block III the engine power is uprated

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and increased to 375hp. The EJDER YALÇIN has a maximum speed of 110km/h and a cruising range of 600km. It can accelerate from 0km/h to 40km/h within six seconds.

Nurol Makina won its first export contract from Tunisia for its EJDER YALÇIN Block III 4x4 WAV in early 2017. It was followed by orders from Uzbekistan, Qatar, Senegal, Hungary and South Sudan. Hungary also ordered a number of YÖRÜK 4x4 WAVs from Nurol Makina. According to sources Nurol Makina will deliver 75+ 150 EJDER YALÇIN vehicles to Tunisia, 1,024 vehicles to Uzbekistan, 342 vehicles to Qatar and 25 vehicles to Senegal. According to a MoU signed in October 2017 Nurol Makina will deliver 24 EJDER YALÇIN WAVs to Uzbekistan and an additional 1,000 vehicles to be produced in Uzbekistan in cooperation with the local firm UzAuto. The delivery ceremony of the 24 EJDER YALÇIN WAVs to Uzbekistan Army took place on August 2, 2019 in Uzbekistan. During DIMDEX 2018, Nurol Makina also secured a contract to deliver 214 YÖRÜK (formerly named NMS) 4x4 Wheeled Light Armored Vehicles to the Qatar Emiri Special Forces, to be armed with SARP RCWS, ATGM launcher and IGLA SAM launcher of Aselsan. Deliveries of the YÖRÜK 4x4 WAVs have been initiated and are scheduled to be completed in two years. On June 8th, 2018 Aselsan secured a contract valued at around US$150 Million from Nurol Makina to deliver an undisclosed number of SARP RCWSs, Kornet-E ATGM Launcher Systems and IGLA SAM Launcher Systems to equip the Qatar Emiri Special Forces' YÖRUK 4x4 Wheeled Armored Vehicles (WAVs).

› **SGD Armored Tactical Vehicle-2 (EGM ZTA-2) Project**

In June 2016 Otokar secured a contract valued at €106.1 Million for the delivery of 220 COBRA-II WAVs to the SGD. Some of the vehicles are armed with Aselsan SARP RCWS. The SSB also procured further 100 COBRA-IIs for the GGC. Under the project the SSB ordered a further 17 COBRA-II vehicles in December 2018 to meet the SGD's additional vehicles requirement. Otokar completed delivery of the first batch of COBRA-II WAVs in Special Mission configuration (able to carry a remotely operated Explosive Ordnance Disposal [EOD] Robot inside the fuselage) to the SGD in December, the second batch in May 2019 and the last batch in June 2019.

The COBRA-II Tactical Wheeled Armored Vehicle provides an outmatched performance in a wide range of challenging terrains and climatic conditions. In addition to superior technical and tactical features, COBRA-II also offers high degree of protection and forms a base for a modular platform. Unveiled for the first time in May 2013 COBRA-II has an overall length of 5.6m, width of 2.5m and height of 2.2m. The wheelbase and ground clearance of the vehicle are 3.57m and 400mm respectively, while the gross vehicle weight is 12,000kg. The COBRA-II can negotiate a 48° approach and a 60° departure angle leading onto 60% inclines and 30% side-slopes. It is able to cross 90cm wide trenches and climb over 40cm obstacles. The COBRA-II can be fitted with either 6,7 liter, 6 cylinders 281hp water-cooled turbo diesel engine or 6,7 liter, 6 cylinders 360hp water-cooled turbo diesel engine (Turkish users' preference) with F-34 and F-54 fuel compatibility. The COBRA-II has a top speed of 110km/h and a cruising range of 700km. Besides outstanding mobility capability and up to nine crew (including driver and commander) carrying capacity, the vehicle provides protection, firepower and mission equipment for users on different types of missions. According to an Otokar official, the local content rate in COBRA-II's baseline version is currently at the 57% level but depending on using an indigenous turret system this percentage can be increased to 64%. Otokar utilizes ARMOX 500T armor plates (up to 7 different types of steel sheets with different chemical and physical features since they are used in different parts of vehicle fuselage) and a ceramic based automated Fully Penetrated Cooled Welding Technique (already used in ALTAY MBT Prototype Development Phase) in the manufacture of the COBRA-II fuselage. According to Otokar no other local military vehicle manufacturer utilizes this welding technique and thanks to using this new generation welding technique COBRA-II's ballistic and mine/IED protection level is superior than its competitors. However, as this welding technique takes 2,5 times longer than other standard welding techniques, which means the vehicle has to stay on the production line longer, COBRA-II has a higher production cost compared to its counterparts on the market. Otokar, as subcontractor of Aselsan, also delivered an undisclosed number of (we estimate over 20 vehicles) COBRA-II Tactical Wheeled Armored Vehicles to the TLFC under a contract valued at US$ 40,320,000 Million for the SERHAT Counter Mortar Radars (CMR) Project signed between Aselsan and the Ministry of National Defence (MoND) on June 28, 2018. According to Aselsan, within the scope of the Project acceptance tests of the third party SERHAT CMRs on the COBRA-II Tactical WAVs were carried out during May 27-31, 2019 successfully and the radars were handed over to the TLFC.

COBRA-II WAV with SERHAT Counter Mortar Radar

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ALTAY Project Phase-II Serial Production Project

BMC was assigned as the Main Contractor upon the decree of the Defence Industry Executive Committee (DIEC, the highest decision-making body on defence procurement in Turkey) dated 29 March 2018 under the ALTAY Project Phase-II Serial Production Project. The contractual negotiations were launched in March 2018 with the company and were completed successfully. The contract valued at Euro 3,5 Billion was signed between the SSB and BMC on 9 November 2018. Under the Serial Production Phase, a total of 500 ALTAY MBTs are expected to be procured in two batches. The first batch of the ALTAY MBT Serial Production Phase, for which the contract was awarded, covers the production of a total of 251 ALTAY MBTs in three configurations. Of the 251 ALTAY MBTs under the contract, 40 will be in T1, 210 will be in T2 and 1 will be in T3 configuration. Under the Project, BMC will receive consultancy services from Rheinmetall. According to BMC, Rheinmetall's consultancy will focus on various points being handled by their subcontractors, and which constitute the industrialization aspect of the Project.

The T1 variant, which will have similar features with the PV-1 and PV-2 prototypes developed and manufactured by Otokar but will feature the AKKOR Active Protection System (APS) and an improved add-on armor package from Roketsan (including slat armor at the rear of the turret and the hull, thicker ERA elements at the side skirts of the hull and an add-on armor kit over the turret) is scheduled to be in service with the Turkish Land Forces 24 months following contract effectivity and deliveries shall be completed in 2021 or in 2022 (depending contract effectivity date).

Before the contract effectivity two important drawbacks should be solved. The first one is the approval of the export license by the German Government for the export of the EuroPowerpacks for the ALTAY T1 MBTs to Turkey. The second one is

Roketsan's ERA- Explosive Reactive Armor and Composite Armor System

the selection of the facility where the Serial Production will take place. According to the information we received, depending on the result of the privatization process of the 1st Main Maintenance Factory Directorate, either the facilities at Arifiye or the facilities at Karasu will be selected for the execution of the Serial Production activities. As pointed out above, Serial Production will take place at the 1st Main Maintenance Factory Directorate in Arifiye, Adapazarı. Since BMC has committed to manufacture 6 ALTAY MBTs per month during the Serial Production Phase, modern benches to enable the company to achieve this production rate will be required. For this purpose, BMC will invest up to US$ 50 Million in the 1st Main Maintenance Factory Directorate to upgrade its manufacturing infrastructure with the installation of new generation benches at the facility. The EuroPowerpack incorporates V-12 type MTU MT883 Ka-501CR diesel engine (27,35 liters, dry weight is 1,800kg) coupled to RENK's HSWL 295TM automatic transmission (with 5 forward and 3 reverse gears, dry weight is 2,450kg) and a cooling and air filtration system. The EuroPowerpack is installed in a 'U' configuration in the ALTAY MBT.

The ALTAY MBT T2 configuration will feature an increased armor system, increased protection with the isolation of ammunitions from the hull, laser guided tank ammo firing capability (for this Fire Control System should be upgraded), crew training mode and mobile camouflage net. The T2 variant is expected to begin deliveries shortly after the T1 configuration of ALTAY MBTs have been handed over. Only one ALTAY MBT prototype will be produced in T3 configuration, which will feature an unmanned turret with a bustle-mounted autoloader. The ALTAY MBT T3 configuration is scheduled for qualification in 2024, and it is understood to be intended for use in further trials and technical evaluations rather than for service with the Turkish Land Forces. The ALTAY MBT Serial Production Phase contract also includes lifecycle logistics support service and the establishment and operation of a Tank Systems Technology Center. There is also a plan for the procurement of 60 Armored Recovery Vehicle (ARV) and 50 Mine Clearance variants of the ALTAY MBT, which will be based on the T1 configuration's chassis. On 12 March 2019 Vice Chairman of the Justice and Development Party (AKP) Ali İhsan YAVUZ disclosed that in accordance with the agreement, Qatar will buy up to 100 ALTAY MBTs from Turkey and 40 of them would be delivered to the Gulf country in the first phase. However, speaking to Defence Turkey during the IDEF '19 Fair a BMC official disclosed that there is no formal contract for this purchase yet.

During IDEF'19, within the scope of the project valued at EUR 3.5 Billion, ALTAY Phase-II Serial Production, Aselsan signed a subcontract with BMC with a total value of EUR 840,986.250 Million for the delivery of the following subsystems to be installed on ALTAY MBT T1 (40 tanks), T2 (210 tanks) and the prototype of ALTAY T3;

- Tank Fire Control System
- Tank Command Control Communication and Information System
- Remote Controlled Weapon System
- AKKOR Active Protection System
- Tank Driver Vision System
- Tank Laser Warning System
- Combat Area Recognition and Identification (IFF) System
- Close - Range Surveillance System

In line with the contract, the company will also conduct the delivery of the products required for the training tools to be formed for the user/maintenance training of the aforementioned systems.

At the IDEF '19 Fair, the ALTAY MBT T1 Demonstrator was displayed on the BMC's TUĞRA TTV at BMC stand. Prepared within 2 months by the BMC staff at the 1st Main Maintenance Factory Directorate in Arifiye, Adapazarı, the ALTAY MBT T1 Demonstrator was based on the ALTAY PV2 prototype and featured several dummy subsystems due to the fact that their development processes were not yet completed.

There are four Aselsan AKKOR APS radars deployed at the corners of the tank turret, moreover there are many electronic units within the tank for AKKOR APS, therefore the back of the turret is slightly expanded. Manual utilization of the AKKOR APS is not considered since it is a system reacting in a duration measured with milliseconds. The tank commander switches the system on and off via the user interface (control panel) and receives data on whether the launchers (two launchers each with two cells) are full or empty. The weight of the ALTAY MBT PV2 prototype is 63.5 tons and 25 tons of this is the weight of the turret. With the installation of Roketsan's new add-on armor and AKKOR APS on the turret and hull the combat weight of ALTAY T1 would be increased. In response to our question on whether the increase in the tank's weight due to the additional armor package in the T1 version will affect the performance of the power pack or not, BMC representatives stated that extra changes were not necessary since the weight of the T1 configuration remained within the weight limits they projected. AKKOR APS will also be deployed in the 210 T2 model to be manufactured after the 40 T1s, but a completely different armor package will be used in this version. BMC representatives underlined that a significant amount of weight change will be faced as the main armor of the tank will also be different and added, "We cannot state a figure yet but the first 40 tanks are T1, so we have a long time before the T2 schedule. We will proceed step by step, upon the approval of the SSB". The same power pack will be utilized in some of ALTAY T2 MBTs but according to the current plan indigenous powerpack will start to be deployed in the ALTAY MBT starting from T2 configuration. According to BMC officials, in order to compensate for the increase in weight, an indigenous diesel engine being developed by BMC Power for the ALTAY T2 MBT will be more powerful and will offer better performance than the existing 1,5000hp EuroPowerpack.

ALTAY Main Battle Tank over the TUĞRA TTV

Despite the fact that the ALTAY MBT Serial Production Contract valued at Euro 3.5 Billion signed with the SSB still has not entered into effect, BMC already has launched its activities in a 5,000 m2 area at the 1st Main Maintenance Factory Directorate in Arifiye. According to the information we received from the representatives of BMC with whom we had the chance to interview during the IDEF '19 Fair, 100 professional BMC staff have been working on the ALTAY Project as of this April and this number is planned to be increased to 300 by the end of the year. Nearly 1,300 people are expected to be employed within the scope of the project during the Serial Production Phase with nearly 1,000 blue collar staff.

BMC signed a contract on the ALTAY MBT Power Pack with the SSB on June 13, 2018. The name BATU was given to the ALTAY MBT Power Pack to incorporate a diesel engine and automatic transmission that will be developed by BMC Power. Meanwhile, allegedly, BMC has been conducting activities in order to develop a new engine with a power capacity of 1,600hp that is

based on the Fiat/Iveco MTCA V12 diesel engine with 1,270hp (950kW) power capacity and 25.8lt volume utilized in the Ariete MBT with the support of Fiat. Allegedly Fiat Company will provide support to the activities and benefit from the data acquired during the development process, and at the end of this cooperation two different engines will be revealed. The Italians will design a supercharged engine with a 1,500hp power capacity. The engine that BMC will utilize in the ALTAY MBT will feature a turbocharger for the higher power requirement.

The ALTAY MBT is operated by a crew of four, consisting of a commander, gunner, loader and driver. The commander is seated on the right side of the turret, with the gunner forward and below his position and the loader on the left side of the turret. The commander's panoramic periscope mounted in front of the loader's hatch. The tank's main weapon is a 120mm 55-calibre smoothbore gun fitted with a thermal sleeve; fume extractor and a muzzle reference system. Ready to use 120mm ammunition is be stowed in the turret bustle with blow out panels in the roof. The loader's hatch has a ring mount for a 7,62mm machine gun, and Aselsan's SARP Remote Controlled Weapon Station (RCWS), armed with .50-calibre (12,7mm) machine gun, is mounted on the left side of the turret roof (behind the loader's hatch), for operation by the commander. The ALTAY MBT measures 10,85m in length, 3,68m in width and 3,32m in height, with a combat weight of 63,5 tons. Thanks to its powerful EuroPowerpack, ALTAY MBT accelerates from 0 to 32km/h (0 to 20mph) in 6 seconds and attains a maximum speed of 65,5km/h, the speed and agility also helps to improve survivability. The ALTAY MBT can cruise at 450km with internal fuel.

The 3rd+ Generation ALTAY MBT also was proposed for the Royal Army of Oman (RAO)'s Modern Main Battle Tank (MBT) tender covering the procurement of 77 tanks by Otokar. The company submitted its proposal at the end of the year 2014 within the scope of the procurement program that was initiated in August 2013. The ALTAY MBT's PV-2 prototype participated the field tests (mobility and firing tests) executed in Oman in July – August 2018. As part of the tests, 150 live firings were executed against fixed and mobile targets with the ALTAY PV2 MBT and a 4,500km distance was covered in desert conditions. According to the information we received, ALTAY MBT displayed successful performance in the tests that were conducted in Oman. In the tender, ALTAY MBT's most serious competitor is German Leopard 2A7 MBT. During the 10th Ambassadors Conference held by the SSB on 16 August 2018, President of Defence Industries Prof. İsmail DEMİR declared that one of the ALTAY prototypes succeeded in the field tests by an undisclosed country (Oman) and he said that the countries to which ALTAY MBT has export potential are Oman, Qatar, Bahrain, Saudi Arabia, Malaysia and Indonesia.

M60 and Leopard 2A4 MBT Modernization

Soon after several Turkish M60A3, M60T and Leopard 2A4 MBTS were hit by Kornet-E/AT-14, Milan, TOW-II, 9K115-2 Metis-M and Fagot/AT-4 Anti Tank Guided Missiles (ATGMs) launched by Islamic State (ISIS) and YPG/PKK militants during Operation Euphrates Shield (carried out during August 24, 2016 – March 29, 2017) in Syria, in January 2017 the SSB launched a tender for the modernization of 169 M60T, 40 M60A3 and 81 Leopard 2A4 MBTs to improve their protection level and increase their survivability against modern ATGM threats.

The FIRAT-M60T Modernization Project was launched for the modernization of M60T MBTs to increase their survivability against modern ATGM ATGM (Anti-Tank Guided Missile) threats, to increase their firepower and their situational awareness. The Main Contract valued at EUR 109,245 Million + TL 25 Million was signed between the SSB and Aselsan on 11 May 2017, and the Amendment no 1 to the contract valued at EUR 96.7 Million + TL 25 Million was signed on 24 July 2018. Under the FIRAT-M60T Modernization Project , the Main Contractor Aselsan, in cooperation with the 2nd Main Maintenance Factory Directorate, integrated a 12.7mm SARP RCWS, YAMGÖZ Close-Range Surveillance System (360° Situational Awareness System), Tank Laser Warning Receiver System (TLUS, to detect, classify, identify and give warning of laser threats aiming on the platform such as; Laser Range Finders, Laser Designators and Laser Beam Riders), Tank Driver Vision System (TDVS), Smoke Grenade Launchers, Air Conditioning System, Auxiliary Power Unit (APU) and Audible Warning System and Protective Coating (at the turret walls and ceiling, to maximize crew protection from possible shrapnel threats encountered in the event of RPG and ATGM attacks) on 169 M60T MBTs in the TLFC inventory. In April 2018 the SSB's İsmail DEMİR announced with a tweet that under the FIRAT-M60T Modernization Project, delivery of the 90 40mm Automatic Grenade Launchers (AGL)

FIRAT-M60T was displayed static display area at IDEF '19

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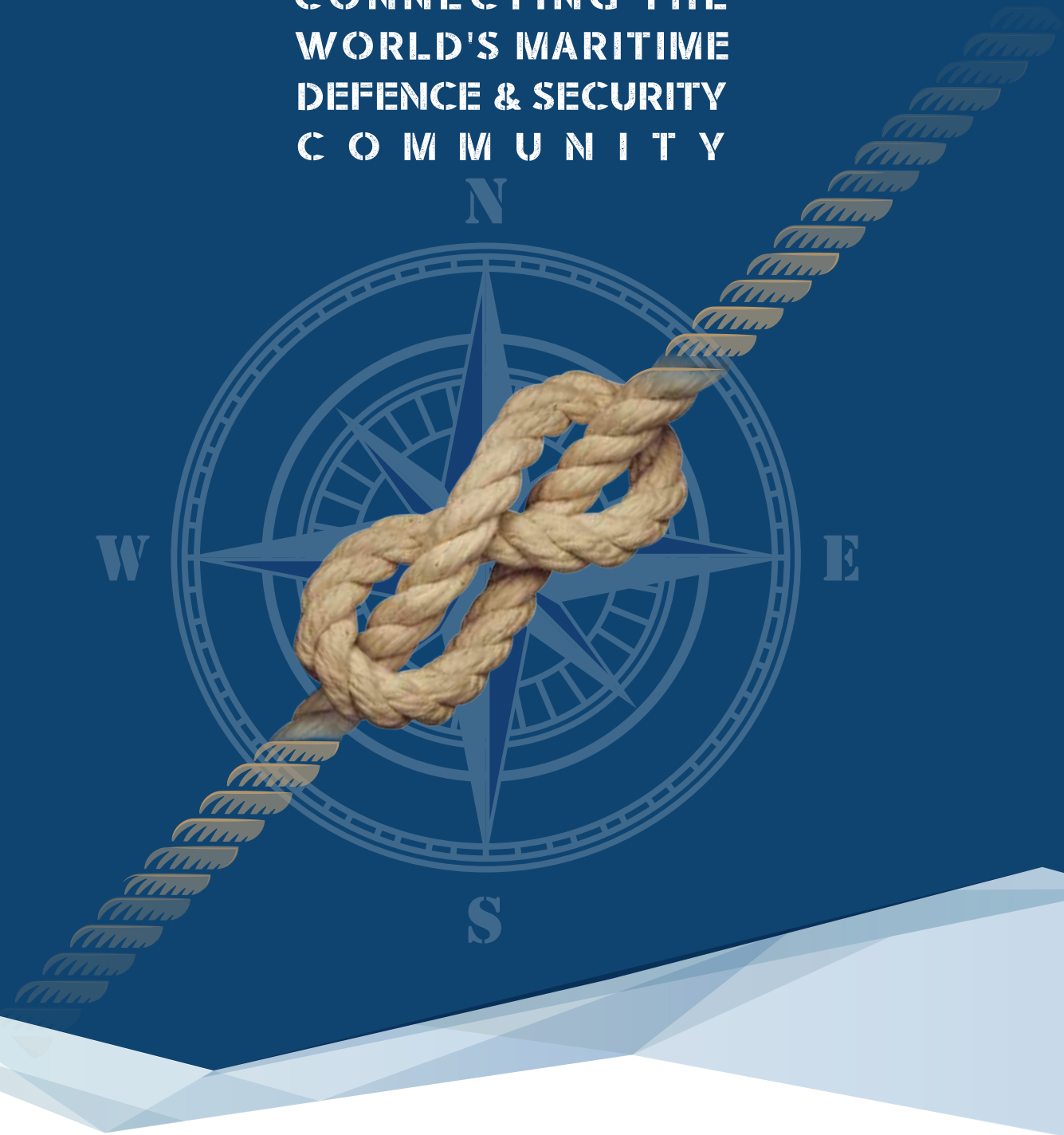

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had been completed. 40mm AGLs are integrated on SARP RCWSs and replaced the 12,7mm machine gun. Aselsan in cooperation with MKEK developed 40mm smart grenade munitions with airburst functionality and performed firing tests in April 2018. Some of the modernized M60Ts dubbed M60TM, were deployed during Operation Olive Branch that was launched on January 20, 2018 against YPG/PYD positions surrounding the Syrian city of Afrin.

With the Contract Amendment no 1, the total amount of the Project contract has reached EUR 206 Million + TL 50 Million. In accordance with the amendment to the contract, the AKKOR PULAT Active Protection System (APS) will be installed on 40 of the 169 M60TM MBTs tanks. Out of the 169 tanks named M60TM that were modernized as part of the FIRAT-M60T Project, the Telescopic Periscope System (TEPES) will be installed on 73 of these tanks. Moreover, 90 40mm automatic grenade launchers were procured in 2018 to be used in the tanks.

AKKOR PULAT APS is capable of physical destruction and it is able to simultaneously cope with multiple threats and it provides 360-degree protection capability. The system detects RPGs and ATGMS directed towards the M60TM AMT 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. Aselsan displayed the M60TM AMT equipped with the AKKOR PULAT APS in the outdoor exhibition area during IDEF '19. According to the information on the product's brochure, the AKKOR PULAT APS contains three critical sub-systems: The Control Panel, Power Distribution Unit and the Counter Measure Module. Maximum 8 Counter Measure Modules that consists of a millimetre-wave Triggering Radar and Counter Measure Munition can be installed on every MBT. However, according to feedback given by the Turkish Armed Forces, and as no Counter Measure Module deployment was planned over the turret, only 6 Counter Measure 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 cab and the Counter Measure 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 Counter Measure Munition 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 Counter Measure Munition. The Triggering Radar is able to 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 the range the warhead right at the back of the millimetre-wave Triggering Radar is activated for interception. When the cylindrical Counter Measure Munition 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 shoots 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 Aselsan official as the fast-moving splinters moves 35 degrees upwards after the activation, it can, technically, also intercept ATGMs with a top attack capability to a certain extent. In one of his remarks, the former Minister of Defence Nurettin CANİKLİ stated that interception up to 8-10 meters was possible with AKKOR PULAT while with AKKOR APS interceptions up to a distance of 100 meters of could be conducted. In the field tests executed with AKKOR PULAT APS, over 400 ballistic tests were conducted against various threats such as RPG, Kornet-E, Konkurs and TOW.

M60TM seen here equipped with AKKOR PULAT APS

With the help of the Telescopic Periscope System (TEPES) integrated on the M60TM AMTs, secure surveillance and target acquisition capabilities while in the defilade position are gained. On account of Aselsan's TEPES mast mounted sighting system, which is to be integrated to a total of 73 M60TM AMTs, 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 Commanded Weapon System, etc.), acquisition of the target coordinates and video/image recording will dramatically increase the survivability of the M60TM. The system capable of capturing thermal images and TV images via its E/O sensors 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.

Roketsan and Aselsan have been selected for the modernization of M60A3 MBTs. With modernization undertaking, the aim is to increase the survivability, the firepower and the situational awareness of 40 M60A3 MBTs (sufficient to equip one tank battalion) in the Turkish Land Forces service. Dubbed the M60A3T1, the modernized M60A3 MBTs are integrated with a 12.7mm SARP RCWS, YAMGÖZ Close-Range Surveillance System (360° Situational Awareness System), Tank Laser Warning Receiver System (TLUS), Smoke Grenade Launchers, Tank Driver Vision System (TDVS), Fire Extinguishing – Explosion Suppression System, Audible Warning System, Power Distribution Unit, Protective Coating and Increased Armor Protection (Roketsan's add-on ERA armor modules and slat armor at the rear of turret). M60A3T1 MBTs will be also integrated with Aselsan's AKKOR PULAT APS. Photos of the modernized M60A3T1 MBTs were posted on social media/twitter accounts in March 2018.

BMC was selected for the modernization of 84 Leopard 2A4 MBTs (sufficient to equip two tank battalions/one brigade) under different categories and a contract (according to sources valued at around US$300 Million) was signed in 2017 between BMC and the SSB. But according to a BMC official, as a result of the constantly changing requirements of the end user the Project has evolved into a completely different point. Required modifications and evolutions to answer the TAF's new requirements, that occurred during recently gained operational experiences, have been implemented on the Project structure and modernization efforts on prototype Leopard 2A4TM were launched in 2018. Modernization of the prototype Leopard 2A4TM is expected to be completed in 2019 and then Serial modernization of the remaining 83 MBTs will be initiated (either at the 1st Main Maintenance Factory Directorate or at the 2nd Main Maintenance Factory Directorate).

New Generation FIRTINA (FIRTINA-II) SPH

Serial production of the 140 New Generation T-155 FIRTINA (FIRTINA-II) Self Propelled Howitzers (SPH) commenced at the 1st Main Maintenance Factory Directorate in 2018. According to the Aselsan 2017 Activity Report, the first phase of Qualification Tests with the FIRTINA-II prototype were carried out in 2017. On December 14, 2018 Aselsan secured a contract valued at US$194,6 Million to deliver New Generation Fire Control Systems for the 140 FIRTINA-II SPHs that were ordered for the Turkish Land Forces Command.

Developed over the existing 281 FIRTINA-I SPHs, the FIRTINA-II SPH features some improvements over its predecessor including the new turret design with propellant conditioning unit, fully electrical and servo controlled turret & gun aiming and drive system (replacing a hydraulics based drive system), improved Fire Control System, increased firing rate, extended effective range, fully automatic ammunition loading system (FIRTINA-I is equipped with electrically driven and an electronically controlled automatic ammunition loading system) and integrated with Aselsan's 12,7mm SARP RCWS for self-protection. The high degree of automation allows FIRTINA-II to react in a shorter timeframe to execute its mission, with reduced manpower. After receiving the fire command, FIRTINA-II is able to fire on target within 30 seconds, to complete the fire mission and to relocate in 90 seconds.

Operated by a crew of five, the 155/52 calibre T-155 FIRTINA-II SPH has a maximum firing rate of up to eight rounds per minute thanks to its automatic shell loading system. The maximum range of the 155/52-calibre gun is 18km with M107 (HE), 30km with M549A1 RAP (HE) and 40+km with MKEK/Roketsan MOD 274 HE ER ammunition. The FIRTINA-II SPH's 52 calibre ordnance is capable to use all NATO standard ammunition. In order to meet the Turkish Army's long range HE type artillery munitions requirement, MKEK in cooperation with Roketsan (responsible for the base bleed unit of the ammunition), developed MOD 274 HE extended range (ER) 15mm 52 calibre artillery ammunition and received a contract for the delivery of the first batch of 5,020 MOD

The New Generation FIRTINA-II SPH

274 ammunitions at the end of 2014. In 2017 follow on orders for an additional 9,000 (2,000 + 7,000) MOD 274 HE artillery ammunition were awarded.

The T-155 FIRTINA-I and FIRTINA-II SPH prototypes are powered by German MTU-881 KA 500 1,000hp diesel engine coupled with Allison's X1100-5 fully automatic transmission built in South Korea under Allison license. However, during IDEF '19 a MoU (Memorandum of Understanding) was signed between Caterpillar Defence UK and the Turkish MoND for the development of a new diesel engine, to be based on the core of Caterpillar Defence UK's existing diesel engine but will be developed with the participation of 1st Main Maintenance Factory Directorate engineers to meet FIRTINA-II-specific requirements and it will be an ITAR Free product so as to not face any export license problems as in the case with MTU's MTU-881 KA 500 engine. The development of a new V12 type 1,200hp diesel engine will take place at the 1st Main Maintenance Factory Directorate in Arifiye, Adapazarı. The new engine will be coupled with Allison's X1100-5 fully automatic transmission because according to Caterpillar Defence UK officials the Turkish end user is happy with the existing transmission. Meanwhile, speaking at the Aselsan Union of Forces Summit held on February 5, 2019 at the ATO Congresium Center in Ankara, Turkish MoND Hulusi AKAR, formerly Chief of the Turkish General Staff, disclosed that Turkey has recently signed a contract with Qatar for the sale of FIRTINA Self Propelled Howitzers (SPHs). MoND AKAR did not share any figures regarding the number of FIRTINA SPHs to be delivered to the Qatar Emiri Armed Forces (QAAF). It is believed that the contract covers New Generation FIRTINA (also dubbed FIRTINA-II) SPHs, which are under production at the 1st Main Maintenance Factory Directorate located in the Sakarya province of northwest Turkey. In October 2018 it was reported that after receiving assurance that there would be no export restrictions, state-owned Machines and Chemical Industries Board (MKEK) signed a contract to procure 20 powerpacks (including 5TDFMA-1 engines) from UkrOboronProm (Ukrainian Government's Defense Industry Enterprise) for the FIRTINA-II SPHs. Probably these 20 powerpacks would be installed in the QAAF's FIRTINA-II SPHs.

Using same chassis and turret with the T-155 FIRTINA-I SPH, the POYRAZ Ammunition Resupply Vehicle is capable of loading ammunition in a supply area and transferring ammunition to the FIRTINA-I SPH within the required time and location in all kinds of terrains and battlefields. The POYRAZ Ammunition Resupply Vehicle has the necessary mobility and survivability capabilities for operation within the tactical operational environment of the FIRTINA-I SPH. Fitted with Aselsan's automatic Ammunition Transfer System, and compatible with all kind of ammunition used for FIRTINA-I SPHs, the POYRAZ vehicle can carry 96 155mm projectiles and 96 modular powder charges. It can transfer 48 projectiles and 48 modular powder charges in less than 20 minutes to the FIRTINA-I SPH.

The Main Maintenance Factory Directorate completed production of the POYRAZ Ammunition Resupply Vehicle prototype in 2011 and the vehicle was displayed during the IDEF '11 Fair. Following the extensive test campaign acceptance of the prototype vehicle was completed and the serial production phase, covering 70 vehicles commenced in 2013. The 9.5m long, 3.76m height and 47 ton POYRAZ Ammunition Resupply Vehicle is operated by three crew and powered by a V-12 type 750hp AVDS-1790 diesel engine coupled with an Allison CD-850 automatic transmission. This power pack was obtained from M48A5T1 MBTs that were phased-out of Turkish Land Forces service.

KORKUT SPAAG and FNSS ACV-30

The KORKUT Self Propelled Anti-Aircraft Gun (SPAAG) System project covers the procurement of 42 Weapon System Vehicles (SSA, will replace existing aged M-42A1/A2 Duster Walker systems) and 14 Command and Control Vehicles (KKA) all based on the FNSS ACV-30 Armored Combat Vehicle (ACV) chassis. On June 25, 2011, Aselsan the Main Contractor of the KORKUT SPAAG System Program, awarded a Tracked Carrier Vehicle Development Contract to FNSS for the design, development and production of one Command and Control Vehicle chassis and two Weapon System Vehicle chassis prototypes to be based on the ACV-30 within two years.

After an extensive mobility and firing test campaign that was launched in 2015 and which was carried out with the participation of the SSB and Turkish Land Forces (TLF) representatives, acceptance of these vehicles was carried out on August 24, 2016 and the KORKUT SPAAG prototypes (2x Weapon System Vehicles and 1 Command & Control Vehicle) entered into the service of the TLF. The systems made a strong impression during the 'Fire at Will 2017' Operation on October 20, 2017 by achieving direct hits to targeted drones.

KORKUT SPAAG Vehicles are based on the FNSS ACV-30 ACV chassis

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Following the successful completion of the prototype development and qualification phase, the KORKUT SPAAG Serial Production Phase, covering the production and delivery of 40 SSAs (Weapon Systems Vehicles) and 13 KKAs (Command and Control Vehicles) was launched with a contract valued at Euro 467,767 Million signed between the SSB and Aselsan in May 2016. Aselsan then signed a contract with FNSS to procure a total of 53 ACV-30 tracked vehicles. In accordance with the contract schedule, FNSS completed delivery of the first batch of ACV-30 chassis during the first half of 2018 to Aselsan, who then converted them into KKA and SSA configurations. Meanwhile MKEK, responsible for 35mm GDF-003 twin guns, completed the manufacture of the first batch of 6 guns to be installed on 3 KORKUT SSAs and carried out acceptance tests at the test range on April 26, 2018.

Delivery and acceptance of the first batch of 1 KORKUT KKA and 3 SSAs that were manufactured under the KORKUT SPAAG Serial Production Phase for the Turkish Land Forces Air Defence School and Training Center Command took place in March 2019. As part of the acceptance test, live firing was performed against a high-speed targeted drone flying at a speed of 200m/s. The second batch is scheduled to be delivered in September 2019. Serial Production and the delivery of 40 KORKUT SSAs and 13 KORKUT KKAs to the TLF will be completed by 2022. Each KORKUT SPAAG Team will consist of 1 KKA and 3 SSAs so that with 42 SSAs and 14 KKAs the Turkish Army will be able to establish 14 KORKUT SPAAG Teams.

The KORKUT SSA vehicle is equipped with an unmanned turret, which is armed with two 35mm Oerlikon GDF-003 automatic cannons produced in Turkey by MKEK. The vehicle has the capacity of carrying 400 35mm ammunitions in total, 200 of them (100 for each barrel) within a remotely operated unmanned turret, equipped with automatic ammunition loading system, and 200 of them within the chassis. The system is also equipped with the capability of firing 35mm ATOM air burst ammunition, similar to AHEAD, which is designed and developed by Aselsan in cooperation with TUBITAK-SAGE and produced by MKEK.

The crew includes a gunner, commander and driver who are seated in the chassis of the vehicle. The 35mm guns have a rate of fire of 1,100 rounds per minute. There is also a Ku-Band, 3D Fire Control Radar with a 30km instrumented range and is mounted on the rear top of the turret along with a thermal imager and a day TV camera on the right side. The KKA uses the same chassis, ACV-30, but is equipped with a turret including X-Band, 3D Mobile Search Radar (MAR), that provides fast and accurate detection and tracking of low altitude airborne targets up to a maximum range of 70km.

The ACV-30 platform chassis is provided with a unique, space laminated armor system combining steel and aluminum technology for protection against the firing of small arms and mine blasts. Powered by a 600hp diesel engine, coupled with fully automatic transmission, the 7,07m long, 3,62m overall height and 3,9m wide ACV-30 can reach 65km/h on the road and can swim at 6km/h with 2 water jets. Having a combat weight of 29,5 tons the ACV-30 has a cruising range of 500km.

ZAHA Program

On March 7, 2017 the Armored Amphibious Assault Vehicle (ZAHA/AAAV), also named the Marine Assault Vehicle (MAV) Program contract was signed between the SSB and FNSS. Under the contract the ZAHA will be developed and produced by FNSS based on an indigenous development model. FNSS will deliver a total of 27 vehicles, including 23 in personnel carrier, 2 in command and control vehicle and 2 in recovery vehicle configuration. The technical characteristics of the ZAHAs were determined by taking into consideration the operational concept and mission requirements defined by the Turkish Naval Forces Command.

FNSS revealed the first complete prototype of its Marine Assault Vehicle (MAV) at the IDEF '19 Fair held in Istanbul. According to FNSS CEO and General manager Nail KURT, MAV has entered the Critical Design Phase and the entire project is scheduled to be complete by 2021. According to FNSS, the MAV is built from 5000 series military grade aluminum armor, which is alloyed with magnesium. Alloys in the 5000 series are resistant to corrosion and relatively easy to weld, making them well suited for the construction of amphibious vehicles. The aluminum is used to

© FNSS

ZAHA - The Armored Amphibious Assault Vehicle

form the structure of the hull as well as provide elements of the vehicle's blast protection. The bottom of the hull is reinforced with support, and the thickness has been adjusted to maximize stiffness and energy absorption.

The MAV/ZAHA will be able to carry 21 fully equipped infantries as well as 3 crews, they will have ballistic and mine protection at a certain level and will be able to move rapidly in water and on land. They will have the capabilities of firing at targets with their unmanned turret with 12.7mm Machine Gun (MG) and 40mm Automatic Grenade Launcher (AGL) and perform operations at various sea levels.

Powered by a diesel engine, coupled with fully automatic transmission, the 8,3m long and 3,3m wide the MAV/ZAHA can swim at 7km/h with 2 water jets. With a combat weight of 30 tons the ZAHA will have a 21 troops capacity in addition to a three-man crew (driver, commander and gunner). To be integrated with a remotely operated turret armed with a 12,7mm machine gun and a 40mm automatic grenade launcher, the MAV/ZAHA can operate at sea state 4 conditions. The MAV/ZAHA will be able to negotiate up to 40% side slopes and a 60% gradient and is capable of crossing natural or man-made obstacles up to 90cm high, and trenches 2m wide.

Modern Medium Weight Tank (MMWT) Program

The Indonesian Modern Medium Weight Tank (MMWT) Program stands out as it is the first Government-to-Government (G2G) cooperation project in the Turkish Land Platforms Sector.

The conceptual design of the KAPLAN MT Harimau (Tiger) MMWT was completed and was revealed during the Indo Defence 2016 Fair held in Jakarta, Indonesia in November 2016. The first prototype developed and manufactured by FNSS in Ankara, Turkey underwent qualification trials in Indonesia, which was unveiled at the IDEF '17 Exhibition in Istanbul and also participated in the Army Day Parade in Indonesia

© FNSS

The Indonesian Modern Medium Weight Tank

on October 5, 2017. PT PINDAD engineers, who have been trained in the engineer¬ing development and manufacture phases of the first prototype at FNSS, also completed the production of the second prototype in Indonesia with support from FNSS. The qualification of the two MMWT prototypes as well as firing trials and durability tests were completed in 2018. KAPLAN MT is the first medium weight tank to be certified by the Indonesian Army and qualified for serial production. Following the successful completion of live firing tests and mobility trials FNSS and PT PINDAD initiated negoti¬ations towards the serial production of KAPLAN MT MMWT platforms, which the Indonesian Government indicates a keen interest in. During IDEF '19, where FNSS displayed the KAPLAN MT MMTW equipped with Aselsan's AKKOR PULAT APS against increasing ATGM threats to tanks in the battlefield, on April 30, 2019 a Long-Term Contract on the Serial Production of KAPLAN MT (Harimau/Tiger) MMTW was signed between FNSS Savunma Sistemleri A.Ş. and PT Pindad. The contract covers the procurement and delivery of 18 KAPLAN MT Harimau MMWTs to the Indonesian Land Forces within two years.

Based on the FNSS KAPLAN-30 chassis and dubbed the Harimau (Tiger) by Indonesia, MMWT design comprises advanced ballistic and mine protection with a broad range of firepower, from close support of infantry to anti-armor. The KAPLAN MT Harimau MMWT is fitted with CMI's Cockerill 3105 (CT-CV 105HP) turret armed with a 105mm L-53 CV rifled gun and a coaxial 7,62mm machine gun and for ease of deployment in jungles/tropical forests and the soft grounds of Indonesia, the vehicle has a combat weight of 35 tons. Since the main gun uses an autoloader (with 12 rounds ready to fire) the KAPLAN MT Harimau MMWT has a three-man crew. The 7m long and 3.2m wide and 2.7m height KAPLAN MT Harimau MMWT has a top speed of 70km/h on roads and a cruising range of 450km, with on-board fuel. In order to have a minimum power to weight ratio of 20hp/tons, the KAPLAN MT Harimau MMWT is believed to be powered by a 700hp class power pack.

PARS-II/AV-8 Gempita ACV Program

Under the US$559 Million contract awarded in February 2011, in cooperation with DRB-HICoM DEFTECH of Malaysia FNSS will design, develop and produce a total of 257 armored personnel carriers to be based on PARS-II 8x8 in 12 different configurations including; the infantry fighting vehicle (IFV), armored fighting vehicle (AFV), the armored personnel carrier (APC), tank destroyer (AFV-ATGW), command vehicles (ACV), signals (AVS), reconnaissance vehicle as well as recovery vehicle. While the original PARS 8x8 was 24-25 ton vehicle, the AV-8 IFV-25 configuration weighs 28 tons and its equipment differs considerably

from that of PARS. Deliveries will span over 7 years and are planned to be completed by 2020. Malaysia is said to be considering placing an order for the second and third batches of AV-8 vehicles. The second batch is expected to be on the agenda around 2021-2022.

On December 6, 2014 the Malaysian Army received delivery of the first 12 of 257 AV-8 Gempita Armored Combat Vehicles (ACVs). The then Malaysian Army Chief General Raja Mohamed Affandi Bin Raja Mohamed NOOR accepted the first batch of 12 vehicles, all of which are in the IFV-25 configuration. During a ceremony witnessed by the then Prime Minister Najib Tun RAZAK, formally named the vehicle 'the Gempita', which is a Malay term for 'thunderous noise'. The IFV-25 configuration of the AV-8 ACV is fitted with a one-person FNSS Sharpshooter turret armed with a stabilized ATK Armament Systems M242 25 mm dual-feed gun and an FN MAG 58M 7,62 mm co-axial machine gun. 46 of the 257 AV-8 vehicles will be delivered in IFV-25 configuration. The weapons systems capabilities of the AV-8 Gempita includes; a 25mm gun, specially designed two-man turret with a 30mm gun, 12.7mm RCWS as well as an Anti-Tank Guided Weapon (ATGW).

RAO PARS-III 8x8/6x6 WAV Program

During the second half of 2015, FNSS received a contract valued at around US$ 500 Million from the Royal Army of Oman (RAO) and the Ministry of Defence of the Government of the Sultanate of Oman to design, develop, manufacture, qualify (both international and customer) and deliver a total of 172 PARS-III Wheeled Armored Vehicles (WAVs) in 13 configurations and the contract became effective on September 20, 2015. Under the contract FNSS will deliver 145 PARS-III 8x8 vehicles in 8 different configurations and 27 PARS-III 6x6 vehicles in 5 different configurations. Contract period will be finished in May 2020. This contract represents the second export order for the PARS WAV following Malaysia. RAO PARS-III 8x8WAVs feature some country specific modifications and upgrades and have slightly different appearance compared to PARS-II/AV-8 Gempita vehicles of the Malaysian Army. Contrary to PARS-II/AV-8 vehicles, the RAO PARS-III WAVs do not have swimming capability but in return they have better ballistic and mine/IED protection thanks to add-on armor modules. The official delivery of the first PARS-III WAV to the RAO took place on July 12, 2017 at the FNSS facilities located in Gölbaşı, Ankara/Turkey.

The PARS-III 8x8 is powered by a German Deutz turbocharged, water-cooled diesel engine, developing 550hp coupled to a fully automatic transmission with 7 forward and 1 reverse gear. Meanwhile, the power pack of the PARS III 6x6 consists of a water-cooled turbocharged diesel engine with an output power of 483hp and a fully automatic transmission with 7 forward and 1 reverse gears. The diesel power pack is mounted to the rear of the driver on the left side of the hull, between the first and second axles. The power pack architecture, which allows disassembly and reassembly in less than 60 minutes, allows the user to replace the engine in the field as an additional benefit.

RABDAN 8x8 AACV

In February 2017, during the IDEX 2017 Fair, Otokar signed a deal worth US$661 Million to build 400 'RABDAN' 8x8 Amphibious Infantry Fighting Vehicles (IFVs, based on ARMA 8x8 and fitted with a Russian-made two-man turret armed with a 100 mm 2A70 gun, a 30 mm 2A72 coaxial cannon and a 7.62 mm PKT coaxial machine gun) for the United Arab Emirates (UAE) Land Forces. The 'RABDAN' 8x8 Amphibious IFVs will be manufactured both at Otokar facilities in Turkey and by Al-Jasoor, a Joint Venture company between Otokar LS and Heavy Vehicles Industries of Tawazun at the Tawazun Industrial Park manufacturing facilities in Abu Dhabi. According to the contract signed in February 2017, the production of the first 100 vehicles will be accomplished at Otokar's facilities. To this end, Otokar started the delivery of the RABDAN IFVs to the UAE Land Forces in the last quarter of 2018 (October/November). In this context the first RABDAN armored vehicles out of production successfully completed acceptance tests at the Otokar plant in Sakarya as well as amphibious and firing tests in the Gulf, and the first batch was delivered to the UAE. Following the delivery of the first batch of RABDAN IFVs late last year, the vehicles were included in the inventory of the UAE Armed Forces. As of February 2019, a total

RAO PARS-III 8x8

of 30 vehicles were delivered, and this number is expected to reach 120 by the end of 2019. According to the contract, the first 100 vehicles would be built at the Otokar plant in Sakarya and the remaining vehicles will be built at the Tawazun Industrial Park facility in Abu Dhabi. In this context, Otokar started the mass production of RABDAN vehicles in 2017. Due to the urgent need of the UAE Land Forces, deliveries are being carried out 4-5 months ahead of the schedule specified in the contract. In this context, a workshop was established by Otokar/Al Jasoor in the UAE for the final assembly of vehicles. Otokar/Al Jasoor has also started training activities for the crew (driver, vehicle commander, gunner) and maintenance personnel of RABDAN IFVs in the UAE. In this context, delivery of the training support equipment was completed in early February. Otokar also is conducting negotiations with UAE for the second phase that covers the delivery of further 300 vehicles in various configurations. According to sources, the UAE Army also has a plan to order a further 500 RABDAN IFVs under the third phase of the project.

According to the first technical specifications released by the UAE Company Al Jasoor Heavy Vehicles Industries, the RABDAN has the capacity to carry a total 12 personnel including driver and commander. It has gross vehicle weight (GVW) from 28,000 kg to 30,000 kg. The RABDAN is powered with a Caterpillar 12,5 liter diesel engine developing 600hp coupled to an Allison 4500 automatic transmission with 6 forward and 1 reverse gear. The RABDAN has a top speed of 105km/h and a cruising range of 700km. The RABDAN offers ballistic protection up to STANAG Level 4 and mine protection up to STANAG Level 4a/b. The vehicle is fully amphibious and propelled in the water at a maximum speed of 10km/h thanks to two propellers mounted under the hull rear. The 8x8 vehicle is fitted with a two-man BMP-3 turret, which is armed with one 100mm 2A70 semi-automatic rifled gun/missile launcher as the main armament and one 30mm 2A72 coaxial cannon and one 7,62mm PKT coaxial machine gun as the second armament.

RABDAN 8X8 AACV

AKREP-IIe Electrical Armored Vehicle

Designed and developed by Otokar as an armored reconnaissance and weapons platform, the AKREP-IIe 4x4 New Generation Armored Vehicle Product Group is manufactured to fulfil the contemporary and future demands of armies with its low silhouette. In addition to its operational performance under all types of field conditions the vehicle has high maneuver capability and has an infrastructure that enables the utilization of alternative power packs such as electricity, diesel and hybrid. The power generation and transmission systems, sensors, computers, communication and targeting systems are integrated within a single system in the AKREP-IIe and the vehicle provides an infrastructure that will accelerate the transition to autonomous vehicles. Different configurations of the AKREP-IIe were designed, such as the Armored Reconnaissance Vehicle, Fire Support Vehicle (90mm gun), Light Weight Infantry Support Vehicle (25mm gun, the model displayed at the Fair) and Laser Gun Vehicle. Two NMC540 Serial new generation Li-Ion battery packs manufactured by Altınay Company were included in the Light -Weight Infantry Support Vehicle with a hybrid propulsion system were displayed at the Fair. The product AxleTech an independent suspension system is also present in the vehicle. The AKREP-II Fire Support Vehicle to be equipped with a 360hp power capacity diesel engine and CMI Cockerill CSE90LP 90mm automatic gun is expected to be revealed at the EuroSatory 2020 Fair.

The AKREP-IIe in surveillance and force recon/combat reconnaissance configuration has a crew of three; Driver, Gunner and Commander. However, all the main functions of this vehicle can be implemented by a crew of two. The Driver sits in the center of the vehicle upfront and has access to a modern, sports car like, re-programmable three large flat-panel multi-function displays. Commander (left) and Gunner (right) sits behind the Driver and can control sensors, radios and the 25mm gun the AKREP-IIe is carrying. Both Commander and Gunner have a large multi-function display and the Gunner can control the 25mm remotely operated gun via control stick with multi-function buttons. Vehicle is also fitted with a mast-mounted long-range day/night observation system with 360-degree surveillance capability.

Two propulsion options are proposed for the AKREP-IIe Electrical Armored Combat Reconnaissance Vehicle. The version revealed to the media at the Anechoic Chamber at Otokar plant in Arifiye in April 2019 is fitted with novel full electric drive/propulsion technology including a pair of alternators/DC motor (procured from a undisclosed foreign company and each generating 180kW, around 250hp) and Altınay's battery packs (which can be mounted both in the front and in the rear of the vehicle) that generate around 500hp. With existing Altınay's NMC540 Serial new generation Li-Ion battery packs AKREP-IIe has a range of 250km on a single charge and the battery packs can be recharged within 3 hours. The second version, which is currently under development,

will be fitted with a 450hp diesel engine. An ongoing development effort for this version is scheduled to be completed in a year. Thanks to its full electric drive technology AKREP-II has an extra punch in performance (compared to the diesel propulsion version) when needed and can also execute its mission silently in high-threat environments without radiating any thermal and acoustic signature. The AKREP-IIe can be airlifted by the C-130 Hercules and A400M military cargo aircraft. This means the AKREP-IIe can be flown directly into the area of operations and can roll off their transports ready to go to work.

Having a combat weight of 13.5 tons the AKREP-IIe offers similar ballistic protection capability with COBRA-II (according to open sources the baseline vehicle is STANAG 4569 Level 3 compliant). Its armored monocoque hull is fabricated from high-hardness armor steel. The AKREP-IIe also uses several common subsystems with COBRA-II and is being considered as a first step of Otokar into the field of unmanned combat vehicles.

AKREP-II Electrical Armored Vehicle

URAL Special Operations Vehicle (ENGEREK-II)

The prototype of the URAL Special Operations Vehicle, which is the new version of ENGEREK Special Operations Vehicle that was based on LandRover Defender 110 tactical vehicle, was displayed for the first time during the media tour that took place in April 2019 at the Otokar Arifiye plant. The URAL Special Operations Vehicle is an open-topped light armored vehicle operated by a crew of five and can be used for long-range reconnaissance and special operations. The vehicle offers cross-country mobility with high off-road performance and a well-balanced power-to-weight ratio. It features a 4x4 wheel drive layout and an open architectural design configuration.

While the ENGEREK featured only armored under-protection for the fuel tank and underbody composite armor that provides protection for the crew (5+1) against only anti-personnel mines exploded underneath the vehicle, the URAL Special Operations Vehicle features both side armor (up to waist-high and provides protection from small arms fire) and improved underbody protection for heavier mine explosions as well as a ballistic protection for the engine compartment.

The URAL Special Operations Vehicle has three weapon mounts; Front (rotating gun mount and weapon adaptor for a 5,56 mm or 7,62 mm caliber weapon), Back (rotating and height adjustable gun mount and weapon adaptor for a 5,56 mm or 7,62 mm caliber weapon and a Main Gun Ring at the roof (gun pintle and weapon adaptor for a 5,56 mm, 7,62 mm or 12,7 mm caliber weapon and a 40 mm grenade launchers). For rapid deployment by air, URAL Special Operations Vehicle can be transported by the C-130 Hercules and A400M military cargo aircraft and by CH-47F Chinook heavy lift helicopters (as an under slung load). The vehicle can, in theory, be transported internally by a Chinook, although the weapons mounts have to be removed to allow this.

URAL Special Operations Vehicle (ENGEREK-II)

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ATEŞ Armored Border Security Vehicle

In October 2017, Aselsan secured a €29.676 Million contract from the Undersecretariat of the Treasury to deliver 57 Tactical Wheeled Armored Border Security Vehicles for the protection and surveillance of Turkey's Western borders (Bulgaria and Greece). The project is financed via EU funds. Under the Project, Aselsan selected Katmerciler's HIZIR 4x4 WAV as a platform to integrate its ŞahinGözü (FalconEye) EO sensor, ACAR surveillance radar and YANKI Gun Shot Detection System. A Euro10.485 Million contract was signed between Aselsan and Katmerciler for the procurement of 57 HIZIR 4x4 WAVs. After integration with Aselsan's border surveillance system, the vehicle was dubbed the 'ATEŞ (Fire) Mobile Border Security System'. According to the MoND 2017 Activity Report, ATEŞ Mobile Border Security System deliveries would start in December 2018. However, the delivery of the first batch of 20 ATEŞ Armored Border Security Vehicles took place on May 16, 2019. Deliveries of the remaining 37 vehicles are scheduled to take place in 2019.

The HIZIR 4x4 Tactical Wheeled Armored Vehicle is designed and optimized for high performance under extreme operational conditions in rural and urban areas for 9 personnel. The vehicle has a high level of ballistic and mine protection. It is agile, dynamic, versatile, low maintenance and is an easy-to-maintain platform for various configurations such as combat vehicles, command control vehicles, CBRN vehicles, weapon carriers (easy integration of various weapon systems), ambulance vehicles, border security vehicles, and reconnaissance vehicles. Katmerciler unveiled the 'HIZIR' its new armored combat vehicle for the first time at the '3rd High-Tech Port by MÜSİAD' organized in Istanbul November 9-12, 2016. With 400hp (298kW), the HIZIR is the combat vehicle, which has the highest engine power in its range in the Turkish Defence Industry. The vehicle has a gross weight of 16,000 kg and can reach a top speed of 110km/h. HIZIR 4×4 features a V-shaped monocoque armored hull design that offers advanced protection to the 9-man crew. HIZIR can be configured for a wide range of missions including command and control, medical evacuation platform, forward observation and convoy support. The HIZIR is fitted with an Aselsan SARP Stabilized Advanced Remote Weapon Platform. Depending on the requirements, the SARP can be equipped with a 12.7mm machine gun, 40mm automatic grenade-launcher or a 7.62mm machine gun ■

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An Intelligence-Driven Approach to Cyber Threats

In the age of big data, it is easy to think that only machines can detect a signal amid the noise. While it's true that big data tools can discover signals that might not be obvious, they can also create their own kind of noise in which the true signal — a true threat — can be lost.

That's a problem anyone dealing with traditional security monitoring systems over the past few years has come to recognize. Threat detection systems have become extremely good at detecting anything that looks anomalous but, as the number of detected anomalies keeps going up, the number of actual threats is still a small fraction of those. Research indicates that less than 1% of reported anomalies represented actual threats and figuring out which detected threats constitute those dangerous few is exhausting, anxiety-inducing work.

The Need for Human, Contextualized Intelligence

What security professionals suffering from alert fatigue need is threat intelligence that has already been vetted and contextualized by human beings. Big data and AI tools provide an abundance of data and they can identify events and activities of concern, but most security professionals within an enterprise have neither the training nor the time to make sense of the raw information. They need threat intelligence that has already been sifted, analyzed and contextualized, a "finished intelligence" that is "actionable" to their organizations.

That's where human intelligence professionals and threat hunting teams come into play. These professionals detect a different kind of threat than those detected by big data and AI tools. If machine tools excel at detecting individual trees, human intelligence professionals excel at understanding the character of the forest.

They can detect code phrases and double meanings in dark web conversations that machine tools may not detect (until they've been trained to do so). They can consider the motives of threat actors and the connections that bind them. They can examine the actions of these actors, even actions that are ostensibly benign, and occasionally detect a plan in those activities long before a machine can detect an exploit resulting from those actions.

Augmenting Intelligence for a More Focused Response

I'm not suggesting that human intelligence professionals and threat hunting teams replace the monitoring and detection systems. Instead, they can augment and enhance the raw intelligence captured by these powerful machine tools. Human intelligence teams can bring insight to the interpretation of raw intelligence that no machine can. They can connect clues with the glue of experience and contextual understanding, which no machine yet does.

The Challenge of Acting on Augmented Intelligence

There's one problem with gaining access to this kind of augmented intelligence: few organizations are in a position to use it effectively. The defensive infrastructure of most organizations is still cluttered with old walls erected to stop older threats, and the work of tuning those defenses remains a serious challenge.

Security personnel within an organization need deeper insight into the hardware, software and services informing the organization's infrastructure. Finished intelligence is going to provide much more focused information about which organizations are at risk, at which points of vulnerability, and for what reason. A new threat may take advantage of a vulnerability in firmware on a certain class of IoT device, for example, but a security team can only act upon that information if they know that they have those devices in their IoT estate and at what release level their firmware is.

What enterprise security professionals need is a way to operationalize this finished threat intelligence. They need tools that can provide deep insight into the hardware, software and processes informing the operational ecosystem of the enterprise, including its endpoints, networks, clouds, IoT devices, supply chains and more. Moreover, they need tools that can enable them to make changes to any element in that ecosystem in a streamlined and orchestrated manner.

Better threat intelligence creates an opportunity for an enterprise to mount a proactive cyber defense, but without an ability to operationalize that threat intelligence, the enterprise may not be able to launch the defense effectively in advance of the impending attack. With tools to operationalize this threat information, an organization can respond quickly and effectively to protect its people, data and processes — even its brand and reputation — from any emerging cyber threat.

Moving Forward

An intelligence-driven approach to cyber threats requires movement on two fronts simultaneously.

We need to continue to gather and analyze threat data aggressively. Finished intelligence that has been vetted and contextualized by human intelligence experts and threat hunting teams can be passed on to the security professionals within an organization. The latter can then proactively implement the appropriate precautions to protect the enterprise against the real threats in the environment.

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“The Operating Environment Which Turkey Offers at the Moment is one Which British Companies Find Attractive!”

"The British Army Marches in Turkish Boots"

During the IDEF 19 Fair on 30 April 2019, Mark GOLDSACK Director of the Department for International Trade's Defence and Security Organization (DIT DSO) hosted a media briefing at the DIT DSO stand in Hall 2 Stand 226A. During the event which represented his first media briefing since taking up his appointment as DIT DSO Director Mark GOLDSACK provided detailed information on the UK's defence and security strategy for Turkey and replied our questions.

DIT DSO Director Mark GOLDSACK's Speech

"I am very glad to be back in Turkey, it's not my first visit here. Inevitably as an Army Officer I've had a lot to do with the Turkish Armed Forces over the years. The last time I was here extensively was working with the Turkish Army when deployed in Afghanistan where I served along side them. So, a long history of working with our Turkish friends.

I'm delighted in my new post to be able to come to the Show (IDEF '19) here and pick up on an extremely important strategic relationship for the UK, not just from the military point of view but from the defence industrial complex as well. And for me to be able to come, talk, learn – most important thing – just what the potential of that relationship is, is fantastic. We have a long history working here, BAE has been, for many years, in joint ventures, and from our perspective the strength of the Turkish Industry – which came out very clearly in the opening ceremony, that surge and desire to invest and to develop and pick up on an indigenous capability here, is all part of how we want to see our own industry develop. And our industry is uniquely placed I think globally because it's private, because it's efficient, and because it's driven by competetive hunger. It has business models that mean joint ventures with the sorts of companies that Turkey is fielding these days, they are extremely viable. I think we, globally, can provide a real market lead from that respect. There's some very inventive propositions out there from all of the companies that we brought with us, on how we might work together. And I think from our point of view the trick here is to come up with longterm strategic development partnerships in which both sides win. The amount of national treasure that gets invested in these projects, the significance of those projects to our respective countries are really fundamental. So, none of us can afford to waste resources, waste money, waste efforts. And so, we are constantly looking for how we can link up. And where we have really strong healthy military links as we do in Turkey and where you can combine two powerful economies, it really does make sense to seek those joint ventures out.

So from my perspective, I'm delighted to be back in Turkey. It's a place I've always enjoyed coming, always enjoyed working with the Turkish Army and I'm delighted to be coming back as a civilian this time heading up our defence and security organization. And from my perspective, not just looking at defence, its probably just worth expanding slightly what we are dealing with here, because the defence side is the easiest, the most visible, it attracts the big numbers and the great videos and so on, but there's a significant amount of activity in the security space as well.

Cyber, as a subset of that, obviously is critically important these days given how agile most of our common foes are at disabling national infrastructure and so on, but also physical security, fundamentally important when we are facing the range of terrorists threats that we are, across the board. So, there's a huge amount of work to be done in that space well. So, from our perspective, we are looking, sadly, at a much more destructive world than we did perhaps 20 years ago. Alongside our strategic partners in Turkey, we're looking at very similar threats, very similar challenges for how we employ and use our defence, security and cyber capacity.

And for us, coming here with I think, some 14 firms on the wider show piece and a good 19 displaying in close proximity here to the UK national stand, that I think is evidence of the seriousness in which we regard Turkey as a partner, and the seriousness with which our firms are looking forward to engaging over the next 2-3 days. I was very struck, this morning walking around initially, at the stands, just the the depth and variety of relationships that have been generated here, and most of it in that most important space of all, which is what you do with intellectual property. How do we actually create design together? Because creating plate metal is fine, but actually the clever bit is can you share the design? Can we work together in that space where you're looking at a threat and you're being innovative in how you take it down.

So that's probably enough opening remarks from me, I don't know if it gives you a flavor of where we are coming from. As I said, I am excited to be here, and I'm excited to be engaging over the next couple of days with both officials and businesses."

Defence Turkey: On the Intellectual proprty (IP) side, there's obviously a strong initiative in Turkey to establish it's own domestic development but IP is arguably probably the most valuable part of the development. What plans do you have to balance that relationship between building a joint venture and not giving away all the IP or at least protecting the IP, so the company's investment is safe or secure?

Mark GOLDSACK: IP lies at the heart of every joint venture, so the most difficult piece to settle when you're discussing any of these things is exactly how its going to be shared and how in turn its going to

be exploited. From our perspective we are very open to innovative proposals. None of our companies are against sharing IP, all of them are looking at how we can, not just work together, but look to third markets as to how we can exploit those together and take advantage of the joint offering that we're going to put out there. But we should not kid ourselves that its going to be an easy discussion, its not. That piece lies at the heart of all of these discussions and therefore the value of it is reflected in the negotiations that take place and most are very commercial by thier very nature, and that is the company's business and it would be wrong for me to interfere with that. All I would say is that all of them in my discussions with them have recognized that the way forward in the modern world is to come together in partnerships where that IP becomes shared because when both sides win, you have the most powerful offer, and that's where we are coming from.

Defence Turkey: How many British companies are participating at IDEF?

Mark GOLDSACK: There's 13 in a group and there's over 20 others. For me, the tell isn't so much that you have independent company stands here but most of our biggest brands are actually working with a Turkish partner here. So it would be for example, SAP with their joint venture partners here, not demonstrating separately. That's what I think the significant shift is. The fact that we've got these joint ventures up and running and if we are genuinely going to turn those offerings into shared capability, shared projects, that's, I think, the indicator of success, not so much that you've got stand alone statements of separate and independent IPR (Intellectual Property Rights), its that joint piece that we are looking for.

Defence Turkey: At the moment the UK is undergoing the process of Brexit – Do you expect any change in relations in the field of the defence sector after Brexit? Any measures taken?

Marc GOLDSACK: I'm not going to comment on Brexit, but from a defence perspective, and its a very stable part of the economy, particularly the countries like

Turkey or the UAE, the relations will continue as before. None of the joint ventures that we are talking about are affected adversely by anthing that is happening, so I just see it as a movement of strength...

Defence Turkey: In the Turkish media there was some news about Rolls Royce and BAE Systems having had some difficulties due to IP issues, since BMC, a joint Turkish-Qatari venture, had already taken part in the TF-X Engine Program. Maybe the defence ministries of both countries can take a role in holding and the sharing of IPR on a governmental level to help the program progress smoothly?

Marc GOLDSACK: On that I cannot comment on the specifics of commercial negotiations because I am not privy to that, generically though, I would just say don't be suprised that these discussions are difficult because the IP lies at the heart of this whole piece. It would take some robust discussions on both sides to work out what is a mutually beneficial outcome from it. And I said in the begining, for me the ideal outcome is both sides walk away with a win from this. You are never going to get a satisfactory joint venture when one side or the other feels that the IP has gone too far in the other direction. It has to be a shared output at the end of the day. And what you see being reflected in the more public arena, is simply the fact that these are very robust discussions. The offers that the British companies have put on the table are very good offers, they're sound and we believe there's a real strength to them and there's a real voracity to the depth of IP cooperation that is sitting behind that. I am confident that those discussions will continue, and I am sure that over the next couple of days we'll be having a lots of dicussions about that and I'm looking forward to them, because for me, that's where the sweet spot lies.

Defence Turkey: The UK has recently launched a new 6th generation jet fighter, Tempest. Would it be possible for Turkey to join the UK's next generation fighter program? Some countries already declared their interest to be a partner in that program.

Marc GOLDSACK: These discussions are on-going, and I look forward to hearing what people have got to say. The UK is always looking for international partners. I don't think its any different on the F-CAS piece. And again, if you bring it back to the opening points we were discussing on Intellectual Property, the real question is what are people bringing to the party? If we have substantive, genuine investment and deep research that starts to develop this leading-edge technology in a meaningful way there's absolutely a discussion to be had there.

Defence Turkey: What kind of collaborations do you think will emerge in the near future between Turkish & UK Defence Industries?

Mark GOLDSACK: Well if you look at the variety of companies that you come across at this show, there's a significant number of companies in aerospace. I would be very suprised if you didn't see some very interesting stuff float up from that. The discussions have

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always been ongoing with TF-X the stimulation from discussion from our own Program (Tempest) I think will also provoke some of those disucssions and help us try to map out where some of those relationships can go. So, I would expect a good strong conversation on aerospace.

Maritime, always an interesting space. We've got a large number of companies demonstrating there, not just pure maritime in terms of ships but also the systems and the aircraft that go with them, helicopters and so on, so I think there's some interesting discussions to be had there. We've got some very leading-edge technology there, world beating in fact. So, there's some interesting opportunities there and again if you bring it back to the purpose of these joint ventures is that everybody should benefit from it. It's not just about dominating production from one side or the other. So, I think the maritime space offers some very interesting opportunities.

Then in the land space, we've got a number of exhibitors with us who have a long history of providing power trains, a lot of the more sensitive ways of deriving availability into activity, and indeed a couple of service companies that also look at how you do test and evaluation, how you drive forward availability in a broad sense, all of which, when you put them together, make for quite a powerful offering to the system. So, I think from my brief walk around this morning everybody is looking forward to really a quite stimulating set of discussions on how we can take things forward.

What we are also looking for in that discussion is a two-way traffic. Because not only are we here selling, we're are also a buyer in our own right. And I think what you are seeing is the defence market starts to globalize better and joint ventures start to establish themselves, my challenge back to you is where is the Turkish supply chain that we can engage with? Because, when you look, we've already got a joint venture which is supplying into us, the British Army, when the Army marches on its boots, what's it got on its feet? Turkish boots. So, there's a two-way traffic here that we need to see come to life and so I would encourage you to encourage Turkish companies to approach us, to find those roots into the supply chain. I believe that Turkey has got some really competetive offers to make, those that pair up with our industrial entities. The quality of Turkish engineering, the depth of your labor market, the skill sets of your engineers, are all things that are valuable, and they just need to be brought together. And so, for us we are looking for that two-way piece. It's not just a one-way trade anymore in this game. It's absolutely about joint parntership.

Defence Turkey: Do you expect any new joint ventures in the near future?

Mark GOLDSACK: I cannot announce anything now, but I encourage you to discuss with these companies over the next 2-3 days, it is where this stuff is going. All of these companies have come because they have had engagements with their Turkish opposite numbers that have said to them this is an interesting conversation, this is somewhere we can really do business, and the operating environment which Turkey offers at the moment is one which they all find attractive. So, if you look at the show as a marriage making effort, everybody is interested in linking up. We need from that to have those industrial conversations with one another to find exactly where those hook ups are sweetest and to pick on those technologies, those projects, those endeavors where, with a reasonable amount of pace, we can create that growing momentum of the stuff that's already picked up and come along, and I hope over the next 2-3 days to be involved in those conversations and have a very different conversation with you in 2-3 days time once I have been fully educated myself on the potential of the Turkish market.

Defence Turkey: Will you also perform such conversations with the Presidency of Defence Industries (SSB)?

Mark GOLDSACK: Yes, the SSB obviously – but I have a list over 40 companies that I will personally be discussing with – my program is packed, from one end to the other with it. And that is something that I've always felt is important because if you don't cover the ground, you don't really understand the potential of the market and one of the really interesting bits of this is that there's a hook up at the OEM level with big companies, they will always find a match. The trick is can those companies that provide cutting edge technolgies, the smaller guys who tend to be the market leaders in what they are doing, can they find lodgings inside those big partnerships where you start to pull through some genuine development, for example there's a number of people that are offering that design capability into the system and looking at providing very very key subsystems for these projects. Whilst the top-level piece is fine and they'll have the big meetings, there's a large number of smaller companies as well, who in time will grow the next generation of commercial contracts.

Defence Turkey: Where do you see the relationship between the UK and Turkey in terms of Cyber Security?

Mark GOLDSACK: I don't think its overstating anything to say that every single government in the world is deeply concerned about cyber security. Its the most fast evolving and the most potentially threatening of any of the things that we face, and therefore every single government I know of is deeply concerned on how to deal with that threat. The things that we do know are that it is very difficult to deal with it head on, on your own, because it's a global problem, therefore, you need partners to deal with it. And where you've got not just a close strategic relationship but deep economic relationships, much broader than defence and we need to look at the relationship between Britain and Turkey not just in terms of the defence relationship, but the depth of the broader economic piece, our interests are absolutely aligned in trying to come up with common protection. Because we are all threatened by the same sets of cyber

destabilization tactics. So, I think for all of us its a really interesting conversation. Its also very different to bring it to life in the open press, because of the sensitivities are such that the technology, the details of the threats, the details of the counters and the solutions and the nature of the discussions taking place. I think it goes without saying that the cornerstone of the strategic relationship is to be able to discuss these things. Cyber is a strategic issue. It fundamentally affects any government across its whole broad range of operating issues, not just the defence economy piece, certainly not just the military threat piece, so as a strategic threat you require really really carefull strategic relationships to manage it, and its a challenge and all countries look at it and take it extremely seriously.

Defence Turkey: Is it possible for Turkish companies to meet the requirements of the UK Government and the UK Armed Forces? Have these questions come up on the agenda during your discussions with Turkish companies and the SSB?

Mark GOLDSACK: Absolutely, there's a constant discussion about it. In a previous job of mine, I used to work in our land requirements area, and we were in open discussion 6 or 7 years ago with Turkish companies on supplying into the British military supply chain. So, its a discussion that's been there for a long time, it's an established one and the trick of all of these is to make sure that when companies bid in, they're given the right introduction into the system so they can identify the opportunities in a timely manner and make their pitches accordingly, and my team here on the stand, stand ready to help with that process. They are ready to talk to any company that wishes to export to the UK, to invest in the UK. We are absolutely there to promote that as well. I'll bring it back to my opening comments. It's about a two-way relationship. Defence, security, cyber matter so much to countires, they have to be a mutual relationship. It's no longer a game of one-way dominance of the other. You have to work together in the space. Otherwise people get frustrated, they don't get what they need and the amount of national resources that is invested in this space needs to see a return back into the economy.

Defence Turkey: How do you view Turkey's economic situation? Do you think Turkey's current economic abilities create sufficient attractiveness for foreign investment and partnerships?

Mark GOLDSACK: The best answer that I can give to your question is you wouldn't see the 30 plus British companies here if they didn't think there was a secure investment platform. The companies speak for themselves much better than any government official can. And why? Because they are genuinely private companies. They're not here because the British Government has told them to be here. They're here because they can recognize a partner when they see one, they recognize a good investment when they see one and they they're all having substantive discussions with their Turkish opposite numbers that see a real genuine joint business opportunity out there. So, yep, things are rough in the world now, but it doesn't mean that there isn't opportunity or platforms to work in

by Saffet UYANIK

Behind the Crosshairs: Armoring Up with Remote Weapon Systems as the New Game Changers of Today's Battlefield

The Remote-Controlled Weapon Stations (RCWS) are modular weapon systems supporting small and medium caliber guns (5.56mm and 7.62mm), machine guns (12.7mm), automatic grenade launchers, and anti-tank missile launchers. These systems can be mounted on a wide range of land platforms ranging from lightweight vehicles to heavy armored fighting vehicles. Remote controlled systems allow the vehicle crew to operate the RCWS completely under armor, minimizing the probability of casualties. Remote weapon systems are equipped with powerful thermal and daylight cameras with high magnification and features gyro-stabilization for accurate on-the-move engagements. These features make the RCWS exceptionally suitable for urban warfare such as the military operations conducted by US forces in Iraq or mountainous regions such as Afghanistan.

The idea of a turret-mounted, remote weapons systems on vehicular platforms has increased tremendously over the last decade. RCWS is one of the most significant new weapons to appear in today's battlefield. Although the RCWS were a bit impractical when they were first introduced, they become a real lifesaver in a noticeably short amount of time. Before the introduction of RCWS turret gunners made up a considerable number of combat casualties. Without RCWS turret gunners, crews were too exposed to the attacks of adversaries. The need for a remote-control gun turret that worked effectively, dependably, and affordably emerged due to asymmetrical warfare tactics that conventional militaries are facing now, such as what was experienced of the United States in Operation Enduring Freedom (OEF-Afghanistan) and Operation Iraqi Freedom (OIF-Iraq). The rise of global terrorism, resurging regional conflicts, and humanitarian crises and the following political instability began to pose a virulent threat to national and international security. Because non-state actors almost invariably employ the techniques and tactics of asymmetric warfare, conventional forces need new capabilities to become successful in modern combat situations and post-conflict scenarios. This need is an extension of the armoring up and slimming down argument. As conventional militaries face more and more insurgent groups that know the local battlefield much better, this puts them at the mercy of these groups which have the luxury of setting up ambushes for vulnerable conventional forces. Countering these threats and gaining the upper hand, again, especially in a COIN fight, have made RCWS widespread and an essential part of counterinsurgency.

Since 2004 various countries developed Remote Control Weapon Stations (RCWS) to bolster their military capabilities and to bolster their troops in many conflicts around the world. Among these, the United States operates the largest fleet of multiple versions of vehicle-mounted remote weapon systems with over 11,000 units fielded around the globe. As technology advanced over 25 countries from Western Europe to the East, Asia has also followed this new trend and introduced their unique solutions.

Kongsberg PROTECTOR - The Common Remotely Operated Weapon Station (CROWS)

The Common Remotely Operated Weapon Station (CROWS) is a remote weapon station system used by the US military on its armored vehicles. The CROWS program began as an effort to quickly equip troops in Iraq with a highly accurate weapon system equipped with advanced sensors. The US military currently operates the M101 CROWS and M153 CROWS-II systems. The system allows operators to engage targets without leaving the protection of their vehicle. It is designed to replace the turret gunner on Humvees to improve combat effectiveness and it can be mounted on a variety of vehicle platforms. The CROWS system supports the 5.56mm M249 Squad Automatic Weapon (SAW), 7.62mm M240B Machine Gun, 12.7mm (.50 cal) M2 Machine Gun, and the 40mm the Mk 19 Grenade Launcher. The system is composed of a mount which is fixed to the exterior of the vehicle and the remote-control group. The gyro-stabilized mount is capable of a continuous 360° azimuth rotation and -20° to +60° elevation movement. The system incorporates a daylight video camera (3x, 15x, and 30x magnification) and a thermal camera (4.3x and 12.5x magnification). Both cameras use an eye-safe laser rangefinder, which allows the gunner to zoom in on targets. The sight systems can also identify targets up to 1,500 meters away.

The mount can absorb about 85% of weapon recoil and features a fully integrated fire control system that provides ballistic correction. This allows the gunner to see the threats around the vehicle and acquire and engage targets moving at 40 km/h (25 mph) with an estimated 95% accuracy rate while the vehicle is in motion. The cameras and the weapon on the system can also be used together or separately. The operator can scan an area while the weapon is pointed to another direction. This feature is especially used when observing a suspicious situation from a distance. The control group mounts inside the vehicle and includes a 15-inch

color monitor with live video from cameras, switches, and a joystick with an armrest for additional comfort and reduced fatigue during prolonged operations. The gun itself is controlled by a joystick which provides the gunner with full remote control of the weapon system, allowing the operator to control the weapon with just one hand. The weight of the weapon station varies depending on different armament modules. The M101 CROWS weights 135 kg (298 lb.) and the M153 CROWS-II weights 172 kg (379 lb.). Both systems can carry 96 rounds for the Mk 19,400 rounds for the M2, 1,000 rounds for the M240B, and 1,600 rounds for the M249. Each CROWS cost $190,000.

› **M101 CROWS:** The first group of CROWS was developed in conjunction with Recon Optical, Inc. (ROI) based in Barrington, Illinois. The US Army fielded 35 Recon Optical RAVEN R-400 RWS systems in early 2005 in Iraq and over 300 additional units by the end of 2006.

› **M153 CROWS-II:** In 2007, Norwegian defence contractor Kongsberg Protech Systems won the US$ 1 Billion CROWS II contract for the delivery of up to 6,500 CROWS systems to the US Army. The M151 PROTECTOR CROWS II is an improved variant of their PROTECTOR RCWS used on the Stryker M1126 Infantry Carrier Vehicle. As of February 2011, the US military has invested over $2 billion in production and has ordered over 11,000 systems for all services.

The US military uses more than a thousand M153 CROWS-II systems. The system has employed M1114 and M1116 up-armored HMMWVs, M93A1P1 nuclear, biological, chemical reconnaissance vehicles, Buffalo MRVs, RG-31 Nyalas, RG-33s, variants of the 8×8 M1126 Stryker wheeled APCs, Oshkosh M-ATVs, JERRVs, Caiman and MaxxPro MRAPs, and variants of the M1A2 Abrams main battle tanks.

M153 CROWS

Krauss-Maffei Wegmann - FLW Series

The Fernbedienbare leichte Waffenstation (remotely operated light weapon station) is a family of remote weapon stations produced by the German defence company Krauss-Maffei Wegmann. KMW initiated the development of the FLW Series in the mid-2000s to meet the requirements of the German Army Bundeswehr. The system can automatically detect fitted weapons with calibers of 5.56mm, 7.62mm, 12.7mm, and 40mm via a standardized interface after replacement and the weapon station adapts it's the ballistic tables in the fire computer accordingly. None of the three versions require penetration of the vehicle roof, which allows easier retrofitting of older vehicles with an FLW weapon station. The same weapon station, for example, can be moved from an MBT to a light patrol vehicle. All versions of the FLW feature electronic dual-axis stabilization, and both the weapon and the optics can be stabilized separately. Modular electro-optical sensor systems provide field surveillance and target acquisition by day, night or under poor visibility.

The system comprises a high-resolution CCD color camera with zoom, a powerful thermal imaging device (cooled or non-cooled), and a laser rangefinder. The FLW is operated from the inside of the vehicle and the operator can scan the surrounding area through the video feed of the thermal imager or the daylight camera on a 12-inch color screen. A multi-position operation capability was being implemented in 2013, which allows the output of the sensors to be shared on multiple screens, allowing more than one soldier to observe the area with the FLW's optics and to operate the weapon station. The high elevation aiming angle of the FLW 100 and the FLW 200 from -15° to +70° offers distinct advantages for urban combat and operations in mountainous terrains. The combination of highly advanced electro-optical sensors and stabilization guarantee a fast and precise reaction to threats, even when driving. The ammunition load depends on the armament and the loaded ammunition, while the E/O systems are fitted according to the customers' needs. The German Army has chosen the Rheinmetall LAZ 200 and LAZ 400L E/O systems for the FLW series. Both systems feature a thermal imager, a high-resolution day CCD camera, and a laser rangefinder. The LAZ 400L has an eye-safe laser rangefinder and a cooled thermal imager. Future improvements might include a counter for the available ammunition, an automatic cleaning system for the optics and the integration of networking with a battlefield management system and warning sensors. Additionally, the FLW remote weapon stations allow the adaption of ballistic armor protection and, command and simulation systems. A scan mode and new sensors (like a sniper detection system) can be integrated as well.

KMW-FLW 200

The Development of the FLW 100 series started in the mid-2000s. The slightly larger FLW 200 with greater weapon compatibility was designed shortly after. In 2008 the initial 230 light FLW 100 and 190 heavy FLW 200 weapon stations were delivered to the German Federal Office for Defence Technology and Procurement. Currently, KMW offers three versions of the FLW weapon stations, the FLW 100 for light vehicles, the larger FLW 200 and the heavy FLW 200+.

› **FLW 100:** The FLW 100 is the lightest version of the FLW family with a weight of only 80 kilograms (180 lb.) without ammunition and gun. FLW 100 does not require roof penetration of the vehicle. The FLW 100 has a maximum gun depression of -15° and a maximum elevation of +75°. It can be armed with a single 5.56 mm or 7.62 mm machine gun and is intended for combat ranges up to 1,000 meters (3,300 ft). The electro-optics of the FLW 100 are in a container mounted behind the ammo box, located left of the gun. The sensors include a CCD color camera with x10 magnification, which offers an identification range of up to 1.5 kilometers (0.93 mi), and an uncooled thermal imager with a 640x480 resolution. The identification range of the thermal imager is 1 kilometer (0.62 mi). For self-protection and non-lethal combat, the FLW 100 can be fitted with the Wegmann 40 mm protection system.

› **FLW 200:** In comparison to the FLW 100, the FLW 200 is heavier and has a slightly lower maximum elevation of only 70°. It is also heavier, weighing about 160 kilograms (350 lb.) without weapons and ammunition. However, unlike the smaller predecessor, the FLW 200 can be fitted with a 12.7 mm heavy machine gun, such as the M2 Browning, or with a 40 mm automatic grenade launcher. In the case of the German Army, the 40 mm GMW from Heckler & Koch is the preferred grenade launcher, while the M2 HMG or the new Rheinmetall RMG.50 are used as machine guns. The FLW 200 can hold either 100 or 200 rounds of 12.7 mm ammunition, depending on the size of the ammo box. For the 40 mm launcher, only a container for a total of 32 grenades is available. The heavier armament compared to the FLW 100 results in a combat range of up to 2,000 meters (6,600 ft). The electro-optics of

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the FLW 200 are in a container mounted at the right side of the gun, whereas the ammo box is located on the left side. The electro-optics include a color CCD camera with x10 magnification and a thermal imager, which is cooled unlike the one of the FLW 100. This increases identification range to 2 kilometers (1.2 mi). The FLW 200 can be fitted with six 76 mm Wegmann smoke grenade dischargers for additional self-protection of the vehicle. In 2013, the electrically driven Rheinmetall RMG.50 was being qualified for the FLW 200.

- **FLW 200Plus:** The FLW 200+ (FLW 200Plus) was first revealed at Eurosatory 2012. It is a modified version of the FLW 200, designed to handle even larger weaponry such as autocannons up to the 20 mm caliber. In the case of the prototypes, the FLW 200+ has always been presented with a Rheinmetall Rh 202 gun. The FLW 200+ was demonstrated on a GTK Boxer and a PMMC G5 from German FFG. The FLW 200+ is intended as a simple replacement and upgrade of the original FLW 200. None of the mechanical and electronic interfaces has been altered, making it backward compatible for upgrading vehicles fitted with the previous version. The FLW 200+ weights 475 kilograms (1,047 lb.) when fitted with the Rh 202 autocannon and 100 rounds of ammunition. The Rh 202 has a dual-feed mechanism, that allows the usage of 100 rounds of one type and 30 rounds of another type at the same time, with the possibility of switching the selected ammo type in between the shots. Compared to the FLW 200 the elevation arc has decreased to a maximum elevation of only +50°. The maximum depression of -15° stayed the same. The FLW 200+'s optics include a color CCD camera with x10 magnification and a cooled 640x480 thermal imager with two different fields-of-view, providing an identification range of over 2 kilometers (1.2 mi).

German Army Bundeswehr ordered more than 980 FLW 100 and FLW 200 remote weapon stations between 2008 and 2013. The FLW 100 and the FLW 200 have been fitted to versions of the Dingo 1 and 2, the upgraded Fuchs 1A8, the GTK Boxer, and Eagle. The FLW 200 was fitted to the Leopard 2 PSO and 2A7 prototypes. While the German version of the Leopard 2A7 is not fitted with an RWS, the Qatari Leopard 2A7+ tanks are fitted with the FLW 200.

Rheinmetall Fieldranger

Rheinmetall Fieldranger Family

The Rheinmetall Fieldranger family features an array of modular remotely controlled weapon stations (RCWS) for modern combat vehicles. Fully digital and stabilized, they are designed for use in a wide variety of missions and are compatible with all types of vehicles. With 24/7 operational capabilities, the Fieldranger family provides an extensive solution for high-precision engagement of targets while keeping the operator safe from enemy fire. The Fieldranger family currently comprises four different weapon stations.

- **Fieldranger Light:** Designed to be mounted on lightweight vehicles, the Fieldranger Light weighs less than 75 kg. It can be armed with a 5.56mm or 7.62mm machine guns.
- **Fieldranger Multi:** The Fieldranger Multi, with an empty weight of around 200 kg, is suitable for tracked and wheeled tactical vehicles. It can be fitted with a support weapon such as 12.7mm (.50 cal.) heavy machine gun or a 40mm automatic grenade launcher, enabling highly accurate fire even while on the move.
- **Fieldranger Dual:** Designed for medium and heavyweight platforms and weighing around 260 kg, the Fieldranger Dual supports a main armament as well as a coaxial secondary weapon. The Fieldranger Dual (formerly Nanuk-Dual) is a fully stabilized weapon station with long-range day/night all-weather sights and a laser rangefinder. Its versatile weapon cradle supports two weapons simultaneously. The main weapon can be either the 12.7 mm NSV-T, the AGS 30 mm AGL, or the 12.7 mm KORD. The coaxial weapon can be either the 7.62 mm PKT or the 7.62mm PECHENEG. Adaptor kits are available for other customer-specific weapons upon request.
- **Fieldranger20:** Finally, the Fieldranger20 is a compact and low-weight medium-caliber weapon station designed for mounting on light armored or special forces vehicles. It is designed for various applications such as security missions, fire support, and urban area combat. The Fieldranger20 is armed with a 20mm Oerlikon-KAE automatic cannon.

As an established, recognized supplier of remotely controlled weapon stations (RCWS) on the international market, Rheinmetall has integrated more than a thousand weapons stations for the Canadian Army, the French armed forces and the Belgian Army, to name but a few clients. Rheinmetall's remotely operated weapon stations enjoy a well-earned reputation for endurance under extreme conditions, ease of use, reliability, and precision.

Rheinmetall Fieldranger20

RAFAEL Samson (Katlanit)

The Samson Remote Controlled Weapon Station (RCWS), also known as Katlanit is a Remote Weapon System that enables a variety of weapons to be operated automatically or by remote control, including 5.56 mm, 7.62 mm, and 12.7 mm (.50 cal.) machine guns, 40 mm automatic grenade launchers, and anti-tank missiles. Globally integrated on thousands of fielded ground and naval platforms, RAFAEL'S Samson family of advanced RWS capitalizes on a deep understanding of emerging military needs. All the RWS elements utilize more than 90% tested and qualified Manufacturer Off-the-Shelf (MOTS) hardware and software. All these allow SAMSON to secure optimal operational capabilities while minimizing risks. RAFAEL'S Samson emphasizes crew survivability and safety as well as reduced environmental emissions and a low noise level inside the crew compartment to ensure better crew workload performance. There is a total of three variants of the Samson family:

- **Samson Jr. LRCWS:** The Samson Jr. LRCWS is a Lightweight Remotely Controlled Weapon Station, designed for use on Armored Fighting Vehicles (AFVs) and other vehicle types in which deck load must be kept to a minimum, such as trucks, ambulances and other 4- wheeled light vehicles. Weighing 60-75 kg (132-165 lb.), the system provides the host vehicle crew defensive fire capability without compromising the vehicle's internal space. The Samson Jr. LRCWS may host a 7.62 mm M240 General Purpose Machine Gun (NATO western standard) or 5.56mm M249 MINI-MI Machine Gun and their equivalents. Due to its size, it can also host sniper weapons and non-lethal weapons, making it suitable for paramilitary missions as well as military operations.
- **Samson Mini:** The Samson Mini is a high-performance remote weapon station designed use on light wheeled or tracked combat vehicles, fast attack boats and other platforms requiring improved offensive capabilities. The dual-axis, gyro-stabilized Mini has a low center of gravity for stabilization and weights 140-160 kg (310-350 lb.). This single-weapon RWS accommodates a variety of armaments including a 5.56mm SAW and LMG, 7.62mm GPMG and Gatling gun, 12.7mm HMG, 14.5mm, 40mm AGL, ATGM Launcher and ASM, fed by high-capacity magazines. Supported by a ballistics-protected multi-sensor Sight Pod, with a mechanism for super-elevation ballistic angle calculations, the SAMSON Mini provides a 'round-the-clock response to battlefield challenges. Safety-related movement and firing limitations are implemented using the ACS/FIS. The system's highly accurate target engagement, auto-tracking capabilities, and stabilization enable superior performance under the most adverse conditions. Also, the Samson Mini's open architecture allows for the addition of effectors, sensors, tactical information systems and the use of customer furnished equipment for an effective battlefield response.
- **Samson Dual:** The Samson Dual remote weapon station is a robust system that can be mounted on a variety of wheeled ground platforms and tracked armored vehicles. The Samson Dual provides the simultaneous use of a wide range of main and secondary armaments as well as an optional anti-tank missile launcher, giving the Samson Dual significant capabilities for a multi-mission response. The Mk II is lighter than manned turrets and does not require penetration into the vehicle hull, saving significant interior space. The in-hull reloading system provides reliable protection while enabling the crew to continue combat under armor for maximum lethality and survivability on the open battlefield and in close urban situations.

Produced by RAFAEL with more than 40 years of experience and integrated worldwide on thousands of fielded ground platforms, SAMSON family of advanced Remote Weapon Stations delivers high performance with superior survivability. The reliable and battle-proven, SAMSON RWS has been adapted to a broad range of tracked and wheeled platforms and accommodate diverse weapons and sensors for customers in more than a dozen countries.

Burevestnik - 6S21 remote-controlled weapon stations (RCWS)

Manufactured and developed by the Russian TsNII Burevestnik scientific-research institute, 6S21 remote-controlled weapon stations (RCWS) is designed as an armament system for armored combat vehicles and other special-purpose vehicles. The system can perform reconnaissance, battlefield surveillance and target recognition using TV and IR cameras and can engage both moving and stationary targets, using 7.62mm and 12.7mm machine-guns. The indigenous RCWS can be armed with a machinegun or an automatic grenade launcher (AGL).

The 6S21-01 RCWS is armed with a 12.7mm 6P49 Kord heavy machinegun, while the 6S21-02 and 6S21-03 armed with a 7.62mm Kalashnikov PKTM machinegun. The 6S21-01 can carry 200 rounds of 12.7x108 mm cartridges, while the 6S21-02 and 6S21-03 can carry 500 and 320 rounds of 7.62x54R mm cartridges, respectively. The 6S21-01 lacks the thermal imager that is integrated with 6S21-02 and 6S21-03 unmanned stations.

6S21 is expected to be used widely by the armed forces of the Russian Federation soon. It has already been integrated with the newest Russian armor, such as Kurangets-25 and Bumerang armored personnel carriers (APC). Burevestnik is also developing the marinized modification of 6S21. Burevestnik has developed three variants of 6S21.

6S21-03

Examples of Remote Weapon Systems Produced in Turkey

Turkey is one of the leading countries in the world, which operates a large fleet of remote-controlled weapon stations. Turkish Armed Forces, Gendarmerie General Command and Turkish National Police employ a high number of RAFAEL Samson RCWS mounted on Otokar COBRA armored vehicles and over 1000 Aselsan product RCWS on various land and naval platforms. Forming the backbone of the Turkish Land Platforms/Systems sector, defence industry companies such as Aselsan, Otokar, and FNSS manufactures high-tech and reliable remote weapon stations to cater for the requirements of the Turkish security forces and the militaries of the allied nations around the world.

OTOKAR - ÜÇOK & BAŞOK

Introduced for the first time at IDEF 2015, the ÜÇOK and BAŞOK remote weapon systems are lightweight and modular turret systems which can be operated with 14.5 mm/12.7 mm/7.62 mm machine gun or 40 mm automatic grenade launcher. Both systems have an optical suite composed of thermal sight, day sight and laser range finder providing 360° situational awareness and fire zone. The gunner can monitor and control the sight system inside of the vehicle.

- **ÜÇOK:** The ÜÇOK Remote Control Weapon Station is a stabilized machine gun platform which can be equipped with 12.7 mm/7.62 mm machine gun or 40 mm automatic grenade launcher. The weapon station has dual axes independently driven sight which is equipped with a thermal camera, a CCD camera, and a laser range finder. Independently driven sight allows the aiming while having the super-elevation and lead angles for accurate firing. ÜÇOK RCWS has an electrical drive, automatic ballistic calculations, and a stabilization system with automatic target tracking capability. Also, it can be operated manually from outside of the vehicle. In reconnaissance mode, while the gun is stationary; the target search can be realized by using cameras independently from the gun.

ÜÇOK RCWS

Otokar - BAŞOK RCWS

- **BAŞOK:** The BAŞOK Remote Control Weapon Station is a stabilized weapon station with a 7.62 mm machine gun which is designed for armored vehicles. The system is equipped with a CCD day camera and variable beam width projector along with the gun. BAŞOK has an electrical drive and stabilization system and capable of ballistic correction via stadiametric range determining system. BAŞOK can be operated manually on top of the vehicle.

FNSS - Armored Remote Weapon System (ARWS)

FNSS exhibited the Remote-Controlled Weapon System ARWS (Armored Remote Weapon System), for the first time at IDEF '19. The qualification process of the system was successfully completed in December 2018 and mass production of the ARWS system has started. The first customer of the system is a foreign user. Remote-controlled weapon systems, which are fielded extensively by the armed forces around the world, provide personnel safety thanks to their unmanned nature and the significantly increased hit rate with their firing control systems. FNSS states especially the military operations in urban areas clearly show that having ballistic protection is a critical necessity for these systems. Because these systems can be targeted by enemy fire or damaged by the debris and fragments in conflict zones and become unable to perform their functions. When faced with a similar situation, ARWS can continue its missions with high reliability thanks to its NATO STANAG 4569 Level 2 ballistic protection.

The ARWS system can be equipped with an M2 12.7 mm/.50 caliber machine gun, Mk19 40 mm automatic grenade launcher, M240 7.62 mm machine gun or FN MAG58 7.62 mm machine gun. ARWS can carry 300 12.7 mm bullets, 750 7.62 mm bullets, or 64 40 mm grenades. The system can be integrated into different types of vehicles, from 4x4 vehicles to main battle tanks. The system is capable of continuous 360° azimuth rotation and -20° to +60° elevation movement. The ARWS is also equipped with an uncooled thermal camera and high-resolution daylight camera.

FNSS entered the remote-controlled weapon station market, where there are plenty of alternatives, with an innovative solution, the ARWS. As stated by the company, FNSS received feedback from its users before developing the ARWS. FNSS analyzed the existing solutions in the market beforehand to see the extent of the requirements and came up with a system that features superior ballistic protection characteristics compared to other systems.

FNSS ARWS

Aselsan – STAMP & SARP FAMILY

Globally integrated more than 1000 of fielded naval and ground platforms, Aselsan's Remote Controlled Weapon systems are developed to meet the emerging requirements of modern armies. RCWS are primarily designed for use on naval platforms, armored military vehicles, 4x4 armored vehicles, armored patrol vehicles as well as for stationary use to serve for the defence of strategic assets according to tactical requirements. Deployed in Turkey and many countries abroad under adverse environmental and combat conditions, these robust weapon systems have high first-hit accuracy and auto-tracking capability for accurate shooting on-the-move. High stabilization performance and auto-tracking capability allow the gunner to keep his sights on target on-the-move. Additionally, RCWS family has automatic ballistic correction capability for the target distance, target speed, and route, meteorological conditions and ammunition type. The Aselsan RCWS family maximizes personnel security by utilizing computer-aided remote control.

- **STAMP:** STAMP is a remotely operated stabilized weapon station for small caliber guns. STAMP can be fitted with either a 12.7 mm Machine Gun or a 12.7mm GA-19/A Gatling Gun or a 7.62 mm Machine Gun or a 40 mm Grenade Launcher. STAMP configurations incorporate advanced features, such as remote operation, built-in electro-optic sensor system, day and night operation, automatic target tracking (detect, track and fire on the move) stabilized turret and ballistic computation. The infrared and daylight TV cameras of the system enable detection and recognition of targets that would not be possible with the naked eye. The system is capable of ballistic calculation and automatically tracking the targets and enabling a high hit probability by accurate firings. The STAMP System has a stabilized turret which always enables the line-of-sight of the gun to be aimed at the target. Due to the stabilization feature, the system can perform precise firings against stationary or moving targets while the platform is on-the-move. The system can be operated remotely by using the remote gun control unit and hence provides gunner protection against counter fire. The system has additional features of defining firing zones both in azimuth and elevation. STAMP System has a modular structure enabling easy installation on various naval platforms for asymmetric warfare and coastal defence.
- **STOP 25:** STOP is a new generation, cost-effective, medium caliber weapon system for naval platforms fitted with 25mm KBA or 25mm M242 Bushmaster Automatic Cannon. The system provides a lightweight, versatile and effective means of force protection for applications ranging from capital ships to patrol craft. The 25mm automatic gun has a single barrel with dual ammunition feeding. The optional High Accuracy Stabilized Gimbal (HASG) which can rotate in elevation and azimuth axes relative to turret can be integrated into the system. STOP has exceptionally high hit-and-kill probability with impressive firepower comprising of a two-axis stabilized turret containing an electro-optical sensor suite and fire-control software. STOP can acquire targets and engaging them autonomously either via the ship's Combat Management System or by use of own sensors. The optical sensor suite of STOP provides enhanced situational awareness and the ability to identify threats day or night, in all weather conditions. The high accuracy of STOP is achieved by using sophisticated stabilization algorithms and powerful servo drive/control system in both traverse and elevation enabling precision engagement on the target and fire execution under the coordination of a state-of-the-art fire control computer. STOP can detect, identify, deter, engage and destroy threats with a versatile sensors-weapon combination situated on a fully stabilized turret that can be operated from a remote control console Latest technology fire control capability enables STOP to auto-track a moving target while the carrier platform is stationary or moving.
- **SARP:** SARP is a remotely operated stabilized weapon platform for small and medium caliber machine guns and automatic grenade launchers. The platform combines high-precision reconnaissance and engagement capabilities with effective firepower while keeping the operator under armor or in a safe area away from counter fire. Through its extensive surveillance and remote-control capabilities, SARP enhances situational awareness of the gunner in his proximity while the vulnerability to attacks is decreased drastically. Depending on the operational requirements, SARP can be equipped with a 12.7mm machine gun, 40mm automatic grenade launcher or 7.62mm machine gun. The compact design of the system proves SARP perfect match for integration onto tactical vehicles, fixed surveillance posts, and towers. Stabilization, automatic target tracking, and advanced ballistic computation features provide fire-on-the-move capability against stationary and moving targets.
- **SARP-L:** SARP-L is a lightweight (less than 80 kg) and remotely operated stabilized weapon platform for low recoil weapons and provides exceptional capabilities against asymmetric threats. The platform combines high-precision reconnaissance with effective firepower while keeping the operator safe under armor. Depending on the operational requirements a 5.56 mm or a 7.62 mm machine gun can be interchangeably mounted to SARP-L Turret.
- **SARP-DUAL:** The SARP-DUAL is an extension of the existing Remote Weapon Station Family which includes the use of two coaxial weapons. Depending on the operational requirements, SARP-DUAL can be equipped with 7.62mm machine gun, 12.7mm machine gun or 40mm automatic grenade launcher as the primary weapon, and 7.62mm machine gun as the secondary weapon.

These systems allow soldiers to conduct operations during day and night under adverse environmental and terrain conditions with the help of the electro-optic sensors. RCWS is designed in compliance with military standards for both ground and marine applications including salt fog, temperature, humidity, etc. In close cooperation with defence forces worldwide, Aselsan RCWS is a mature and qualified product based on operational experience in combat zones

Leonardo's World-Class Technology and Industrial Collaboration Form the Heart of the Company's Offering in Turkey

Leonardo has worked with Turkey for many years, contributing to a number of important defence and security programs. Recently, the Company re-branded its in-country subsidiary as Leonardo Turkey Havacılık, Savunma ve Güvenlik Sistemleri A.Ş. (Leonardo Turkey Aviation, Defence and Security Systems Inc.). The new name highlights the subsidiary's focus on the needs of Turkey and its ability to provide a comprehensive defence and security offer to the country, which is seen as a strategic market in Leonardo's industrial plan.

The Turkish Armed Forces currently have access to growing budgets so will be looking to equip themselves with best-in-class products and systems. With this in mind, Leonardo stands ready to share its 70 years of experience and expertise in supplying state-of-the-art systems and technologies for Turkey's high-level requirements for defence, protection and security across a number of domains: air, land, naval, space and cyberspace. Leonardo is also an ideal industrial partner, looking to build mutually beneficial relationships in full coordination with the Presidency of Defence Industries (SSB).

Some potential areas for collaboration where Leonardo is already in discussion with Turkish industry relate to flagship Leonardo products such as the KRONOS radar family and VULCANO guided ammunition. These could both play a role in the modernization of Turkey's Armed Forces and Leonardo is also looking at ways of addressing the export marketplace in partnership with Turkish industry.

KRONOS radar systems are state-of-the-art products which can meet today's emerging threat scenarios, especially where armed forces need to improve security and response times while reducing manpower requirements. Offering high flexibility, operational modularity and reliability, the main role of a

KRONOS system is to detect, track and identify targets and to provide weapons systems with targeting data, including TBM (Tactical Ballistic Missile) defence capabilities. The radars can be easily deployed, deliver high performance for a number of operational uses, and are highly reliable with graceful degradation. They are multi-functional, multi-mission systems, which can perform surveillance and tracking tasks both simultaneously and independently.

This multi-functionality and ability to deliver multiple modes simultaneously is based on the KRONOS family's use of Active Electronically Scanned Array (AESA) technology. This has been developed in-house by Leonardo which boasts its own Gallium Arsenide (GaAs) and Gallium Nitride (GaN) manufacturing capability. AESA technology has become prominent in the radar marketplace due to the benefits it offers over traditional mechanically-scanned array radars. KRONOS radars also come with a stealth function, which limits the radar cross-section, making it less vulnerable to countermeasures. Both land and naval operations have benefitted from the introduction of AESA technology and Leonardo has been at the forefront of innovation in this area. The KRONOS family includes both land and naval variants.

KRONOS GRAND and KRONOS LAND are both designed for Land missions. KRONOS GRAND is a multifunctional radar system designed by Leonardo to support tactical air and coastal defence operations. The system simultaneously performs surveillance, target tracking and electronic counter-countermeasures (ECCM). It can detect and track all types of air and maritime threats and is easy to integrate into a defence surveillance network, contributing to the broader Recognized Air picture (RAP). KRONOS LAND is a very compact, flexible and fully autonomous radar system for tactical operations. It fits within an ISO container with a volume of just 20 square feet. It can be transported by standard commercial trucks, helicopters, aircraft, ships and trains, can be deployed on unprepared sites by two people and made operational in 10-15 minutes from its arrival on site.

KRONOS NAVAL, KRONOS GRAND NAVAL and KRONOS Power Shield are state-of-the-art naval variants. KRONOS NAVAL can equip naval vessels for applications such as point defence against threats, air and sea surveillance, littoral warfare, missile and gunfire support. The system can detect and track all types of air and maritime threat, such as high-speed missiles, low level unmanned aerial vehicles, helicopters, rockets and artillery blasts from offensive gunfire, vessels and small maneuverable surface targets. In addition, the Company is providing new operational capabilities which are deemed necessary for shipborne radars, for example Anti-Tactical Ballistic Missile (ATBM) capabilities, which are considered a priority by potential users due to the increasing use of these threats. KRONOS GRAND NAVAL is the most advanced multifunctional naval radar worldwide and, as with KRONOS Power Shield, is designed to cover the full spectrum of capabilities required in modern,

complex scenarios for ballistic missile defence and surveillance. Naval KRONOS family radars can be easily integrated into a defence surveillance network, contributing to the overall Recognized Air Picture (RAP). In addition, when integrated into a surface-to-air missile system, the radar can provide multiple missile uplinks simultaneously, providing information to allied forces and enabling complete interoperability in critical environments.

The KRONOS family of radars draws on Leonardo's experience in the development of multi-functional radar systems. To date, around 40 KRONOS radar systems have been delivered to customers including Italy (one of the Company's domestic markets) as well as South America, the Middle East and the Far East.

In the naval defence domain, the Turkish Navy is a key customer for Leonardo. Over the years around 60 naval defence systems, which include the 76/62 Compact, 40L70 Twin Compact and 30mm Micro Fire Control System (MFCS), have been provided for a range of naval units. For Turkey's Milgem follow-on corvettes Leonardo has been supporting the 76/62 Super Rapid naval gun, configured to use Strales guided ammunition. Meanwhile, Leonardo is proposing its 127/64 naval gun, configured to use VULCANO GPS-guided ammunition, for Turkey's TF-2000 class frigates.

VULCANO is a family of guided ammunition developed by Leonardo with Diehl Defence under an Italian-German government agreement. Variants include the VULCANO 127mm for navies and the VULCANO 155mm for land-based artillery, transforming indirect fire. Both calibers have completed qualification in accordance with STANAG 4667 and are ready for the market. The baseline versions of both include GPS based guidance and Height of Burst (HOB) sensors. The armed forces of several nations have expressed interest in the range and performance of VULCANO. In Turkey, the current focus is on VULCANO 155mm for the Turkish Army, and discussions are ongoing with local manufacturers for possible collaboration and local production.

VULCANO ammunition's combination of IMU-GPS navigation with Semi-Active Laser (SAL) or Far-Infra¬red (FarIR) sensors enables it to engage even small stationary and moving targets with direct hits at extended ranges. The naval ammunition features flight sequences which comprise a Ballistic Flight Path involving initialization and GPS acquisition, a Glide Path with Mid-Course GPS navigation and Terminal Homing including SAL Mode, Far Infrared (FarIR) mode or GPS as backup. VULCANO 127mm Guided Long Range (GLR) can achieve a range up to 85 km fired from a 127mm/64 cal. naval gun mount. It is equipped with either SAL (for semi-autonomous Terminal Homing missions), FarIR (for autonomous missions against Targets with an IR-Signature) or Height of Burst (HoB) sensors (for GPS Guidance towards pre-programmed coordinates). The mission spectrum of the VULCANO 127mm includes Naval Fire Support (NFS) and Anti-Sur¬face Warfare (ASuW).

VULCANO 155mm GLR

VULCANO 155mm BER

For land requirements, VULCANO 155mm performs flight sequences which encompass a Ballistic Flight Path involving Initialization and GPS Acquisition, a Glide Path with Mid-Course GPS Navigation and Terminal Homing with SAL mode or GPS as backup. VULCANO 155mm GLR land artillery ammunition relies on GPS Mid-Course guidance and a HoB Sensor for optimal performance against various targets.

VULCANO 155mm GLR can achieve a range up to 70 Km fired from a 155/52 cal. system. It can also be equipped with Semi-Active Laser (SAL) sensor in the Terminal Homing phase for pin-point engagement of stationary or moving ground targets. SAL Terminal Homing also eliminates target location errors. Laser designation is achieved by the human-in-the-loop Joint Fire Support Team (JFST) and offers the possibility of aborting a mission. Combining a laser sensor with a high-performance prefor¬med-fragmented warhead (PFF) featuring insensitive munition characteristics (IM), strongly enhances the capability of accurate target engagement. For land applications, a VULCANO Programming Unit (Integration Kit) and a portable Fire Command Unit (stand-alone) VULCANO 155GLR are provided

Seen and Heard at the International Paris Air Show 2019

by İbrahim SÜNNETÇİ


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TRANSFERRING
THE FRENCH ARMED FORCES KNOW-HOW
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The 53rd edition of the International Paris Air Show, which is organized every two years by the SIAE, a subsidiary of GIFAS, the French Aerospace Industries Association was held from 17 to 23 June 2019 at Paris' Le Bourget Airport. The event spans seven days including four trading days for industry members and three days open to the public. The International Paris Air Show is one of the oldest and largest air shows in the world. Since it takes place biennially, the 54th edition of the show will take place in June 2021 in Le Bourget

Held on an internal and external area spanning over 125,000m2, including 52,000m2 of stands, 335 Chalets representing 35,000m2 of built areas and 38,000m2 of exhibitor outdoor space and buildings. The International Paris Air Show welcomed a record number of exhibitors with more than 2,453 exhibitors/companies from 49 countries. International exhibitors represented more than 50% of the numbers and came mainly from the following countries: 360 U.S., 141 Germany, 141 Italy, 103 UK and 83 Belgium. There were 1,185 French exhibitors from 12 French regions (they displayed their products and solutions at Hall 2 and Hall 4) and 1,268 international exhibitors from 48 countries. At the 2019 Paris Air Show 26 National pavilions were erected. During the show, in total, contracts valued at US$ 140 Million were signed.

Over the seven days, the 2019 International Paris Air Show attracted 316,470 visitors of which 139,840 were professionals (40% from outside France representing 185 countries) and 176,630 were general public visitors, as well as 2,700 accredited journalists from 87 countries. The show hosted a total of 276 Official Delegations from 98 countries and 7 International Organizations, including 171 Official Defence Delegations from 88 countries and 7 organizations (AED, GCC, G5 Sahel, NATO, UN, EU and OCCAR, including 16 Foreign Ministers, 48 Chiefs of Staff and 18 Vice Ministers or Secretaries of State) and 124 Civilian delegations.

At the 2019 Paris Air Show 140 aircraft were presented including 36 in flight presentations. Among them, new products and aircraft that have left their mark on history: the Airbus A330 NEO, the Boeing B789-9 and KC46, the Bombardier Global 7500, the Lockheed Martin F-35A JSF, the Kodiak 100 from Daher, the Rafale and Falcon 8X from Dassault, the KC-390 and Praetor from Embraer, Textron with the Quote Latitude, the Alpha Electro Pipistrel presented by DGAC, Russian Helicopters and its Ansat, Turkish Aerospace with the T129 ATAK and the commemoration of the 75th D-Day anniversary of the landing of the C47 THAT'ALL BROTHER and the C53 D-DAY DOLL!

The Show was inaugurated on Monday 17 June by the French President, Emmanuel MACRON. Prime Minister Edouard PHILIPPE came to the Show on Friday 21 June, when it opened to the general public. Nine French Ministers and Secretaries of State and numerous key figures in French politics also visited Paris Air Show 2019.

Turkey's Participation at the 2019 International Paris Air Show

Eight Turkish Defence & Aerospace Industry companies had booths at the 2019 International Paris Air Show including Aselsan, Roketsan, TUSAS Engine Industries (TEI) and Turkish Aerospace (TUSAS). Turkey's presence was headlined by TUSAS, which unveiled a full-sized mock-up of its next generation fighter the National Combat Aircraft (abbreviated MMU in Turkish), which is also known as the TF-X (Turkish Fighter – Experimental) with mock-ups of air-to-air and air-to-ground weapon systems on 17 June 2019 at the show. TUSAS also displayed its ever-growing product range including a full-scale mock-up (indeed a ground prototype of the aircraft) of the HürJet New Generation Advanced Jet Trainer (AJT) & Light Combat Aircraft (LCA), which TUSAS hopes will replace the T-38M jet trainer fleet in the service of the TurAF, the T625 GOKBEY Turkish Light Utility Helicopter (TLUH) and the ANKA MALE UAV as well as small scale models of the HürKuş Basic Trainer and the Light Attack Aircraft, Airborne Stand of Jammer (Air SOJ), the 10-ton class Multirole Utility Helicopter and the twin-engine ANKA-AKSUNGUR MALE Class Armed UAV. During the 2019 Paris Air Show

TUSAS signed a contract with Avio Aero, a GE Aviation business in Italy. Under the contract Avio Aero will manufacture parts for the main gearboxes & tail rotor of the T625 GOKBEY TLUH in its facilities located at Torino, Italy. At the show a Letter of Intent (LoI) was also signed between TUSAS and Eurojet Turbo GmbH for the delivery of EJ200 turbofan engines (single engine configuration) to power HürJet prototypes. The LoI was signed by TUSAS President & CEO Temel KOTİL and EuroJet CEO Clemens LINDEN. Since the EJ200 turbofan engine, which is considered to be the benchmark in the 20,000lb thrust class military engine market, was specifically was designed to power the twin-engine Eurofighter Typhoon, two major modifications should be done on the EJ200 to convert it into a single engine fighter engine.

TUSAŞ Revealed a Mock-up of the Turkish Fighter

During the Paris Air Show, on 17 June 2019 TUSAS unveiled a full-sized mock-up of its next generation fighter, the MMU/TF-X, or Turkish Fighter (TUSAS, refers to this program as Turkish Fighter [TF] and exclude the X at the end of its title with an emphasis that it is no longer an Experimental aircraft). Speaking at the aircraft presentation regarding the one-to-one mock-up of a Turkish Fighter, TUSAS President & CEO Temel KOTİL said that when it enters into service, the Turkish Fighter will be "the best fighter in Europe" and capable of carrying the long-range, air-to-air METEOR missile of the European manufacturer MBDA. "We have increased our speed ... We have enough strength to build this fighter," he added. Previously, the company had revealed its intentions to fly the Turkish Fighter in 2026. However, during his address, TUSAS President & CEO KOTİL disclosed that the aircraft would be completed in 2023, with first flight in 2025 and the next generation fighter will enter the service of the Turkish Air Force (TurAF) in 2028. "Once we develop the Turkish Fighter, we will become the world's fourth country to have this type of aircraft. Meanwhile; Japan, the Republic of Korea, Iran and India are also working on similar projects. So, there is a competition between countries," KOTİL added. The ceremony 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 TUSAS and various Turkish sub-contractors on the MMU/TF-X Program, and Malaysia is one of the potential candidates for this role.

The MMU/TF-X, or Turkish Fighter will be a single-seat, twin-engine combat aircraft (based on the FX-1 concept) with Low Observability and Super Cruise capabilities and is to be equipped with indigenously developed systems and sensors. Replacing the F-16C/Ds currently in the service of the TurAF during the first quarter of the 2030s, the Turkish Fighter will be a fifth-generation indigenous air superiority fighter with secondary ground attack capability, which will escort and provide air protection to the TurAF's F-35A Lighting II fleet. The TurAF currently operates 238 F-16C/D aircraft and Turkey is likely to procure some 150 TF-Xs in the long term to replace the F-16s. According to TUSAS, the Turkish Fighter will measure 21 meters (68,89ft) long, have a 14-meter wingspan, height of 6 meters and a maximum takeoff weight (MTOW) of 60,000lbs+ (27,215kg+). It will also have a maximum altitude of 55,000+ feet, and a combat radius of 600+ nautical miles. The Turkish Fighter will have a maximum speed of Mach 18 while running on two engines (each generating 27,000lb thrust).

In every aspect of size – height, weight, wingspan, – the Turkish Fighter is bigger than the existing 5th Generation fighters including F-22, F-35, Su-57, J-20 and KF-X. Nevertheless, the overall design of the Turkish Fighter mock-up bears similar features (such as twin-engine and canted vertical tail design) to the F-22 Raptor and the F-35 Lightning II stealth fighters, but with a narrower and longer fuselage and a wider wingspan.

Even if it will be an all-weather, multirole fighter the MMU/TF-X's primary role will be air-superiority. Like the F-22 Raptor air superiority fighters the MMU/TF-X also has both cheek and ventral internal weapons bays. The ventral internal weapons bay can hold up to four launchers for medium/long range (Beyond Visual Range) 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 air-to-air missiles.

Temel KOTİL - President & CEO of TUSAŞ

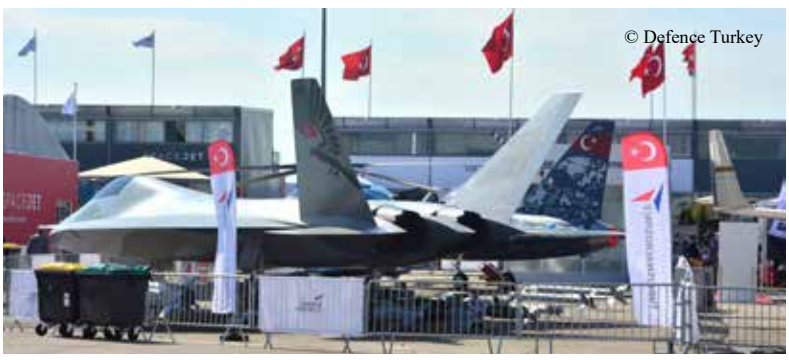
The Turkish Fighter will also have new generation features including Low Observability, High Maneuverability (to be better than the F-16), Internal Weapon Bays, Increased Situational Awareness, Interoperability with AEWs, UCAVs and AARs, Super Cruise, Advanced Avionics for Sensor Fusion and Independent 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 an Integrated Electro-Optical Targeting System (which abbreviated BEOS in Turkish and will have similar function with the Electro-Optical Targeting System [EOTS] on the F-35), a 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. As of June 2019 Aselsan, has already been contracted to develop the indigenous

Turkish Fighter - TFX

AESA Radar, BEOS, IRST System and EW Suit. Negotiations regarding the Integrated Cockpit Display System (panoramic cockpit display) and HMDS are currently ongoing. TUBITAK, on the other hand, has been contracted for the development of the Integrated Processing Computer (Mission Computer).

Within the course of the Turkish Fighter development program, new capabilities and equipment will be added to the aircraft under a "Block Development Approach". In each Block, the level of local content ratio will also be increased. The first Turkish Fighter prototype will be in Block-0 configuration and is expected to be rolled-out in 2023, when Turkey will celebrate its 100th anniversary of the founding of the Republic. Following the ground tests, 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-I prototypes will be in air superiority configuration and the first aircraft that enters TurAF service in 2028 will be in Block-I configuration. The TuAF will achieve/declare IOC with Block-I Turkish Fighters. According to TUSAS, the TurAF originally planned for the first entry into service to occur in 2029 but since the company has accelerated its efforts, the entry into service date was able to be moved to an earlier time. TUSAS will start Block-II deliveries in 2031 and following their entrance into TurAF service FOC will be declared. The Turkish Fighter Block-IIs, multi-role model with air superiority plus air-to-ground capabilities, will feature increased local content share thanks to their indigenously developed engines, sub-systems and avionics.

According to TUSAS, engineers taking part in Turkish Fighter 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, however during the 2019 Paris Air Show it was reported that there will be five Turkish Fighter prototypes. 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 TUSAS President & CEO Temel KOTİL disclosed that they have ordered 5 turbofan engines from General Electric (GE) and at the moment they are in a delivery state. "We will use F-16 engines (probably the F110-GE-129E version due to twin engine configuration) in the first prototypes of the TF-X in the first flights. Development of the indigenous turbofan engine is continuing" KOTİL added. We estimate that four of the engines will be installed on two of the Turkish Fighter prototypes and the fifth engine will be used as 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%], TUSAS [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 SSB President Prof. İsmail DEMİR 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. SSB President DEMİR 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 8 November 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. 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 the F110 Turbofan Family.



Roketsan and Micro Satellite Launch System (MUFS)

Roketsan displayed the scaled (1/10) model of the MSLV at its stand during the 2019 Paris Air Show. The contract for the Micro Satellite Launch System (MUFS/MSLV) Development Project between the Presidency of Defence Industries (SSB) and Roketsan was signed on November 5, 2018. When the project is over, micro-satellites of 100kg and below can be placed in Low Earth Orbit (LEO) at an altitude of at least 400km. With this project, Turkey will acquire capabilities, that only leading countries in the world possess, such as a satellite launch, testing, and manufacturing infrastructure and the ability to establish launch sites.

Under the contract, Roketsan will develop a three-stage Micro-Satellite Launch Vehicle (MSLV) and will establish the Test/Production Facilities and a Launch Site. The MUFS/MSLV Development Project has a 7-year schedule and as of June 2019 seven months of the schedule already have passed. According to schedule, in 2025 Roketsan will execute a mission demo with the MSLV and to install a micro satellite into its LEO orbit. Currently the Conceptual Design Phase of the project is ongoing. In this context Roketsan engineers are carrying out Loss & Gain analysis on several MSLV conceptual designs, one of which will be selected within the scope of this phase and then the Detailed Design Phase will be initiated.

The Roketsan MSLV will consist of three stages; including a solid-propellant motor cluster (with three rocket motors) in the first stage, a solid-propellant rocket motor in the second stage, and a liquid-fueled rocket motor (will operate at 100-120km altitude, beyond the Earth's atmosphere, and take satellite/s up to 400km altitude/orbit) in the third stage. The satellite itself will be enclosed in a metal shield known as a fairing during the third stage. The fairing provides protection to the satellite while it is being launched and makes it easier for the launch vehicle to travel through the resistance of the Earth's atmosphere. When the satellite reaches above the Earth's atmosphere, the fairing splits apart and burns up in the Earth's atmosphere. Measuring 25m in height, the Roketsan MSLV will have a lift of mass of 35 tons.

The MSLV Launch Site will include centers and facilities such as a Launch Ramp, Umbilical Tower, Mobile Integration Tower, Launch Control Center, Mission Control Center, Flight Termination Ground Station, Data Collection, Evaluation, and Analysis Center, Tracking Radar, Fixed Telemetry Antenna, Solid-Propellant Stage Assembly, Integration and Test Facility, Fairing Assembly, Integration and Test Facility, Propellant-Loading Facility and Propellant Storage Area.

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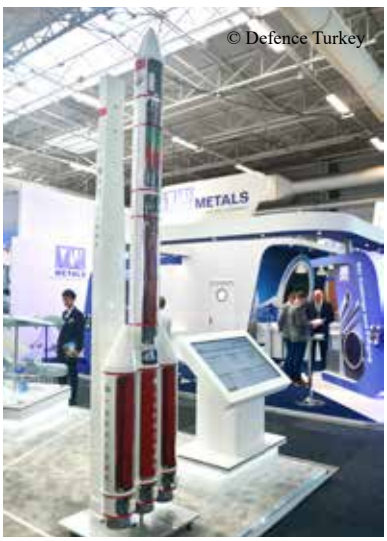
Roketsan was also awarded a contract by the Turkish MoND for the development of the National Satellite Launch System (SLS), which also covers the development of a National Satellite Launch Vehicle (SLV) with an expected capability of placing a payload 1.5 tons into a Sun-synchronous orbit at an altitude of 700km for launching locally designed and manufactured satellites into orbit as well as the foundation of the Satellite Launch Center. The National SLS Project was initiated on July 17, 2013. According to the 2015 Annual Report of the Turkish MoND, the SLS Project called "SIMSEK" (Lightning) aims to support the sustainability of current and planned satellite programs and provide independent access to space, when considering Turkey's current and subsequent satellite needs. With the establishment of the necessary technological infrastructure in this field, it is planned to launch a satellite with the required qualifications from the year 2023 with the national SLS and to be placed into its orbit.



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The SIMSEK SLV, will consist of two separate stages, each with a liquid-fueled rocket engine. The first stage will incorporate liquid-fueled rocket engine cluster and Oxidizer Tank, while the second will hold a liquid-fueled rocket engine and Fuel/Oxidizer Tank. The Satellite will be carried within the Payload Fairing, which is located in the nose section. Measuring 35m in height the Roketsan SLV will have a lift of mass of 160 tons and its main rocket engine will have a diameter of 2.5m.

Under the signed contract, the studies within the frame of the Pre-Conceptual Design Period (Period-I) carried out by Roketsan as the Main Contractor, were completed as of January 2015. In the meantime, alternative roadmaps were determined in order to reduce the risks during the Design and Development Period and to acquire critical technologies for satellite launch systems at a maximum level. As part of the alternative roadmaps study carried out by the SSB Department of Air Defence and Space, technical support from abroad or international cooperation in Period-II were also evaluated. The planning activities for the Design and Development Period (Period-II) are still in progress.

The National SLV will be able to place a payload of 1.5 tons into a Sun-synchronous orbit at an altitude of 700km and will be used for launching locally designed and manufactured Communication Satellites and EO/SAR-based Earth Observation Satellites into orbit. Thanks to the National SLV, indigenously designed and manufactured satellites can be placed into low-earth orbit (LEO) without any restrictions.

Leonardo Unveils its Largest-Ever UAV; The Falco Xplorer

On June 17, at an unveiling event at the Paris Air Show, Leonardo introduced its latest, third iteration of its Falco Unmanned Aircraft System, the Falco Xplorer.

It is a 9-meter-long, 18.5-meter-wingspan aircraft with a maximum takeoff weight of approximately 1.3 tons, a maximum useful payload capacity of 350kg, intended to operate at 24,000ft, and with a notional endurance of 24 hours. Powered by a 115hp (can be upgraded to 130hp) Rotax 914 engine the Medium Altitude Long Endurance (MALE) Class Falco Xplorer UAV is expected to enter its launch customer's (Italian Air Force) service in 2020. According to Leonardo, the Falco Xplorer UAV can climb up to an altitude of 30,000ft with a 200kg payload and can execute its mission at altitudes of 21,000 to 24,000ft with a payload of 350kg. The aircraft is not equipped with a de-icing system.

Even though the weaponization of the aircraft is possible, according to Leonardo since the Falco Xplorer UAV is aimed to provide Intelligence, Surveillance and Reconnaissance (ISR) capability over land and sea, their overall design roadmap does not include any plan to install a weapon payload on the aircraft. The Falco Xplorer UAV is equipped with both a C-Band radio Line of Sight (LoS) communication system with a command/control range of 200 to 250km and a Ku-Band satellite communications (SatCom) capability for beyond radio line of sight operations. Featuring a V-shaped tail boom, a pusher propeller, retractable landing gears and an automatic take-off and landing system, the Falco Xplorer UAV's baseline fit-out includes the Lightweight Electro-Optical Space Sensor (LEOSS) in a 15-inch turret, a Gabbiano T-80UL (Ultralight) multimode synthetic aperture radar that can undertake mapping and ground moving target indication, a SAGE digital Electronic Support Measure (ESM) and Electronic Intelligence (ELINT) System for Radio Frequency (RF) ISR missions and an automatic identification system (AIS) for maritime use. The Falco Xplorer UAV can also be fitted with the Leonardo Spider COMINT System. Leonardo can also flexibly modify the sensor suite in-line with

customer requirements, including integrating third-party sensors. The sensors will be integrated through Leonardo's powerful mission management system, which draws on the Company's experience in both the manned and unmanned domains and includes protection from cyber-attacks as standard under the Company's 'secure by design' philosophy. The platform's Ground Control Station (GCS) allows operators to control the aircraft and its sensors and incorporates data exploitation tools, enabling the dissemination of useful information to wider C5I systems. It also provides mission data analysis, mission planning, training and simulation capabilities.

According to Leonardo its technical characteristics place the Falco Xplorer UAV within the Missile Technology Control Regime (MTCR) Class II Category and since the system is entirely designed and manufactured in Europe, it is not subject to International Traffic in Arms Regulations (ITAR) restrictions.

As of June 2019 Leonardo, already completed the manufacture of first Falco Xplorer prototype and is performing ground tests with the aircraft. Leonardo was expected to execute first flight test with Falco Xplorer UAV in June from Trapani Airport in Italy. But the Company did not issue any news on this expected maiden flight as of July 2019. A series of trials will take place throughout the year and the aircraft is planned to be qualified by the end of 2019. The Falco Xplorer UAV could then be delivered to its launch customer (the Italian Air Force) during the first half of 2020.

Leonardo also has a plan to offer the Falco Xplorer UAV on a leasing model. Speaking to Defence Turkey at the 2019 Paris Air Show, a Leonardo official provided following information on the program, "The existing Falco UAV users have said that they are interested in a platform that had more sensor/payload capability and that had longer endurance. The Falco Evo has SatCom, but this has SatCom and 24-hour endurance. Because we are working closely with customers on the Falco Evo, we talk to them, we know what kind of things they are asking for, and what they are asking for was more endurance, more payloads to be able to do different missions. It's not just people wanting to buy it. So, the important thing is that it's a service that we offer as well as a platform. You can buy one obviously, but you can also hire us to provide just the sensor data, or just the information. So, Leonardo builds, owns and operates the system and the sensors and then deliver just intelligence to the customer, which is similar to the model that we use with the United Nations for the Falco Evo".

RAS Debuts PN's Second ATR-72/500 MPA at the 2019 Paris Air Show

Germany-based aircraft Maintenance, Repair and Overhaul (MRO) company, Rheinland Air Service (RAS) introduced the Pakistan Navy (PN)'s second ATR-72/500 Multirole Maritime Patrol Aircraft (MPA) with ASW capabilities, which is now known as the RAS 72 Sea Eagle, to the general public at the 2019 Paris Air Show.

The aircraft had previously been in service with the PN as a transport aircraft but has been converted into an MPA configuration at RAS' facilities in Mönchengladbach, Germany under structural modification work which lasted 12 months. RAS handed over the second aircraft to the Pakistan Naval Air Arm in late June 2019.

Pakistan awarded a contract to RAS in 2015 to convert two refurbished ATR-72/500s into MPAs. The work began in January 2016, following the release of export permits by the German Government. The first RAS 72 Sea Eagle MPAs, which were handed over by RAS in June 2018, re-entered service with the PN on 12 December 2018 in a ceremony held at the PNS Naval Air Station Mehran in Karachi. The structural modification work on the first ATR-72/500 aircraft lasted 15 months. According to RAS as of June 2019 the first RAS 72 Sea Eagle aircraft in PN service performed over 300 missions which lasted 500+ flight hours. According to RAS, the PN has the intention to convert three more ATR-72s into MPA configuration but it depends upon budget allocations.

The RAS 72 Sea Eagle Multirole MPA with ASW capabilities is equipped with the Leonardo Seaspray 7300E Active Electronically-Scanned Array (AESA) radar, Elettronica ESM/ELINT suite, FLIR Systems Star SAFIRE III high definition electro-optical and infrared (EO/IR) turret. The platform also features an Acoustic Processing System, Sonobuoy Launching System, Chaff and Flare Dispensing System, Ku-Band satellite communications (SatCom) system, AIS transponder, Direction Finder, IFF, a PN specific indigenous data link system and two weapon hard-points for Italian lightweight ASW torpedoes enabling anti-submarine warfare (ASW) and maritime patrol capabilities. According to RAS officials, thanks to its modular concept the operator consoles onboard the RAS 72 Sea Egle MPA can be pulled out from the cabin within 2 hours. RAS officials also underlined that the platform features a semi glass cockpit and uprated engine (which offers the same performance as the ATR-72/600 version).

The sensors onboard the aircraft are integrated through the Aerodata AG's AeroMission Mission Management System running on four multifunctional operator consoles. The AeroMission Mission Management System includes a sensor fusion algorithm and can compile feeds from each sensor to build a complete situational awareness picture for the crew. Due to its onboard communications abilities the RAS 72 Sea Eagle is able to transmit all the information captured on-board in real-time to the dedicated command center.

Cobham Mission Systems Have Agreed on a Joint Market Approach with Rafael and Diehl Combining Their Launchers with the Latest Missiles

With over 50 years' experience as a leading supplier of Weapons Carriage and Release (weapons suspension and release) systems, Cobham is instrumental in the advancement of weapons release technology for the Air Forces and Navy's of many foreign governments. Cobham products offer superior design and integration capabilities across a range of solutions, including; Missile Launchers, Bomb Racks, Ejection Launchers, single and multi-rack with both Pneumatic and Pyrotechnic activation. Cobham combines low-weight with high-performance, reliability, maintainability and low through-life costs. Cobham's Air-to-Ground Weapons Carriage and Release products for combat aircraft include a range of rail-launchers and bomb racks which are compatible with a wide selection of smart and dumb munitions including Small Diameter Bomb, Brimstone and Hellfire missiles. Cobham's Air-to-Ground Weapons Carriage and Release systems are available for single or multiple weapons carriage applications in a range of configurations to suit all customer needs. The company's bomb racks feature pyrotechnic, pneumatic, or release systems of stores from 250lbs to 3,500lbs in single, dual and triple rail launcher configurations. Cobham also has practice bomb carriage systems for use in training environments. Cobham's Air-to-Air Weapons Carriage and Release equipment plays a key role in the facilitation of Defensive Counter Air (DCA) and Offensive Counter Air (OCA) missions. Cobham's Air-to-Air weapons carriage and release products (comprising Air-to-Air Missile Eject Launcher [MEL] and Air-to-Air Missile Rail Launcher) are compatible with short range, Medium range and beyond visual range missiles including; AIM-9, ASRAAM, IRIS-T, A-Darter, AMRAAM and Meteor.

The company senior representatives shake hands in regard the arrangement in the Rafael chalet, Cobham team on the right and the Rafael team is on the left

Developed to meet the highly dynamic modern fighter jet manoeuver environment, the lightweight and ITAR-Free Air-to-Air Missile Rail Launcher Fox-10 is the principle design for Cobham's Advanced Missile Launcher Family. Weighing just 33kg the Fox-10 has a forward umbilical connection and is designed to carry both Short-Range Air-to-Air Missiles (SRAAM) and some Beyond-Visual-Range Missiles (BVRAAM) up to a missile mass of 125kg. The Fox-10 Advanced Missile Launcher is suitable for fast jets, rotary wing and unmanned air vehicles and its lightweight design is ideally suited for carriage on pylon stations in either a single or twin mount configuration. The Fox-10 Air-to-Air Missile Rail Launcher is also suitable for installation at the wing-tip, within side weapons bays, with UCAV platforms and on rotary wing aircraft.

Cobham introduced its brand-new Air-to-Air Missile Rail Launcher Fox-10 for the first-time during the 2019 Paris Air Show and has agreed to non-exclusive arrangements with Rafael and Diehl to combine their missile capabilities with its Advanced Missile Launcher Family. Cobham has also offered Fox-10 as part of the SARE solution for TF-X (Turkish Fighter) Program. TUSAS is also looking for twin missile mounting adaptor for the heavy rail launchers, which Cobham is also bidding for. SARE is the abbreviation

Fox-10 Advanced Missile Launcher fitted to the Diehl's IRIS-T SRAAM displayed at Diehl stand

used in Turkey for Suspension and Release Equipment – which Cobham calls it Weapons Carriage and Release (WC&R) Equipment. Main Contractor TUSAS will soon launch an international tender to procure an undisclosed quantity of Suspension and Release Equipment (SARE) for integration onto Turkish Fighter prototypes and production aircraft. The SARE solution for TF-X refers to the suite of equipment required to meet the requirements for carriage and release of a variety of weapons and stores in a variety of locations inside and outside the aircraft. According to sources the proposal is also covers an option for co-design and co-production of some launchers in Turkey. Cobham, which also secured a contract in August 2017 to provide Missile Eject Launchers for the South Korean KF-X fighter aircraft is one of the bidders for this tender.

On 17 June 2019 as the world's leading supplier of critical control solutions Cobham Mission Systems (CMS) have agreed with Rafael Advanced Defence Systems which develops, produces and delivers Air-to-Air (A2A) missiles for more than 65 years, to a non-exclusive arrangement that will enable a joint approach to combine Rafael's missile capabilities with Cobham launchers. The company senior representatives Mr. Pini YUNGMAN, EVP and GM Air and Missile Defence Systems and Mr. Shachar GRINBERG, VP Air Defence and A2A Weapons for Rafael and Mr. Jim BARBER, Sector President Cobham Mission Systems and Mr. Paul WATSON, SVP and GM for Cobham Wimborne BU shook hands in regard to the arrangement an the Rafael chalet at the 2019 Paris Air Show.

Cobham said that early products for integration will include Rafael's well-established I-Derby BVRAAM in combination with the CMS Fox-10 Lightweight (33kg) Advanced Missile Launcher with clearances for the Python-5 SRAAM on Fox-10 to follow. According to a press release issued by Cobham on 17 June 2019, "The agreement between Rafael and CMS will bring significant customer benefits as the proven missile and launcher combinations will eliminate product integration issues, reduce program risk and reveal wider savings. Working together in this way will reduce response time and improve the technical solution options."

The architects of the arrangement between Rafael and Cobham – Mr. Gil LUKACH, (left) Business Development Director for Rafael and Mr. Steve HARRIS (right) Business Development Director for Cobham

Regarding the agreement Steve HARRIS, CMS Business Development Director, said: "Fox-10 is a high-performance system, which provides customers with a lightweight, state of the art weapons interface compatible with the latest Air-to-Air missiles." Shachar SHOHAT, Director of Marketing and BD at Rafael's Air & Missile Defence Division, said: Rafael's Air-to-Air customers include 13 Air Forces worldwide. Rafael has developed and fielded five generations of Short-Range Air-to-Air missiles and two generations of Medium-Range BVR Air-to-Air missiles. These missiles have participated in multiple high-intensity conflicts, with many interceptions of enemy aircraft, including fighters, helicopters & UAVs."

In an 18 June press release, CMS said that it has agreed with Diehl to a non-exclusive arrangement that will enable a joint approach to combine Diehl missile capabilities with Cobham launchers. According to a press release early products planned for this approach will include Diehl's well-established IRIS-T SRAAM in combination with the CMS Fox-10 Advanced Missile Launcher.

During Paris Air Show on 18 June we approached Steve HARRIS, CMS Business Development Director and also the architect of the arrangement between CMS and Rafael to get first-hand information on Fox-10 Advanced Missile Launcher and Cobham's approach to the Turkish Fighter Program.

Defence Turkey: In your approach arranged with Diehl and Rafael, the first phase covers only air-to-air munitions. Is there any plan for the utilization of a similar approach in Diehl or Raphael's other type of munitions including air-to-ground, air-to surface etc.?

Steve HARRIS: Yes, so this the start of the journey and air-to-air weapons are the first priority. We have plans with Rafael to integrate their air to air weapons with our rail launcher and then later, to integrate them with an eject launcher. We are also working with Diehl for air to air weapons but there is absolutely no reason why we couldn't take this approach with any product between the two companies. It's a concept that we're happy to run with.

Defence Turkey: You have just underlined that in this approach you are taking out some integration risk (integration of the missile to the launcher) and the associated cost. So, what about the test and certification process? You are also responsible for this issue.

Steve HARRIS: We will certify our products as we always do, and that certification will take account of the fact that we've already integrated the weapon on the launcher. So, we will have completed the vibration and strength testing and all of the environmental testing – the customer can select the missile knowing that the missile and launcher combination is qualified for use. This only then

leaves the customer to integrate the missile and launcher combination on their aircraft – but they can do this knowing some of the usual program and cost risk has been eliminated.

Defence Turkey: Does your agreement with Rafael and Diehl have a specific target market? Any limitations?

Steve HARRIS: No constraints and it is not exclusive. For Cobham, we are clear that the customer often makes a missile selection early in their procurement process and the launcher is often considered later – or the onus is placed on the missile Prime to bring a launcher. By working with the missile Primes, Cobham can position to mutual advantage and the customer has better choices earlier in the program. In regards the customer base, we all recognize there are often demands for ITAR-Free products and this is where our product base perfectly supports the missile manufacturers and their customers.

Defence Turkey: So, the missile manufacturer may offer a choice of launcher provider to its customers for selection. And if the customers select your launcher solution will they contact directly with you or with missile manufacturer?

Steve HARRIS: The missile manufacturer will always have a choice as to which launcher to offer the customer. If it is a Cobham product, we will then work together with the customer to provide a great, low-risk solution. The commercial approach is flexible but most likely to present the customer with a single contract arrangement to purchase a complete solution. We do anticipate, in parallel with this, a separate Through-Life Solution to be available direct from Cobham.

Defence Turkey: You are allowing the customer to not have to consider integration costs and risks. Does your launcher solution also feature technological improvements over the existing launcher solutions on the market?

Steve HARRIS: Our new launcher utilizes the latest technology in design and manufacture and as a consequence, it has an impressive carriage capability (currently up to 125kg) and a very low mass (33kg). This compares very well to others in this class of launcher that typically weigh around 38-40kgs. All Cobham products are proved with an internationally recognized certificate of design and performance.

Rafael's I-Derby BVRAAM and Fox-10 launcher – this combination is the starting point for the arrangement between CMS and Rafael. Fox-10 is a new product and integrating it with Rafael's I-Derby will be a great step forward for both companies

Defence Turkey: Will the same launcher be used for Rafael and Diehl missiles?

Steve HARRIS: Yes. Our electronic control unit is capable of communicating with more than one missile and this capability is being expanded as the market requirements become clear. It will eventually be possible to include weapons from other missile Primes should there be a need.

Defence Turkey: And are your launchers are ITAR-Free?

Steve HARRIS: Yes, they are ITAR-Free. Cobham UK is very clear that Turkey has a strong preference to avoid products with ITAR restrictions and thus we can meet that need. Additionally, we own all the Intellectual Property and can make independent choices about how we design, develop and manufacture or products.

Defence Turkey: Is this the first time you've introduced Fox-10 Advanced missile Launcher into the market?

Steve HARRIS: Yes, you are at the front end of the program although happily, we have other potential customers who seek a modern lightweight rail launcher as well. It's a great new product and it has a bigger brother, which we have called Fox-20. Fox-20 is in the development phase and will cater for the larger missiles such as AMRAAM and Meteor BVRAAM – so a carriage capability of around 185kg. Fox-20 is the natural next step from Fox-10 and will complement our other Multi-Missile Launcher (NMML) currently in service with Saab Gripen.

Fox-10 is intended for use with SRAAM missiles and has a forward umbilical as used by most short-range missiles. However, because of its strength, it can carry longer range missiles provided they have a forward umbilical connect – like Rafael's I-Derby. This is a really important feature as typically this weapon would have to be used with a larger (60kg plus mass) launcher.

We have built-in options for mounting. Fox-10 has 30" spaced bolt attachments suitable for installation at the wing tip, underwing on a pylon or on a trapeze in a side pod. In addition, we can provide a lightweight adaptor to convert to 14" spaced NATO Bale Lugs allowing attachment to any NATO standard Eject Release unit. Some customers have indicated a desire to fit two weapons at their under-wing pylon stations and we have an adaptor to enable this capitalizing on the light weight of the solution and the ability to double the pylon payload.

Cobham has taken a new step in naming our new rail launcher and we are trademarking this and future products. Hopefully, the Fox-series will be synonymous with modern, lightweight, ITAR-Free rail solutions for a wide range of aircraft and their operating forces.

Defence Turkey: Mr. HARRIS thank you for sparing your time for our readers. Have a good show.

Leonardo IFTS Media Briefing; Decimomannu AFB Selected as Home Base for IFTS Step 2

At the 2019 International Paris Air Show, Leonardo displayed its best training solutions; the M-345 Basic Jet Trainer and M-346 Advanced & Lead-in Fighter Trainer that it offers on the flight training market at its outdoor static display area. The two aircraft, designated T-345 and T-346 when used as trainers in Italy, also represent the heart of the International Flight Training School (IFTS), which will be operated under a public-private partnership to provide Basic, Advanced Jet and Lead-in Fighter Training to cadets of Foreign Air Forces.

The ITFS was launched by Leonardo together with the Italian Air Force (ItAF) under a Collaboration Agreement signed on 17 July 2018 at Farnborough International Air Show to offer one of the best training courses for military pilots worldwide. To be based on the Galatina Air Force Base (AFB), located in Southern Italy and home base of the 61st Wing, and Decimomannu AFB in Sardinia, the IFTS Project is designed in two steps;

Step 1 Galatina Air Force Base: Starting from 2020 the T-345 jet trainers will arrive the Base, which will serve as the Basic Training Excellence Center.

Step 2: Decimomannu Air Force Base: Starting from 2021 T-346s will be transferred to Decimomannu AFB which will serve as the Advanced Training Excellence Center.

Currently the 61st Wing in Galatina AFB hosts 50 foreign Instructor Pilots and Student Pilots (cadets) from 9 foreign countries such as the United States, Spain and France. Starting next year, the flight school will introduce the new integrated system based on the M-345 HET - High Efficiency Trainer (named T-345 by ItAF), which will gradually replace the obsolete T-339A (used for Phase II) and FT-339C (used for Phase III) fleets.

Once it is at its peak, the IFTS is expected to operate 22 T-346 aircraft and up to 22 simulators (currently operates 2 Full Mission Simulators and 2 Flight Training Device), with over 40 civilian and military Instructor Pilots (15 Air Force + 25 Civil [selected by ItAF]), and conduct over 70 Phase 4 courses per year. Leonardo is hoping to achieve over 8,000 flight hours per year, to train 72 to 80 trainees per year once the site is fully established.

On August 19, 2019 the staff of the IFTS at the 61st Wing in Galatina, conducted the first flight training activity of Phase 4 with the exclusive use of the Training Management and Information System (TMIS). The TMIS is an advanced management software developed by Leonardo Aircraft Division with the collaboration of the ItAF. The TMIS system is currently being tested and implemented at the 212th Group/61st Wing which is equipped with 18 T-346As belonging to the ITAF and 3 M-346s (with mixed military/civilian crews) belonging to the IFTS.

In order to provide first-hand information and deeper details on the achievements and what they have done since June 2018 with the IFTS initiative to international media members Leonardo organized a Media Briefing on 19 June 2019 with the participation of Lucio Valerio CIOFFI, Managing Director of the Leonardo Aircraft Division, Colonel Luigi CASALI Chairman of the Italian Air Force IFTS Program Office (Head of Training and Standardization Office, Air Education and Training Command) and Giuseppe RECCHIA, Vice President of Training at the Leonardo Aircraft Division at its chalet during the Paris Air Show.

Giuseppe RECCHIA, Vice President of Training at the Leonardo Aircraft Division

Giuseppe RECCHIA, Vice President of Training in Leonardo's Aircraft Division

"With the creation of the IFTS we aimed to provide training to military pilots. Our aim is to provide training to both to the Italian Air Force (ItAF) and to Foreign Air Forces pilots, to train fourth and fifth generation fighter pilots. As you know, the IFTS was inspired by a common decision of the ItAF and Leonardo to foster synergies in advance training services. Combining the capabilities of both the ItAF as a leading Military Pilot training provider, deriving from 70+ years of experience, and the know-how and capabilities of Leonardo in training systems. The IFTS, as you are aware of, is based on the most advance scenarios which have been developed and tested by the ItAF with their experience and is based on the most advanced integrated training system, the T-346. The pillars of our project, the pillars of the service are both the know-how and the assets we are providing. Of course, the IFTS is the consequence of a common vision, a joint vision between the industry – Leonardo - and the Italian Air Force."

Regarding infrastructure investment to be carried out in the Decimomannu AFB Mr. RECCHIA provided following information, "The IFTS as you know is an ambitious project – we have identified the final airbase, we need to increase the capacity of the IFTS – we need to create a new infrastructure. We have completed the preliminary design of the new infrastructure that will be fully dedicated to the IFTS at the Decimomannu AFB. We are about the show you the first images of the future infrastructure that we are going to build in next two years. We will create a new ground-based training infrastructure with dedicated simulators to be able to deliver 70+ Phase 4 courses per year."

Colonel Luigi CASALI Chairman of the Italian Air Force IFTS Program Office

"I am the head of the Program Office that the ItAF has set up to manage this new project in which, of course, we strongly believe in, the IFTS. We talked about the IFTS also last year, so we know that today the IFTS is focused on training tomorrow's air warriors, basically. We are training fourth and fifth generation fighters, that's the focus of the IFTS today. As you can see, the vision (Create a Military Pilot Training Excellence Center Primary Reference for Next Generation Fighter Pilots) is broad. Big potential for growth, and we've already started that. It will be expanding to the other phases of training. So, right now it's Phase 4 for jet trainers, tomorrow will be Phase 3 and Phase 2 for jet trainers and we will also be expanding also to the other platforms, we will also be providing training also to helicopters, multiengine and UAV platforms pilots. So, broad vision. But not only that, we have a very fine piece of equipment, which is the T-346 Integrated Training System. It has been proven to be state of the art. The technology that is in this Integrated Training System is top notch. I don't believe we have Air Forces today that can provide the functionalities and the training that we can provide with the Phase 4 training simulators based on the T-346. But this potential, this technology, live virtual constructive technology, I repeat its already reality. We are flying live virtual constructive sorties today at the Galatina AFB. Again, this live virtual constructive technology is there to be exploited. In our vision we are looking to implement radar capabilities, we are looking at the base where we are set up now for IFTS, to create complex scenarios. As you can see, big potential to grow and big potential to exploit on one hand the know how that was developed in 70 years of training by the ItAF and on the other hand, the technology that is there today in the T-346 Integrated Training System. So, having said this on the vision, I would like to move on and give you an operational update from the pilot perspective. What has happened in this last year in relation to the IFTS.

Lots has been done. We've been working very hard. We have set up all those measures that were necessary

Colonel Luigi CASALI Chairman of the Italian Air Force IFTS Program Office

to be able to, for the first time for the ItAF, to have within our structure, civilian instructors, we have developed and set in place all the procedures that are needed to have extra aircraft that are already within the availability of the IFTS today. This in a nutshell has brought us to have three extra T-346 jets down in Galatina AFB today, which arrived in the beginning of 2019. We are forecasting to have a fourth aircraft arrive within the end of the year, and this will force us to increment and I will go back to this in a second, the actual capabilities of Phase 4 training at Galatina AFB. We have not only got the aircraft, but we have actually got our first 2 civilian Instructor Pilots and we are putting in the pipeline an extra 4 civilian Instructor Pilots.

So, what is happening basically by the end of this year we will have three to four T-346 aircraft dedicated for IFTS and 6 Instructors and we are planning to start our first IFTS Class by the end of this year, beginning of next year.

There's another major milestone that has been implemented this year; which is the selection of another base. We need to understand here what's happening. Basically, lots of experience, lots of international students down at Galatina AFB. Right today as we speak, we've got more than 50 international students and instructors down there coming from 9 different countries. We have almost reached our max capacity at Galatina AFB. And again, we want to exploit it more, we want to exploit it further. So, the idea there is to have, at the end of the day, an excellence training center in the basic sector in Galatina and we've selected another airfield that will be the main center of training excellence for advanced operations which is the Decimomannu (Cagliari) AFB.

Many of you may know Decimomannu AFB, I would say it's the European fighter town. It's been a base where we had many international partners join us in the past years there, Great Britain was there, Germany was there, United States was in Lecce (Galatina AFB), of course now it goes up and down so what we want to do now is focus on Decimomannu AFB. It has the ideal airspace, the ideal ranges, it has the ideal structure to be able to exploit fully IFTS there. So, this is

ITAF Galatina Air Base - Trainees and Instructors

Step 1. The IFTS today – this is what has happened in the past year, and as I said we got the aircraft down there, we found our instructors, we are getting our first students there and we will be able to increase our student through put in 2019-2021 by 8 students per year, it's not much but it's what we can do, because we are busy, its full, there's not a lot of spare capacity down there. For this reason we are going to use these next couple of years to invest heavily in Decimomannu AFB and to have Galatina AFB be an international center of advanced training based on a campus that will be fully dedicated to the students and will be able to exploit this capability, but furthermore, it will put the students in an ideal environment to be able to succeed. We always keep that in mind. That is our main business. We want to provide the future air warriors for our Air Forces, so that's number one.

Step 2 is Decimomannu AFB. We highlighted the fact that in 2020 Galatina AFB will be getting the T-345 which is again, a fine piece of equipment, new technology, new airframes, new ground based training system and this will allow us to consolidate and further grow our actual capability in the basic training sector in Galatina. In the meantime, we are working on Decimomannu AFB and in 2021 is when we are planning on start moving the T-346 assets from Galatina AFB to Decimomannu AFB. Again the end game here is pretty clear - international training center for the Basic Training sector in Galatina on the T-345, which has just been acquired and in Decimomannu AFB the Advanced Training of excellence based on the T-346 integrated training system and all the environment of Decimomannu AFB.

Italian Air Force M-346 Full Mission Simulator

By Decimomannu AFB, I already touched on these briefly; first of all, a dual runway to support high training volumes, something we need when we start developing that amount of hours. We're talking about almost 9,000 hours only in Decimomannu AFB for Phase 4 and it will be even more in Galatina AFB. So, we are talking of numbers that for sure need two dual runway operations.

Dedicated airspace – we talked about that, it's there, it's there to be used, it's there to be exploited and that is one of the main reasons why we decided to go to Decimomannu AFB. Live-fire air-to-air and air-to-ground ranges for advanced training are also available in Decimomannu AFB and of course the weather in the Mediterranean is ideal for advanced training operations.

And I would like to add to this the fact that Decimomannu AFB is today the main deployable base for our frontline fighters. That's another added value for Decimomannu AFB. It means that our Advanced Training excellence will have continuous interaction and contact with the frontline fighters and thus encouraging the exchange of information, the continued exchange of best practices in order to make this happen.

In conclusion, it's a great partnership between industry that owns our integrated training system, that developed it that maintains it and on the other side, the ItAF, our experience in flight training and our experience in the international environment, and bringing in an excellent international flight training school to-train 4th and 5th generation fighters."

Answering a question on when they expect the Final Operational Capability for the Decimomannu AFB, Lucio Valerio CIOFFI, Managing Director of the Leonardo Aircraft Division provided following answers:

Lucio Valerio CIOFFI, Managing Director of the Leonardo Aircraft Division

"We are planning to have Decimomannu AFB available not later than at the beginning of 2022, so at the end of 2021 and beginning of 2022. In terms of the customers – the market will follow us. We want to increase to up to 70 courses per year. We will have additional and new customers as we are providing a different service at Decimomannu AFB. I would like to underline that we are not moving a capability from one place to another, we are creating a double capability with one in Galatina AFB dedicated to Phase 2 and Phase 3 with the new T-345s that you have seen in the static display - with an increasing number, now we have 18, we will arrive at 33 and then at the end to 45, which is the requirement. And at the same time, we will move Phase 4 Decimomannu AFB because we have a big ground capability which is also Red Air and UAV and so on, so I think it is an ambitious project that has already started, it's not an idea such as last year. It's a real project with aircraft flying with a service which has been created by a team in which the ItAF provides experience, the plan, the know-how and we provide technology in order to become the best training service provider for the future."


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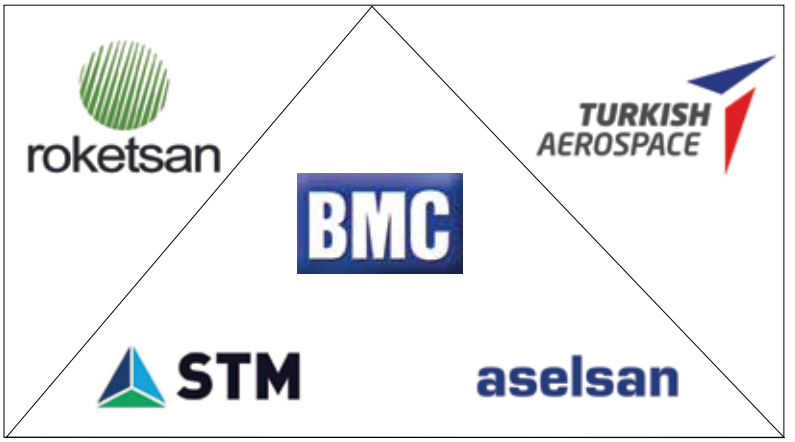
Turkey on the Top 100 List with Five Defence Industry Companies

The most prestigious defense industry list, the "Defense News Top 100 List 2019", published by Defense News magazine every year based on the previous year's defense industry sales, was announced on July 23, 2018. Aselsan, Turkish Aerospace (TA), Roketsan,STM and BMC were included on this year's list. Thus, Turkey stood out with five companies ranking on the list for 2019. The total domestic and foreign defense revenue of the 5 Turkish companies in 2018 was recorded as US$ 4.486 billion.



Having entered the world's top 100 defense industry companies list for the first time in 2006 and rising from 93rd place, Aselsan maintained its stable upward trend on this year's list. Ranking 55th on list, Aselsan moved up to 52nd place as Aselsan increased its defense turnover by 26% in 2018 compared to the previous year and raised its defense turnover to US$ 1.792 billion. Aselsan achieved a defense turnover of US$ 1.424 billion in 2017, US$ 1.195 billion in 2016, and US$ 1.025 billion in 2015, the year in which oil and natural gas prices had fallen sharply.

According to 2018 data, Aselsan's total turnover, which constitutes 93% of defense sales, was realized as US$ 1.917 billion in 2018. In 2017, the company achieved a total turnover of US$ 1.470 billion, increasing its commercial and military sales by US$ 447 million over a one-year period. According last year's list, Aselsan increased its total turnover by US$ 227 million when compared to the previous year.

Having ranked 64th in 2018, Turkish Aerospace (TA) fell to 69th place on this year's list. The defense revenues of the company have decreased in the last two years, while revenues from civil and commercial projects have increased significantly. Accordingly, as per 2018 data, the total turnover of the company was US$ 1.665 billion, while defense turnover was US$ 1.055 billion. The defense turnover of the company declined by 4% compared to the previous year, while structural component manufacturing for civil aviation increased notably. Having entered this prestigious list for the first time from 84th place in 2012, TA obtained an average of 85% of its total turnover from defense revenues during 2012-2017, and this rate dropped to 77% in 2018 and 63% on this year's list. This indicates that the company will invest more in the manufacturing of structural components within the framework of new strategies, and in light of the recent data, TA has manufactured a total amount of US$ 615 million for the civil aviation market.

STM, another successful Turkish company that entered the Top 100 List for the first time, from 97th place in 2018, ranked 85th this year – up 12 positions from last year. STM realized defense sales of US$ 369 million in 2018 and increased its defense sales by 56% to US$ 563 million in 2019. The total turnover of the company was recorded as US$ 586 million.

Roketsan which entered the list from 98th place in 2017 and ranked 97th last year, with defense revenues of US$ 376 million, rose to 89th place on the 2019 list – up 8 positions from the previous year. Having achieved its total turnover from defense revenues, Roketsan's defense turnover was recorded as US$ 522 million.

The last Turkish company that entered the list this year was BMC, which manufactures armored vehicles for its domestic and foreign customers. The company's defense revenues of US$ 298 million in 2017 increased by 86% in 2018 reaching US$ 554 million. Thus, BMC entered the list for the first time in 85th place in 2019.

18 new companies, most of them Chinese, entered the list this year and U.S. Lockheed Martin once again placed on the top, #1on the list as it has last year well. Lockheed Martin increased its defense revenue by 5% and achieved US$ 50 billion 536 million compared to the previous year, while Boeing, which ranked 5th on the list last year, ranked 2nd with US$ 34 billion 50 million in defense revenue this year. U.S. Northrop Grumman took 3rd place on the list with US$ 25 billion, 300 million in defense revenue, while Raytheon ranked 4th with US$ 25 billion 163 million. Aviation Industry Corporation of China (AVIC) was one of the Chinese companies that was new to the list this year , ranking 5th with US$ 24 billion 902 million in defense revenue.

Amongst the top twenty ranking of the Defense News 2019 Top 100 List were 8 American companies, 7 Chinese companies, 1 British company, 1 Russian company, 1 French company, 1 Italian company and 1 Dutch / French company.

HENSOLDT Will Deliver SERO 400 Series Search & Attack Periscopes for Preveze Class

HENSOLDT will upgrade the vision equipment used by the Turkish Navy's Preveze Class submarines to state-of-the-art technology

HENSOLDT will upgrade the vision equipment used by the Turkish Navy's Preveze Class submarines to state-of-the-art technology. The contract is worth approximately 40 million euros. For the first time, two SERO 400 systems will be combined.

The four Class 209 submarines were built and commissioned in the 1990s. HENSOLDT will supply a total of eight SERO 400 periscopes, all of them with thermal imagers as add-on units.

The order was placed by the Turkish company Savunma Teknolojileri Mühendislik ve Ticaret A.Ş. (STM), which has the overall responsibility for the upgrade program. "This is already our third project with STM.

Collaboration with our Turkish partner has been very successful, not only in the case of the AY modernization program involving our SERO 250 for the Turkish Navy, but also regarding the Agosta upgrade," said Klaus Rettenmaier, Head of Naval Systems in HENSOLDT's Optronics Business Line. "The decision to combine two SERO 400s was made in view of the commonality with the Turkish New Type Submarine Program (NTSP)."

Therein, HENSOLDT is supplying a combination of the OMS 100 Optronics mast system and the SERO 400 periscope for the REIS Class submarines. In addition, HENSOLDT is also supplying the equipment for the periscope workshop in Turkey, including special tooling. This means that, as a result of the continued deployment of the SERO 400, synergies will arise not only in the area of operating and training, but also in maintenance.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Leading-Edge Periscope Systems for Submarines

The SERO 400 family represents the leading-edge in sensors, optics and electronics for classical attack missions and with optional IR module for surveillance missions.

Moreover, the visual direct view provides the experienced observer with unparalleled detail recognition, especially with regard to color fidelity and the recognition of colored position lights, for example, over long distances. The binocular eyepiece also enables to observer to gain a certain spatial impression of the scene observed, which is not possible with any two-dimensional image display on a monitor.

To make it as easy and reliable to operate as possible for the observer, top priority was given to ergonomics. The vertically positioned handles, for example, are just one sign of these efforts.

The SERO 400 family can be fully integrated into the submarine's weapon systems enabling full remote control.


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Inauguration of the Aselsan Cyprus Advanced Technologies Research Center

The Aselsan Cyprus Advanced Technologies Research Center was inaugurated on 22 July 2019 and will carry out its activities at the Middle East Technical University (METU) Northern Cyprus Campus Kalkanlı Technology Valley (METU-KALTEV). The high-level protocol of the two countries, particularly the President of the Turkish Republic of Northern Cyprus (TRNC) Mustafa AKINCI, Vice President Fuat OKTAY, Minister of Transport and Infrastructure Cahit TURHAN and Turkish Air Force Commander General Hasan KÜÇÜKAKYÜZ participated

in the opening ceremony for the Aselsan Cyprus Advanced Technologies Research Center and ODTU-KALTEV.

The Aselsan Cyprus Advanced Technologies Research Center will carry out pioneering research studies and academic activities to increase Aselsan's competitive power and will work on developing technologies in the fields of bio-defence, autonomous systems, artificial intelligence, sensors, advanced materials to ensure the acquisition of next generation national and critical technologies.

Aselsan aims to further develop its position in the region in the next period in order to carry out various R&D and testing activities by starting its activities in a 500 square meter office area allocated to it within the region. Aselsan will develop advanced technology research projects and a communication test field that it has established with the academicians who are experts in their fields, as well as technologies that will enable the use of wind energy in the island network.

Aselsan carries out its activities with the mission of reducing Turkey's foreign dependency in the technological field and toward being a defence company that makes its people proud. Aselsan is the leading Turkish company in terms of expenditures allocated to R&D, employing 4144 R&D staff at 6 Research Centers within its body.


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Prof. Dr. Haluk GÖRGÜN, Chairman of the Board and General Director of Aselsan, who welcomed the visitors to the Cyprus Advanced Technologies Research Center, said on the subject: "We believe that our research center which is planned be operated at METU KALTEV, will be an extremely critical achievement for Aselsan."One of the most important factors is that we will carry out joint research and development activities with the academic staff of METU Northern Cyprus Campus. Aselsan will also implement a project for the development of micro grid components that will make renewable energy sources (wind, solar) harmonized in the region and make them available on the island network. This will pave the way for wind energy use on the island. On the other hand, Aselsan will carry its research potential to Cyprus and provide an environment for graduate students where they can do research, as well as opening a new business path for graduates, which will contribute to the employment in the region. Aselsan, which is in a pioneering position among the firms opening offices in METU-KALTEV, will also set an example for the other technology firms in Turkey and make the region an attraction center. Most importantly, it will create added value for both Cyprus and our country by making use of the academic power of the universities in Cyprus. Additionally, Aselsan's existing spiritual and strategic ties with the Turkish Republic of Northern Cyprus will be strengthened through the establishment of this Research Center in Cyprus, demonstrating Aselsan's proud contributions toward national technology ownership in Turkey.

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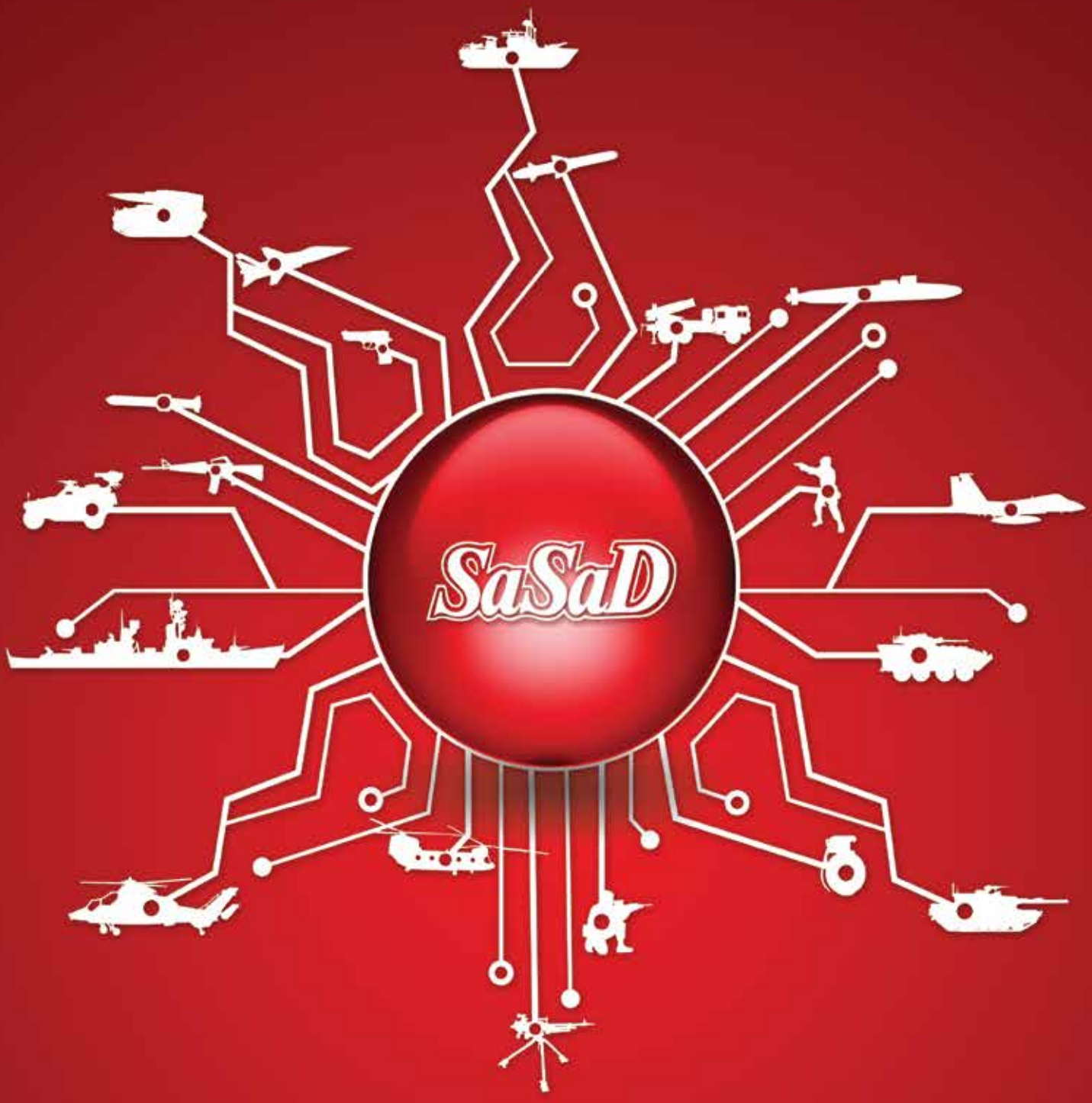

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STM Announces New Cyber Threat Status Report

Executing significant projects in the field of cyber security and developing indigenous products, ThinkTech, the Technological Think Tank of STM, published the Cyber Threat Status Report on July 22 which covers the period from April to June.

In the report, while warning against cyberattacks carried out by malicious software, it stated that attacks targeting increasing software vulnerabilities are frequently spread via office documents and spam e-mails. The reported noted that Turkey is amongst the target countries of cyberattacks that have been carried out via malware.

STM Savunma Teknolojileri Mühendislik ve Ticaret A.Ş.'s new Cyber Threat Status Report warned against the fact that attacks using malware have been on the rise recently by targeting software vulnerabilities and poses a serious security threat to not only personal data but also can impact critical infrastructures as well. It was also stated in the report that unauthorized accesses made through malware give rise to illegal capture of sensitive data, such as identity numbers and passwords, and disclosure of corporate information, and the vulnerabilities that are remotely run by cyber attackers increase the extent of the risk.

Cyberattacks being Realized without the Necessity of Password and Username

The rapid development of information technologies results in the diversification and increase in instances of software vulnerabilities that may possibly become targets. The report stated that Microsoft has recently released a patch for a security vulnerability named BlueKeep and underlined that the attacker is able to run codes with the 'administrator' authorization without any authentication. The fact that Windows 7 and Windows 2008 R2, one of the most widely used operating systems for critical infrastructures, is affected by the BlueKeep vulnerability shows just how great the effects of vulnerability exploit code development can be.

Another cyberattack mentioned in the report is the APT34 (OilRIG) which was leaked through a special Telegram channel last April. These malware codes provide access to databases using vulnerabilities in web applications. In this way, attackers can access a great deal of data without the need of a username and password, infect the intranet of an organization over the servers and capture user passwords.

Turkey also the Target of Attacks via Office Documents

The report also drew particular attention to malicious codes sent in the form of office documents and e-mail attachments in attacks designed to hack data and systems. Emotet, known for its worldwide campaigns, poses cyber threats through office documents and phishing attacks.

Active since 2017, APT MuddyWater carries out its attack campaigns with malicious office documents that are sent as e-mail attachments. The attacker's ability to download files to the captured systems and run them from remote server results in a risk increase. Turkey is also amongst the countries that Emotet and MuddyWater has targeted recently.

Attention to Raffle Applications Targeting Personal Information

According to STM's report, it is seen that attacks on mobile platforms in the form of a contest or raffle to capture users' information are increasing, especially on special days and periods. Mentioning the malicious raffle application released during the month of Ramadan, the report stated that personal information of users such as ID numbers or customer IDs, passwords and phone numbers are collected in order to be eligible for the raffle.

Mind-Boggling Threat in Computed Tomography Diagnosis

Having referred to university research, the STM Cyber Threat Status Report highlighted the risks that have arisen due to attacks on medical imaging systems such as Magnetic Resonance Imaging (MRI) and computed tomography (CT). Within the scope of the research, an attack demo carried out in a volunteer hospital demonstrated that the imaging results can be interfered with and diagnostic findings could be changed. When the modified images were examined by radiologists, the intervention caused a great deal of error in the diagnosis of the disease. STM previously announced that it has initiated R&D activities to develop an innovative cyber security product to reduce such critical risks in hospitals and to prevent possible attacks, and drew attention to this fact once again in its report.

Today, the fact that cyber threats have spanned a wider attack area proves the importance of protective and preventive measures that need to be taken by companies. Stating that awareness should be expanded on this issue, the report cautions companies and advises them to take necessary security measures in their systems by scanning vulnerabilities that arise worldwide. In cyber security processes, there is also an increasing need for decision support systems that place risk management on a rational basis by performing automated vulnerability scanning. STM continues to develop and invest in systems that empower cyber security experts to make fast and prioritized decisions to provide an optimal advantage in vulnerability management.

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Preliminary Design Review (PDR) Phase of HürJET Project Concluded Successfully

Within the scope of the "Advanced Jet Trainer & Light Attack Aircraft" HürJet program, launched in August 2017 under the coordination of the Presidency of Defence Industries (SSB) and under the responsibility of Turkish Aerospace, an important threshold has been reached. On July 22, it was announced on the official twitter account of the SSB that the Preliminary Design Review Phase of the project was successfully completed and the Conceptual Design Phase (CDP) was announced to have been completed in April of this year as well.

The PDR Phase will be followed by the Critical Design Review (CDR) and Test Readiness Review (TRR) Phases. The CDR Phase is scheduled to be launched in 2019 and to be completed in 2020. Whereas the Test Readiness Review (TRR) Phase is planned to be completed in 2021. The first HürJet prototype is planned to perform its maiden flight in 2022.

Management Appointment to the Turkish Space Agency

The chairman and board members of the Turkish Space Agency, which was founded by presidential decree published in the Official Gazette dated December 13, 2018, has become official with the assignment decisions issued by the President of Turkey, Recep Tayyip Erdoğan. According to the appointment decree published in the Official Gazette on August 7, 2019, Aerospace and Space Technologies General Manager of the Ministry of Transport and Infrastructure Serdar Hüseyin Yıldırım was appointed as the Turkish Space Agency Chairman of the Board, and Prof. Yurdanur TULUNAY - founder of İstanbul Technical University (ITU) Aerospace Engineering Department, Prof. Sacit ÖZDEMİR - Director of TÜBİTAK National Observatory, Assoc. Prof. Lokman KUZU - Director of TÜBİTAK Space Technologies Research Institute, Ahmed AKGİRAY – from the NASA Mars Project, Murat İKİNCİ - General Manager of STM Savunma Teknolojileri Mühendislik ve Ticaret A.Ş. and Cenk ŞEN - TÜRKSAT General Manager were appointed as Board Members.

MİLKAR Electronic Attack System Begins Active Duty

Within the scope of the Mobile V/UHF Electronic Attack System Project (MİLKAR / National Jammer-3A3) initiated in 2015 between the Presidency of Defence Industries (SSB) and Aselsan in line with the needs of the Turkish Land Forces, the aim is to implement electronic attack capability to target communication systems that communicate in V/UHF frequency band on different platforms. MİLKAR-3A3 systems are used to prevent target V/UHF band communication by delaying or transferring misleading information which provides an advantage to allied troops in the tactical field. These systems are also critical in terms of the tasks performed within the scope of anti-terrorism and cross-border operations.

In light of the experiences in the Syrian operation field, the delivery of 11 MİLKAR-3A3 systems was completed and put into service within the scope of the project carried out to provide uninterrupted electronic warfare support across a wide geography. The delivery of 4 more systems is scheduled by the end of the year. The MİLKAR-3A3 system is divided into two vehicles as upper and lower frequency bands. In accordance with the needs of the user, the solution can be produced in a single vehicle according to the band division and vehicle selection to be determined. Air conditioning units, antennas and primary power supply generator with system switch are ergonomically located on 4x4 vehicle platform. Thanks to the fact that all contents can be transported on the vehicle platform, MILKAR-3A3 has high mobility in the tactical field. The position can be changed in a very short time after the jamming task is executed.

With the MILKAR-3A3 system, custom solutions can be produced in the frequency range of 30-3 thousand MHz. The system has continuous, look-through, target-triggered jamming types, the protected frequencies / frequency bands can be specified to protect allied radio communication. The MİLKAR-3A3 system has a power infrastructure that supports uninterrupted operation which makes a difference with its fast installation / assembly and high mobility in the tactical field.

20 New Armored Vehicles Delivered to the Turkish Armed Forces (TAF)

Under the coordination of the Presidency of Defence of Industries (SSB), the VURAN multi-purpose armored vehicle was delivered to the Turkish Land Forces Command within the scope of the efforts for supplying weapons, vehicles and equipment needed by security forces.

With the newly added vehicle in the inventory of the TAF, the objective is to increase the operational capabilities of security forces and their responsiveness to current threats. With the Tactical Wheeled Armored Vehicles (TWAV) Project, security forces are supplied with new technological armored vehicles with enhanced security, maneuverability and mobility.

Within the scope of the Tactical Wheeled Armored Vehicles (TWAV) Project, which aims to supply either advanced versions of the vehicles existing in the TAF inventory or the newly developed vehicles in order to increase the maneuverability and mobility of the security forces within the framework of the new opportunities offered by the technology, the delivery of VURAN vehicles recently developed by BMC has been initiated. The first 20 of the VURAN vehicles entered the inventory of the Land Forces Command. The VURAN vehicles were included in the TAF inventory for the first time, and thus a new armored vehicle was offered for use by security forces. Within the scope of anti-terrorism and border missions, the vehicles will be used to provide vulnerable area or facility protection, patrol between police stations, convoy protection, zone, point and road discovery, and physical border security.


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VURAN has high ballistic, mine and handmade explosive protection. The vehicles are capable of high mobility with combat weight with powerful engines and drivetrains. The vehicles can be integrated with different equipment in order to perform various tasks. The VURAN, which is able to carry 9 crew members, can reach a speed of 110 kilometers per hour. The VURAN has front rear view camera, automatic fire extinguishing system, remote controlled weapon station, run-flat tire inserts and A/C with heating and cooling functions. Aselsan's Sarp Weapon System, which is integrated into the vehicles, can be equipped with 7.62 millimeters machine guns, 12.7 millimeter anti-aircraft or 40 millimeter bombs.

Contract Between the SSB and Aselsan for 22 Additional Modular Base Areas

Within the scope of the project carried out by the Presidency of Defence Industries (SSB) according to the needs of the Turkish Land Forces Command, 3 modular bases equipped with advanced reconnaissance, surveillance and weapon systems developed with domestic and national facilities were successfully completed and delivered to the Turkish Armed Forces within the scheduled period. Within the framework of the project conducted by Aselsan as a contractor, the total number of base areas delivered so far is 36, while the construction of 15 base areas is still in progress.

The modular base areas offered to the service of the Turkish Armed Forces consist of portable living units reinforced against mortar bombs, ballistic protection systems, alarm, safety and warning systems. The installation activities for modular base areas equipped


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with night and day vision thermal cameras, radar and sensors detecting the surface and underground mobility, remote control weapon systems are ongoing within the scope of the Modular Temporary Base Area Project signed on February 5, 2013 between the Presidency of Defence Industries and Aselsan.

Within the framework of the project that was initiated to secure the strategic points, the SSB also signed an amendment with Aselsan on August 7, 2019 for an additional 22 areas to be established in the upcoming period. Within the scope of the "Modular Temporary Base Area Project", the SSB had previously ordered an additional "Security System" valued at US$ 119,115,506 on January 12, 2018. The latest improvements and additions are planned to be completed by 2020.

The 9th A400M Delivered to Turkish Armed Forces

Test and acceptance activities of the 9th aircraft produced within the scope of A400M Project carried out by the Presidency of Defence Industries (SSB) in order to increase the tactical transportation and logistics capabilities of the Turkish Armed Forces (TAF) were completed in Seville, Spain where production took place. According to the statement made by President of Defence Industries Prof. İsmail DEMİR from his social media account, it was stated that the 9th A400M brought to Turkey by Turkish pilots would be deployed at the 12th Air Transportation Base Command in Kayseri.

The 9th aircraft produced at Airbus facilities has the most advanced configuration delivered so far. The 10th aircraft that will contribute to the defence of the country by gaining more strength to the power of the Turkish Air Forces is expected to be delivered in 2022. Turkey is one of the six participating countries in the project with Germany, Belgium, France, England and Spain. The first A400M aircraft was delivered to Turkey in 2013 and the delivery of the last aircraft is scheduled to be made at the beginning of 2022.

Within the scope of A400 program, Turkish domestic industry takes responsibility for the design and production of the aircraft, together with the participating countries. Design and production of the main structural components of the A400M aircraft such as the Front Middle Body, Rear Body Upper Section, Parachutist Doors, Emergency Exit Door, Rear Upper Escape Door and Tail Cone, as well as the most important flight control surfaces such as Aileron and Speed Brakes (Spoiler) is being carried out by Turkish Aerospace engineers and technicians.

In addition, TEI is also amongst EPI's subcontractors in the production of the A400M aircraft's TP400 engine, which is an indigenous turboprop engine designed by Euro Prop International (EPI) consortium (Rolls-Royce, MTU, Snecma and ITP), which is the sub-contractor of AMSL company. Within the scope of the project, the retrofit activities to enable the aircraft to reach their final configurations will be performed at the Kayseri 2nd Air Maintenance Plant Directorate as of 2020. Compared to A400M users in other countries, Turkey owns A400M aircraft which have the highest value in terms combat readiness rate, and this fact is cited as a success on multiple platforms in which participating countries are taking part.

Vocational Training Cooperation Protocol for the National Combat Aircraft

In order to train National Combat Aircraft and Heavy Class Attack Helicopter technicians, a Vocational Training Cooperation Protocol was signed between Turkish Aerospace (TA) and the Vocational and Technical Training General Directorate. Within the scope of the protocol signed by Turkish Aerospace President and CEO Temel KOTİL, Ministry of National Education Technical Education General Manager Kemal Varın NUMANOĞLU and TA Board Member Adnan ÇELİK, to train qualified personnel for the defence industry, the "Şehit Hakan Gülşen Vocational and Technical Anatolian High School" in Kızılcahamam, Ankara will be changed to "Turkish Aerospace Şehit Hakan Gülşen Vocational and Technical Anatolian High School".

Within the framework of the cooperation, the objective is to provide internship opportunities for high school students in Turkish Aerospace and to support the laboratory and workshop infrastructures of the school by TA and to design educational activities according to TA's needs.

Awarding scholarships to successful students and employment opportunities to the graduates, TA is also taking part in the protocol signed. Thus, TA will be training technicians to build the National Combat Aircraft and Heavy Class Attack Helicopter. Within the framework of cooperation, the graduates of TA Şehit Hakan Gülşen Vocational and Technical Anatolian High School that are entitled to take part in the defence industry related departments of research universities will also be given scholarships by TA during their higher education.

Joint Venture Established by Baykar Defence and Ukrainian Company

A joint venture (JV) in the field of high-precision weapons and aerospace technologies was established between Baykar Defence, a Turkish defence industry company and Ukrspetskport of the Ukrainian state defence company Ukroboronprom. It was stated by the Ukrainian National Defence and Security Committee that the joint venture would operate in the field of high-precision weapons and aerospace technologies and would bring together the defence capacities of both countries to produce new modern weapon systems for their armies.

One of the first projects of the JV will be to develop a new generation of UAVs. The project aims to develop a UAV that can conduct detailed reconnaissance flights at high attitudes, fly long hours, have significant acceleration capabilities, and attack a wide range of high-precision weapons.

Bayraktar TB2 UAVs purchased from Ukraine by Turkey had been delivered a while ago and the tests had been successfully performed. During part of his visit to Turkey on August 7, Ukraine President Vladimir ZELENSKİY visited the National Armed-UAV Systems Manufacturing and R&D facilities.

TEI Inaugurates Turkey's First NADCAP Accredited Material Testing and Research Laboratory

July 29, 2019. The opening ceremony of Turkey's first NADCAP accredited Material Testing and Research Laboratory, which aims to serve Turkey's indigenous engine projects, was held with the participation of President of the Defence Industries Prof. İsmail DEMİR, Eskişehir Governor Özdemir ÇAKACAK, Eskişehir MPs Harun KARACAN, Utku ÇAKIRÖZER, Metin Nurullah SAZAK and the accompanying delegation.

"As a result of many successes that we have been realizing as a country in the defence industry, there is a particular increase in self-confidence and capability in our country. In consequence of these developments, we are on our journey from being a technology-using country to being a technology-producing country. I think the laboratory for which we are here now is a cornerstone on our journey", said Prof. İsmail DEMİR in his speech before the opening ceremony.

TEI President & CEO Prof. Mahmut Faruk AKŞİT said that an important laboratory was gained both to TEI and to the Turkish defence and aerospace industry. "This laboratory will not only be used by TEI but also by the universities in our country and the private sector organizations serving the aviation/aerospace industry in the future, and I hope the first NADCAP accredited Material Testing and Research Laboratory will be beneficial for Turkey".

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The laboratory will serve the Turboshaft Engine Development Project (TEDP) being executed under the auspices of the Presidency of Defence Industries. Within the scope of this project, the studies are being carried out on the indigenous design of TEI-TS1400 turboshaft engines, the design of parts and modules, and the development of a database containing the materials from which such parts will be produced.

The determination of the characteristics of high temperature area materials in aerospace engines through real tests and their use in design is of critical importance for companies that design indigenous engines. The TEI Material Testing and Research Laboratory will be able to carry out tests at engine-specific operating temperatures and existing capability improvements will be able to be performed. In this way, the most reliable information on the materials contained in the engine will be provided via testing and verification.

The sample based mechanical tests that have been carried out abroad since the beginning of the project will be performed at the TEI Material Testing and Research Laboratory in the upcoming period.

Pakistan MİLGEM Program Hull-Mounted Sonar System Contract Signed

July 31, 2019. The Military Factory and Shipyard Operation Inc. (ASFAT) and Meteksan Defence signed a Hull- Mounted Sonar System Contract within the scope of the Pakistan MİLGEM Project.

With this contract signed, the YAKAMOS Hull-Mounted Sonar System, which has successfully been serving in all over the seas as the sonar of the ADA class corvettes developed and built nationally within the scope of MİLGEM project, was selected as the sonar system of 4 corvettes to be built within the scope of Pakistan MİLGEM Project. Turkey also took place amongst the countries that can export antisubmarine warfare sonar with this contract. With the agreement signed on September 6, 2018 between Pakistan and Turkey, the MILGEM Corvette had been decided upon to enter the inventory of the Pakistan Navy.

All critical technology components including the lowest level materials such as ceramic materials in the YAKAMOS Hull-Mounted Sonar System, which will be supplied through the Pakistan MİLGEM Project Hull-Mounted Sonar System Contract signed by ASFAT and Meteksan Defence, will be designed nationally and produced with domestic resources. The YAKAMOS Hull-Mounted Sonar System


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will be included in the inventory of the Pakistan Navy, an allied country, for the first time in addition to our Naval Forces inventory.

The YAKAMOS Hull-Mounted Sonar System was designed to detect and track targets such as submarines, torpedoes and surface platforms that may be faced in the marine environment. The YAKAMOS Hull-Mounted Sonar System, which is used for detecting and tracking submarine, torpedo and other underwater targets / threats by surface platforms such as corvette and frigate, is able to detect the sound propagation of targets in passive mode, and is able to automatically calculate the direction and distance of the targets by using the echoes reflected from the targets in active mode. The system can also be used for the detection of mine and mine-like objects during field passages.

Aselsan's Historical Order Record

According to the written statement made by Aselsan on August 21, 2019, it was released to the public that the company's backorder amount exceeded US$ 10.2 billion and reached its historical peak level. Having closed the year 2018 with a backorder of US$ 9.1 billion, Aselsan signed new contracts worth US$ 1.8 billion in addition to its deliveries in the first half of 2019.

Among these contracts, the Altay National Tank Mass Production Project of EUR 841 million, Pakistan Atak Attack Helicopter Project of US$ 241 million and the Modular Temporary Base Area Project of US$ 113 million have become prominent.

Having restructured its International Marketing Department at the beginning of 2019, Aselsan has been increasing its effectiveness in Asian and African countries, and especially in Turkic Republics. Within this context, with the last export to Gambia, it has increased the number of countries it has exported to 64 since its establishment. Aselsan increased its sales by 41 percent as of the end of June 2019 and reached TL 9 billion compared to the same period of the previous year, and its net profit growth was recorded as 42 percent exceeding the increase rate of sales in the same period.

The positive momentum in Aselsan's financial statements also reflected to the collected revenues of July. The collected revenues exceeded TL 690 million (US$ 122 million) which is quite above the average of the first six months of 2019.

Having been ranked 52nd in the Defence News Top 100 list of the worlds' largest defence industry companies, Aselsan aims to close 2019 with a 40-50% growth rate on a TL basis.

The Fifth Fast Patrol Boat Begins Active Duty

The fifth boat was delivered to the Naval Forces within the scope of the Fast Patrol Boat Project built by Yonca Onuk Shipyard. The fifth boat was delivered within the scope of the 8 Fast Patrol Boat contract signed between the Presidency of Defence Industries (SSB) and Yonca Onuk Shipyard in order to ensure the security of the Naval Forces' critical facilities as well as naval bases containing navy elements.

Weighing 11 tons and 12.65 meters long, the MRTP12 model boats have a 80 cm draft and can reach 47 knots. The boats are also equipped with an Aselsan 12.7 MM remote controlled stabilized STAMP machine gun.

Aerial Photographic Survey Aircraft Delivered to the General Directorate of Mapping

July 16, 2019 Turkish Aerospace (TA) completed the Aerial Photographic Survey Aircraft (HAFÇU) project, the contract of which was signed with the Presidency of Defence Industries (SSB) on May 22, 2018 in order to meet the needs of the General Directorate of Mapping. HAFÇU, which was supposed to be delivered on August 1, 2019, was delivered well before the scheduled date on April 26, 2019 thanks to the intensive efforts of TA engineers and technicians.

Within the scope of the project Turkish Aerospace undertook all heavy maintenance and repair tasks, especially the logistics activities, and performed camera modifications of for the HAFÇU. Following the integration of the cameras for the HAFÇU, TA successfully completed the flight tests and it was delivered to the General Directorate of Mapping.

Delivery Figures of MPT-76s Exceed 40 Thousand

Developed and produced by the Turkish defence industry in line with the needs of the Turkish Armed Forces, the number of National Infantry Rifles (MPT-76) exceeded 40 thousand with the delivery of 4 thousand 500 units recently.

Within the scope of the 100-Day Action Plan announced on December 13, 2018, the Presidency of Defence Industries (SSB) signed a contract with the Machinery and Chemical Industry Corporation, KaleKalıp Makina ve Kalıp Sanayi A.Ş. and Sarsılmaz Silah Sanayi A.Ş. for the production of 50 thousand MPT-76s.

The development phase of MPT-76 modern infantry rifle, which has tactical technical features required by security forces and will serve in all kinds of terrain and weather conditions in day and night, within the scope of the ongoing serial production of pistols and rifles developed recently in the light weapons group was completed successfully under the coordination of the Presidency of Defence Industries (SSB). Thus, a great success was achieved in line with the objective of increasing the rate of meeting the needs of the Turkish Armed Forces domestically.

Havelsan's National Technologies Prove Themselves at NATO Exercise

July 12, 2019. Under the leadership of NATO's Allied Transformation Command, the CWIX 2019 exercise took place last month at the Joint Force Training Center in Bydgoszcz, Poland. The interoperability between command and control capabilities and information technology services were tested in the exercise.

During the exercise, there was a remarkable development for the new generation combat management system - ADVENT - developed by Havelsan and the Naval Forces Command. The ADVENT Tactical Data Link Module (DLP) has proven itself to operate in full compatibility with NATO countries' tactical data link systems.

The ADVENT Tactical Data Link Module successfully performed all functions and tactical data exchange that determine the standards of NATO member countries in the military field over Link 11, Link 16 and Link 22 networks during the tests made with special systems for Finland, Spain, Germany, Czech Republic, Italy, Denmark, USA and NATO. It was demonstrated that it can work in 100 percent compatibility with NATO ACCS, NATO IOTA and Cloud 22 reference systems.

In line with these developments, Turkey's tactical data link capability at the FMN Spiral 2 level was certified.

In addition, the Havelsan products Harbiye Command Control Information System, CBRN Information System, Kaşif Geographic Information System and allied troop tracking systems also passed successfully the data exchange tests with other country systems performed in accordance with NATO standards.

The first official version of the ADVENT Combat Management System was released and launched this year.

Developed by Turkish engineers with nearly 6 million lines of code, ADVENT is considered to be one of the world's leading advanced combat management systems.

ARES Shipyard Launches the First Boat of the Oman Coast Guard Command

Within the scope of the project initiated for the Oman Coast Guard Command to prevent arms and drug smuggling and illegal migration activities in the Arabian Sea and the Gulf of Oman and to protect critical coastal facilities, Oman will procure 14 ARES 85 Hercules fast patrol boats from ARES Shipyard. In the first military ship export contract for Oman, worth US$ 100 million, the first of the boats is planned to be launched in September 2019 and delivered the following month in October.

According to the contract signed last year, 14 26-meter ARES 85 HERCULES Fast Patrol Boats will be produced for the Oman Coast Guard Command. The boats that operate with water jet propulsion system can reach speeds over 50 knots and are equipped with a remote controlled 12.7 mm automatic weapon system. In addition to these features, the boats are equipped with military radar, electro optics and night vision systems. On the other hand, there is a high-speed RHIB boat on its deck for boarding missions as well as for search and rescue tasks.

Turkish Aerospace has Signed a Protocol on Aerospace Research Projects, Testing, Simulation and Training with Royal NLR, The Netherlands

July 31, 2019 Turkish Aerospace signed a framework agreement on future projects with the Royal Netherlands Aerospace Center (NLR). Within the scope of the protocol signed between Turkish Aerospace President and CEO Prof. Temel KOTİL and NLR CEO Mr. Michel PETERS, cooperation will be realized in the fields of aerospace research projects, training, modeling, simulation, testing and new manufacturing techniques.

Turkish Aerospace President and CEO Prof. Temel KOTİL and his team have conducted a technical visit to the Royal Netherlands Aerospace Center. With the participation of NLR CEO Mr. Michel PETERS, the visit stepped up the development of relations between the two countries. Both companies are focused on investigating areas of further collaboration with ongoing and future projects.

Otokar Increases Exports Share of Turnover to 81% as Global Expansion Continues

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August 1, 2019 Otokar, a Koç Group company, announced its 2019 H1 results. As Otokar focused on exports, the share of exports in turnover rose to 81 percent in the first six month of 2019. Otokar General Manager Serdar GÖRGÜÇ expressed their pleasure about Otokar's first half results and noted that the company's turnover reached TL 1.3 billion as exports increased five-fold year-on-year, "With a broad range of commercial and military vehicles, technology, design capabilities and solutions developed and tailored to client needs, Otokar is preferred more and more with each passing year. We are moving with confident steps toward our goals with our innovative product range and services."

Otokar, Turkey's leading automotive and defence industry company that operates in more than 60 countries across five continents with products with owned intellectual property rights, announced its first half results for 2019. With several deliveries of commercial and defence industry vehicles, Otokar completed the first half of 2019 with TL 1.3 billion in turnover, achieving an increase of 163 percent year-on-year. In the same period, Otokar also succeeded in increasing its exports five-fold. In addition to surpassing its 2018 margins, Otokar also increased the share of exports in its total turnover to 81 percent.

General Manager Serdar GÖRGÜÇ explained that Otokar raised the share of exports in total turnover from the 30 percent level in the same period of the previous year to 81 percent, thanks to export-focused activities, "We started 2019 with the goals of maintaining our leadership in the domestic bus market, and raising our export targets both in commercial and defence industry vehicles. In the first six months, we were able to reach almost the total performance of the previous year, and we are very pleased with the results. Our engineering capabilities, skilled human resource, extensive product range, solutions developed and tailored to client needs, strong sales network and aftersales services are admired and preferred by more than 60 countries worldwide as we continue to increase our sales figures. The share of exports in our total turnover, which was 65 percent as of year-end 2018, rose to 81 percent in the first six months of this year. Compared to the first six months of the previous year, our exports grew nearly five-fold as turnover reached TL1.3 billion and profits rose to TL 195 million."

GÖRGÜÇ noted that Otokar has allocated nearly 8.5 of its revenues for R&D activities in the last 10 years, and added that the company continues to elevate its position in international markets with its own production vehicles: "The vehicles designed by our engineers with our own technologies, our applications and the commercial vehicles developed and tailored to operators' requirements are serving millions of passengers around the world. We are also a leader in the defence industry with products that we develop and manufacture against present and future threats as we strive to provide the best products and services for more than 50 users, and in particular our armed and police forces. As a pioneer in both commercial vehicles and the defence industry with numerous firsts to our name, we are moving with confidence toward our goals. We meet the expectations of our customers by accurately interpreting their needs to expand our presence in target markets."

Cyber Security and Defence Industry Sectors Gather at Cyber Cafe


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July 24, 2019 the 6th Cyber Cafe event, with the theme of "Cyber Security in Defence Industry", organized by the Turkey Cyber Security Cluster in order to bring together the representatives of Cyber Security companies with the representatives of different sectors and to increase cooperation, was held at the SSB Nuri DEMİRAĞ conference hall.

Organized under the auspices of the SSB, nearly 200 participants from the SSB, General Staff, Gendarmerie General Command, General Directorate of Security and National Security Council, as well as Cluster member companies and the leading companies of the Defence Industry attended the event.

In the opening speech made by the President of Defence Industries Prof. İsmail DEMİR, the importance of the utilization of domestic products in Cyber Security was highlighted and the contribution of the cluster to the ecosystem was emphasized.

During the event, SSB Cyber Security and Information Systems Group Head Mustafa ÖZÇELİK gave information to participants about the activities of the Cyber Security Cluster over the last year and the progress that was achieved in the development of the ecosystem. A panel on "Cyber Security Vision Sharing in the Defence Industry" was also held under the moderation of SSB Vice President Mustafa Murat ŞEKER and with the participation of the TAF, Gendarmerie General Command and Security General Directorate representatives.

ACAR-K Radar is in the Inventory of the Argentine Armed Forces

August 1, 2019 the reception of ACAR-K Ground Surveillance Radars produced for the Argentine Armed Forces was carried out with the participation of General Hector Prechi, Commander of the 2nd Army of Argentina. Within the scope of the acceptance activity, the ACAR-K Surveillance Radar was tested in different scenarios for the detection of pedestrians, light vehicles, tanks and helicopters in line with the request of the Armed Forces of Argentina. Testers from the relevant units of the Armed Forces of Argentina operated the ACAR-K radar. Operators said they were satisfied with the performance of the ACAR-K radar. After acceptance activities of the ACAR-K radar resulting in superior success, during the interviews with top ranking officers of the Surveillance Radars Command, the importance of integrated logistics support within and after warranty was emphasized as a service for the radar department of the Argentine Armed Forces. In the meeting, it was said that the need for ground surveillance radars in the coming period can be met with the ACAR-K radar. Following the user and maintenance and repair training given within the scope of acceptance activity, ACAR-K Radars were sent to related units and joined the inventory of Argentine Armed Forces.

The SOM-J Missile Can be Used in MMU and AKINCI UAV

It was announced on TÜBİTAK SAGE's social media account that the SOM-J Cruise Missile, which was developed by lowering the features of SOM Cruise Missiles, via TÜBİTAK SAGE and ROKETSAN cooperation, so that it can fit into the interior station of the F-35 Lightning II Joint Strike Fighter of (JSF), could be integrated into the National Combat Aircraft (MMU/T-FX) and Akıncı UAV after Turkey's suspension from F-35 program.

In the announcement made on the Institute's twitter account, following statements appeared: "The SOM-J missile developed by TÜBİTAK SAGE and Roketsan for F-35 aircraft could be integrated into the National Combat Aircraft and Akıncı UAV. In addition, as one of the few countries in the world developing cruise missile for the F-35 aircraft, it can be exported to friendly and allied countries".

The SOM-J missile is a member of the medium-range, air-to-land ammunition family SOM and was designed to be used against heavily protected land and sea targets. The SOM-J missile has a modular design to support the required operational flexibility and was developed based on SOM Ammunition technology, which already exists in the inventory of the Turkish Air Force.

TÜBİTAK SAGE Delivers 100+ More HGK-84s to the Turkish Armed Forces (TAF)

Within the scope of the Ammunition Supply Project Contract of the Presidency of Defence Industries (SSB), 100+ units of the HGK-84 Precision Guidance Kit, developed in line with the needs of the Turkish Armed Forces, were delivered to the Air Forces Command. On the SSB's official twitter account, it was stated that the delivery of 100+ more HGK-84 was made to the TAF.

Developed by TÜBİTAK SAGE, HGK-84 transforms 2000 lb. Mk-84 general purpose bombs in the inventory of Air Forces into smart bombs. Reaching a range of 25 km at a 40000 ft. altitude, the HGK transforms 2000 lb. Mk-84 general purpose bombs into smart bombs, so that the existing bombs gain high precision impact capabilities under all weather conditions at 6.3 m deviation, even when dropped from a distance. This allows the aircraft to complete its mission safely without approaching the danger zone.

Successful Launch of the Second SpaceDataHighway Satellite on Ariane 5

The EDRS-C satellite, the second node of the SpaceDataHighway network (also known as EDRS, European Data Relay System), has been successfully launched into geostationary orbit at 31° East by an Ariane 5 rocket from Kourou, French Guiana. After a test period, it will double transmission capacity of the system in order to serve two observation satellites simultaneously and provide redundant back-up for the SpaceDataHighway.

This second satellite is joining EDRS-A which transmits on a daily basis the images of Earth acquired by the Copernicus program's four Sentinel observation satellites. Since it entered service in late 2016, it has achieved more than 20,000 laser connections. The reliability rate has reached 99.5%, and these successful connections have downloaded more than 1 petabyte of data. Full operations including EDRS-C are expected by the end of 2019, when its inter-satellite link and end-to-end service will be tested and commissioned with the Sentinel satellites.

The SpaceDataHighway is the world's first 'optical fiber' network in the sky based on cutting-edge laser technology. It is a unique network of geostationary satellites permanently fixed over a network of ground stations that can transmit data at a rate of 1.8 Gbit/s. It will be a key component of the Airbus Network for the Sky (NFTS) program. NFTS combines various technologies- satellite and ground communications, air-to-ground, ground-to-air and air-to-air tactical links, 5G mobile communications and laser connections - in a resilient, unified, secure, highly interoperable, mesh network for aircraft, UAVs and helicopters.

SpaceDataHighway satellites can connect to low-orbiting observation satellites at a distance up to 45000 km, intelligence UAVs or mission aircraft via laser. From its position in geostationary orbit, the SpaceDataHighway system relays data collected by observation satellites to Earth in near-real-time, a process that would normally around 90 minutes. It thus enables the quantity of image and video data transmitted by observation satellites to be tripled and their mission plan to be reprogrammed at any time and in just a few minutes.

"The SpaceDataHighway makes our data connections more secure, more stable, more reliable, with more bandwidth and in near real time. The launch of our second satellite is just the start, laser communication will be a revolution for many industries," said Evert Dudok, Head of Communications, Intelligence & Security at Airbus Defence and Space.

A third communication node is to be positioned over the Asia-Pacific region by around 2024. Equipped with three laser terminals, EDRS-D will significantly increase the system's communication capacity and considerably expand its coverage.

From 2021, the Pleiades Neo Earth observation satellites will begin to use the SpaceDataHighway. By the end of 2019, the system will also provide a fully European broadband communication service to the Columbus module of the International Space Station (ISS).

The SpaceDataHighway is a public–private partnership between the European Space Agency (ESA) and Airbus, with the laser terminals developed by Tesat-Spacecom and the DLR German Space Administration. Airbus owns, operates and provides commercial services for the SpaceDataHighway. The EDRS-C satellite platform supplied by OHB System AG is also carrying a payload for Avanti Communications.

Rheinmetall and MBDA to Develop High-Energy Laser Effector System for the German Navy

Rheinmetall and MBDA Deutschland have agreed to collaborate in the high-energy laser effectors domain. The two companies intend to construct, integrate and test a laser demonstrator for the German Navy's corvette K130.

Capable of engaging targets at the speed of light with extreme precision and minimal collateral damage, lasers constitute a whole new dimension in defence technology. Now, for the first time ever, this capability is to be investigated under quasi-operational conditions using a demonstrator installed onboard a German corvette. The details and division of responsibilities between the two companies will be determined as soon as the performance

specification is made available by the Federal Office for Bundeswehr Equipment, Information Technology and In-service Support, Germany's military procurement agency.

Looking ahead to the joint project, Peter HEILMEIER, Head of Sales and Business Development at MBDA Deutschland GmbH, notes that "cooperation between Rheinmetall and MBDA will be particularly beneficial for the Bundeswehr. Both companies will be leveraging their respective special strengths to make this German Navy project a resounding success."

Werner KRÄMER, Managing Director of Rheinmetall Waffe Munition GmbH, sums up the venture as follows: "We're going to be cooperating very closely to put the military potential of laser technology to work for the Bundeswehr, boosting its operational readiness and combat effectiveness. Compared to other countries, too, our two companies possess extraordinary capabilities. Lasers offer new tactical possibilities on land, at sea and in the air. In partnership with the German Navy, we want to press ahead with this new technology

Collins Aerospace Redefines Mission Capabilities of C-130H

Through Modernization Program with the French Air Force

Program includes new avionics upgrades with modern digital glass cockpit and first dual Head-Up Guidance (HGS) with Enhanced Vision Systems on a C-130H

23 July 2019, Collins Aerospace Systems, a unit of United Technologies Corp. has completed the first cockpit modernization of fourteen contracted Lockheed Martin C-130H Hercules for the French Air Force. Collins Aerospace plays a central role in the on-going certification flight test campaign, in Bordeaux-Mérignac, France.

The aircraft is equipped with the Collins Aerospace Flight2™ avionics solution and the industry-leading dual HGS-4500 Head-Up Guidance (HGS) with EVS-3000 multispectral enhanced vision system to improve pilot situational awareness. An electro-optical infrared camera for asset detection is also integrated into the HGS. Together these solutions further enhance C-130H operational capabilities to support specific mission requirements.

"Modernizing to the Flight2 system provides the French Air Force with the latest generation of avionics and optimized support and maintenance solutions to complete demanding missions all over the world," said Olivier Pedron, managing director, Avionics for Collins Aerospace in France.

Following the first flight and qualification of the first two aircraft by the French Armament General Directorate (Direction Générale de l'Armement, DGA) Collins Aerospace, together with Sabena Technics, will deliver modification kits to the Service Industriel de l'Aéronautique (SIAé) to complete the installation on the remaining 12 French C-130Hs in the fleet.

Awarded by the DGA in September 2016, Collins Aerospace is the prime contractor, in accordance with its FRA-21J capability, together with its partners Lockheed Martin and Sabena Technics.

With Flight2™, the C-130H will comply with the most recent International Civil Aviation Organization (ICAO) standards, equipping it with a tactical advantage in both military operations and civil airspace environments. In addition, Flight2 provides commonality for optimized support and maintenance across other French Air Force platforms such as E-3, AWACS, KC-135 and HUD commonality on the C-130J.

Collins Aerospace has delivered over 2,900 Flight2 solutions for military fixed-wing and rotary-wing aircraft. Additionally, 371 C-130 aircraft have been upgraded, or are on contract to be upgraded, with the Flight2 solution. More legacy C-130 aircraft have been fitted with Collins' avionics than any other single provider in the world.

The Flight2 integrated avionics solution has received a certificate of design by Lockheed Martin Aeronautics, the C-130 Hercules original equipment manufacturer.

Expodefensa 2019: Center of innovation for Security and Defence in Latin America and the Caribbean

The international tri-service defence and security exhibition, Expodefensa 2019, will take place from the 2nd to the 4th of December 2019 in Bogota (Colombia)

Since its inception in 2009, Expodefensa is positioned as the leading major Defence and Security event in Latin America and the Caribbean. This exhibition of the Colombian Ministry of Defence, Expodefensa is organized by the two entities Corferias and Eurosatory, with the participation of armed, security and emergency forces. Both organizers are references in event organization, Corferias as the Bogota International Business and Exhibition Center and Eurosatory as the leading worldwide land and airland Defence and Security event. Today Expodefensa is the international reference event for all individuals in Latin America and the Caribbean who are in charge of defence and security, whether public or private, and for those who are looking for technology solutions and international equipment in land, air and maritime domains.

In 2017, Expodefensa hosted 269 exhibitors from 34 countries, more than 12,500 professional visitors including 74 Official Delegations from 30 countries and 124 journalists. The numbers continue to grow every session.

Expodefensa highlights the widest range of Defence and Security products presented in Latin America to maintain or restore peace and to prevent and combat natural and industrial disasters. Several centers for exploitation of energy resources and mine sites are located in the region, which require adequate protection. With exhibitors from all over the world, Expodefensa presents the widest range of Defence and Security products adapted to regional requirements. In 2017, Expodefensa hosted exhibitors from 34 countries, among them United States of America, Israel,

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India, South Korea, China, France, Brazil, Peru and many others. But the Latin American industry is also developing very quickly as confirmed by the 28% of Colombian exhibitors who presented high-quality products. Turkey, which has one of the most dynamic Defence and Security industries in the world, will also be represented at Expodefensa 2019. Among the Turkish exhibitors will be internationally renowned companies such as Aselsan and Otokar.

In 2019, exhibitors and subcontractors will present high-tech products and proven, cost-effective solutions. In addition, service companies (maintenance, assistance, etc.), laboratories and research institutes, international organizations and public institutions will participate in the event. All these international exhibitors will exhibit alongside the Colombian armed forces and military industry, which are currently undergoing significant development.

The exhibition welcomes Official Delegations, Defence and Security forces, manufacturers looking for business opportunities and trade visitors from the entire world, but above all most will come from Latin America and the Caribbean. Expodefensa is a great opportunity to develop networks and business, to communicate with potential clients, to reinforce international corporate identity and increase visibility in the dynamic Colombian and Latin American market. It responds to the expectations of governments, critical businesses and industries and all private and public authorities of the Latin American region and the Caribbean.

The presence of exhibitors coming from five continents allows for the discovering of new suppliers and the latest innovations of the sector. Expodefensa also provides opportunities to develop contacts and exchange ideas with experts in the domain, to share knowledge, experiences and lessons learned. This event is a venue for dialogue and interaction between armed & security forces and their suppliers which exhibit the latest products in the Defence & Security industry.

Expodefensa is the predominant meeting for all Defence and Security players in Latin America and worldwide who wish to discover, to understand, to meet and to discuss topics within this ever-evolving sector. A wide range of products and systems will be presented, and high-level attendees will attend the fair.


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