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– the Scandinavian Military Magazine –

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FSi

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– the Scandinavian Military Magazine –
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TOTAL WAR IN THE CYBER DOMAIN

The entire civilised world, with the possible exception of a mr. DonAs the number of lives lost in war has been reduced during recent years, the war in cyberspace is raging at full strength, and spreading to ever new areas. In recent years, the cyber war has spread to include the exertion of influence by foreign states on large population sections, to promote both commercial and political interests.

In the middle of all this, the cyber war continues to target critical infrastructure and how this infrastructure can be destroyed, or even worse, controlled by a foreign power.

Not least, the traditional cyber battle continues over information content, such as insight into political and business processes, private and public databases, and perhaps most of all, access to sensitive technology.

Protecting information is becoming more and more demanding.

As early as several years ago, the hacker kids in the basement were replaced by professional, "state-employed cyber warriors", with regulated working hours and orderly pay and pension schemes. In addition to the persons involved in this thievery being highly educated, professional players, the technology development is also working in favour of the information thieves. So-called Quantum computers will in the very near future be capable of breaking just about any kind of codes, passwords and encryptions. And this development just continues.

Nobody believes that this cyber war is going to stop any time soon. And for the nations of the West, it is natural to seek solutions together, to share information, technology, and knowledge, in order to resist cyber-attacks. In the same manner that Western countries have been cooperating through NATO on traditional defence for more than 70 years, we are now seeing NATO members and NATO partner countries standing shoulder to shoulder in the cyber war. The American CMMC initiative (CMMC = CyberSecurity Maturity Model Certification, cf. article page 10), which requires of suppliers to the US military that they certify the supplier's cyber security, means that requirements and systems are being developed to increase cyber security across nations. Presumably, other allied nations will soon be using similar systems for their defence supplies.

But the cyber war is targeting all walks of society, not merely the defence sector and the defence industry, but all spheres of industry, financial environments, civilian infrastructure, the health sector and even individuals. In short, cyber-attacks are directed against the whole of society, and defending against cyber-attacks will require the whole of society to be involved. Applying military terminology, one would say that the cyber war is a total war, and it requires full mobilization.

Accordingly, for the years to come, we should expect that not just the defence industry will be required to certify cyber security, but that similar requirements will be applied to all parts of society.

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COVERPHOTO: A Leopard 2A7 during winter trials
Leopard 2A7 was introduced in 2017, and is the most recent version of the Leopard 2 main battle tank.
Photo: KMW

The Leopard 2A7 is the most recent version of the Leopard 2 main battle tank.

LEOPARD 2 MAIN BATTLE TANK: A CORNERSTONE IN EUROPE'S LAND DEFENCE

All the way since the Cold War, the Leopard 2 main battle tank has been among the cornerstones in the land defence of Europe. Today, no less than 12 nations in Europe are operating the Leopard 2 battle tanks: Austria, Denmark, Germany, the Netherlands, Norway, Spain, Switzerland, Finland, Poland, Portugal, Greece and Sweden. Further to this, Hungary is also in the process of procuring the Leopard 2. Beyond the European countries, operators of the Leopard 2 also include Canada, Chile, Indonesia, Singapore, Qatar and Turkey.

Photo: KMW

Continuous development

The development of the LEOPARD was initiated early in the 1960's, while it was not until the 1970's that the development gained momentum, resulting in the first Leopard 2 battle tank entering service in 1979.

The full story about the development of the Leopard 2 is pretty long. Ever since the first Leopard 2 battle tank entered operative service in 1979, the further development of the Leopard 2 has been more or less a continuous process. The newest and current version is designated the Leopard 2A7, while several countries are operating the version numbers of A4, A5, and A6. Even though the name may be the same, there are substantial innovation steps between the different versions of the Leopard 2 main battle tank. It should furthermore be noted that the same versions may also have different variations for different countries, meaning that e.g. a Danish Leopard 2A5 is not necessarily the same as a German or Swedish Leopard 2A5. However, the wearing parts are the same.

User driven development

A major part of the upgrades of the Leopard 2 through the years has come about as a result of requests from the user nations, in the form of what is often refered to as the Leopard 2 Users' Club.

In the Users' Club, several of the European user countries meet on a regular basis, to discuss new threats, new technological possibilities, as well as quite simple things like new sensors etcetera. The user group will make a decision on what needs to be done, and what suggestions are rejected, and determines the distribution of development costs and such matters. In this manner, the continuous development of the Leopard 2 has to a great extent been promoted by the users.

An example is the development of a mine protection kit. Five nations, that is Norway, Sweden, Germany, the Netherlands and Switzerland, conducted in 2003 a joint analysis of the threat posed by mines, IED's etcetera, and concluded that something needed to be done. The nations reached an agreement on the spread of costs, and a mine protection kit was developed and made in Germany. When Canada, with reference to their use of the Leopard 2 in Afghanistan, came to us with a query regarding mine protection, we were able to deliver this almost instantaneously in 2007, due precisely to the initiative of the five user nations a few years earlier.

Leopard 2A7

The Leopard 2A7 was introduced in 2017, and is the latest and most recent version of the Leopard 2 main battle tank.

So far, both Germany and Denmark have started the process of upgrading their earlier models to the level of the A7. Denmark is upgrading her A5 battle tanks to A7 level, while Germany is upgrading various models of its Leopard 2 fleet to the A7 level. Other nations, such as Hungary and Qatar, have elected to procure brand new Leopard 2A7 battle tanks off the production line.

The upgrade to A7 level means in many ways that the users are getting an almost whole new tank, including a total engine overhaul, renewed drive line, and new suspension systems etc.

Weight

– Much has been said about the weight of the A7 version of the Leopard and some sources have claimed that the A7 version weighs in at more than 70 tons. This is simply not correct, says a KMW spokesman. The weight of today's model of the A7 varies between 61 and 65 tons. However, the A7 is prepared for a weight of close to and over 70 tons, in that the engine and drive line, springs and suspension etcetera have been renewed, and all have the capacity to support the battle tank even if the weight should climb to the mentioned 71 tons. With this, the A7 version is prepared for future weight increases, that may come as a result of additional equipment, add-on armour etc.

New engine, while users favour the old

A new drive motor has also been developed for the Leopard 2, the so-called EuroPowerPack. This is as of today just a prototype.

– Even if the EuroPowerPack engine is both lighter and smaller, and the power is mostly the same as the original MTU engine, the users have so far shown no interest in the new engine, states the KMW spokesman. - The MTU engine of today, which is to all intents and purposes identical to the original from 40 years back, is tested through and through, and is a known entity to the users. The possibility of interoperability with other Leopard 2 users when it comes to workshop facilities and repairs, as well as spare parts and training, is why the users still favour the good old workhorse engine.

Main gun

The main armament on the Leopard 2 is the Rheinmetall L55 120mm. For the Leopard 2A7, the newly developed L55 A1 version has been introduced, with the capacity for higher pressure.

Rheinmetall has also been working on a 130mm cannon for almost 20 years now, and have finally come up with a prototype. This gun may be a candidate for the next generation of battle tanks, but no decision has been made yet. It seems as new and much larger gun will call for a number of compromises to be made. Not just the wight of the cannon, but perhaps even more important, the added weight and size of the ammunition, will pose major design challenges.

If a 130mm cannon is to be mounted on existing battle tanks, a whole new turret will be required. Besides, there is a widespread uncertainty about how effective the 130mm cannon will actually be against enemy battle tanks. As of this date, no new 130mm ammunition is available, and both development and verification of new ammunition take time before production can start. It will probably take at least upwards of ten years before the 130mm cannon is viable and a whole new generation of battle tanks will then be likely.

Secondary weapons

The secondary weapons are user specified, but as of today, a standard 7.62-millimetre machine gun is used on most of the Leopard 2 battle tanks.

As of today KMW has received an order for additional secondary weapon only from one customer; this came from Qatar, who wanted a remote-controlled weapons station on all of its main battle tanks.

Armour

The armour protection on the Leopard 2 was stepped up significantly from the Leopard 2A4 to the Leopard 2A5 version. This was to raise the level of protection against enemy cannon fire from their battle tanks. For the A6 and A7, protection has been improved again, among other things with the use of new materials. It should be noted that Sweden wanted better protection of the main battle tank on the roof, for their A5 battle tanks. This separates the Swedish A5 vehicles from other A5 tanks.

The Leopard A7 comes with a standard package for armour and passive protection. The standard package for passive protection is geared towards tank-to-tank protection. KMW can also offer different supplemental packs, such as protection against RPG and other types of anti-armour weaponry, depending on the customer´s requirements. These systems are interchangeable and can be installed and detached again as needed.

Active protection

To date, the only order for active protection has come from the German Army. A number of countries have indicated an interest in active protection, but so far only Germany has placed a firm order, and then only for a modest number of her Leopard 2 tanks.

Sensors

In the Users' Club, a continuing subject is that of sensors and technology. For the A7, all the users have opted for the same sensors and the same technology, both for the shooter and for the vehicle commander, in line with what the Users' Group has arrived at. This applies to the main aiming equipment and the central parts of the on-board systems. Some countries have chosen various pieces of optional or add-on equipment, while this has no bearing on the main systems in the battle tanks. Most countries have during joint exercises experienced the value of having identical vital elements on board the various nations' tanks.

For the day-and-night cameras for the driver, the different user nations have to some extent had particular specifications, opting for different solutions. Sometimes a user country might prefer for these systems to be the same as that used by other vehicles in the defence of that country.

Industrial collaboration

The Leopard 2 programme has extensive experience from industrial collaboration. For a number of years, the chassis and body for the Leopard 2 has been manufactures in Greece, and the Swedish Leopard 2A5 were at the time made in co-operation with Hägglunds of Önskiöldsvik, some 400 kms – 250 miles – north of Stockholm.

– We are envisioning for example doing the final assembly of either the complete tank or the turret at several locations in Norway, explains the KMW spokesman. However, this will be up to the wishes and preferences of Norway.

KMW can also foresee the possibility for Norway to participate indirectly in the Leopard 2A7 programme. The integration of the Kongsberg integrated combat solution in particular may be the closest to hand. If Norway chooses to integrate this system on her battle tanks, this may open the door to selling this solution to other nations in the future. A prerequisite for this to succeed is that the Norwegian battle tanks carry this system on board, and demonstrate to other nations the added value for the interoperability together with the CV90, artillery, F-35 aircraft and so on. Only then will the full potential be revealed to the other nations. ■

LEOPARD 2 A7 NO

- **Crew size:** 4
- **Max. reverse / forward:** 28 km/h / 60 km/h
- **Forward slope:** 60 %
- **Side slope:** 30 %
- **Ditch crossing:** 3.0 m
- **Vertical obstacle:** 1.05 m
- **Fording:** up to 4.0 m
- **Ammunition:** 42 rounds
- Multi-purpose grenade launcher system 12 x 76 mm
- **Length (12 o'clock position):** 10,968 mm
- **Width:** 3,774 mm
- **Height (PERI):** 3,180 mm
- **Weight:** 61.5 t – 64.3 t
- NBC protection system

ENGINE:

- MTU Multi-fuel power pack 1,500 hp

MAIN GUN:

- Fully stabilized smooth bore 120 mm long version (L55 A1)
- **Vertical elevation:** –7.4° up to +17.4°
- **Horizontal** n x 360°
- Fuse programmable high explosive ammunition

SECONDARY GUN:

- Coaxial MG fully stabilized GPMG, 7.62 mm

SECONDARY GUN:

- Coaxial MG fully stabilized GPMG, 7.62 mm

FACTS AND FIGURES

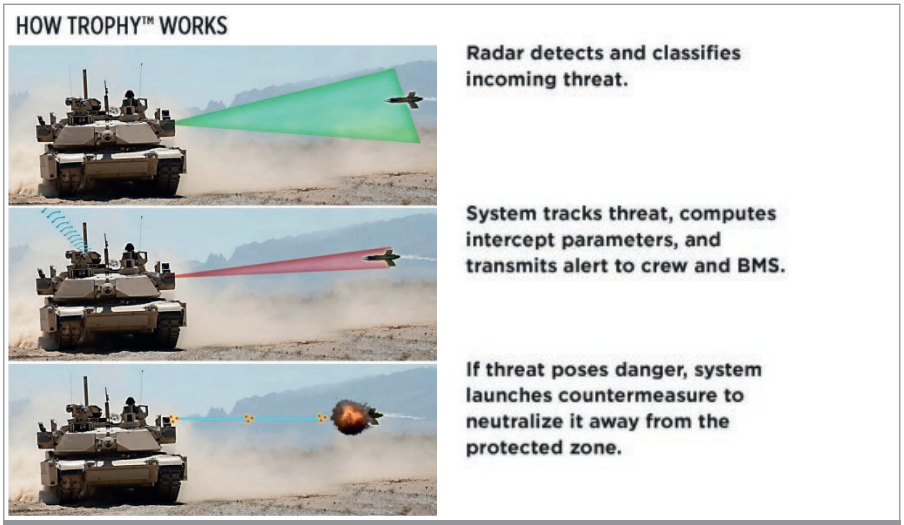
LEOPARD 2 IN SHARP OPERATIONS

The first time the LEOPARD 2 was used in a sharp conflict was in 1999, when Germany deployed 28 Leopard 2A5 to Kosovo. Later on, the Dutch contingent to Bosnia-Hercegovina operated a number of Leopard 2A4 and 2A5.

I 2006, Canada deployed a suite of Leopard C2 battle tanks to Afghanistan. The Leopard C2 was an upgrade of the Leopard C1. (Leopard C1 corresponds to the Leopard 1A3). However, the Canadian C2 battle tanks were pushing the age of 30 years when they were deployed, and the Canadian Army soon found out that the operational effectiveness of these vehicles was rather limited. Canada then chose to borrow 20 units of the Leopard 2A6 from Germany including the mine protection kit, and the first of these vehicles came to Afghanistan in August of 2007. In October of the same year, even Denmark went in with Leopard 2A5 to support her forces in the southern part of Afghanistan.

The most extensive sharp operations with Leopard 2 took place in 2016, when Turkey went into Syria in an attempt to take down the Islamic State (ISIL). Turkey disposes of 354 of the old Leopard 2A4 version, and a number of these were sent to take part in the conflict in Syria. It is estimated that a total of ten Turkish Leopard battle tanks were destroyed, some by anti-armour weaponry, and some by improvised explosive devices (IED) in Syria during the period of 2016 to 2017. This is the greatest number of Leopard 2 battle tanks that have been destroyed in any conflict.

TROPHY ACTIVE PROTECTION SYSTEM ON GERMAN LEOPARD 2 TANKS



Ill. Rafael

Israeli defence industry group Rafael Advanced Defense Systems announced in February that the German Federal Ministry of Defence has decided to equip the Bundeswehr's Leopard 2 MBTs with Rafael's TROPHY Active Protection Systems (APS).

The German Army plans to successively equip a number of its tanks with active protection systems in light of the threat posed by modern anti-tank weapons. The systems will be delivered over the next several years. Krauss-Maffei Wegmann is the contractor to install Trophy components on the tanks.

Developed by Rafael in response to anti-armour attacks, TROPHY APS provides mature, combat-proven protection against rocket and missile threats and simultaneously locates the origin of the hostile fire for immediate response. TROPHY is the only fully-integrated, combat-proven APS in the world and has been installed on Israel Defense Forces' Merkava tanks since 2010, as well as on the Namer APCs. TROPHY has made numerous combat interceptions with no injuries to crews or dismounted troops or damage to platforms since its first operational interception in 2011. TROPHY has accrued over 1,000,000 operating hours, including 5,400 successful field tests, and is now under contract for serial production of over 1,800 systems.

In January, Rafael and partner DRS announced that they had completed the delivery of TROPHY Active Protection Systems (APS) ordered by the U.S. Army for installation on Abrams main battle tanks, under contracts awarded on an urgent need basis by the US Army.

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K2 : Neste generasjons stridsvogn er klar for konkurransen

K2 er en av de mest avanserte stridsvognene i verden. Den nyutviklede stridsvognen er basert på banebrytende teknologi. Kombinasjonen av velprøvd og moderne europeisk og koreansk teknologi gir stridsvognen det høyeste nivået av beskyttelse, ildkraft og mobilitet.

K2 s unike egenskaper gjør at vognen er svært godt tilpasset den krevende norske topografi med daler og utfordrende fjellområder. Dette, kombinert med det moderne designet til K2, gjør denne stridsvognen til det beste valget med en levetid på mer enn 30 år understøttet av en stabil og pålitelig logistikk. Samtidig kan Norge se frem til økt deltagelse fra norsk industri som igjen bidrar til økt forsyningssikkerhet og beredskap.

Det er bra at Norge anskaffer nye stridsvogner gjennom åpen konkurranse. Ved å teste de forskjellige stridsvognene mot hverandre under norske forhold, får Norge et klart og tydelig bilde av hvilken stridsvogn som best møter Norges langsiktige behov.

K2 er klar for konkurransen.

Hyundai Rotem is representet in the Nordic Region by Military Equipment Denmark A/S

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Norwegian Defence and Security Industries Association (FSi)

THE LEADING ASSOCIATION IN NORWAY ADVOCATING THE INTERESTS OF ITS SECTOR, AND THE PRIMARY INTERLOCUTOR FOR THE GOVERNMENT IN MATTERS OF IMPORTANCE TO THE INDUSTRY. AFFILIATED WITH THE CONFEDERATION OF NORWEGIAN ENTERPRISE (NHO) AND REPRESENTING MORE THAN 100 COMPANIES

SAMARBEID FOR ET HØYTEKNOLOGISK OG FREMTIDSRETTET FORSVAR

For litt over ett år siden ble de mest inngripende tiltakene i Norge siden 2. verdenskrig iverksatt. Usikkerheten om konsekvensene av pandemien var stor, også i forsvarsindustrien. Så langt har forsvarsindustrien unngått omfattende konsekvenser. At myndighetene lyttet til industriens behov og raskt iverksatte tiltak for å dempe de negative effektene av krisen var avgjørende. Bedriftene har klart å holde produksjonen i gang, og å sikre at både Forsvaret og allierte lands forsvar har fått sine leveranser. Situasjonen som pandemien har skapt har bidratt til å synliggjøre at norsk forsvarsindustri og eksport av forsvarsmateriell fra Norge er viktige bidrag til alliansens beredskap og sikkerhet.

Erfaringene viser også at forsvarsindustrien kan bidra til verdiskapning og aktivitet i industrien når mange andre bransjer blir hardt rammet. Da mye annen virksomhet bremset kraftig opp, holdt forsvarsindustrien aktiviteten i gang i mange bedrifter i hele landet. Langsiktige kontrakter med solvente offentlige kunder og samarbeid med store internasjonale forsvarsleverandører, gjør forsvarsindustrien bedre rustet til å komme gjennom kriser, slik den vi nå opplever, enn mange andre bransjer. Dette har hele den norske forsvarsindustriklyngen erfart. Ikke minst har mange mindre underleverandører i hele landet, som særlig i de første månedene av krisen opplevde en svært dramatisk markedssvikt i segmenter som olje og gass og maritim industri, hatt stor nytte av forutsigbare langsiktige leveranser til forsvarsprogrammer både i inn- og utland.

De langsiktige konsekvensene av pandemien for forsvarsindustrien og det internasjonale forsvarsmarkedet er fortsatt uavklarte. Mer proteksjonisme ser vi allerede antydninger til. Dersom forsvarsbudsjettene blir salderingspost for å dekke inn budsjettunderskuddene som tiltakspakkene medfører, må det forventes ytterligere tilstramminger. Det er derfor grunn til å anta at det internasjonale forsvarsmarkedet blir enda mer krevende når pandemien er tilbakelagt.

Uavhengig av pandemien, påvirkes forsvarsindustriens omgivelser av globale sikkerhetspolitiske utviklingstrekk og en teknologisk utvikling som går raskere enn noen gang. Dette er bakteppet når regjeringen nå har lagt frem en oppdatert forsvarsindustriell strategi: "Samarbeid for et høyteknologisk og fremtidsrettet forsvar" (Meld St. 17 (2020-2021)). Strategien tydeliggjør i enda større grad enn gjeldene strategi (Meld. St. 9 (2015-2016)), sammenhengen mellom forsvarsindustrien, nasjonale sikkerhetsinteresser, forsyningssikkerhet og materiellberedskap. Regjeringen slår fast at samarbeidet mellom forsvarssektoren og forsvarsindustrien skal videreutvikles og styrkes.

Strategien legger opp til å videreføre hovedlinjene i gjeldene strategi ved å forsterke tiltak som har dokumentert virkning. I tillegg introduseres en rekke nye tiltak som industrien har etterspurt. Det legges opp til en helhetlig tilnærming fra forskning og utvikling frem til gjennomføring av anskaffelser, levetidsunderstøttelse og videreutvikling. Regelverk, prosesser og prosedyrer for investeringer og anskaffelser skal forenkles.

Regjeringen varsler tiltak særlig rettet mot å legge til rette for at Forsvaret i større grad skal kunne samhandle med små- og mellomstore bedrifter. I denne forbindelse vises det til at konseptutvikling og eksperimentering, i samvirke med brukermiljøene i Forsvaret, skal bidra til dette.

Viktigheten av eksport, både av hensynet til nasjonale sikkerhetsinteresser og forsvarsindustriens behov for kontinuerlig aktivitet, understrekes. Støtten til eksport av forsvarsmateriell fra Norge skal videreføres og styrkes, gjennom blant annet målrettet bruk av nye virkemidler. I denne forbindelse slås det fast at krav om forpliktende industrisamarbeidsavtaler, som en integrert del av anskaffelseskontrakten, vil bli videreført ved anskaffelser av forsvarsmateriell fra utenlandske leverandører.

Strategien regjeringen foreslår er et godt utgangspunkt for å legge til rette for at norsk forsvarsindustri skal bli bedre i stand til å møte utfordringene den står overfor, slik at industrien forblir en viktig bidragsyter til nasjonal sikkerhet og verdiskapning med interessante og attraktive høyteknologiske arbeidsplasser i små og store bedrifter i hele landet.

Det er en ambisiøs strategi som forutsetter endringer i måten industrien og Forsvaret samhandler på, betydelige investeringer i forskning og utvikling, at både personell og materiell stilles til disposisjon for konseptutviklings- og eksperimenteringsaktivteter og mer ressurser til å støtte eksport av forsvarsmateriell.

Forutsatt at tilgangen på ressurser står i forhold til ambisjonene og at tiltakene iverksettes hurtig og med tilstrekkelig kraft, ligger det godt til rette for at strategiens målsetting kan bli oppfylt. Det forutsetter at behandlingen i Stortinget bidrar til å sikre fortsatt stabile og forutsigbare rammebetingelser som gjør det mulig for forsvarsindustrien å fortsette å satse i Norge. Bredest mulig politisk oppslutning om strategien i Stortinget vil være et godt utgangspunkt for å sikre at «Samarbeid for et høyteknologisk og fremtidsrettet forsvar» styrker både nasjonal sikkerhet og norsk forsvarindustri.

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CMMC: CYBERSECURITY MATURITY MODEL CERTIFICATION

CMMC is a freshly developed model for the assessment and certification of suppliers' level in terms of cyber security. The model will be compulsory for all suppliers to the US armed forces, and for all subcontractors to companies that are suppliers to the US military.

The USA is the Norwegian defence industry's most important export market, and it therefore came as no surprise that there was considerable interest when the FSI arranged a cyber seminar on CMMC in January. More than 100 delegates attended the seminar, with keynote speakers in both Norway and the United States.

The conference was opened by the Norwegian Ambassador to the US, Anniken Krutnes, who focused her address on the strategic importance for Norway of the Norwegian defence industry. But the Norwegian defence market is not big enough to sustain the industry, so the Norwegian defence industry is dependent on exports. Norway and the USA are very close allies, and although the American defence market is important for Norwegian industry, Krutnes explained, the Norwegian defence industry has also contributed to the creation of thousands of jobs in the USA.

Katie Arrington, the Chief Information Security Officer to the Assistant Secretary of Defense for Acquisition, explained the backdrop for the CMMC model.

– Today, we are all connected to each other through the internet, and often there is only a single password that protects our data from being available to everyone who is on-line. Uncovering passwords is the easiest and most common way for intruders to intrude on company or private data. And unfortunately, passwords are often quite easy to guess; we have a penchant for using passwords of the easiest type, like a favourite colour, the name of the street where we grew up or live today, the name of the spouse, and so on.

– Those who are really interested in your company, do not penetrate the firewalls just to steal drawings, data and product information, but they look for and steal everything that is available, such as overview and personal data about employees, subcontractors etc. When China a few years ago presented a fighter jet that was remarkably similar to the F-35, we found that this was no accident. China had penetrated the chain of supply for F-35 production. We accordingly have a need to be able to monitor the supply chain of our defence supplies, and this is where CMMC enters the picture.

– Even the technological developments are working against us when it comes to cyber security. Under development today are so-called quantum computers, which will be able to break through every kind of encryption. Here we really need to work together, both industry, research communities and authorities, to face up to this development.

Sharing experiences

Jan Kopperud and Anja Heggem from Kongsberg, Kent Nilsen from Nammo and Hans Petter Thomassen from Kitron presented the CMMC work that is going on in their companies, and the experiences they have made so far.

All three companies began by explaining that they have a strong focus on CMMC, and that they initially aimed to gain CMMC certification within about a year. However, all three companies had also experienced that the process takes time, so the time frame is somewhat uncertain. In addition, all three companies placed strong emphasis on training their own personnel.

Hans Petter Thomassen from Kitron summed up his presentation like this:

– We have essentially undergone the same deliberations as Kongsberg and Nammo. Training is the key to success. We must realise that the cyber threat has come to stay, and this means we cannot rely only on external consultants to deal with this. We have to build the competence in our own organization and be able to involve the entire organization in this work.

Thomassen concluded by emphasizing that for a high-tech company like Kitron, which receives more than 40,000 different components from a large number of subcontractors, cyber security in the supply chain is one of the really big challenges.

FACTS AND FIGURES:

CMMC

CMMC stands for "CyberSecurity Maturity Model Certification" and is a unifying standard for the implementation of cyber-security across the Defence Industrial Base (DIB). The CMMC framework includes a comprehensive and scalable certification element to verify the implementation of processes and practices associated with the achievement of a cyber-security maturity level.

The theft of intellectual property and sensitive information from all industrial sectors due to malicious cyber-activity threatens economic security and national security. Estimates have concluded that malicious cyber-activity cost the US economy between 57 and 109 bn USD. The global cost of cyber-crime was estimated as high as USD 600 bn in 2017.

The more than 300 000 companies in the supply chain of the US armed forces (The Defence Industrial Base, DIB) is one of the main targets of the malicious cyber actors.
CMMC is designed to provide increased assurance to the Department that a DIB company can adequately protect sensitive unclassified information, accounting for information flow down to subcontractors in a multi-tier supply chain.

The US office of the Under Secretary of Defence for acquisition and Sustainment has developed the CyberSecurity Maturity Model Certification (CMMC) framework. The CMMC model measures cyber-security maturity with five levels and aligns a set of processes and practices with the type of sensitivity of information to be protected . The CMMC model is based on multiple cybersecurity standards, frameworks and other references.

HACKING4ALLIES: EXPERIENCES FROM THE PILOT PROJECT

Hacking 4Allies (H4A) is a programme designed to help Norwegian defence and security startups grow and enter the U.S. market. The program sources problems common to both the U.S. and Norwegian national security and defence, to help Norwegian technology startups address these problems.

At the end of February, these co-operating partners co-hosted a webinar for the presentation of experiences and opportunities in the H4A for Norwegian industry companies. The backdrop consisted of experiences from the initial H4A pilot programme. This pilot programme was organised by FFI and Innovation Norway, and four Norwegian SMB companies took part: Alva Industries, Exitus, Fieldmade, and Ubiq Aerospace.

The webinar was opened by Ms Anniken Krutnes, the Norwegian ambassador to the USA, who noted in her address that Norway is a unique ally to the USA on many counts, and that the USA and Norway have a long-standing tradition for working well together. The Ambassador made a particular point of noting that Norwegian defence industry has created more than 1000 jobs in the USA.

Professor Steve Blank, a Silicon Valley entrepreneur, opened his statement by commenting that becoming a supplier to the US Armed Forces is not for the faint of heart. It can take several years just to find out exactly how to start the process. – My advice to Norwegian businesses who are considering an entry into the US market, is to provide people with as much training and education home in Norway as possible. Secondly, companies should start to create hubs, where they can be of assistance to each other and draw on the others' experiences, good and bad. And programmes like H4A are also valuable tools. Every kind of programme like this will shorten the process of entering the US market.

Steve Blank also opined that the climate for being accepted as a foreign supplier to the American Armed Forces is much more favourable than it was just a few short years ago.

– The USA has begun to understand the meaning and value of allies. This has come about not least due to China's ever-increasing ability to position itself in high-tech and academic environments, Blank concluded.

Torgeir Mørkved from FFi concluded that the pilot programme had been a success, and that work was now ongoing with future H4A programmes.

– The need for technological innovation is greater today than when we started four years ago, and the globalization of technology has increased the difficulty of standing the course alone. Alliances are therefore essential in the race to stay at the cutting edge of technology, while also keeping up further development.

– The pilot programme was particularly directed towards special forces and their equally special needs. For the next round, we are envisioning a broader approach, with a view to Arctic operations. We are thinking that the early phases of the programme should be conducted in Norway, in collaboration with ICE Worx.

ICE Worx is the FFI's centre for innovation, intended to stimulate and promote broader collaboration and facilitate for more experimentation within the defence sector, while forwarding the development and use of more efficient tools and processes. In this manner, the centre will be contributing to better materiel and technological solutions for the Armed Forces.

– Through this work, we are hoping to build a group for innovative Norwegian businesses who can support and assist each other if one or more of the businesses choose to make a play for the international market.

Favourable experiences

The four businesses who took part in the H4A pilot programme, all presented their experiences. All the businesses agreed that the programme had been an extremely useful learning experience. Not least, the companies had been able to develop and participate in a valuable network. Two of the businesses even signed contracts on the investor side.

Ubiq Aerospace participated in the in the H4A pilot program. One of Ubiq´s main products is D-ICE , an intelligent ice detection and mitigation solution for unmanned aircraft. *Ill. Ubiq*

FACTS AND FIGURES:

H4A

Hacking 4 Allies (H4A) is a collaboration between Innovation Norway, The Norwegian Defense Research Establishment (FFI), The Norwegian-American Defense & Homeland Security Industry Council (NADIC), BMNT Partners, and the Royal Norwegian Embassy.

FACTS AND FIGURES:

NADIC

The Norwegian-American Defense & Homeland Security Industry Council (NADIC) is a trade association that has been established to develop the business and research cooperation between the Norwegian and American related industries. NADIC studies relevant opportunities and facilitates stronger ties between Norway and the United States, while encouraging a fair competitive environment in U.S. markets.

NADIC seeks to enhance existing relationships by promoting awareness of capabilities, products and services offered by the Norwegian defence and security community.

NORWEGIAN INDUSTRY DAY NATO SUPPORT AND PROCUREMENT AGENCY (NSPA)

In early March and under the auspices of the Norwegian Ministry of Defence, the FSi together with the NSPA arranged a web seminar about NSPA and how Norwegian Industry can approach this huge procurement agency.

GEO of FSi, Torbjørn Svensgård gave a brief presentation of Norwegian Defence industry and stated that over the years, several Norwegian companies have had deliveries to NSPA. – Still, we believe that there are more Norwegian companies who have a potential for a NSPA contract, and these companies should look into the possibilities here.

And as for 2019, Norway ordered 70 million Euro in materiel and services through the NSPA system, and Norwegian industry did only get contracts for 42 million Euro, so the balance is not in Norway´s favour.

NSPA Chief of Market research and industry information, Mr. Carlos Ferrer Lopez, presented NSPA and emphasised the importance of having the industry understand the procurement procedures and ways of thinking among the NSPA.

- At the outset, we are always looking to get the best possible value; that is our baseline. Normally, we do most of our purchasing from NATO countries, including in some cases also NATO partner countries.

In closing, Ferrer Lopez underscored that the time frames for NSPA procurements can often be tight, and for businesses with a wish to participate in future contests, it is important to become familiar with the procedures and processes of the NSPA beforehand.

NSPA Source File

The NSPA Source File is a centralised database containing past, present, and potential vendors, including performance and capabilities. The information registered in the Source File supports the source selection for NSPA's procurement as well as the determination on the eligibility of a company for the award of a contract.

Source Identification Section Chief Mr. Enzo Silvestro gave a presentation of NSPA source file, and strongly suggested for businesses to get registered in the database ahead of time, since time is often of the essence when the request arises.

And not least, Silvestro added pointedly, make sure you keep the registry information up to date, with regard to changes to contact persons, new product types, technology advances, new owners etcetera.

Almost all requests for proposals or information are published through our website. We also always chase capabilities within NATO countries, companies that are both registered in a NATO country and do the main part of their manufacturing within a NATO country. You can subcontract some of your production outside NATO, but not from industry in countries under communist control like, for instance, China.

The company NorLense has delivered inflatable tents to NSPA for use in Estonia. *Photo: NorLense*

NorLense

The company NorLense has delivered inflatable tents to NSPA for use in Estonia.

– We have a quite unique product, but still, we have competitors, Rune Fivelstad from NorLense stated as an introduction, adding that an NSPA contract is not just handed over to you for free.

– To follow the opportunities published by NSPA, you have to be active in their website on a weekly basis. And this is quite challenging for a medium company like NorLense. I think for the future, it should be possible to make the procurement portal a bit more automatic when it comes to the publication of business opportunities.

- It important to have correct, updated registrations. There are a lot of tenders issued through NSPA, but also some opportunities by invitation only, and if you are correctly registered, you have a better chance of getting these invitations.

Fivelstad also underscored the information of the RFI (Request for Information), and recommended for companies to be very active in responding to these, with a particular view to correctness and deadlines. – Enter as much technical information as possible, and make sure you are presenting the unique selling points and advantages of your product.

When the RFP (Request for Proposal) comes in, be aware that these require extensive preparation, so make your start well before the deadline. Also make sure you provide accurate information, answer all questions, backing it up with correct, relevant, and updated documentation.

- Furthermore, be conscious about packaging, transport and delivery of the product, both in terms of the technical implementation and not least the costs. Make sure you are aware of the applicable rules for tax and duties for the country where delivery will be made.

Fivelstad used his closing remark to emphasise that a good NSPA delivery is a first-rate reference for the product. – And not least, when we set up the camp with the tents and our equipment in Estonia, we were subject to close scrutiny from users in other NATO countries, and this is the best marketing promotion we can get.

FACTS AND FIGURES:

About NSPA

The NATO Support and Procurement Agency (NSPA) brings together, in a single organization, acquisition, logistic, medical and infrastructural capabilities. As NATO's primary enabler, the Agency's mission is to provide effective and cost efficient multinational solutions to the Alliance, its thirty Nations and Partners.

Headquartered in Luxembourg, NSPA is a customer-funded agency, operating on a "no profit - no loss" basis. The business activity has grown nearly fourfold in the last decade, reaching an annual business volume of €4 billion.

Over 60,000 companies are registered in the NSPA source file, of which 10,000 are actively doing business with NSPA's customers.

METRONOR | METRONOR AS

Metronor AS was established in 1988 and has since then developed and installed dimensional inspection and process monitoring metrology systems to support some of the largest and most renowned global corporations, ensuring that parts fit together the very first time.

In 2006 the company spun off a business unit addressing boresight requirements for military vehicles like fighter and trainer aircrafts, as well as combat and utility helicopters. The company is now about to expand this business to include land-based combat vehicle platforms, providing means for more accurate target acquisition.

The company's technology and products

Metronor possesses unique competence in the field of metrology. By combining advanced mathematical modelling competence with metrology experience and application understanding after years of working with leading companies like Boeing, NASA, Volkswagen, Carl Zeiss, GM, Volvo, BAE Systems, Korean Aerospace, GE Energy and more, state-of-the-art 3D video camera-based solutions have been sold and installed to our customers and partners, offering full CMM and bore-sight functionality on the shopfloor.

The company's organisation, employees and owners

Metronor's unique camera-mathematical modelling techniques represents the core of the company's product portfolio and has been transferred into a range of configurations for sale into the industrial, defence and medical market segments. The company has established dedicated business units addressing the diverse requirements and applications that these market segments represent.

All development, production and customer support activities are managed out of the corporate HQ at Nesbru, Asker, just southwest of Oslo. Local sales and support are also provided out of offices in Beijing, Saarbrucken/Germany and Detroit. In total the company employs 23 persons.

The company is a Norwegian business entity with pension funds and private investors as owners.

The company's involvement in the defence market

Metronor's defence product range (boresight) is sold to end-customers (air forces) via OEM agreements with aircraft platform owners or providers of Aircraft Ground Equipment packages. Metronor's OEM partners are BAE Systems Inc., Saab Aerostructures, BAE Systems Hawk program and Korean Aerospace Industries. – Our industrial CMM products are mostly sold directly to end customers like Boeing, thyssenkrupp Marine Systems and BAE Maritime Services.

FSi membership

Metronor has been a member of the FSi for more than 20 years.

As a Norwegian SMB, it is a complicated task to find relevant POCs within large defence industry players' organizations that Metronor can do business with. The contact network of FSi and their support in opening doors is why Metronor is a member of FSi.

How the company leverages its membership in the FSi

FSi can provide valuable advice on ongoing acquisition programs and assist in opening doors to relevant players. Moreover, to facilitate meetings with offset representatives of companies doing business in Norway. In addition to support from FSi, also MOD, Norwegian embassies, and local FSi / Innovation Norway representatives have contributed in the door-opening process.

Military certified electro-optical alignment system.

Geometrical QC of mechanical interfaces for the International Space Station and SpaceX.

Boresight of the BAE Systems' Hawk Trainer.

THE STORTING WANTS TO INCREASE THE DEFENSIVE CAPABILITY OF CYFOR

Over the latest few months, the Storting, several other society institutions as well as newspapers have been victims of data attacks. Russia was publicly challenged with being behind the attack on the Storting. Norwegian intelligence agencies have for many years been saying that the cyber threats are the fastest growing threats of our time. The Director of Communications for CyFor, Knut Helge Grandhagen, further states that the Storting wants a boost to the defensive capability of CyFor in terms of personnel. A notable number of digital threats are impacting on the Armed Forces regularly.

Text: Tor Husby

– Some of these are serious, while others are less grave and quite easy to manage. The Armed Forces make an attractive target for several very competent digital treat posers, while also being a target for digital intelligence gathering in the more serious end of the scale. Furthermore, the Armed Forces are also hit by many of the challenges facing society in general, with attempts of digital crimes and digital activities. The picture, in other words, is many-faceted. The secret services have for many years been presenting the cyber threats as having the fastest growth, and the picture holds several forms of threats, where crime is a fitting example. There is every reason to believe that this threat will prevail into the far and near future.

Knut Helge Grandhagen, The Director of Communications for CyFor. *Photo: CyFor*

Have the Armed Forces become less or more vulnerable to cyber-attacks?

– The most important aspect is that as a result of the digitalisation and the modernisation of the defence, the dependence on ICT support of the digital services has become greater, and the alternatives have become harder to find.

Fewer alternatives

Looking back to military operations in the 1970's, when radio communications failed, there was always the option to send out a motorcycle messenger or using a field line. As a result of the digitalisation and the sheer size of the Armed Forces today, the dependence on military collaboration operations is higher, the field size of today's units is greater, and many of these alternative functions no longer carry the effectiveness that they used to be able to deliver. With the pace of the modern battlefield, ordinances are not an option, nor is it obviously a valid option to deliver messages to the F-35 with a combat message pad.

Given that the threat and the dependency is increasing, it is reasonable to conclude that the risk to be managed by the cyber defence is greater. The further digitalisation of the defence will by its nature increase the dependency and the risk by a few more degrees. However, there is a considerable number of highly skilled persons striving every day to reduce the remaining risk to an acceptable level.

What is the position of CyFor in relation to our allies?

– This is a demanding issue. There are no current signals that we are lagging behind many others, even though the bigger NATO nations are obviously able to commit much greater resources to the cause.

On a par with others

In terms of proficiency and competence etcetera, we have nothing to be ashamed of. Having said this, it is also clear that defensive capability in many ways broadcasts a message on vulnerability and endurance. The great majority of countries are reluctant to announce exactly what resources they comprise of in this area. For this reason, the basis for making direct comparisons is weak.

This being said, CyFor exercises and trains on NATO-scenarios jointly with other member nations and PfP countries. There have been no circumstances to suggest that we are significantly behind others, even though our professional environments in the area may be small and vulnerable.

Is the Cyber Defence getting the necessary resources?

– In my humble opinion, there is not a single part of the Armed Forces that is allocated the necessary resources. The Defence gets the resources that the society is willing to spend on the defence of the nation, and will and resolve its missions to the best of its ability with the funds available. The same can be said about CyFor.

Parliamentary focus

But it should also be noted that the Storting has these challenges sharply in its focus. There was indeed a "Roman Numeral Decision" in the latest long-term plan regarding the strengthening of CyFor in terms of personnel, connected to its defensive cyber operations, said Knut Helge Grandhagen in conclusion.

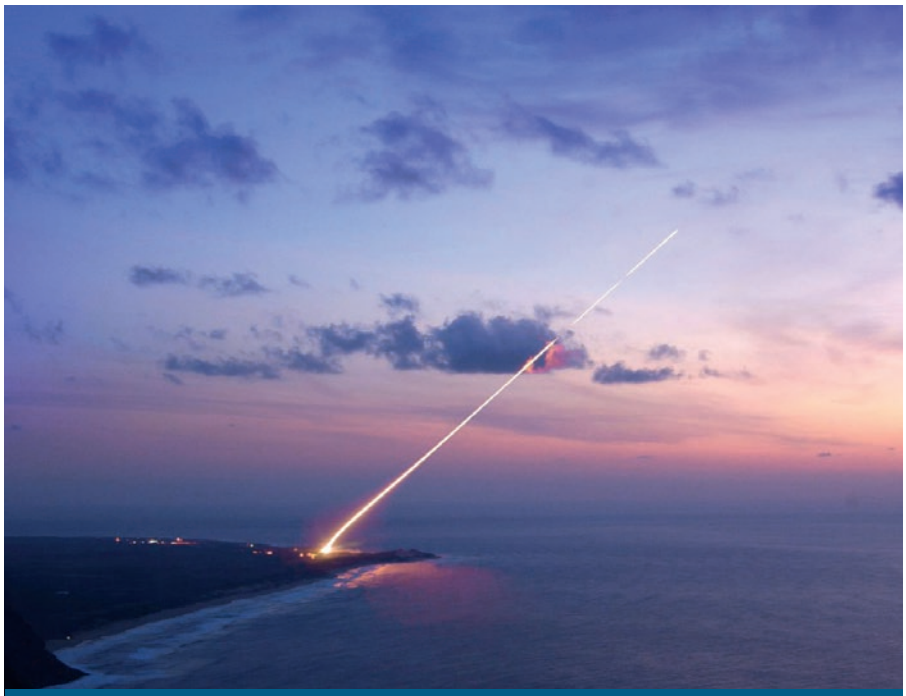
PATRIOT FOR SWEDEN: THE SWEDISH PATRIOT PROJECT ENTERS A NEW PHASE

The FMV has recently received the first deliveries for Sweden's new air defence system. Tools and test equipment are in place for kit packaging, while electrical power plants and vehicles are next in line.

LAUNCHING A PAC-3 PATRIOT MISSILE

The PAC-3 missile, one of the latest versions of the Patriot missiles is highly manoeuvrable and can reach a speed of up to Mach 4.1 (4900km/h)

Photo: Lockheed Martin



TEST FIRING PATRIOT AT NIGHT

As of today, the Patriot system is one of very few ground-based anti-air missile systems that has proved in combat its capacity of intercepting incoming ballistic missiles.

Photo: Lockheed Martin

These are tools and test equipment that have come in from the USA and will next be packaged as kits in different containers. This equipment will be used in connection with the verification work of the first Swedish firing unit, which will be carried out next year. Before we have more containers manufactured for the Armed Forces, the ones we have must be evaluated.

In the spring of 2021, FMV will bring home both heavy vehicles and powerful power plants that are part of the system.

For the vehicles, the FMV chose to use an existing framework agreement with the German RMMV to achieve system equality with other vehicles in the defence, and as favourable conditions for delivery certainty as possible.

The procurement consists of three different vehicle variants: tractors, crane trucks and container trucks.

It is expected that the FMV will deliver the first firing unit to the Armed Forces during the autumn of this year, and during 2022 FMV will receive firing units no. two and three, for handing over to the Armed Forces somewhat later the same year. Delivery of the fourth firing unit is expected in 2023.

Patriot

Patriot was first introduced with in the US armed forces in 1984, and in Patriot's early days, the system was used exclusively as an anti-aircraft weapon. Further development of the Patriot system and introduction of new missiles over the years, has given the system a significant capability against ballistic missiles. As of today, the Patriot´s primary function within the US Army is anti-ballistic missile missions.

Fourteen nations are operating Patriot today: USA, The Netherlands, Germany, Japan, Israel, Kingdom of Saudi Arabia, Kuwait, Taiwan, Greece, Spain, South Korea, United Arab Emirates (UAE), Qatar and Romania. In addition, Poland and Sweden are in the process of introducing the Patriot system in their Armed Forces. In Sweden the Patriot system will be named Luftvärnssystem 103 (Anti-air system 103).

Sweden is expected to use the Patriot system in an anti-missile base protection role, primary for the protection of the Swedish Air Force fighter aircraft bases.

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– Bulletin Board for Defence, Industry and Trade –

K130 class corvette with TRS-3D radar antenna on main mast. *Ill: Hensoldt*

Upgrading 3D radars of Germany Navy

Sensor technologies provider Hensoldt has secured a naval radar modernisation contract from German procurement authority Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw).

Under the contract, the company will upgrade the TRS-3D radars on two German Navy Braunschweig-class (K130) corvettes and an associated shore facility.

TRS-3D is a modular, countermeasure-resistant, medium-range air and surface surveillance system. Over 60 TRS-3D radars are in service with navies and coastguards across the world.

Besides K130 corvettes, TRS-3D radars are fitted on the US Coast Guard's National Security Cutters, US Navy Littoral Combat Ships, as well as Finnish Navy and the Norwegian Coast Guard ships.

Remote Weapon Stations contract

Kongsberg Defence & Aerospace AS (KONGSBERG) has signed a contract valued 1 030 MNOK with Thales UK Ltd. for delivery of the PROTECTOR RS4 Remote Weapon Stations (RWS) to the British Army Mechanized Infantry Vehicle (MIV) program.

More than 20.000 of the PROTECTOR RS family of RWS's has been delivered to 23 countries since the beginning of this century. KONGSBERG has provided UK with PROTECTOR RWS's since 2008, and MIV is the seventh delivery contract including two upgrades for the British Armed Forces. The PROTECTOR RS4 RWS will be integrated on the British Army`s new fleet of BOXER 8x8 vehicles in close cooperation with Thales UK, Rheinmetall and KMW.

BAE Naval Guns for Belgian and Dutch Navies

BAE Systems has been selected to supply 12 Bofors 40 Mk4 naval guns to the Belgian and Dutch navies as part of the Mine Counter Measures Vessels (MCMV) program.

The shipbuilding company Kership will install the guns on the fleet of 12 mine hunting vessels – six for Belgium, six for the Netherlands – with the first ship scheduled for delivery to the Belgian Navy in 2024.

The Bofors 40 Mk4 naval gun is the latest generation in the 40mm family and is used by numerous navies and coast guards around the world. The system was most recently selected by Finland, Sweden, and the United Kingdom.

Bofors 40 millimeter Mk4. *Photo: Finnish Navy*

CZG to acquire Colt

Czech firearms producer Ceska Zbrojovka Group (CZG) has agreed to acquire 100% outstanding equity interest in US-based arms manufacturer Colt Holding.

Under the definitive agreement signed by the companies, the stake is valued for an upfront cash consideration of $220m.

Colt Holding is the parent company of American firearms manufacturer 'Colt's Manufacturing' and its Canadian subsidiary 'Colt Canada'.

CZG president and chairman Lubomír Kovařík said: "We are proud to include Colt, which has stood shoulder-to-shoulder with the US Army for over 175 years, in our portfolio. The combined group will have revenues in excess of $500m and presents a real small arms powerhouse"

If completed, the deal would enable CZG to get significant production capacity in the US and Canada, as well as expand its global customer base. The transaction is expected to close in the second quarter of this year. It is subject to approval from regulatory authorities.

Patria AMVXP 8X8. *Photo: Patria*

Patria AMVXP 8x8 test vehicles to Japan

Patria AMVXP 8x8 vehicles have been sent from Finland to Japan for test purposes. These vehicles are part of the Japanese Ground Self-Defense Force's project called the Next Wheeled Armored Vehicle operating under the Japanese Ministry of Defense. The vehicles will be handed over to the Japanese Ministry of Defense on schedule, and Patria is ready to provide all necessary support to the Japanese in the upcoming tests.

Patria has been selected as one of the competitors for the new 8x8 Wheeled Armored Personnel Carriers (WAPCs) project. The project has progressed to the test phase after which the Japanese Ministry of Defense will evaluate the vehicles.

Small networked multichannel receiver

Novator Solutions today announced the release of HUGIN 200 a small footprint networked multichannel receiver with 4 independent 80MHz radios sharing 512 individually configurable digital downconverters, DDCs. The Server/Client architecture is optimized for real-time performance which continuously streams individual channelized signals in parallel to multiple remote computers & servers.

HUGIN 200 is optimized to listen to hundreds of narrowband communication signals at a low cost/signal ratio. The large amount of individually configurable DDCs, also known as digital drop receivers, combined with the robust server-client architecture and optional analog demodulation in real-time is optimized for demanding applications such as communication and spectrum surveillance.

Novator Solutions AB provides products, complete turnkey systems, and technical consultants within our three business units: Spectral Data Analysis (SDA); Control, Automate & Test; and Remote Measurement.

Apache Helicopters to Kuwait

The US State Department has announced its approval of a possible sale of AH-64E Apache Helicopters and related equipment to the Government of Kuwait at an estimated price of $4bn.

The Government of Kuwait has made a request to purchase eight AH-64E Apache Longbow Attack Helicopters and remanufacture sixteen of their AH-64D Apache Longbow Attack Helicopters to the AH-64E configuration.

An AH-64D Apache Longbow helicopter. *Photo: U.S. Army*

India develops machine pistol for defence forces

India has unveiled the locally developed machine pistol ASMI for the defence forces.

Jointly developed by the Defence Research and Development Organisation (DRDO) and the Indian Army, the pistol was recently displayed at an event.

According to local news reports, the machine pistol is in the class of the Uzi series guns of Israel and has a range of around 100m.

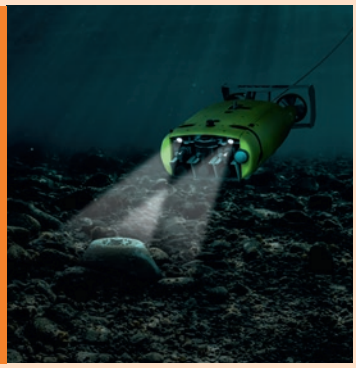
The weapon is expected to replace the 9mm pistols currently used by the defence forces.

The gas-operated semi bull-pup carbine weighs 3kg and is capable of firing 700 rounds per minute (rpm). The weapon is expected to be used for counter-insurgency and counter-terrorism operations.

Saab signs Maritime Mine Counter Measures (MMCM) contract

MuMNS delivers a new generation of mine identification and disposal in a powerful, modular system based on unmanned Mine Countermeasures solutions. This means operational capability with greater flexibility that significantly improves operational tempo, and reduces the cost of Mine Countermeasures operations and risk to personnel.

Photo: Saab



Saab has received the first order from prime contractor Thales, acting as System Integrator of the end to end solution, for the Multi-Shot Mine Neutralisation System (MuMNS). The order value is approximately 300 MSEK and deliveries of the first systems will take place in 2022.

The order received from Thales is part of the Franco-British Maritime Mine Counter Measures (MMCM) programme, where Saab will deliver mine identification and disposal systems operated from unmanned surface vessels. These will serve with the Royal Navy and French Navy.

Follow-on contract for GlobalEye

GlobalEye provides simultaneous air, maritime and ground surveillance. It combines sophisticated radar technology with the ultra-long range Global 6000 aircraft from Bombardier. *Photo: Saab*

Saab has received a follow on contract with the United Arab Emirates regarding the sale of two GlobalEye systems, Saab's advanced airborne surveillance system. The order value is USD 1.018 billion and the contract period is 2020-2025.

The original contract with the United Arab Emirates for GlobalEye was signed in 2015. This contract is an amendment to that signed in 2015.

The work will be carried out in Gothenburg, Linköping, Arboga, Järfälla and Luleå in Sweden and in Centurion, South Africa.

Early official design rendering of the EPC European Patrol Corvette. Fincantieri and Naval Group's 50:50 joint venture Naviris has partnered with Navantia for the European Patrol Corvette (EPC) programme. *Ill: Naviris Fincantieri / Naval Group*

European Patrol Corvette

The European Defence Agency's (EDA) Steering Board has agreed to support the development of a 'European Patrol Corvette' (EPC).

The corvette will be developed as part of the Permanent Structured Cooperation (PESCO) programme.

It is aimed at designing and developing a new class of military ship for conducting various missions. Equipped with a range of systems and payloads, the EPC will primarily be tasked with maritime situational awareness, surface superiority as well as power projection.

Italy, France, Spain and Greece are the four PESCO participating countries involved in the EPC project. The participating member states in the project aim to produce the first corvette prototype between 2026 and 2027.

MQ-9 Reaper aircraft and airmen to Romania

The US Air Force (USAF) has forward deployed its MQ-9 Reaper aircraft and positioned about 90 airmen to Romania.

Based at the 71st Air Base in Romania's Campia Turzii Air Base, the assets will support Nato operations by carrying out intelligence, surveillance and reconnaissance missions.

The MQ-9 Reaper has an operational ceiling of 50,000ft, a maximum internal payload of 800lb and external payload exceeding 3,000lb.

Slovakia to buy 17 Israel Aerospace-manufactured radar systems

The Slovak Ministry of Defence has received approval to procure 17 radar systems manufactured by Israel Aerospace Industries (IAI). The order contract value is €150m.

The agreement also includes technology and knowledge transfer.

The radar systems will be 'interoperable with Nato defence mechanisms'.

Two More P-8A Poseidon for Australia

Air Force's maritime patrol capability will be boosted with Australia set to acquire two more P-8A Poseidon surveillance and response aircraft, bringing the total fleet size to 14.

The Government has also approved sustainment funding for the current approved fleet of three MQ-4C Triton aircraft.

The Poseidon is a highly versatile, long endurance platform capable of a range of mission types including Maritime Intelligence Surveillance and Reconnaissance and striking targets above and below the ocean's surface.

The planned integration of the Long Range Anti-ship Missile (LRASM) into Air Force capability will also allow it to strike adversary surface vessels at significantly increased ranges.

UK orders MBDA's SPEAR mini-cruise missile

MBDA has received a contract valued at £550 million for production of the SPEAR missile system from the UK Ministry of Defence. SPEAR (known in UK service as SPEAR3) is a first-of-class network enabled miniature cruise missile.

SPEAR will be the main medium-to-long-range strike weapon of the UK F-35 combat aircraft, enabling them to defeat challenging targets such as mobile long-range air defence systems at over-the-horizon ranges in all weathers and in highly contested environments.

Guided firings of SPEAR will start within 18 months from a Eurofighter Typhoon fighter aircraft, with missile and launcher production beginning in 2023. The new contract follows the successful implementation of the weapon development phase contract for SPEAR placed in 2016 and the contracting of integration of SPEAR onto F-35 in 2019.

MBDA is jointly owned by Airbus (37.5 %), BAE Systems (37.5 %), and Leonardo (25 %).

SPEAR missile swarm fired by an F-35. SPEAR 3 measures 1.8 metres long and can fly more than 140km over air, land and sea propelled by a turbojet engine. *Ill.: MBDA*

Polish Air Force C-295. *Photo: Gerard van der Schaaf*

India plans to procure 56 military transport aircraft

India is reportedly planning to procure 56 medium military transport aircraft for around $2.5bn.

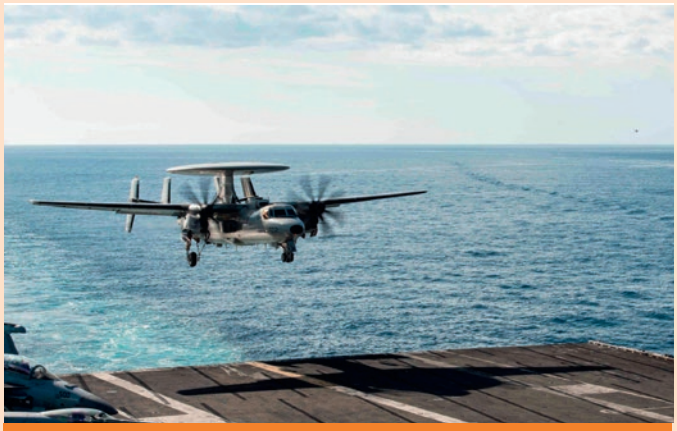
According to local news reports, an agreement is expected to be signed in the following months to procure 56 C-295 transport aircraft for the Indian Air Force (IAF).

Airbus Defence and Space and Tata Advanced Systems (TASL) will jointly deliver the project under the Make-in-India initiative in the aerospace sector, the Hindustan Times reported quoting officials familiar with the development.

The first 16 aircraft will be delivered in flyaway condition in two years.

TASL will locally assemble the remaining 40 units, the deliveries of which will be spread over eight years.

The new C-295 transport aircraft will replace India´s the ageing Avro-748 transport planes that entered services in the early 1960s.



France becomes the second international customer of the E-2D AHE. The Japan Air Self Defense Force, the first international customer, has procured 13 E-2D aircraft so far. *Photo: US Navy*

France to procure three E-2D AHE aircraft from US Navy

France has signed a letter of offer and acceptance (LOA) to purchase three Northrop Grumman-built E-2D Advanced Hawkeye (AHE) aircraft from the US Navy.

The deal is valued at about $2bn and makes France the second international customer of the E-2D AHE.

The aircraft is the latest variant of the E-2 platform and successor to E-2C Hawkeye. It consists of an advanced radar and modernised aircraft systems, as well as aerial refuelling capabilities.

The E-2D's APY-9 radar system offers surveillance detection and tracking capability.

Expected to be delivered by 2028, the three E-2Ds will replace the three existing E-2C Hawkeyes of Marine Nationale, the French Navy. Northrop Grumman is the prime contractor of the E-2D AHE.

Teledyne to acquire FLIR Systems

Teledyne Technologies Incorporated has signed a definitive agreement to acquire FLIR Systems in a cash and stock transaction valued at nearly $8bn.

Established in 1978, FLIR focuses on delivering intelligent sensing solutions defence and industrial applications. Its product portfolio includes unmanned systems, thermal imaging cameras, surveillance and monitoring systems among others.

With this acquisition, Teledyne, which also manufactures digital imaging products and software, seeks to complement its portfolio and deliver better returns to the stockholders.

The transaction is expected to close in the middle of this year, subject to the necessary regulatory and shareholders approvals as well as other conditions. In November, FLIR Systems secured a contract to deliver 250 Centaur unmanned ground vehicles (UGV) to the US armed forces.

First SISU GTP 4x4 for Finland

Oy Sisu Auto Ab has delivered the first SISU GTP 4x4 vehicles ordered by the Finnish Defence Forces. The delivery belongs to the acquisition of the SISU GTP 4x4 test series published by the Finnish Army in summer 2020, the purpose of which is to collect information on vehicle capability and operability for the future needs of the Defence Forces' mobility both in Finland and in crisis management tasks.

The first delivery includes two different armored vehicle configurations, a five-seater general purpose vehicle and a ten-seater armored personnel carrier vehicle.

Photo: SISU

Aircraft Self-Protection

The Defense Logistics Agency (DLA)-Aviation at Warner Robins has awarded a $306M 10-year indefinite-delivery indefinite-quantity (IDIQ) contract to Terma North America in support of the U.S. Air Force (USAF) to provide self-protection hardware, sustainment and engineering services under the Enterprise Contract for the Air Force Life Cycle Management Center (AFLCMC).

The DLA IDIQ contract allows Terma to quickly receive and respond to task orders and provides the USAF a more streamlined option for integrating new Electronic Warfare technology onto numerous USAF platforms. This contract provides a more flexible, efficient means of ordering defensive systems and providing logistical and technical support.

Under the DLA IDIQ contract, Terma will provide a wide range of products including Terma's family of AN/ALQ-213 Electronic Warfare Controllers and other associated components.

This DLA IDIQ contract represents continued growth for Terma. Since 2018, Terma has obtained three major contract awards including the F-16 3D-Audio System for the US Air National Guard F-16s, 3D-Audio Systems for the ANG A-10s, and new Pylon Integrated Dispensing System (PIDS+) Universal for the US Air National Guard F-16s.

Boeing's 1st Japan KC-46 Tanker Takes Flight

The first Boeing KC-46 tanker destined for the Japan Air Self-Defense Force (JASDF) took to the skies on its maiden flight yesterday. This successful flight highlights an important milestone as the aircraft now transitions into the certification phase of development.

Japan is the KC-46 program's first international customer and is scheduled to receive its first jet this year. Japan is now on contract for a total of four KC-46 tankers.

Norwegian solider firing Carl-Gustaf.
Photo: Saab/Norwegian Armed forces

Norwegian order for Carl-Gustaf M4

The Norwegian Armed Forces has signed a framework agreement with Saab for the Carl-Gustaf M4. Saab has received an initial order for Carl-Gustaf M4 weapons with deliveries in 2021.

The recently signed framework agreement allows the Norwegian customer to place orders for Carl-Gustaf M4, associated equipment and training systems during a 7-year period.

The Norwegian Armed Forces has been a user of the Carl-Gustaf M2 system since early 1970's. Today the M2 and the M3 versions are used within the Norwegian Armed Forces.

Carl-Gustaf M4 is the latest version of the portable, shoulder-launched, multi-role weapon system. It gives users a wide range of engagement options and allows troops to remain agile and effective in any scenario. The M4 is also compatible with intelligent sighting systems and future technology developments, such as programmable ammunition. Since the launch in 2014, Saab has signed contracts with fourteen different nations for Carl-Gustaf M4.

The Type-X vehicle has a weight of around 12t and can carry up to 4,100kg of payloads.

Milrem Robotics' Type-X RCV passes initial mobility tests

Milrem Robotics has announced that its medium-class Type-X Robotic Combat Vehicle (RCV) has passed its initial mobility tests.

Unveiled last year, the vehicle was designed to support mechanised units in different missions and help in raising troop survivability by reducing the number of soldiers on the battlefield.

The unmanned Type-X RCV will typically serve as an intelligent wingman to main battle tanks and infantry fighting vehicles and help in breaching enemy defences with minimal risk to own troops.

The Type-X vehicle can be equipped with a cannon up to 50mm. The RCV can be air-dropped when fitted with up to a 30mm cannon.

Typically, the C-130J and the KC-390 can carry one Type-X, an A400M two and a C-17 can transport five units.

Fire-on-the-move for land-based Patria Nemo

Finnish firm Patria has finalised the fire-on-the-move capability for the land-based variant of Patria Nemo, a single-barrelled remote-controlled mortar turret system.

The capability will enable troops to constantly move the mortar system during fire missions, avoiding direct counter hits from the enemy.

Patria Nemo is a turreted, lightweight 120mm mortar system capable of direct and indirect fire missions. It weighs around 1,900kg and offers a full 360° traverse and weapon elevation from -3° up to 85°.

The mortar system, which can be installed on wheeled armoured vehicles or naval vessels, is capable of firing six grenade multiple rounds impact fire missions simultaneously.

A vehicle equipped with Patria Nemo can stow 50-60 rounds of 120mm ammunition, based on the platform.

Patria Nemo is a single barrelled remote-controlled mortar turret system. *Photo: Patria*

83 LCA Tejas aircraft for India

India has cleared the purchase of 73 Light Combat Aircraft (LCA) Tejas Mk-1A fighter aircraft and ten LCA Tejas Mk-1 Trainer aircraft for the Indian Air Force (IAF).

LCA Tejas Mk-1A variant is a fourth-generation advanced fighter aircraft. It features critical operational capabilities such as active electronically scanned array (AESA) radar, beyond visual range (BVR) missile, electronic warfare (EW) suite and air-to-air refuelling (AAR) and more.

The Rs456.96bn ($6.23bn) procurement project for the Indian Air Force (IAF) has been awarded to Hindustan Aeronautics Limited (HAL). The aircraft will feature 50% locally built content, and this will gradually increase to 60%.

LCA Tejas Mk-1A variant is a fourth-generation advanced fighter aircraft. *Photo: Venkat Mangudi*

Development contract for STADT

MOD of Norway has signed an agreement to take part in a development project that has the purpose to extend the range and features of the STADT Stealth Naval Electric Propulsion.

Due to increased use of electric and electronic weapon-systems, the Norwegian Navy and navies all over the world show increased interest for electric propulsion to power future navy vessels. Overall goals are to seek minimum carbon footprint, lower power consumption with utilisation of new low emission power sources. It is also a goal to increase operational range and defence capabilities by Stealth operations.

STADT will in cooperation with the Norwegian Navy further develop its own technology to meet their impressive goals, such as :

- No electric interference and low signature, surpassing todays naval EMC standards
- Bring lifetime and reliability of electric propulsion up to a new high standard
- Extreme Propulsion Efficiency
- Compact footprint and low weight
- Extended endurance of the ships
- Low environment footprints
- Adaptable to any energy source, or combinations
- Scalability to a very high power range
- Fulfilment of naval standards for shock and vibration

The STADT Stealth Drive technology has the capabilities to be essential for the new trend in naval ship propulsion.The naval extension of the STADT Lean Propulsion - the STADT Stealth Drive range, is based upon the core technological elements that has been well developed and proven globally in the patented STADT Lean Drive technology.

STADT has already had a break-through in the Navy-sector and installed STADT Stealth Lean Propulsion in vessels for other foreign navies. The acceptance from the Ministry of Defence and the Norwegian Navy for this joint development project, is important for us to further strengthen our position and possibilities for export and to succeed in ongoing projects and developments towards navies world-wide“ says Hallvard L. Slettevoll, CEO at STADT AS.

The CAMCOPTER S-100 operates day and night and can carry multiple payloads with a combined weight of up to 50 kg. Due to its minimal footprint and size, it is ideally suited for maritime operations

Photo: Nordic Unmanned

Nordic Unmanned has Acquired Two CAMCOPTER S-100 Systems.

Nordic Unmanned has acquired two CAMCOPTER S-100 systems. The first was delivered last week and the remaining will be delivered in Q2 2021.

The CAMCOPTER S-100 was recently operated for the world's first full- scale offshore UAV cargo delivery to the active oil and gas platform Troll A in Norway. These operations were both carried out by Nordic Unmanned and Schiebel.

Schiebel and Nordic Unmanned are both under contract with EMSA (European Maritime Safety Agency) to fulfil its Remotely Piloted Aircraft System (RPAS) services, Nordic Unmanned specifically for maritime pollution and emissions monitoring. The CAMCOPTER S-100 measures the ships' sulphur emissions to check compliance with the EU rules governing the sulphur content of marine fuels. Measurements are transmitted in real time through the EMSA RPAS Data Centre to the relevant authorities.

Novator Solutions expands sales channel in Saudi Arabia, Yemen, Lebanon, and Bahrein

Novator Solutions today announced it has entered a partnership agreement with Saab RDS to distribute Novator Solutions spectral data analysis products and solutions in Saudi Arabia, Yemen, Lebanon, and Bahrein.

Novator Solutions is known in the Aerospace & Defense and RF industry for its networked multichannel receivers and wideband RF/IF recorder solutions.

Novator Solutions AB provides products, complete turnkey systems, and expert technical consultants within our three business units: Spectral Data Analysis (SDA); Control, Automate & Test; and Remote Measurement.

BAE Systems to upgrade Netherlands' CV90s

BAE Systems has secured a $500m contract to carry out extensive mid-life upgrades of the Royal Netherlands Army's Combat Vehicle 90 (CV90) fleet.

Awarded by the Dutch Defence Materiel Organization (DMO), the contract requires BAE Systems to equip 122 CV90s with new turrets and other upgrades, with the option of 19 additional vehicles.

The main weapon position has been changed to improve vehicle balance, accommodate new weaponry and offer ergonomic improvements.

Currently, the work to equip the Dutch CV9035 vehicles with multiple enhanced capabilities is already underway.It includes equipping the vehicles with an Active Protection System (APS), Anti-Tank Guided Missile (ATGM), Electro-Optic Aiming System (EOPS), as well as upgrading its electronic systems.

GTF-8x8 Trakker trucks to the Bundeswehr

The German Bundeswehr has awarded Iveco Defence Vehicles a frame contract for the supply of up to 1.048 military Trakker trucks to be delivered in 2021 - 2028.

All vehicles fulfill the most modern EURO-6-emission-level (still ready for single-fuel-operation) and will be supplied with a protected cab which currently offers among the best-in-class levels of ballistic, mine, NBC- and IED protection. Over the last years, Iveco Defence Vehicles has delivered around 2.000 vehicles from its wide product range to the German Army.

Saab Proposes New Saab Sensor Centre in Canada

Saab announces that it has offered to establish a new facility in Canada as part of its offer for Canada's Future Fighter Capability Project (FFCP).

This would be known as the Saab Sensor Centre and would be located in Vancouver, British Columbia, with a focus on sensor technologies such as radar. The Saab Sensor Centre would provide career opportunities for Canadian engineering talent in the Vancouver area, as well offering research and development avenues for academia.

One of the proposed projects is to develop a Space Surveillance Radar (SSR) in Canada, in co-operation with other companies within the Canadian space industry. It is envisaged that this surface radar will target the global market for greater awareness of objects in the Earth's orbit.

Saab, in co-operation with the Swedish government, has offered 88 Gripen E fighter aircraft, for Canada's FFCP. The establishment of the Saab Sensor Centre is part of the associated Canada-wide Industrial and Technological Benefits program from Saab.

Extended Range Guided Multiple Launch Rocket System for Finland

The M270 MLRS conducts a rocket launch. *Photo: US Army*

The US State Department has made a determination approving a possible Foreign Military Sale to the Government of Finland of Extended Range Guided MLRS Multiple Launch Rocket Systems (ER GMLRS) and related equipment for an estimated cost of $91.2 million.

The Government of Finland has requested to buy twenty-five M30A2 Extended Range Guided Multiple Launch Rocket Systems and ten (10) M31A2 Extended Range Guided Multiple Launch Rocket Systems.

Extended-Range (ER) Guided MLRS is new developmental variation of the Guided MLRS family, ER GMLRS offers an extended range out to 150 kilometers in all weather conditions. ER GMLRS shares significant commonality with legacy Guided MLRS, and is deployable MLRS M270 family of launchers and the High Mobility Artillery Rocket System (HIMARS) launchers. The rounds incorporate a larger motor and have enhanced maneuverability due to tail-driven control.

Finland intends to use these defense articles and services to modernize its armed forces.

This trolley has two test rooms with a temperature specification -54 to + 71°C and a control and engine room. The trailer is prepared for road registration in Sweden. Great focus has also been on making the trailer as compact as possible and adapted for storage inside a container for storage and longer transports as it will often be moved between different test sites. *Photo: Arctest*

Temperature chambers mounted on a trailer

Arctest delivered the first trailer for climate tests to the SAAB Bofors Test Center in Karlskoga. This type of climate test chamber that is mounted on a trailer revolutionizes the way in which climate tests can be done as the test equipment now becomes mobile. This new concept suited SAAB BTC very well as it performs tests and trials in several different places in the country and abroad.

The interest in this product has attracted a great deal of attention in both Scandinavia and in other countries.

Arctest signed an agreement for the delivery of mobile climate cabinets in containers with the Swedish Armed Forces Materiel Administration. A first container is planned to be delivered during the summer of 2021 and in the option there are 2 more containers for later delivery.

This container has two Ex-rated test rooms with temperature specifications -54°C to + 80°C as well as a control and machine room. *Photo: Arctest*

Next gen solution to snipers

Belgium-based FN Herstal unveils the FN Elity, the newly-developed version of its high performance weapon mounted ballistic calculator for snipers, precision shooters and spotters.

The FN Elity Weapon Mounted Ballistic Calculator can fit onto any squad or sniper team weapon of any caliber and spotting scopes.

The FN Elity is a compact, all-in-one system to increase first round hit probability at long range in all weather and light conditions.

Pakistan test-fires surface to surface ballistic missile

The Pakistan military has test-fired the Shaheen-III medium-range surface-to-surface ballistic missile with a strike range of up to 2,750km.

The missile is said to be capable of carrying nuclear and conventional warheads.

Shaheen-III is jointly developed by the Pakistan national engineering and scientific commission, and the space and upper atmosphere research commission.

Belgian Air Force accepts communications system

Rohde & Schwarz passes site acceptance test for voice communications system with high security requirements for Belgium Ministry of Defense command center.

After several weeks of intensive testing with the Belgian Armed Forces, Rohde & Schwarz recently passed a site acceptance test for a voice communications system with red/black separation, delivered to the Belgian Ministry of Defense (MoD). The system has a single human-machine interface and is used in a Belgium Air Component air surveillance and defense command center.

The scope of delivery includes one fully redundant system with over 43 controller working positions. The architecture has redundant secure and trusted configurations for both classified and unclassified domains and each domain is equipped with the necessary number of radios and telephone interfaces. The two domains are strictly separated and connected to each controller working position with a trusted audio switch, ensuring the security level for each domain all the way to the controller headset.

Iran tests long-range ballistic missiles

Iran has tested long-range ballistic missiles during a military exercise in Januray.

State television reported that Iran's Revolutionary Guards fired long-range ballistic missiles into the Indian Ocean, following the testing of surface-to-surface ballistic missiles and locally manufactured drones.

The long-range missiles have a range of around 1,800km and are capable of hitting moving targets in the ocean, according to Iran's state television.

The missile targets were located in the Gulf of Oman and the northern Indian Ocean. Iran has one of the biggest missile programmes in the Middle East.

NASASMS test firing. *Photo: Kongsberg*

Norway upgrades the NASAMS

Kongsberg Defence & Aerospace AS (KONGSBERG) has been awarded a contract of approx. MNOK 266 by Norwegian Materiel Defence Agency for upgrade of the National Advanced Surface-to-Air Missile System (NASAMS).

The upgrade of the NASAMS Sentinel radar's Identification Friend or Foe (IFF) ensures the system operates in accordance with future NATO standards, further improving the already secure identification of friendly aircraft.

NASAMS is the world's most widely used air defence system in its segment, jointly developed and manufactured in a long-time close partnership between Raytheon and KONGSBERG.

The first Visby-class corvette was launched on June 8, 2000 and today five corvettes are in operational service. *Photo: Kjell Enmark/FMV*

Next generation Visby Corvettes

Saab and the Swedish Defence Materiel Administration, (FMV), have signed two agreements concerning the next generation of surface ships and corvettes. A Product Definition Phase for the Mid-Life Upgrades (MLU) of five Visby-class corvettes, as well as a Product Definition Phase for the next generation; Visby Generation 2 corvettes. The collected value of the contracts is 190 MSEK.

The contracts include requirements' analysis and are respectively the start of the modification work of the five corvettes and the acquisition of the Visby Generation 2.

"The contract is a major step forward for Sweden's surface combat capability, with the upgrade of current corvettes and the creation of the next generation vessels. The Visby corvettes have been pioneers for 20 years, and after Mid-Life Upgrades they will be well equipped for future assignments. The experience and knowledge that the Visby class has gathered over the years will feed into the development of Visby Generation 2," said Lars Tossman, Head of Business Area Kockums.

The Visby Generation 2 is a development of Visby-class version 5 and will be equipped with a modern anti-ship missile system, torpedo system and air defence missile system.

The product definition phase regarding Mid-Life Upgrades, aims to make the five ships in the class operationally relevant beyond 2040. In addition to modifying the ships' existing systems, an air defence missile system will be added as a new capability. The RBS15 anti-ship missile system will be upgraded to the latest version as well as will the torpedo system with the new Saab Lightweight Torpedo.

A National Centre for Cyber Security is in the making

The Swedish Government has made the decision to establish a national centre for cyber security. The goal is to make Sweden a safer and more robust place in the cyber area.

Cyber-attacks by state-sponsored actors against Swedish interests are occurring all the time, and are becoming more and more advanced. The current world situation and the ever broader and increasingly complex threat perception is why the government is now deciding to establish a national centre for cyber security.

The intention with the national centre for cyber security is to join together and enhance Sweden's ability to prevent, detect and manage antagonistic cyber threats against Sweden. Furthermore, the centre will provide refined and coordinated advice on how various activities in the private and public sector can protect themselves against cyber-attacks.

Facts about the National Centre for Cyber Security

On the 10th of December 2020, the Government made the decision to establish a national centre for cyber security.

The centre will be established by four cooperating authorities: the Swedish Armed Forces, the Swedish Armed Forces Radio Institute (FRA), the Security Police, and the Swedish Civil Contingencies Agency (MSB).

The centre will collaborate closely with the Swedish Post and Telecom Agency (PTS), the Police Authority, and the Swedish Defence Materiel Administration (FMV), which will be given the opportunity to participate in the centre's activities.

A key part of the assignment will be to promote collaboration with private and public players.

Collaboration within the centre will be developed step by step between 2021-2023.

Piloted firings for artillery shell 155 KATANA

The KATANA smart artillery ammunition successfully demonstrated its flight control capability during a test campaign in Sweden in December last year.

These test firings, carried out from a 155mm CAESAR gun on carriage, confirmed the maneuverability of the ammunition. All the CAS (Canard Actuation Systems) were deployed in accordance with the simulations. Thus, the shell could be fired along a trajectory that increased the firing range compared to a purely ballistic trajectory. Nexter Munitions confirms the mastery of this shell trajectory control system, in the extreme physical conditions of 155mm artillery fire. The next test campaign, scheduled for 2021, will give rise to the first coordinate-guided and coordinate-controlled firings.

EYES ON THE BATTLEFIELD – HENSOLDT: SENSOR SOLUTIONS FOR THE LEOPARD 2 MBT

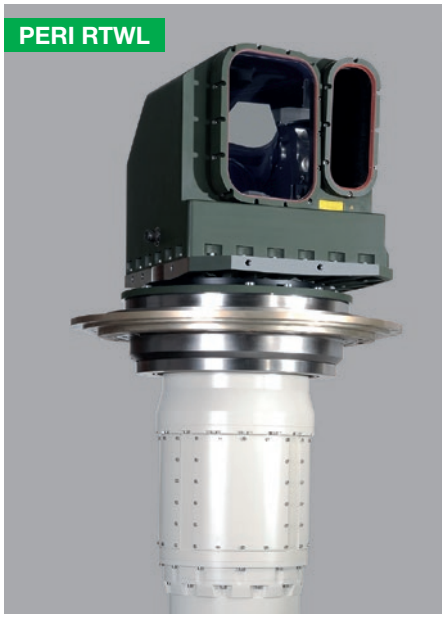
The LEOPARD 2A7+, considered by many experts to be the world's leading Main Battle Tank (MBT), is a force to reckon with on the battlefield. It not only carries powerful effectors on an agile platform but also a well-optimized and combat-proven optronic sensor selection. HENSOLDT, proven partner of the LEOPARD OEM KMW, has a long-standing history of successfully integrating its high-performance sensors into the MBT.

The four-man crew of the LEOPARD is highly dependent on sensors to operate the tank in order to achieve mission success as those devices are their eyes onto the field outside. These environments are most demanding: Combat scenes present multiple challenges, ever-changing at high speed and visual conditions that are harsh with dust, haze, fog and rain to name only a few.

HENSOLDT supplies state-of-the-art technology to KMW and the LEOPARD 2A7+ platform that ensures maximum situational awareness for commander, gunner and driver.

PERI RTWL – a High-resolution Periscope with combat Proven Hunter-Killer Capability

Gyro-stabilized periscopes such as the PERI RTWL provide a clear direct view in almost any condition by employing state-of-the-art thermal imaging technology. HENSOLDT's ATTICA P in combination with direct optical systems operate at the edge of what physics allows. The ATTICA P delivers image information of outstanding quality in the long-wave range. Besides a thermal and charge-coupled device (CCD) camera, this periscope offers an eye-safe laser rangefinder for an enhanced hunter-killer capability. This capability is facilitated by the possibility to slave the gun towards the periscope. For full mission success, the image can be displayed directly into the commander's ocular or visualized on the commander's display.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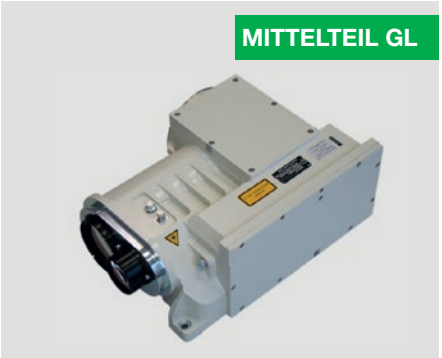

MITTELTEIL GL

SPECTUS – HENSOLDT's multispectral Driver Vision System

Manoeuvring an MBT through a combat zone at high speed requires a highly trained driver at the steering console. HENSOLDT's multispectral driver vision system SPECTUS combines an uncooled thermal imager with a low light level camera. The two videos can be fused and adjusted between 0 and 100 per cent, in order to achieve optimal driver's vision even under severe conditions.

SPECTUS

State of the Art Thermal Imaging and Laser Range Finding integrated into the Gunner Sight

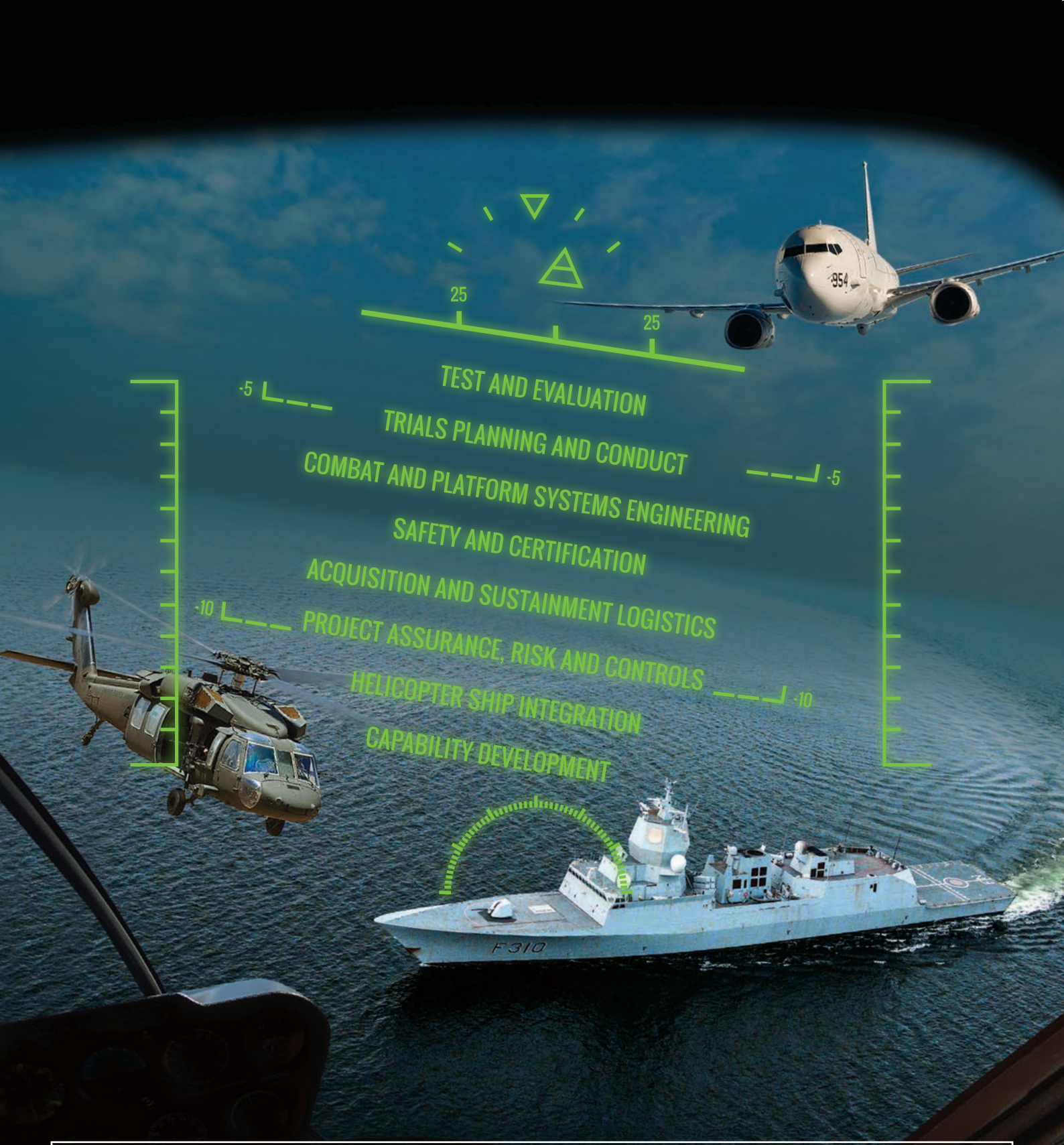
The LEOPARD 2A7+ gunner is operating the main effector of the MBT and is employing HENSOLDT's precise and Eyesafe Laser range finder (Mittelteil GL) as well as the ATTICA GL as thermal imager. These modules can easily be implemented in the EMES where they are at the sole disposal of the gunner.


ATTICA GL

HENSOLDT'S offerings for the LEOPARD 2A7+ are combat proven

HENSOLDT´s state-of-the-art technologies for MBTs are in operation worldwide, currently in use by several armies and LEOBEN members around the world: Germany, Denmark and Canada as well as Hungary and Qatar to name but a few. Of course the demanding military standards are fulfilled, proving that they are designed and engineered to withstand the challenges of military operations around the globe. Our optronic sensor solutions are optimized with regards to their SWaP (Size, Weight and Power) specifications to perfectly fit into the LEOPARD 2 family.

HENSOLDT
Detect and Protect.



Art impression by Boeing illustrating a possible next-generation fighter concept, or F-X. *Ill.: Boeing*

AMERICA'S NEXT GENERATION AIRBORNE WEAPON SYSTEMS

At the end of his video presentation to the Air Force Association's virtual Air, Space & Cyber Conference on September 15 2020, Will Roper stole the show by revealing the service had flown a Next Generation Air Dominance demonstrator aircraft. Dr Will Roper was at that time the Assistant Secretary of the Air Force for Acquisition, Technology and Logistics.

Text: Mark Ayton

According to Roper, test flights had demonstrated the aircraft to be "amazing" and that the programme in its entirety had broken a lot of records, but he said little else.

Roper's revelation was approved to reassure stakeholders inside and outside the Air Force that digital engineering is producing "real things in the real world". Roper stressed the essence of the announcement: "It isn't that we just built an e-plane and have flown it a lot of times in a virtual world, which we've done. But if you think

that we don't care about physical-world results, we do. In fact, NGAD has come so far that the full-scale flight demonstrator has already flown in the physical world... It's a full-scale flight demonstrator. Records have been broken, but I've been impressed at how well the digital technology transitions to the real world."

Roper emphasised the paradigm of designing, manufacturing and flight testing a new aircraft has shifted, such that real aircraft will verify and help refine highly detailed digitally engineered aircraft. Given the NGAD programme is conceived as being a family of systems comprising networked air vehicles equipped with modular sensors, further references within this article will use weapon system rather than aircraft.

The NGAD weapon system is required to place the US Air Force in a better state of capability to enable it to remain ahead of potential peer adversaries, described by former Air Force chief, General David Goldfein as the great powers meaning China and Russia. It would be fascinating to know what Goldfein, the new Chief of Staff of the Air Force, General Charles Brown and Roper actually know about the capabilities of new generation fighters like the Chengdu J-20 and Sukhoi's Su-57.

Questions Posed

Roper said "the service had already flown a technology demonstrator" but his terminology raises the question which service? Air Force or the DARPA (Defense Advanced Research Projects Agency)?

Addressing the House Armed Services Committee in 2015, Frank Kendall, then undersecretary of defense for acquisition, technology and logistics said the NGAD programme would develop and fly two prototypes to demonstrate advanced technologies for future aircraft. This begs the question, have the two prototypes been in existence for some time and for how long?

According to Aviation Week's Steve Trimble, former Chief of Staff of the Air Force, General David Goldfein touched on the Air Force NGAD strategy during a press conference in September 2019. Goldfein said: "We have five key technologies that we're investing in that we don't intend to have all come together on a single platform. They will all mature and accelerate at different paces. As they become ready, you will see us adapting them on existing platforms, sensors and weapons and also looking at new platforms, sensors and weapons."

Given this open source information, it's likely that the demonstrator is being led by the APO (Aerospace Projects Office) as a programme similar to DARPA´s Have Blue programme. The Have Blue programme led to the development of the F-117A stealth aircraft, operational from October 1983.

Thirty versus Seventy

Roper is pushing a new acquisition model based on digital engineering designed to make weapon systems fielded by the Air Force more adaptive and in sync with rapidly-changing technology.

General Brown described digital engineering as a trend, as the Air Force's future, and its potential for ending its current procurement model.

Roper and Brown want to stop the Air Force from having to spend so much money on keeping so many 25-year old plus aircraft in the fight. Their vision is to buy new, more adaptable aircraft capable of defeating new and emerging threats.

Roper wants an Air Force wide model that operates with a sustainment expenditure of just 30 percent, and proposes to do so by retiring entire fleets of the previous digitally developed aircraft after just 15 years of service. Retirees would be replaced with shiny new systems laced with the very latest leading edge sensors, network links and weapons.

Sounds promising, but before the Air Force can embark on developing, procuring and fielding the NGAD weapon system it has to convince the Congress on a series of major aspects; does it need another advanced airborne weapon system when the full rate production of the F-35A remains in abeyance; how many will the Air Force require; what will the NGAD weapon system cost and what legacy systems will the Air Force sacrifice to fund it?

During his virtual Air, Space & Cyber Conference presentation, Roper confirmed the NGAD's acquisition strategy is complete and awaits approval by senior DoD leaders.

General Brown cited the NGAD system's maturity versus emerging threats; what threat environment will the system have to face; and will the NGAD system provide the capability required during its service life as some of the factors under consideration for deciding how to move forward with the NGAD programme.

Brown also said that the use of NGAD prototype systems by Air Force operational test pilots will be key for gaining feedback used to inform the decision makers about fielding. Roper maintains this process will be made much faster by the use of digital design, development, engineering and testing. His forward-thinking Digital Century Series concept, involving agile software development, fully open architecture and digital engineering, is conceived to provide new iterations of weapon systems equipped with the latest mission system software ready for fielding every five to ten years.

According to Roper, the NGAD programme is one of three major Air Force acquisition programmes reliant on digital design, development, engineering and testing to enable the rapid upgrade of capabilities and to cut costs. The Ground Based Strategic Deterrent, a land-based intercontinental ballistic missile system, and the T-7A Red Hawk trainer are the other two. But according to Roper's document "Take the Red Pill: The New Digital Acquisition Reality" released on September 15, the NGAD programme stands alone as the one "positioned to transform its lifecycle through a fully digital acquisition." The document was re-titled to "There Is No Spoon: The New Digital Acquisition Reality" on September 18.

During one of his roundtable discussions at the virtual Air, Space & Cyber Conference, General Brown stated the NGAD programme has to be assessed on the basis of how the new weapon system will fit with the Air Force's current tactical mix of aircraft. Furthermore, Brown said that Air Force decision makers will benefit from knowing the cost of the demonstrator to make an initial determination of the Air Force's future order of battle including NGAD.

Making such major decisions is based on a complex matrix, described by Roper as a choice with a lot of details. Air Force decision makers will need to balance their current fighter fleet's capabilities with their future fleet's requirements. How such a decision will impact on the 2022 five-year budget plan remains to be seen.

Despite the details presented above, none of the usual aspects of a new weapon system programme are known for the NGAD; its appearance, which design house is involved - Lockheed Martin's Skunk Works, Boeing's Phantom Works or Northrop Grumman's Advanced Innovations - and where the test flights took place (most likely Groom Lake or Tonopah, Nevada).

Roper's belief and indeed determination with digital design, development, engineering and testing, and an all new model for weapon system procurement has yet to be proven but may well yield some fascinating and exciting airborne weapon systems in the years ahead. ■

B-1B LANCERS TRAINING IN NORWAY

B-1B Lancer exercising in Norway. *Foto: Torbjørn Kosvold/FMS*

At the end of February, four American B-1B Lancers landed at Air Station Ørland in Norway to train with Norwegian forces.

This is the first time that this type of American aircraft has landed on Norwegian soil. The strategic B-1B Lancer bombers will for a period of time train with Norwegian forces.

From some parts of the Norwegian political community, criticism has been levied against the American bombers being stationed in Norway for a period. This is claimed to be a violation of Norwegian base policy. Said base policy is a self-imposed restriction to the effect that no foreign nations are allowed to have bases on Norwegian soil in peacetime. It is also held that Russia may regard the hostile aircraft as a provocation, which may contribute to increased levels of tension in the Norwegian adjacent areas.

B-1B Lancer

B-1B Lancer is a supersonic strategic heavy bomber. The B-1B formally entered service in 1986, and has supported U.S. forces in Kosovo, Afghanistan and Iraq. The US Air Force had 62 B-1Bs in service as of 2016.

GENERAL CHARACTERISTICS

- **Crew:** 4
- **Length:** 45 m
- **Wingspan:** 42 m
- **Empty weight:** 87,090 kgs
- **Max take-off weight:** 216,364 kgs
- **Maximum speed:** 1,335 km/h (721 kn, 830 mph, Mach 1.25)
- **Range:** 9400 kms, 7600 kms with a weapons load of 16,800 kgs
- **Service ceiling:** 60,000 ft (18,000 m)
- **Armament:** 6 external hardpoints for of ordnance with a capacity of 23,000 kg 3 internal bomb bays for 34,000 kgs of ordnance

PRODUCTION OF T-7A RED HAWK

The first U.S. portion of the T-7A Red Hawk advanced trainer has officially entered the Boeing jet's production line.

The Boeing/Saab T-7 Red Hawk is an American/Swedish advanced jet trainer produced by Boeing in partnership with Saab. It was selected on 27 September 2018 by the United States Air Force (USAF) as the winner of the T-X program to replace the Northrop T-38 Talon. The photo displays one of the two evaluation prototypes.

Photo: Boeing

The training jet, designated the eT-7A Red Hawk by the U.S. Air Force because of its digital heritage, was fully designed using 3D model-based definition and data management systems developed at Boeing during the last two decades. The T-7A Red Hawk employed the digital engineering and design of the Boeing T-X aircraft that went from firm concept to first flight in just 36 months.

"The future of air dominance lies in the ability to move quickly, take smart risks and partner in new ways to get the job done," said Shelley Lavender, Boeing senior vice president of Strike, Surveillance and Mobility. "By creating aircraft and systems along a digital thread, we can accelerate build times and increase quality and affordability for our customers in a way that has never been done before."

The Advanced Pilot Training System also incorporates ground-based live and virtual simulators to give students and instructors a "real as it gets" experience.

In September 2018, the U.S. Air Force awarded Boeing a $9.2 billion contract to supply 351 advanced trainer aircraft and 46 associated ground-based training simulators. Saab is teamed with Boeing on the trainer and provides the aft fuselage of the jet.

"The build process leverages full-size determinant assembly, which allows technicians to build the aircraft with minimal tooling and drilling during the assembly process" said Chuck Dabundo, Boeing vice president of T-7 Programs. "The digital process accounts for a 75% increase in first-time quality."

FACTS AND FIGURES

- **Length:** 14.15 m
- **Width:** 10 m
- **Height:** 4 m
- **Weight:** 3250 kg
- **Powerplant:** 1 × General Electric F404-GE-103 afterburning turbofan, 11,000 lbf (49 kN) thrust dry, 17,000 lbf (76 kN) with afterburner
- **Max Speed:** 808 mph (1,300 kph; 702 kts)
- **Service Ceiling:** 50,000 feet (15,240 m; 9.47 miles)
- **Max Range:** 1,143 miles (1,840 km; 994 nm)
- **Rate-of-Climb:** 33,500 ft/min (10,211 m/min)
- **Crew:** 2

A DIGITAL DESIGN

Boeing's T-7A Red Hawk was built with digital engineering processes, agile software development and an open architecture mission system to enable more rapid, affordable future aircraft development. Compared to traditional aircraft development programs, T-7A experienced:

- A 75% increase improvement in first-time engineering quality
- An 80% reduction in assembly hours
- A 50% reduction in software development and verification time

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