

After India's Withdrawal: What Is Happening With Su-57?

Georg Mader

Alongside the U.S. and China, only Russia has succeeded in developing a stealth-optimised fifth-generation fighter aircraft. However, the T-50 project launched in 2010 – now called Su-57 – has recently suffered a major setback.

For the time being, India is obviously withdrawing from the programme, including its billions of programme share. In ten years, India fears, the aircraft will not yet be technically mature and there will be too many unfinished subsystems, too high costs for too few "Made in India" products and – in view of 12 missing squadrons – probably too low a sales volume. But Su-57 is far from being completed and the programme needs Indian resources to get there. The question now arises as to whether Russia will be able to carry out such a large programme on its own, both technologically and financially, and thus be prepared for significant series production, even if only at a frozen standard.

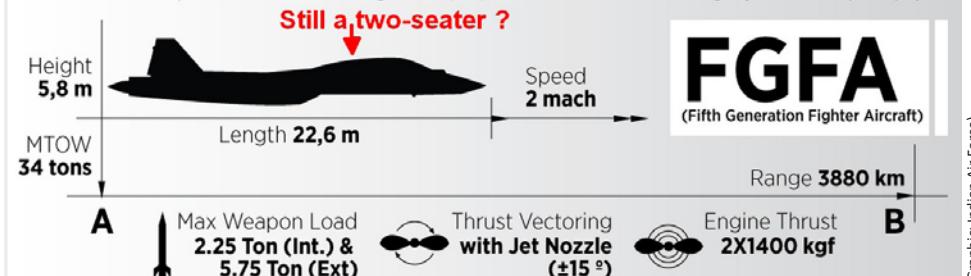
In April, the local Indian IHS Jane's correspondent R. Behdi wrote that India as a long-term programme partner will withdraw from the FGFA (Fifth Generation Fighter Aircraft) programme, as the National Security Advisor Ajit Doval and Defence Secretary Sanjay Mitra already communicated in February to a Russian delegation. Russia has been refusing to share blueprints and source codes indispensable for the production in India.

For decades, Russia was the main supplier of weapon systems for India's Air Force. The 272 Indian Su-30MKI (220 delivered up to the present) may have even saved the Russian fighter industry in the 1990s. Today it is obvious that India is buying its weapon systems increasingly in the U.S., as indicated by India's recent buys of the C-17, P-8, AH-64 or C-130J. However, In-



- The proposed FGFA will have air combat superiority, high tactical capability, group action capability in the regions even with poor communication support. The aircraft will have advanced features like
- Increased Stealth - Low radar cross-section (RCS), Internal deployment of weaponry
- Supersonic cruise and supersonic maneuvering capability
- Data link and network centric warfare capability.

FGFA will be co-developed with Russians. Sukhoi Design Bureau (SDB) has been selected as the Russian agency for this development project.



dia's withdrawal from the FGFA programme does not automatically mean that the only alternative would be an Indian F-35 JSF. When it comes to combat aircraft, India's MoD and the IAF want full-scale modernisation and adaptation authority over the entire lifespan of the product, and this would mean getting access to the F-35's EW systems and their threat libraries. And this is where it all ends: The U.S. government or Lockheed-Martin would never grant India access to the F-35's key IT systems even if India would pay \$7 billion. In addition, India would have to share sensitive data with the U.S. Moreover, as already reported from Dubai with respect to the Emirates, the U.S. military leadership would not allow F-35 technology operate next to opponent (Russian) systems. As the two nations might fight each other in cases of conflict they certainly will not exchange

data packages. This is a similar situation to Turkey, which bought the Russian S-400 air defence system and then wanted to buy 100 American F-35s. So far only Israel is allowed to modify the architecture of the F-35I Adir to adapt, modify and fill its onboard systems nationally.

To avoid misunderstandings: PAK FA / T-50 or Su-57 has a remarkable design, with an RCS about 30 times smaller than a standard Su-27. Despite popular comparisons of an RCS the size of a bird on the F-35, it should be noted that these are only laboratory values from so-called anechoic chambers that have never been tested during a real operation.

Last December the second prototype No. 52 with the Cyrillic letters LL for "Letajushaya Laboratoriya" made a first flight with the promising Saturn engine Изделие 30 (unit 30). Compared to the AL-41F1 engi-

ne (resp. 117S) in the Su-35, the maximum thrust once again increased from 147kN to its current 186 kN and will provide enough power for supercruising, in contrast to the Chinese J-20. It has fewer mobile parts and a fully electronic FADEC control. Furthermore, Su-57 main programme test pilot Sergei Bogdan mentioned towards ESD very innovative solutions, like the new modular avionics network ИМА БК with a code of four million lines, multi-core multiprocessors and fibre optic capacities of 8GB/sec. versus 100 MB/sec. of its predecessor BAGAT launched in 2004 and developed for the Su-35. Last year, an intelligent monitoring system was launched, which, like a "living organism", is designed by the structure-connecting fibre optic mycelium to govern neuronal dynamics and to react in real time to mechanical influences and changed statuses.



In light of such remarkable achievements, crude propaganda coups like the two Su-57 prototypes deployed to Syria for a few days in February are not really necessary. But perhaps the Indian withdrawal was already known at that time, and those videos in which one or two Kh-59 air-to-ground cruise missiles were "successfully launched against Islamists" were shown as a publicity stunt. But the weapons in the video were completely red as usual with the new Russian ordnance, which rather indicates a first regular test within the two internal weapon bays.

Some weapons associated with the Su-57 on posters and brochures have so far only been known as mock-ups exhibited at the Russian MAKC Air Show at the stand of Russian missile manufacturer TMC. As the author has observed, there has been a similar situation with the AESA fire control



radar developed by Tikhomirov and its suppliers, which was exhibited at several MAKC shows.

In general, as far as the high-tech sector of the Russian defence industry is concerned, grand designs do not always lead to big production. This also has to do with the availability of key parts and machines. For semiconductors, Russian industry is still dependent on microchips from Taiwan and South Korea, which are not always reliable. The continuing weakness of modern manufacturing capacity for real mass production coincides with another crucial aspect: Over the next two years, Russia's defence budget will continue to decline in percentage points of GDP (Rouble 83 trillion or €119 billion in 2017), due to a slow improving economic situation and Western sanctions due to the Ukraine/Crimea crisis. The Duma Defence Committee estimates that security spending will fall by 0.1% of GDP to 2.7% in 2019 and by a further 0.1% to 2.5% in 2020. The defence budget for 2017 has been estimated at Rouble 2.84 trillion. That would have been about 10% less than in 2016. Moreover, the military budget had already fallen slightly from Rouble 3.16 trillion to Rouble 3.15 trillion, after spending had steadily increased since the beginning of Vladimir Putin's era.

Unlike China, Russia has limited funding opportunities for several simultaneous armaments programmes (submarines, battle tanks, nuclear weapons, space travel). The question therefore arises as to what priorities the Russian Air Force VKS sets and what proportion the project will receive. It is worth mentioning once again that the Su-57 was not designed to stay above enemy airspace for hours, as the Western air forces have done for years in most

ly unprotected airspaces of Third World countries.

Even in a system like today's Russia, there are additional factors such as the influence of important persons in the Russian power structure. As long as former Sukhoi boss Michail Pogosyan was managing director of the OAK consortium, the Su-57 seemed to have absolute priority. ROSTEC managers may see things differently. At the beginning of the programme in 2010, it was said that the first 10 test aircraft would be available in 2012 and 150 aircraft would enter service in 2016.

At the end of 2014, there were only 55 that are to be delivered from 2020. And in 2015, Deputy Defence Minister Yuri Borisov said that production planning would initially be reduced to 12 examples to buy more 4.5 generation Su-30SM, Su-34 and Su-35. In the same year, VKS Commander Viktor Bondarew said that production would start in 2017 after completion of all tests. In this context, we are now waiting for the integration and verification of the new 'unit 30' engines. VKS acceptance tests will now begin in Aktyubinsk in 2019. Borisov confirmed in the spring that "Su-57 is part of the state armament programme 2018-2025. An exact number cannot be given today."

This shows that the Su-57's obvious descent on Russia's priority list could also have influenced the Indians. The descent coincides with the advent of Russia's new hypersonic weapon recently praised by President Putin, Iskander's sibling Kh-47M2, Kinzhal which flew over Red Square attached to two MiG-31K on May 9. It offers a increased attack potential of up to 2,000 km without risking valuable aircraft. Although two of the nine existing Su-57 prototypes were also shown, stealth has in Russia as significantly lower priority as the country has excellent Su-35, Su-30SM2/3 and soon MiG-35 aircraft immediately available in large numbers. So if the remarkable Su-57 survives as a flagship project, it will barely reach 300 units.

This is an excerpt, please find the complete article in our online version of **ESD**

Technology

Lithuania Orders SitaWare Frontline For Their Boxer

(df) Lithuania has chosen Systematic's SitaWare Frontline command-and-control (C2) solution for their armoured vehicles, especially the freshly procured 88 Boxer (named Vilkas in Lithuanian service). Testing of the SitaWare Frontline solution on the Boxer platform has taken place with vehicle manufacturer Krauss-Maffei Wegmann (KMW).

"Vilkas represents a step-change in the modernisation of the Lithuanian Armed forces. The introduction of new, advanced IFVs into service for the 'Iron Wolf' brigade



will bring new capabilities to the Lithuanian Land Forces," explained Lithuania's Land Forces spokesman, Captain Donatas Suchockis. "The integration of SitaWare Frontline on Vilkas will give commanders a comprehensive overview of the battle-

field, from headquarters to tactical levels. Importantly, it also brings interoperability, which as a NATO country is key for us."

SitaWare Frontline is capable of providing friendly force tracking information and an automatically updated situational awareness picture that features the disposition of forces, danger areas, points of interest, and intelligence on an enemy. Further functionality includes tactical chat, support for high performance mapping, and the ability to make and display plans directly on a touchscreen interface.

www.systematic.com

Canada Buys More Argus Systems

(df) The Canadian Armed Forces will procure additional 1,256 Rheinmetall Argus soldier systems under their Integrated Soldier System Project (ISSP). The order is worth

about €14 million with deliveries expected in 2019. The Canadian government initially contracted with Rheinmetall to start the qualification phase of the Canadian Army's Integrated Soldier System (ISS) in 2015,

which it has successfully completed in the meantime. The final production phase of the Argus soldier system is underway with 1,632 units dated for delivery this year.

www.rheinmetall-defence.de



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www.mspo.pl

Next Step In U.S. Laser Programme

(df) The U.S. Army has started the next phase of its High Energy Laser Tactical Vehicle Demonstrator (HEL TVD) programme that aims to develop a 100-kilowatt class laser weapon system. The corresponding \$10 million contract has been awarded to Dynetics, Lockheed Martin and its partners. The team recently completed a System Requirements Review and technical baseline update. The next step in the programme will be the preliminary design review in January 2019.

"The HEL TVD program will be pivotal for the warfighters while they are protecting our country. Dynetics, Lockheed Martin and our partners are providing a safe and simple high energy laser weapon system that crews can operate for years to come and across various terrains," said Ronnie

Chronister, Dynetics Vice President of contracts. "We pulled together a cross-industry leading team, which has the expertise and knowledge to understand exactly what is needed. We believe that our solution will be straightforward and will be the type of system that will preferred by the Army."

Iain McKinnie, Lockheed Martin business development lead for Advanced Laser Solutions and Strategy, added: "The Army's HEL TVD programme is a critical step toward realizing this potential, culminating in 2022 testing of a mobile 100 kW-class laser weapon system fully integrated with an Army FMTV truck." Lockheed Martin provides the laser subsystem, as well as other key subsystems. The spectral beam-combined fiber laser subsystem strongly leverages Lockheed Martin's experience from ground vehicle integration gained as part



(Artwork: Lockheed Martin)

of the Army's Robust Electric Laser Initiative (RELI) programme.

Team Dynetics is one of two remaining contractors competing to build the demonstrator that will be tested in 2022. The winning contractor will be awarded a contract option to finish the design, build and integrate the laser weapon system onto an Army FMTV platform and conduct field testing at White Sands Missile Range in New Mexico.

www.dynetics.com

www.lockheedmartin.com

Silk Fibre For Protection

(gwh) Scientists at Wright Patterson Air Force Base, in collaboration with Purdue University, Indiana, are investigating how the properties of silk can be transferred to technically manufactured artificial silk fibres.

The focus is on the cooling and temperature regulating properties as well as the high strength of natural silk. With the ability of passive radiation cooling, silk absorbs less heat in direct sunlight than it emits. This can lead to temperatures between 10 and 15 degrees below zero. The strength of ar-

tificial spider silk is higher than that of polymers (e.g. Kevlar). At the same time, the fibre is more flexible than nylon.

This allows a cooling fabric to be produced. Body protection panels made from this material are lighter but just as effective with significantly improved wearing comfort. Parachutes made of this material are more stable and can carry larger payloads. Last but not least, fabrics made of artificial silk are also suitable for the production of lightweight tents, which – when used far forward – offer protection against heat radiation and dust.

Even if the artificial silk fibres are initially considerably more expensive, such as Kevlar, it is expected that the low weight, the high strength and elasticity as well as the thermal properties of the fibre can provide a breakthrough in application.

www.wpafb.af.mil/afrl

www.purdue.edu



Mobile Laser Cutting System

(gwh) Germany has started a €19 million security research programme on the development of a mobile laser cutting system. The aim of the project is to develop a novel laser cutting system with which the security authorities can open suspicious objects – possible bombs or improvised explosive devices (IED) – safely and evidence-preserving. It is planned to develop a mobile system that will be automated and controlled from a safe distance, opening the shell of a



(photo: LKA NRW)

suspicious object with the help of a laser. The laser systems currently available on the market are adapted with suitable optics for

the described scenario and optimized for on-site use. Ignition by the laser beam, even with sensitive, packaged explosives, must always be reliably excluded. The mobile laser cutting system should be largely automated so that the disarms no longer have to enter the direct danger area.

The project results should be available by April 2021.

www.h-brs.de/de/idt

www.elp-gmbh.de

<https://lka.polizei.nrw>

Sweden Buys Patriot

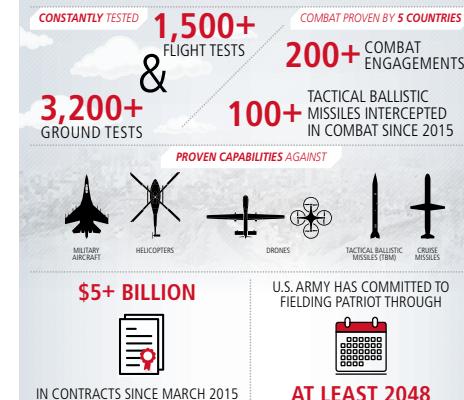
(df) The Director of the Swedish Defence Materiel Administration FMV General Göran Mårtensson has signed the agreement with the U.S. authorities on the purchase of the medium-range air defence system Patriot last week. With this signing FMV can proceed with the acquisition of four fire units, missiles, spare parts, maintenance systems, training and technical support to the Armed Forces, that totals up to about \$1 billion.

"Sweden and 15 other countries trust our Patriot system to defend its citizens, military and sovereignty because Patriot has a proven track record of defeating ballistic

missiles and a host of other aerial threats," said Wes Kremer, President of Raytheon Integrated Defense Systems. "Patriot in Sweden will enhance Northern European security and further strengthen the Trans-Atlantic partnership by providing a common approach to integrated air and missile defence."

Patriot is the backbone of many Europeans defence approaches against ballistic and cruise missiles, advanced aircraft and drones, including Germany, Greece, the Netherlands and Spain. Within the past 12 months Romania and Poland signed Letters of Acceptance for Patriot, becoming the 5th and 6th European nations to procure

PATRIOT™ BY THE NUMBERS



Raytheon's Patriot system. Now followed by Sweden.

www.raytheon.com

(Graphic: Raytheon)

India's Dhruv Helicopter Get Saab's Self-Protection System

(df) Saab announced it has received a follow-on order from Hindustan Aeronautics Limited (HAL) for the IDAS-2 self-protection suite for the Indian Army's Dhruv helicopter. The order amounts to approximately €33.8 million. The order includes the IDAS-2 (Integrated Defensive Aids Suite). Deliveries are expected to begin during 2019. IDAS is designed to provide self-defence in sophisticated, diverse and dense threat

environments. It can be configured to become the high-end system with laser-warning, missile-approach-warning, as well as full multi-spectral detection capability for radar. The system is fully integrated with the BOP-L countermeasures dispenser. It is in operational use in many countries on helicopters, commercial transport aircraft as well as fighters.

"This follow-on order confirms our successful partnership with HAL and further establishes Saab as a local partner to the



(Photo: Saab)

Indian industry," says Anders Carp, head of Saab business area Surveillance.

www.saab.com

Second System Of Australia's ASR-NG Air Traffic Control

(df) HENSOLDT has completed the second final system of Australia's ASR-NG Air Traffic Control. In total the Royal Australian Air Force, through the Department of Defence, has purchased 9 ASR-NG based Fixed Defence Air Traffic Control Surveillance Sensors (FDATCSS programme also referred to as AIR 5431 Phase2) and one Operational Maintenance Trainer (OMT). Due to the location requirements for the final systems at two of the sites, two interim systems are being installed to provide the customer with continuous radar coverage while the legacy radars are removed and replaced in situ with the new Hensoldt solutions.

Each of the ASR radars consist of an integrated primary and secondary radar system. The primary radar helps to detect non-cooperative objects such as small aircraft without transponders or hostile aircraft. It is based on a semiconductor transmitter and includes special signal processing techniques for wide-area surveillance. The secondary radar, MSSR 2000 I, provides automatic identification of cooperative aircraft. It meets NATO's new "Mode S/Mode 5" air traffic control standard.

According to HENSOLDT the installation poses particular challenges because the area covered comes close to the area of Western Europe. The second final system Oakey, near Brisbane, now has completed



(Photo: HENSOLDT)

site installation and joins East Sale, the first interim system, in the Gippsland of southern Victoria and Tindal, the first final system which is installed in the far north of Australia. All systems are now in the set-to-work phase, which will lead to site acceptance testing and then operations. Tindal is expected to be operational in November 2018.

www.hensoldt.net

Torpedo Cooperation Between Finland And Sweden

(df) Finland and Sweden have built up a cooperation on torpedoes. The countries aim to achieve cost efficiency regarding maintenance, opportunity for future further development of torpedo system 47 and exchange of experience utilizing the Anti-Submarine Warfare (ASW) torpedo. The shared shallow Baltic Sea also gives Sweden and Finland common conditions for hunting submarines. The now established cooperation concerns a number of areas in torpedo systems for ASW, ranging from the lending of torpedo systems 45 to collaborative development, verification, integration and training of torpedo system 47 as well as future cooperation during the entire life cycle of torpedo system 47.

"In order for the cooperation to work for a long time, there will be a steering committee to monitor and make decisions within the framework of the agreement," the Swedish Defence Materiel Administration FMV announced. "All practical work in cooperation will be conducted within a working group. At the start-up meeting, the steering committee and the working group were given the opportunity to meet in order to determine how the work will be conducted."

As Saab Dynamics is the supplier responsible to develop, manufacture and integrate torpedo systems 47 for Sweden and against Finland to manufacture and integrate torpedo systems 47, they will also be involved in the cooperation. By the start-up meeting at Saab's site an exhibition of the systems was set up.



(Photo: Swedish Armed Forces)

Simo Laine, Chief of Marine Systems Division at Finnish Defence Logistic Command (FDF LogCom), concludes that the collaboration is a way to find economic benefits and benefits in logistics and education: "We have now laid the foundation for an important cooperation in the underwater area that will benefit both Finland and Sweden."

www.fmv.se

www.saab.com

Israel's Corvettes Get Barak-8 Defence System

(df) Israel Navy's Sa'ar-6 corvettes will get the Barak-8 advanced defence systems by Israel Aerospace Industries (IAI). The Barak-8 system was chosen after it was demonstrated to meet the operational requirements and future challenges faced by the Navy.

Barak-8 is an operational air & missile defence system used by the Israeli and Indian Navy. It provides broad aerial and point



defence against a wide range of threats to the marine arena from the air, the sea or the land. The system integrates several advanced state-of-the-art systems as, digi-

tal radar, command and control, launchers, interceptors with modern RF seekers, Data link and system-wide connectivity.

"Barak-8 is one of IAI's leading systems and a growth engine for IAI in sales to its customers," said Joseph Weiss, IAI CEO & President. "The new deal adds to several Barak-8 contracts entered over the past few years with total value of more than \$5 billion, which is another feather in the system's glorious cap."

www.iai.co.il

New Chilean Antarctic Vessel

(df) Damen Marine Components announced it has won a contract to supply steering gear, rudders and stern tube parts for an Antarctic research vessel of the Chilean Navy, under LRS Polar 5 Class notation. The contract was awarded by ASMAR

Talcahuano Shipyard, Chile. Design of the vessel was done in collaboration with VARD Canada.

Wim Knoester, Director Sales & Marketing at Damen Marine Components, said: "With this project, the Chilean Navy and DMC strengthen the cooperation. The state of the art manoeuvring system allows the new vessel to navigate safely in challenging and icy conditions."

Once built, the 111-metre vessel will undertake roles that include Logistic Support, Search and Rescue (SAR) and Scientific Research, south from the Antarctic Polar

Circle. The operation period shall be at least eight months per year in the vicinity of Alejandro I Island. The vessel will be capable of operating in icy waters, navigating continuously at a constant speed of 3 knots over a 500 kPa flexural strength ice of 1 metre thickness and covered with a 20 centimetre layer of snow.

Damen Marine Components will deliver the equipment for the new polar ship in 2020. The vessel is scheduled to set sail on its maiden voyage to Antarctic Polar Circle in 2023.

www.damen.com



(Photo: Damen)

Military Cloud-Based Network

(df) MASS has developed a new military-grade cloud-based network capability. This cloud-based system includes office functionality, messaging, private secured intranet, video calling and secured software, all hosted on UK Government approved systems, the company announced.

According to MASS the new service can be deployed in multiple areas anywhere in the world at any scale, and can be tailored to include specialist customer applications and databases. The software is also adaptable for smaller organisations that may need the service intermittently and can utilise it on future occasions. Additional functionali-



(Photo: MASS)

ty can be specified to include ERP and GIS applications and database hosting. As well as options such as the provision of ruggedised end user computing devices, encryption of data at rest and in transit, global connectivity by satellite, local encrypted private telephony, and connectivity over digital radio, mobile telephony or PMR in deployed locations.

"The key features of our military-grade, operationally proven command and control solution are now available for the first time beyond Government agencies, with the added simplicity of being operated in the cloud," said Steve Townsend, MASS Training and Operational Support Group Head. "It takes time to set up new IT infrastructure in-house and a deployable infrastructure is an expensive resource to be underutilised. Our solution gives them rapid capability, agile deployment options, peace of mind during operations from encrypted security, and flexibility over contract length."

www.mass.co.uk

LIANDRI started

(df) The AIT Austrian Institute of Technology has started the transnational research project "LIANDRI – Advancing time-of-flight technology for high performance light detection and ranging." The goal of this

project is to bridge application-driven research on photonic sensing with near-future exploitation in the fields of automated driving and industrial manufacturing. AIT: "In the medium term, LIANDRI's findings will enable cars to recognize and identify

distant yet small obstacles along road infrastructure, while robots in future factories will be able to more efficiently perform manufacturing tasks that require precise alignment and tooling procedures."

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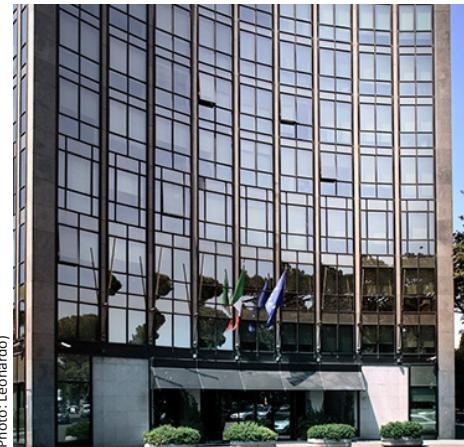
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Industry & Trade

Leonardo's 2017 Full Year Results

(df) Leonardo has published their 2017 full year results. The company stated that: "2017 full year results are in line with the Guidance revised and, as expected, were affected by some non-structural issues in Helicopters. This sector represents an outstanding business with leading product ranges in reference markets, increasing market shares in the most attractive segments and relevant growth opportunities, as highlighted in the 2018-2022 Industrial Plan."

In 2017 new orders amounted to €11,595 million (-3% vs 2016 after adjusting for the effecting of the major EFA Kuwait contract of €7.95 billion in 2016). Leonardo stated that "the overall slight decrease was mainly attributable to the abovementioned



(Photo: Leonardo)

difficulties that affected helicopters and to the decline recorded in electronics, the results of which were also affected by the negative exchange rate effect, in particular on the pound sterling."

The order backlog amounted to €33,578 million (-3.5% vs. 2016). Revenues were

at €11,527 million, a slight decrease (-4%) compared to 2016, also due to the effect of an unfavourable exchange rate arising from the conversion of revenues into GBP and, to a lesser extent, into US\$ (about €160 million).

EBITA amounted to €1,066 million and therefore showed a decrease of 14.9% compared to 2016, with a decline of 1.2% in ROS. EBIT amounted to €833 million; the decline in EBITA was partly absorbed by a reduction in non-recurring costs and restructuring costs (- € 47 million), thus entailing a decrease of €149 million in EBIT compared to 2016.

Group Net Debt amounted to €2,579 million, meaning an improvement of 9% compared to 2016.

www.leonardocompany.com

MASTHEAD

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Changes In Patria's Board Of Management

(df) Patria has announced several changes to its Board of Management. The new position of Chief Business Development Officer has been formed to support the implementation of the strategy, and two new business unit Presidents; for Land and for Systems business units, have also been nominated.

Pasi Niinikoski, currently President of Systems business unit, has been appointed as group level Chief Business Development Officer. He has a wide and long experience in business responsibility in Patria, which supports his new position to drive the development and implementation of the strategy. Niinikoski will start in this position at the beginning of November 2018.

Teemu Raitis has been appointed as President of Land business unit and a member of the Board of Management. He will start at the beginning of January 2019 at the latest. Prior to this appointment, Raitis was the CEO of Epec Oy, a subsidiary of Ponsse. He has also worked as Managing Director

of Ponsse's unit in Brazil and in various positions in Sandvik in Finland, Australia and in Chile.

Jonas Geust has been appointed as the new President of Systems business unit. He will start in this position at the latest in the beginning of November 2018. Prior to this appointment, Geust was the CEO of Rightware, where he has been leading the turnaround of the company into an industry leader in the connected car industry. Before Geust has been employed by Nokia for over 15 years in various management positions. He has been responsible for Nokia's N-Series product portfolio globally.

All three will report in their positions to Olli Isotalo, President and CEO of Patria Group.

Patria is owned by the State of Finland (50.1%) and Norwegian Kongsberg Defence & Aerospace AS (49.9%). Patria owns 50% of Norwegian Nammo, and together these three companies form a quite good suited Nordic defence partnership.

www.patria.fi

4th International Symposium on Development of CBRN

The 4th International Symposium on Development of CBRN will once again provide a professional platform for encounters and exchange of the international CBRN protection community. International experts will inform representatives from the fields of politics, administration, industry, academia, civilian and military organisations about latest developments in security policy and provide an up-to-date risk assessment with a view to chemical, biological, radiological and nuclear risks and the challenges they represent for military and civilian systems when it comes to hazard prevention.

September 3-5, Berlin, Germany



DARPA's 60th Anniversary Symposium

D60 is a three-day Symposium hosted by DARPA in honor of its 60th anniversary. The Symposium will highlight DARPA's innovative approach to creating breakthrough technologies and capabilities from the Agency's past, present, and future. DARPA's mission requires a constant stream of novel ideas and contributions from innovators looking beyond what is possible now. D60 will provide attendees the opportunity to engage with up-and-coming innovators, scientists and technologists, as they continue to provide these contributions.

September 5-7, Washington, USA



MS&D – International Conference on Maritime Security and Defence

In its 10th year of existence, MS&D – the international conference on maritime security and defence – will attract more attention than ever. During the extended two-day conference, speakers and lecturers will address pressing topics – including cybersecurity, climate change and naval technology. Be part of it and seize the opportunity to get together with high ranking global delegations.

September 6-7, Hamburg, Germany



SAHA EXPO

The exhibition which is organised by Turkey's largest Defense and Aerospace Clustering Association, SAHA ISTANBUL, aims to bring together the national and international leading manufacturers that produce special products and systems for the defense industry, civil aviation and space industry. The exhibition, where advanced technological developments in these sectors will be exhibited, will also be a meeting place for representatives of public and private institutions and procurement delegations from domestic and foreign countries.

September 13-15, Istanbul, Turkey



DVD2018

The theme for DVD2018 is Innovation today and tomorrow:

exploiting current capabilities more creatively and identifying novel solutions to enable Conceptual Force Land 2035. The event will showcase the equipment and technology that can support a British Army that is fit to meet future challenges. DVD2018 will focus on 21st Century Manoeuvre and the importance of Army innovation to its future delivery and transformation.

September 19-20, Millbrook, UK



SOBRA 2018

SOBRA 2018, the 7th International Fair of Defence, Security, Protection and Rescue, will present equipment, know-how and the most important institutions that provide defence preparedness, citizen security as well as protection and rescue in natural and other disasters. It will offer professional exhibitions and conferences, with advice for visitors, dynamic presentations, as well as educational and social events in which among others the Ministry of Defence of the Republic of Slovenia, the Slovenian Armed Forces, the Police will participate.

September 20-23, Gornja Radgona, Slovenia



ADEX

Azerbaijan International Defence Exhibition, ADEX, is the largest event in the region, the aim of which is to present a wide range of military products while promoting the innovative development of the Azerbaijani military-industrial complex. The exhibition is also a platform for cooperation between foreign arms-producing companies and the Azerbaijani military departments and defence industry enterprises.

September 25-27, Baku, Azerbaijan

**it-sa**

As one of the leading international trade fairs for IT security, it-sa welcomed 630 exhibitors in 2017, making it the top fair worldwide in terms of exhibitor numbers. It showcases an extensive range of IT security products and solutions including physical IT security, services, research and consulting. At it-sa and the accompanying Congress@it-sa, decision-makers and IT security experts find comprehensive information on the latest issues in IT security.

October 9-11, Nuremberg, Germany

**FUTURE FORCES FORUM**

International exhibition and expert events on the latest trends and technologies in defence and security. All events are focused on the presentation of needs of armed and security forces, state-of-the-art technologies, R&D programmes, and business opportunities, with interactions between all participants due to the interconnected topics. Government, international organisations, industry, R&D institutions meet at one place. NATO and the European Defence Agency are involved in shaping the programme.

October 17 - 19, Prague, Czech Republic



International Platform
for Trends & Technologies
in Defence & Security
www.future-forces-forum.org

**TechNet Europe 2018**

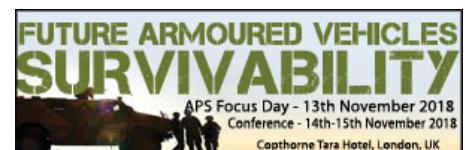
The two-day conference organised by AFCEA Europe in cooperation with the AFCEA Rome and Naples chapters, will be held under the patronage of the Ministry of Defence, Italy. Representatives from some of the highest levels of the European and NATO institutional, academic and industrial world will discuss the current situation, challenges and the various prospects of Maritime Situational Awareness.

November 6-7, Sorrento, Italy

**FUTURE ARMOURED VEHICLES SURVIVABILITY**

As the only event purely dedicated to the area of vehicle protection, Future Armoured Vehicles Survivability 2018 will deliver a strong focus on the relationship between current requirements, emerging technologies and how these might be leveraged to enhance force protection. Building on 2017's focus day, SMi will host an exclusive pre-conference Active Protection Systems focus day, dedicated to this important capability.

November 13-15, London, UK

**NIDV-Symposium – 30th edition**

During the NIDV-Symposium and exhibition, more than 130 companies show their potential. The top political level of the Ministries of Defence, Economic Affairs, Foreign Affairs and Security & Justice are invited. A special programme for the military attachés accredited in the Netherlands is offered. Sister organizations of the NIDV from abroad are also invited. And last but not least, representatives of the armed forces, the police, the fire brigade, the ambulance dispatch center, the coast guard and other public security organizations are present.

November 15, Rotterdam, The Netherlands

