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– the Scandinavian Military Magazine –

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FSi

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NATO; BUDGETS AND PROCUREMENT PROCESSES

At the 2014 NATO summit meeting in Cardiff in Wales, the NATO countries were in agreement on referring to a guideline for defence expenditure of a minimum of 2 percent of the Gross National Product. The NATO summit further agreed that member nations presently at an expenditure level of less than two percent should "aim to move towards the 2 % guideline within a decade".

Since that time, both President Donald Trump and the NATO Secretary General Jens Stoltenberg have not missed a single opportunity to remind the member countries about the 2 % target. But even though the choice of words has at times been offensive, almost threatening, and not least from the US president, it may seem like the person chiefly responsible for the actual enhancements to the NATO countries' defence budgets is the Russian president. Illustrating what may be a point, the increase in the defence budgets is nearly inversely proportional to the distance to the Russian border. East European countries such as Estonia, Latvia, Lithuania, Poland, Romania, as well as Hungary, Slovakia and the Check Republic, can point to a formidable growth in their defence budgets over recent years, even though the countries have been struggling in a weak economy. Countries far removed from Russia, on the other hand, such as Belgium or Spain, show little to zero growth in their defence budgets. While this is naturally a pointed remark, the situation does illustrate the concern that is spreading across Europe, and it is only natural that the worry is greatest among the Eastern countries. The Russian military activities in the Ukraine, the Crimean Peninsula and Georgia, have shown not only the willingness of Russia to exercise military force, but also that the country's military force is as effective as it is formidable. Details that have surfaced in the aftermath indicate that Russia in key areas comprise of weapons systems with capabilities that outshine corresponding capabilities in NATO. The fields to which this applies include artillery range, armoured vehicle protection, and capacity for electronic jamming. These are all capabilities that are highly significant in a battle field.

Keeping a close focus on the NATO nations' defence budgets is clearly important. Without financial resources, there is precious little the NATO defence forces can do. At least similar in importance is the focus on development of weapons systems with at least equal capacities, and preferably with some capacities greater than what Russia can show today. The Western defence industries are performing a great and important effort in this respect, continuously coming up with new and improved weapons systems. The challenge to the NATO countries is to adopt and make use of the new systems, and quickly at that. The defence organisations in all the Western countries have long-established traditions for extremely sluggish procurement processes. Trimming down the military procurement processes should therefore, without losing sights of the defence budgets, be a key focus area for NATO over the coming years.

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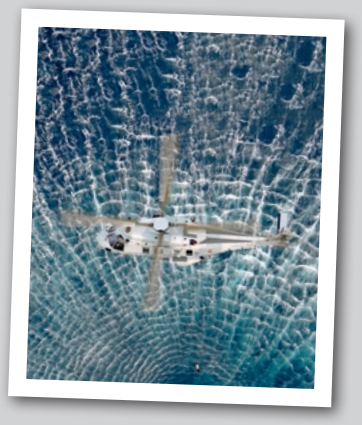
Coverphoto:
A French Navy NH90 NFH *performing a sonar diving mission.*
Photo: Airbus Helicopters



NH90; OPERATIONAL COST AND DELAYS

The NH90 is a medium-sized, twin-engine, multi-role military helicopter developed by NHIndustries, a joint-venture between Airbus, Leonardo and Fokker. The NH 90 helicopter is delivered in two main variants, the Tactical Transport Helicopter (TTH) for army use and the navalised NATO Frigate Helicopter (NFH) for naval use. The NH90 program has suffered several delays, which has in turn delayed active deployment of the helicopter by some operators.

-The NH 90 program started out in the 1990s, says Ernst Heckert, head of Export Variants at NH-Industries. -Four countries (France, Italy, Germany and the Netherlands) decided to jointly develop a common platform in the 10-ton class that could serve both tactical troop transport as well as maritime missions. That led to the foundation of NHI in 1992 which is a joint venture of the helicopter industries of these four countries. It was a clear requirement to have a modern, versatile platform that would ensure a high degree of commonality between the different variants in order to make cooperation between the countries easier. The helicopter was to integrate the most advanced technologies such as Fly-by-wire and a complete composite airframe, characteristics which were not offered by any other platform in that segment of the market.

Sever delays

Many factors have contributed to the time required for the design and development phases, but it is evident that the high number of variants and configurations, implying significant customizations for each customer, has increased the complexity and was therefore one of the main causes of the delivery time of the helicopters Heckert continues and adds that the complexity of the highly integrated core and missions system led to development and qualification efforts which required long campaigns to set the systems.

The Nordic customers, Norway, Sweden and Finland started out in the early days with the ambition of having one standard helicopter with a high degree of commonality. However, the very different operational requirements of these nations in the end led to three very different NH90 variants. For example, the Swedish NH90 is unique in having an increased cabin height leading to a significantly modified airframe. Furthermore, it is equipped with a fully customized mission system for ASW missions adapted to specific Swedish needs.

In the same way, the Norwegian variant has a fully customized mission system as well as an electronic warfare system from American company ITT, which was integrated only on that variant.

Finland chose to stay close to other TTH variants which has very much limited the specific developments for this variant. But in that case local final assembly line had to be set up, before starting the production of the helicopters.

The 20 Finnish helicopters and the 18 helicopters for Sweden are all delivered. Most of them were manufactured at Patria facilities in Halli, approximate 120 km north of Helsinki.

-As of the end of 2018 we have delivered 381 helicopters, and the total order book is 566 h/c for 14 countries including the most recent orders from Qatar and Spain which have added another 51 bookings in 2018. These new orders show that NH90 is able to convince new customers to add it to their capabilities as well as existing customers to increase their already ordered fleets and order new variants, Heckert emphasizes.

- Half of customers, namely Sweden, Finland, Australia, New Zealand, Oman, the Netherlands and Belgium, have already received all of their ordered aircraft. Several countries have successfully deployed the NH90 in very challenging operational theatres such as Afghanistan and Mali, and in naval missions for antipiracy or antisubmarine warfare.

The feedback that we receive from the pilots is that they are really satisfied with the aircraft, in particular regarding its performance and operational capability. On the service side, as for any recent aircraft we are on the journey to reduce

Swedish NH90 helicopter. *Swedish NH90 is unique in having an increased cabin height leading to a significantly modified airframe. Furthermore, it is equipped with a fully customized mission system for ASW missions adapted to specific Swedish needs.*

the maintenance load, and some important steps have already been passed.

Operational cost and availability

-Today, we observe different availability values depending on the customer and the operational situation. We have customers displaying a consistent and sustainable 60% fleet availability, which is in-line with standard military readiness levels, Christian Vanzulli, head of Product Support at NHI, explains and adds that when required, for example during exercises and deployments, then operational availability levels are much higher and can reach 90%.

-Generally speaking, there is a correlation of higher availability with Service-By-The-Hour support arrangements provided by industry. It is worth to notice that availability is also strongly influenced by customer-controlled factors such as training, manpower resources and the operational need.

-I also think it is fair to say that we have been doing a lot when it comes to increasing availability and reducing hourly cost, Vanzulli continues. In particular NHIndustries launched last year, in partnership with the customer nations, a dedicated program to improve availability and affordability of NH90 support. The program is a portfolio of 28 projects of diverse complexities and durations, addressing all fields of the aircraft sustainment: repair and overhaul, spares availability, scheduled maintenance plan. On this last one let's emphasize that we have already achieved the extension of the maintenance tasks from 600 to 900 flight hours. We also plan to launch new advanced services for the benefit of our customers.

Flight cost per hour

Some Norwegian media has written that a flight hour with the NH90 has a cost of NOK 260 000 (29 000 EURO), compared to Sea Hawk which cost NOK 40 000 (4 500 EURO). -Regarding these figures, I'd like to say that it is notoriously difficult to analyse these costs and essential to compare like with like, Vanzulli says and adds that the Seahawk and NH90 are very different aircraft. The NFH NH90 is truly a "Force Multiplier" combat system which has been designed to perform a number of missions with a single platform.

-Anyway, any cost per flight hour value is strongly driven by the amount of hours flown, as costs are not at all linear to hours. As the Norwegian fleet has flown very low amount of hours so far, any calculated value will not at all be representative of the overall NH90 product.

Fewer variants

-In retrospect, as industry, we should have been stricter regarding the number of variants and national requirements and we should have suggested not developing and qualifying many different variants in parallel. In many cases, for the same functionality, we have developed several different systems due to national requirements. To give an example, on NH90 we have qualified four completely different EWS systems (Electronic Warfare Systems).

Furthermore, the requirement of having assembly lines in several countries has also significantly impacted the complexity of our supply chain and production system. At one point, we were running six NH90 assembly lines in parallel.

-Today, we have streamlined the industrial setup (three assembly lines only), and the NH90 program has reached a stable production rate of around 35 h/c per year. We have finished development and qualification of the previously ordered variants and can now develop and produce variants for new customers or additional orders, Ernest Heckert says in conclusion and adds that in addition our focus is now on improving fleet availability at customers' and thinking about future capabilities improvements.

NORWAY'S PROCUREMENT OF NH90

Norwegian NH 90 helicopter. *Norway chose the ITT's AN/ALQ-211(V) suite of integrated radio frequency countermeasures (SIRFC) or electronic warfare system (EWS) from the understanding that this system would be installed on a huge number of American helicopters. The Americans reversed their decision to use this system for their fleet, however, leaving Norway as the sole user of the system on their 14 helicopters.*

The procurement programme for new helicopters for the Norwegian Defence was initiated by the Defence Chief in 1992, with a view to evaluating the possibility of a single type of helicopter to cover all the helicopter needs of the diverse branches and purposes (Frigate, Coast Guard, Army support, and Search and Rescue).

In 1996, the Nordic countries agreed to look into the possibility of a joint procurement through what was then referred to as the Standard Nordic Helicopter Programme. The four candidates under evaluation included the Sikorsky S92, Agusta Westland AW101, Eurocopter EC725, and NH Industries NH90. The conclusion of the study was that the NH90 was the only helicopter to satisfy the operational demands in a satisfactory manner, and a contract was signed in 2001 for the purchase of 52 NH 90 helicopters: 20 (TTH) for Finland, 18 (NFH) for Sweden and 14 (NFH) for Norway. At the time, Denmark had already pulled out of the Standard Nordic Helicopter Programme. The Norwegian helicopter order was to replace six Westland Lynx copters used by the Coast Guard, while six NFH units were destined for the new frigates in planning (one helicopter for each) for the Navy.

The Finns were to be using their helicopters for tactical transports in the Army, while the Swedish helicopters were planned to fill various roles, particularly in anti-submarine warfare.

The agreement called for the first helicopters to be delivered in 2005, and the full delivery of all 14 helicopters for Norway was supposed to be completed in 2008. In the end, it was 2011 before the first NH90 came to Norway, and even this was a so-called temporary or intermediate operative version, delivered to assist in the phasing-in, testing and training with the new helicopters. As of today, the number of helicopters delivered to Norway stands at 9. Finland has received all of their 20 helicopters, and Sweden has taken delivery of all of their 18 helicopters.

Norwegian special requirements

Among the main causes for the delays in the NH 90 deliveries, are the special demands made by the various operators. Norway too has had her particular demands, which have taken a lot of time to develop and get certifications for. One reason is that the Norwegian Defence has lacked the capacity to perform certifications on its own helicopters, and the certification job was therefore assigned to NAHEMO (NATO Helicopter Management Organization) made up from the military authorities of France, Germany, Italy and the Netherlands. This placed the certification of the Norwegian helicopters in a queue, pending the certification of the first maritime helicopters delivered to France, Italy, and the Netherlands.

Norway has chosen for the N90 to have flotation capability in the case of a landing on water, and a further Norwegian requirement has been for the life rafts to be located in containers on the outside of the helicopter. The container for the emergency rafts should have the same crashworthiness as that of the helicopter itself – a criterion that has proved something of a challenge to develop as well as to certify. The reasoning behind the Norwegian requirement for external rafts can be traced back to the accident outside Grimstad in 1991, when a Sea King helicopter was forced to land on the sea during a trial flight. The crew managed to get out and on to the roof of the wrecked helicopter, but they were unable to get hold of the life rafts that were inside the water-filled helicopter cabin. Fortunately, this accident took place in calm waters, and everyone was saved, but if it had happened on the open sea in rough weather, he consequences would likely have been disastrous. This incident was then the background for the Norwegian request that the NH90 helicopters should have external containers for life rafts. In a later development, the Swedish NH90 helicopters have also had their life raft containers located on the outside of the aircraft.

A further Norwegian special request was the installation of an electronic warfare system (EWS) from the American manufacturer ITT. This company was about to deliver its EWS system for a series of US helicopters, and by choosing this system, Norway had hoped to gain advantages in using the same system on the Norwegian helicopters as that which was in use on a great number of American helicopters. American authorities, however, decided to drop the ITT system from their helicopters, leaving Norway with an EWS system on their 14 helicopters of a specification only operated by Norway, with the attendant disadvantages for operations, upgrades and maintenance costs that should instead have been advantages.

NFM GROUP:

FROM BASEMENT BUSINESS TO BILLIONS

From its start-up about 25 years ago, in a cellar room at Ski south-east of Oslo, the company we know as NFM GROUP has risen to annual revenues of 750 million NOK, or 75 MEUR (2017), stemming from deliveries to some 25 countries all over the globe.

Chairman Carl F. Sejersted Bødtker (left) and General Manager Walter Øverland of the NFM Group. The mannikin in the middle is dressed up in some of the products supplied by the NFM Group.
Photo: MilitærTeknikk

-Back in 1996, a group of us back from Home Guard exercise were chatting about the basic equipment provided for Norwegian soldiers, and we did some thinking out loud on how this soldiers' equipment could be improved upon, explains Walter Øverland, CEO for NFM Group. - A few weeks later, we approached the Defence Supply Command to investigate the possibility of buying a small supply of textiles with the defence camouflage pattern imprinted, and skipping ahead a few steps, we left there clutching a development contract.

In 1998 we had developed our first tactical combat vest, which was the first product we supplied to the Norwegian army. At the time, we were using a small number of seamsters located in Norway, while we were quick to realise that this kind of production in anything like the scale we were contemplating could not be done domestically. This led to us starting our own production facility in 2001, located in Poland.

In 2006 we also started production of ballistic protection shields for soldiers' personal protection. We acquired Frec

NMF GROUP deliveries soldier equipment to some 25 countries all over the globe. *Photo: NFM*

Technology AS, a company specialised in the development of ballistic protection shields of very superior quality, comprising a particularly high degree of protection even along the edge zone of the plates.

We are currently among the world leaders on combat vests and personal protection; we are largest in Europe in this market, and number three in the world, behind two American companies. The production facilities in Poland cover some 12,000 square metres, and we have also started a production facility in the western Ukraine, near the city of Lviv.

Two companies
NFM Group comprises of two divisions; NFM and Equipnor.

NFM carries out R & D, design, production, and sales of the NFM products on the world market, while Equipnor is the trading entity for tactical gear targeting defence and police forces in Norway and Sweden. Equipnor is also representing several foreign suppliers on the Norwegian and Swedish markets; Equipnor is actually the largest distributor of defence and police/ security products on the Scandinavian market.

- The reason behind the massive growth we have seen since starting up, is in my opinion the fact that we have from the beginning focussed heavily on the individual soldiers and their individual needs. On the protection side, we have an advantage in our in-house development of both hard anti-ballistic plates and soft anti-ballistic protective panels. In addition, we design and manufacture the supporting vests for the protection panels, as well as other load bearing systems and equipment for the soldiers, such as magazine pouches, belt systems, backpacks and bags. This affords us the opportunity to utilize the individual parts in a holistic system. From the market view, we are finding that more and more

customers are looking for deliveries of the full scale of soldier equipment, from skin to outer protective layers, often also including carrying systems like back packs et cetera. In addition to what we design, make and deliver in-house, we can through our sub-suppliers offer the entire suite of soldiers' equipment as a holistic and modular system. This is something we are finding that more and more countries are looking for, says Øverland, citing the joint Nordic NCU (Nordic Combat Uniform) programme as an example. But we are also seeing that many other countries are thinking along the same

Through its subsidiary company Frec Technology, the NFM Group develops highly advanced composite panels for anti-ballistic body armour plates. The NFM protective plates are marketed under the brand name of Skjold, the Norwegian word for shield. The picture shows a variety of different types of plates, with various weights and protection properties etc. Photo: MilitærTeknikk

lines, such as the Netherlands, who has a project coming up with many similarities to the NCU programme. Among the other major contracts in the pipeline in this field in Europe, the upcoming German programme for soldier equipment must surely be among the greatest. France has some notable on-going programmes, to one of which we already have secured a substantial delivery contract.

Øverland also mentions the successful collaboration that the NFM Group has enjoyed with the Baltic states over several years.

FOUR NORDIC COUNTRIES – ONE COMMON FIELD UNIFORM

Under the direction of NORDEFO, the four Nordic countries have put in a dedicated joint effort to develop a common field uniform for all climatic zones, to be used by all branches of the military. User requirements have been determined for each of the countries, while the camouflage patterns are going to be different from one country to another. The price tag is some 400 million euros spread across a period of four years, divided fairly equally between the four nations. The Danish soldiers will be the first to wear the new uniforms, probably not before 2021 at the earliest.

Text and photo: Tor Husby

The military users were the first to voice the need for a common uniform. A number of others followed suit, right up to the political level, sharing the same views. This common understanding was a key factor for success, while it was generally speaking not a problem for NORDEFCO to get the four countries to work together.

High priority

The project has enjoyed high priority, with a good deal of focus, says Project Manager Thrude J. Leirvik from Forsvarsmateriell. She has followed the project from the early days, and was the Norwegian project manager until she in 2018 was appointed the joint project manager for the Nordic Combat Uniform Project.

- What were the basic professional reasons behind the idea of developing a common set of Nordic uniforms?

- The countries have for decades been procuring individual garment products that over the course of time were not well matched to each other. Now, the four countries wish to procure a clothing system that is adapted to the others, in order that we can achieve higher comfort, better adapted products, lower weight, and thereby increasing the capacity and endurance for each individual soldier.

- To what extent will the safety and other functions improve with the introduction of new uniforms?

- These uniforms are not subject to specific requirements in terms of safety. But the system can offer extended endurance, which is an important issue for the soldier.

- What will be the greatest differences, or improvements?

- All the uniform components are procured as a system designed to work together. All the elements will be procured through ONE supplier, thereby offering a holistic overview as well as a systemic responsibility.

User testing in 2019

- What will be the most significant phases going forward?

-This will be the user testing, planned to be started in 2019 with an expected duration of six months. Following this will be negotiations and the signing of a supply contract, says Thrude Leirvik.

The news that the four Nordic countries of Sweden, Denmark, Finland and Norway are joining up in a Nordic Combat Uniform Project has generated

Denmark, Finland, Norway and Sweden have put in joint effort to develop a common field uniform for all climatic zones. The photo displays Finish soldiers skiing in Norway during the NATO exercise Cold Response in 2016. *Photo: FMS/Winnefride Steen*

some notable interest, not just throughout Europe, but also around the world, showing that there is considerable international industry interest in becoming a supplier. It is a Nordic requirement to arrive at four identical contracts, one for each nation, each with ONE primary supplier (using subcontractors as required in each case). through to the conclusion of the project. This is a frame agreement with a duration of seven years.

For some time, there has been serious negotiations with a series of potential manufacturers, and the process is at the early stages of 2019 standing around the halfway point.

All climatic zones

- The project is enamoured with systemic thinking. We are after clothing from the skin all the way outwards, and this naturally encompasses a diverse range of smaller and bigger garments. It is our requirement that the uniforms will be usable in all climatic zones, which is to say from the Arctic to desert areas, at sea as well as in land. The project does not, however, encompass clothing or protection for heads, feet and hands. In other words, we will not be including helmets, mitts or boots and shoes with insoles in the procurement project. Nor will we include special items targeting particular fields, says the project manager in clarification.

- Why the decision against uniforms with a common camouflage pattern?

- There is a great deal of Nordic research behind the design of the camouflage patterns specific to each force. Therefore, this is pretty much a given, says Thrude J. Leirvik.

She also says that not just the industry is popping its ears about the uniform project. There is also a great deal of military interest in the Nordic Combat Uniform Project. With colleagues attending, she is travelling around to give briefings on the NORDEFCO course of action at international military conferences and fairs. Further to this, several countries have petitioned for a look-in.

Norway as "Lead Nation"

Norway is the "Lead Nation" in the project, tasked with managing the common goals. The Norwegian Defence will be getting their new uniforms from some time in 2022. In the capacity of project leader, Norway has set out a control group, a project management group, and other groups of legal resources, quality assurance (environment and ethical), technical requirements, commercial issues, and naturally one for the military users. A total of about 50 persons have been engaged.

The Norwegian Armed Forces can be expected to dress up in the new uniforms sometime after 2022, says project manager Thrude J. Leirvik.

Project Manager Thrude J. Leirvik of the Nordic Combat Uniform Project calculates that savings of 5-6 percent can be achieved through four countries joining forces in one common procurement.

NATO OTAN

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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

NY TEKNOLOGI GIR MULIGHETER

Som en del av forberedelsene til arbeidet med neste Langtidsplan for forsvaret, som er planlagt behandlet i Stortinget våren 2020, la FFI nylig frem rapporten "Hvordan styrke forsvaret av Norge?" Rapporten vurderer ulike retninger for videre utvikling av Forsvaret.

Rapporten inneholder også en beskrivelse av rammebetingelser som den videre utviklingen av Forsvaret må forholde seg til. En av rammebetingelsene er teknologisk utvikling som rapporten slår fast at bidrar til å skape konseptuelle endringer for militære styrker. Som eksempler på slike utviklingstrekk i dag trekkes den brede introduksjonen av elektronikk, informasjons- og kommunikasjonsteknologi frem som eksempel. Det vises til at kunstig intelligens, additiv produksjon, kvantedatamaskiner, nanoteknologi, tingenes internett og autonomi er teknologiområder som vil ha stor betydning for militære operasjoner i fremtiden.

FFI peker ut noen teknologiområder som særlig viktige for Forsvaret:

- Sensorer for overvåking og målfatning på større dyp
- Plattformer og systemer for robust kommunikasjon
- Presisjonsstyrte avstandsleverte våpensystemer
- Effektivt kommando- og kontroll- (K2)-system

Videre peker FFI på at konvergens, det at teknologiske fremskritt på ulike områder virker sammen og forsterker hverandre, bl.a. ved at det utvikles nye systemer der flere systemer og teknologier integreres på en slik måte at de gjensidig forsterker effekten ved å ta i bruk ny teknologi, som et viktig aspekt.

På samtlige av teknologiområdene finnes det høy kompetanse hos de tre hovedaktørene (Forsvarssektoren, FFI og forsvarsindustrien) som tradisjonelt har samarbeidet om å utvikle materiell og systemer til Forsvaret innenfor rammen av det såkalte trekantsamarbeidet. Videre faller samtlige av teknologiområdene som FFI har identifisert som særlig viktige også sammen med flere av de teknologiske kompetanseområdene der det, ifølge den nasjonale forsvarsindustrielle strategien (Meld. St nr. 9 (2015-2016)) av hensynet til vesentlige nasjonale sikkerhetsinteresser, er behov for å opprettholde industriell kompetanse i Norge. I tillegg er systemintegrasjon også et av kompetanseområdene industrien forutsettes å skulle videreføre.

Det ligger med andre ord godt til rette for å styrke og utvide samarbeidet mellom aktørene i trekantmodellen for å bidra til at ny teknologi omsettes i materiell og systemer som bidrar til å styrke forsvarsevnen. Det forutsetter imidlertid at det finnes midler til å satse på forskning og utvikling. I denne forbindelse er det betimelig å minne om at en enstemmig stortingskomité, ved behandlingen av den forsvarsindustrielle strategien, la til grunn at det skulle satses på forskning og utvikling innenfor de åtte teknologiområdene. I lys av FFIs vurderinger og behovet for å utnytte potensialet ny teknologi har i forhold til å styrke forsvarsevnen, er den kommende langtidsplanen en viktig mulighet til å realisere denne satsningen slik at industriens kompetanse, og teknologien industrien besitter, i enda større grad enn før kan omsettes i innovative og relevante operative kapasiteter. Norge er kommet langt i å utvikle teknologi på flere av områdene FFI trekker frem, også i et internasjonalt perspektiv. En målrettet satsning kan bidra til å sikre at vi opprettholder posisjonen over tid. Det vil komme både Forsvaret og industrien til gode.

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FSi EXPORT CONTROL SEMINAR

The export control rules constitute an important regimen to which many businesses in the defence sector need to keep a conscious relationship. This year's seminar was held over two days in March at the Holmen Fjord Hotel in Asker near Oslo, and as many as 100 delegates had shown up to gain further insight into this comprehensive matter.

Jenny Hahn of FD Associates used a full day to review the extensive American export control rules regimen, with particular emphasis on the Export Administration Regulations (EAR) and the International Traffic in Arms Regulations (ITAR).

Hahn opened by saying that even if a Norwegian company does not export directly to the USA, the business activity may still be subject to the American rules. If the product or service of the Norwegian company contains or is based on American components, technology or knowledge, said product or service will be subject to the American export regimen. Hahn also pointed out that American authorities are actively pursuing foreign businesses that are suspected of violating the rules, and this is a type of attention that businesses should take particular care to avoid.

The entire first day of the seminar was devoted to reviewing the American rules, which in itself gives a good indication of just how extensive and all-encompassing these rules really are.

Like most countries, Norway has its own rules and regulations for export control. Erik Furu from the Ministry of Foreign Affairs opened by explaining that export control involves security policy, defence policy as well as foreign policy. Export control is about Norway honouring her international commitments, which in turn reflects on Norway's reputation and the reputation of Norwegian industry.

– The current state of affairs is that we are able to follow the rules without undue effort when it comes to goods. When it comes to knowledge, however, the situation is not as clear-cut. Many hold the opinion that knowledge cannot be subject to the export control rules, Furu explained, and went on to encourage the industry to assist the Foreign Ministry in this field, by spreading information to research communities, colleges and universities.

Kai Kristian Kiessler from the Federal Ministry for Economic Affairs and Engery in Germany works on a daily basis with the German export control system, and opened by stating that there is not a lot of differences between the German and the Norwegian systems. – And we are discussing the same issues, Kessler further noted; Brexit, Saudi Arabia and Yemen.

Per annum, German authorities handle some 15,000 licence applications, and about 300 officials have export control as their field of work. The volume of export requiring licenses came to about 6 billion Euro in 2017.

The export of weapons and military materiel is a controversial issue in Germany, and the current coalition government has signalled that they intend to tighten the rules. For one thing, the government wants stricter rules to govern exports to countries with an involvement in the conflict in Yemen. Germany has also expressed a wish to have the stricter export rules harmonised internally in the EU, and have them laid down as part of the common European Union export rules. This initiative, however, has met with considerable resistance from the French government, Kiessler explained. The French and the German governments have notably different views on weapons exports to Saudi Arabia, for example.

– Furthermore, the issue of exports of military material to Turkey is currently under hot debate in Germany. As of today, several German journalists are incarcerated in jail in Turkey. This adds another aspect to the already problematic issue of weapons export to Turkey, not least because Turkey is also a fellow member of NATO, said Kiessler in conclusion. ■

Jenny Hahn from FD Associates provided an insight into the extensive American regimen of export control rules. FD Associates is a specialist consulting company based in the Washington DC area. The company provides clients guidance in the requirements of the Export Administration Regulations (EAR), the International Traffic in Arms Regulations (ITAR) and the Foreign Trade Regulations (FTR).
Photo: MilitærTeknikk

Erik Furu (left) from the Norwegian Ministry of Foreign Affairs, and Kai Kristian Kiessler, Head of Division Control of War Weapons, Export Control, Special procedures in the German Federal Ministry for Economic Affairs and Energy.
Photo: MilitærTeknikk

PROGRAM CONFERENCE SEA SYSTEMS

Like earlier years, this year's Program Conference Sea Systems was held in the city of Bergen. This year's conference broke all participation records, with a total of 120 attending delegates. Furthermore, the interest in taking part in the speed-dating part of the conference has never been greater.

One of the key issues during this year's conference was *autonomy* – a technology area that will probably only keep growing in significance over the coming years, in the naval sphere as well as the other branches of the armed forces.

Autonomy was a major issue for this year's conference, and Bjarte Haugsvær from the KNM Tordenskjold opened his address by asking the rhetorical question – Why autonomy?

The answer is self-evident, really – to reduce the risks involved in human presence. There are several reasons for seeking to reduce the human presence. The American Navy is talking about the three D's – Dirty, Dangerous and Dull. Meaning that we do not need to place personnel in dirty areas, such as chemically contaminated areas, or dangerous areas such as might be encountered in mine clearance. We also wish to avoid humans being subjected to boring, repetitive routine tasks. This is partly because humans work too slowly, and partly because human senses are dulled in the processing of such tasks. A typical example could be to let computer systems perform analysis of massive amounts of data, sorting out information that is important enough for humans to take a closer look.

Bjarte Haugsvær (left) from the Navy, and André Pettersen of the Norwegian Defence Research Establishment (FFi). Photo: MilitærTeknikk

From the left: Bjørn Jalving from Kongsberg Group, Odd Arne Samdal from Thales Norway and Knut Roar Wiig from the company Nordic Unmanned AS. Photo: MilitærTeknikk

Haugsvær works in close cooperation with André Pettersen from the Defence Research Establishment FFi, and Pettersen posed the next rhetorical question: *How can the machines assist us?*

And the answer spanned everything from decision support to manning naval vessels. The FFI is currently working on several projects under the autonomy banner, and will probably be spending more than 200 MNOK (20 MEUR) over the next five years, for a further insight into what opportunities this technology might offer.

– We are working to develop a common autonomy framework, while we have also worked to develop various demonstrators, explained Pettersen

The industry representatives were also given the chance to present their thoughts on autonomy.

Knut Roar Wiig from the company Nordic Unmanned AS focussed his presentation of the significant savings that can be achieved through the use of autonomy. The Sandnes-based Nordic Unmanned AS delivers

ART IMPRESSION OF "YARA BIRKELAND"

"Yara Birkeland" will be the world's first fully electric and autonomous container ship, with zero emissions. With this vessel, the fertilizer production company Yara will reduce diesel powered truck haulage by 40,000 journeys a year. The vessel is currently being built at the VARD Brevik shipyard, and will be delivered early 2020. The vessel will gradually move from manned operation to fully autonomous operation by 2022.

The "Yara Birkeland" will be 80 metres (260 ft) long. It will be propelled by electric motors powered by batteries. The optimal speed will be 6 knots (11 km/h) with a maximum speed of 10 knots (19 km/h). The total cost of the vessel is estimated to 25 million USD (220 MNOK), approximately three times the cost of a conventional container ship of the same size. The Norwegian Government gave a grant of MNOK 133.6 towards the construction of the ship. According to some estimates, Yara may save up to 90 % of annual operating cost vs. a similar conventional ship.

Kongsberg is responsible for development and delivery of all key enabling technologies on "Yara Birkeland", including the sensors and integration required for remote and autonomous operations, in addition to the electric drive, battery and propulsion control systems.

products and services based on unmanned technology.

– The important thing is for the industry as well as the armed forces community to start making use of this technology, so we can get a clearer picture of where we are at and what we need to develop. And obviously, as with the advent of any new technology, we are facing a certain degree of resistance and uncertainty with the introduction of new ways of doing things.

Kongsberg Group has worked with autonomous vessels over many years, and Bjørn Jalving focused his presentation especially on autonomous seagoing craft, both submerged and surface vessels. – At this time, several commercial autonomous vessels are in the planning and building stages, Jalving said, mentioning among others the Yara Birkeland as an example. This vessel, planned to carry fertilizer for the industry company Yara, is currently being built at the Vard shipyard. – We foresee significant economic savings related to this vessel. The practically eliminated crew cost is just one thing, but the main saving may be in the electric propulsion, as well as in not having to build the accommodations, cabins, galley et cetera required to keep a crew happy, and the omission of security and rescue equipment, life boats and rafts, required by a crewed vessel.

Jalving also pointed to a demonstration of Kongsberg's autonomous submerged vessel Hugin, performed in the Mediterranean Sea some time ago. The Hugin was operated from an unmanned surface vessel, from which it was launched to dive down to a depth of 4000 meters, before returning to the unmanned surface vessel to be lifted on board. All of this was done without human intervention, Jalving explained, and suggested that five or six such vessels each with a Hugin could be very effective hunting enemy submarines in a Norwegian fjord.

The last industry representative to speak was Odd Arne Samdal from Thales Norway. Samdal raised the issues concerning autonomous vehicle and security with respect to data transmission. What if an enemy manages to manipulate the data from an autonomous mine clearing vehicle, making it report back to the parent craft that "this area is now cleared of mines?". The example is chosen to illustrate that information security is a vital aspect with regard to autonomous vehicles, Samdal explained, adding that Thales and the Defence Research Establishment FFI are currently engaged in a R&D project to review these issues further.

FSi SMB CORPORATE PRESENTATION:

IMPETUS

We develop IMPETUS Afea Solver, a software tool to do large-deformation analysis of structures, which often occurs for extreme loading conditions. IMPETUS Afea Solver can efficiently do analysis of impact, blast and terminal ballistics. Application areas include IED (improvised explosive device) and the shock response on vehicles, warhead design, fragmentation analysis, shock loading and shock response, fortification and design of advanced armour solutions.

IMPETUS core values are accuracy, robustness and user friendliness. The software has several unique features and we aim to be the innovation driver within our field.

IMPETUS software is used by test laboratories, research organizations, universities, agencies, consulting companies, suppliers and OEMs within the defence market.

About IMPETUS

IMPETUS started in 2006, and the development of software was initiated in 2008.

Today IMPETUS has 6 full time employees (PhD; MSc, BSc) and is located in Flekkefjord on the south coast of Norway. IMPETUS' Swedish daughter company is located in Huddinge, just south of Stockholm.

The company is owned by its employees.

Involvement in the defence marked

The IMPETUS software tool is licensed to defence agencies, OEMs (Original equipment manufacturers) and suppliers within the defence market. Our customers use our tool for investigation of alternative designs and to develop new products. A typical customer is a manufacturer of armour or armoured vehicles. Defence is 70% of IMPETUS' market.

Company's standing as a member of the FSi:

Since 2012.

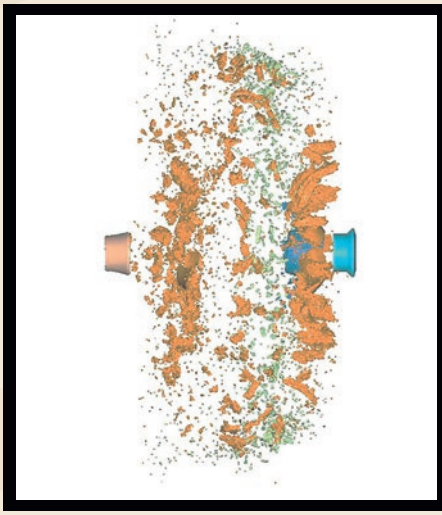
Why maintain the membership in FSi:

Good arena for networking.

SIMULATION VS. EXPERIMENT

The top photo displays a blast loading hitting a reinforced concrete wall. The illustration to the left displays the analysis result worked out with the IMPETUS software tool. The photo to the right displays the actual result of the high explosive impact.

Photo: NDEA, Norwegian Defence Estates Agency



TEST OF APEX AMMUNITION

The actual impact is displayed to the right. To the left, the computerized picture of the impact and fragmentation created by the IMPETUS software.

Photo: Nammo/FFI

KNM "MAUD" ARRIVES IN NORWAY

On Friday, March 29th, the KNM "Maud", the all-new Navy logistics vessel, arrived at the Navy base of Haakonsvern near Bergen. Maud is a new and vital logistics and support resource in the marine defence. With its substantial load capacity, the vessel can provision own and allied forces to allow the operative units extra duration in the operative theatre.

With a length overall of 183 meters, or 600 feet, and a displacement of 27,500 tons, the KNM Maud will be the overwhelmingly biggest vessel in the Norwegian Navy. For comparison, the Fridtjof Nansen class frigate measure 134 meters overall (440 feet), and their fully loaded displacement is 5200 tons. Photo: Sjøforsvaret/FMS

Further to the importance of KNM Maud in boosting the operational stamina of the other Navy vessels, the very presence of a logistics vessel is an attractive resource within NATO. Our planning calls for the KNM Maud to be a part of and to offer support to the standing NATO maritime forces, said Prime Minister Erna Solberg.

KNM Maud may also feature as a command ship to control naval military operations from the sea level. The vessel is also intended to support other Defence units, as well as to function as a resource to the general community in a readiness context.

Maud is able to support the civilian community in the event of a crisis or disaster, humanitarian operations, or search and rescue (SAR) operation. The ship is prepared to host a medical unit capable of treating up to 48 patients, with its own surgical theatre, trauma room, intensive care unit, hyperbaric chamber and many other speciality rooms we know from hospitals.

The KNM Maud is expected to become fully operational in the course of 2020.

– Bulletin Board for Defence, Industry and Trade –

Allies to Pay for Hosted US Troops?

The European Council on Foreign Relations published a report in February suggesting Trump may be preparing some "bills" for NATO allies. Rumors are that the Trump administration may start billing countries which host United States military installations and forces. Some media sources have even suggested that the charges would cover the full cost of US deployments plus 50 percent more.

A NATO official however stated that the matter has not come up at the alliance level. Noting any such arrangements are bilateral, the official would only say that the US presence in Europe is beneficial both to Europe and the US.

Previously South Korea agreed to increase the amount it pays Washington for the deployment of US troops there from about $830 million to $924 million (738 million EURO to 822 million EURO) under intense pressure from the US president and fears he would withdraw some of the 28,500 troops there without the spending boost.

Carl-Gustaf Ammunition for USA

Saab has received an ammunition order from the U.S. Department of Defense (DoD) for the Carl-Gustaf man-portable weapon system. The total order value is $16 million (approximately 145 MSEK). Deliveries will take place in 2020.

RBS 70 Mk II Missiles to the Czech Army

Saab has received an order to deliver the Mk II missile for RBS 70 to the Army of the Czech Republic. The deliveries will take place in 2019.

The order was placed by the NATO Support and Procurement Agency (NSPA), responsible for acquisitions for NATO members. The Czech Republic is a user of the RBS 70 as well as the new RBS 70 NG system, both systems are compatible with the Mk II missile.

Remote towers centre

Norway's Avinor Air Navigation Services has commenced the construction for what will become the world's largest remote towers centre, controlling the air traffic at 15 airports from the Arctic city of Bodø.

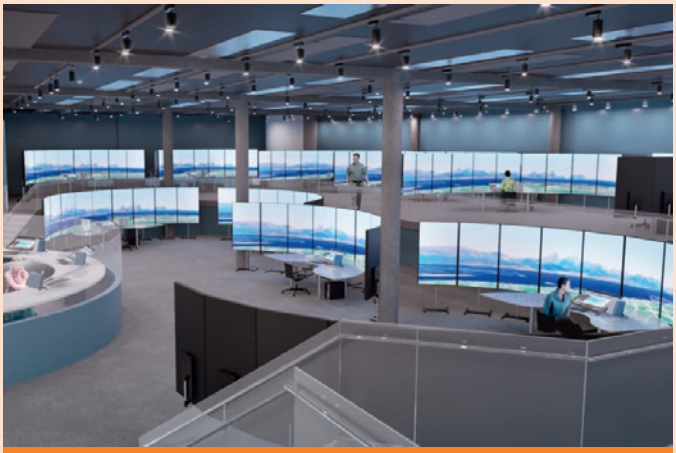
The new Remote Towers Centre in Bodø, Norway is an MNOK 110 investment (about 11 millions EURO).

Civil use of military technology

-The Remote Towers Centre will run on the Ninox Remote Towers platform. When complete, it will provide more flexibility and better accessibility to 15 airports, which spreads across a vast geographic area of Norway. As a result, the new Remote Towers Centre will open up the possibility to increase the opening hours of smaller airports, ensuring better access for ambulance flights and business development alike for small Arctic communities. Today these airports often have to keep closed for parts of the day, due to the lack of staff, says Anders Kirsebom, CEO of Avinor Air Navigation Services

-We are implementing the Ninox Remote Towers platform together with the Kongsberg Group and Indra. One of the success factors for this project is that the new platform will provide an equal or better safety level compared to that of conventional towers.

-The Ninox Remote Towers platform includes the use of IR technology (infrared camera) and MTI technology (Moving Target Indicator), which detects moving objects in the airspace or on the ground. This includes drones, birds, humans, cars or other objects which can represent a danger to air traffic, says Kirsebom.



The centre will employ about 60 persons, ensuring better knowledge sharing and redundancy amongst staff. The first airport tower to be controlled remotely is Røst, located in the Lofoten islands of Norway. The plan is run the first operation by September this year. Illustration: Archus Arkitekter/ Avinor

The NINOX Electro-Optical Sensor Suite (EOSS) from KONGSBERG, consists of a rotating platform housing a visual and infrared 360° camera and a pan-tilt platform housing a visual zoom camera, a fixed lens IR camera, a laser range finder and signal lamp. Photo: Catchlight Fotostudio/ Avinor

German armed forces; operational readiness slowly increasing

In March, Inspector General Eberhard Zorn presented his annual report on the operational readiness of the Bundeswehr's main weapon systems to the Bundestag's Defense Committee.

The material readiness of the approximately 10,000 weapons systems of the Bundeswehr averaged 70 percent last year. The downward trend in the material operational readiness of the main weapon systems was stopped, in parts even reversed.

As a prime example of this development, the Inspector General cited the wheeled GTK armored troop transport vehicle Boxer. In addition, "the A400M is also showing a positive trend, with the simultaneous arrival of ten other aircraft and its certification as a tanker." The A400M can now take over transports in the operational areas; This is partly due to the simplification of procedures and the increase in maintenance capacity.

The Bundeswehr is on the right track, but has not yet arrived at its destination. The operational readiness of the U212A submarine is not satisfactory, as at least three submarines should have been available for missions towards the end of 2018.

All in all, the trend reversals of material and finance are slowly but increasingly taking effect, and additional reforms are planned for this year.

Increased US defense budget

On March 11, 2019, President Donald J. Trump sent Congress a proposed Fiscal Year (FY) 2020 Budget request of $750 billion for national security, $718.3 billion of which is for the Department of Defense (DoD). The FY 2020 Budget maintains momentum from the sustained funding increases enacted in FY 2017, FY 2018, and FY 2019 to repair damaged readiness, and the Budget marks a key next step in how we operationalize the 2018 National Defense Strategy. The 2018 national Defense Strategy states that "Long-term strategic competitions with China and Russia are the principal priorities for the Department, and require both increased and sustained investment, because of the magnitude of the threats they pose to U.S. security and prosperity today, and the potential for those threats to increase in the future.

Specifically, the Department's FY 2020 budget builds the Joint Force's capacity and lethality by investing in:

Cyber: $9.6 billion
Space: $14.1 billion
Air Domain: $57.7 billion
Ground Systems: $14.6 billion
Maritime domain: $34.7 billion.

The Budget highlights emerging technology projects including:

- Unmanned / Autonomous projects to enhance freedom of maneuver and lethality in contested environments - $3.7 billion

- Artificial Intelligence / Machine Learning investments to expand military advantage through the Joint Artificial Intelligence Center (JAIC) and Advanced Image Recognition - $927 million

- Hypersonics weapons development to complicate adversaries' detection and defense - $2.6 billion

- Directed Energy investment to support implementation of directed energy for base defense; enable testing and procurement of multiple types of lasers; and increase research and development for high-power density applications - $235 million

Rheinmetall to supply the Swiss Army's new command simulator

Following a comprehensive evaluation by armasuisse, one of Switzerland's four federal-level procurement agencies, Rheinmetall has won an order to supply a new command simulator for training the nation's military leaders. The contract has been signed in February 2019.

The new command simulator will be located at the Swiss General Staff School (Gst S) in Kriens in Canton Lucerne. For years, this training centre has been using simulator-based technology to school Swiss Army officers in every aspect of military leadership.

Virtual training simulators to Finnish Armed Forces

The Finnish Defence Forces Logistics Command has signed a contract with Saab's training and simulation business unit for the procurement of virtual training simulators.

The contract is valued at approximately 9m EURO and the acquisition of virtual simulators is part of the Finnish Armed Forces' Training 2020 programme.

Under the contract, the company will supply equipment that includes simulations of weapons used by the Finnish military, as well as software that designs a virtual environment and provides a base for post-training analysis.

In addition, the company is required to offer system maintenance support. Deliveries under the contract will be carried out this year.

Training 2020 programme is being implemented to provide soldiers with skilled training in a safe and environmentally friendly area.

The high-impact cost-effective training will prepare soldiers for potential challenges faced in future security environments. Training will benefit both the defence system and the individual.

US Army clarifies rules on autonomous armed robots

The US Department of Defense (DoD) has clarified its rules on the use of autonomous armed robots in battle, stating that humans will always have the final decision on deploying lethal action.

The DoD recently announced its plans to upgrade military aiming systems, using machine learning to create a gun platform that can choose its targets autonomously.

Under the Advanced Targeting and Lethality Automated System (Atlas) project, the US Army will incorporate autonomous aiming capabilities into ground combat vehicles to help US Army gunners reach a higher level of precision.

The US Army said that "the Army has a desire to leverage recent advances in computer vision and artificial intelligence/machine learning to develop autonomous target acquisition technology, that will be integrated with fire control technology, aimed at providing ground combat vehicles with the capability to acquire, identify, and engage targets at least three times faster than the current manual process.

For the project, the DoD is looking for commercial partners to help deliver the autonomous aiming system.

Chinese 40-Ton Helicopter?

The 40-ton class heavy helicopter, jointly developed by China and Russia, is expected to be delivered by 2032, said Wu Ximing, a Chinese political advisor and chief designer of helicopters for the Aviation Industry Corporation of China.

Wu said that China lacks experience in technologies related to the transmission system.

Russia however is more experienced in the transmission system when it comes to 40-ton class helicopters, as Russia's Mi-26 is of the 56-ton class.

China is responsible for the helicopter's design and production and Russia would be acting as a technical partner.

"-Our goal in the co-operation is to learn from Russia's strong points and close the gap," Wu stated.

Under the contract, at least 200 heavy helicopters will be built in China. The heavy helicopter would have a weight-lift capability of 15 tons, a range of 630 kilometers and a top speed of 300 kilometers an hour.

China will have a complete helicopter family covering from 500-kilogram class to 40-ton class.

Secure network for French Navy vessels

The French defence procurement agency DGA (Direction générale de l'armement) has awarded the RIFAN 2.1 contract to an industrial consortium headed by Airbus and also comprising the Naval Group and Rohde & Schwarz. This contract was signed for a maximum duration of eight years and up to a maximum amount of 150 million EURO.

The contract covers work to maintain and adapt the existing IP network for the French naval forces, RIFAN 2 (Réseau IP de la Force Aéronavale étape 2), to the needs of the Navy in the coming years, to integrate new ships and remedy hardware and software obsolescence.

It will also enable the future front-line frigates of the FDI ('frégates de défense et d'intervention') programme and the future replenishment tankers of the BRF ('bâtiment ravitailleur de forces') programme to be integrated into the RIFAN 2 network. The purpose of the programme is to equip French naval forces with a truly secure broadband network. It is designed for exchanges of data of various classification levels, ranging from 'Unclassified' to 'Secret', between ships at sea and on-shore command centres.

A total of 63 French navy ships are equipped with the RIFAN 2 network, ranging from aircraft carriers and frigates to support ships, patrol craft based overseas and submarines. *Photo: French Navy*

Coastal surveillance radars to France

Thales has received a contract from the French Defence Procurement Agency to supply two coastal surveillance radars to enhance maritime threat detection.

Under the contract, Thales will provide its Coast Watcher 100s that is claimed to offer protection for tactical test areas. Radars will monitor maritime traffic in and around the areas and detect any intrusive threats.

Thales noted that the focus of maritime threat detection has shifted from blue-water operations to coastal and littoral zones due to evolving threats.

The scope has increased to include tackling various threats in these zones such as intrusion by hostile vessels and aircraft into sensitive areas, trafficking, shipping accidents, and maritime pollution, the company added.

Thales has so far delivered about 30 Coast Watcher 100 radars to several countries.

Coast Watcher 100 radar. *Photo: Thales*

Defense-level encrypted smartphones for Swedish healthcare

International medical imaging IT and cybersecurity company Sectra has delivered its secure smartphone, Sectra Tiger/R, to two Swedish healthcare regions. Sectra's solution will enable the regions to securely communicate sensitive or classified information within their organizations and with central government authorities.

Sectra Tiger/R is an encryption solution for smartphones and tablets. Within the two regions, Sectra Tiger/R will be used by key individuals in the security organizations to communicate sensitive information, such as crisis preparedness, information security or incident response capability.

The solution will be delivered as a service, whereby the system's infrastructure and administration will be managed by Sectra. The regions will thus gain a cost-efficient solution that can be swiftly and easily implemented in day-to-day operations while avoiding high investment thresholds.

Sectra Tiger/R *Photo: Sectra*

Nammo assumes majority ownership position in MAC LLC

A year after announcing its acquisition of a minority position in US company MAC LLC, Nammo is pleased to confirm that it has assumed a majority ownership position in the company. Based in Bay St. Louis MS, the company is a leader in the development and production of lightweight polymer cartridge cases for small and medium caliber ammunition.

Nammo, as a major supplier of specialty ammunition for military and commercial users, believes that this technology will strengthen its ability to provide a reliable advantage to its customers.

MAC LLC will continue to operate as they have, providing a leadership role in lightweight ammunition solutions, and will be an important part of Nammo's US growth plan going forward.

The acquisition has been reviewed and approved by the US government.

F-16s for Taiwan?

Taiwan could begin to receive its first batch of 66 new F16V fighter jets from the U.S. as soon as the end of 2020.

Taiwan has made new progress in the purchase of 66 F16V jets from the U.S. On Feb. 27, the Ministry of National Defense officially submitted its application for the fighter jets.

The U.S. is expected to give an official decision on the request within 120 days, and mostly likely June at the latest. The estimated cost of the new warplanes will be between billion US$ 7.76 billion and US$ 8.08 billion, and delivery of the jets could begin by late 2020.

A military official told China Times that the reason why Taiwan is opting for F-16V jets instead of the state-of-the art F-35 fighters is that the U.S. has said it is not willing to sell the advanced aircraft to Taiwan for at least 10 years. In addition, the official said it will take another eight years produce the jets for Taiwan and to train its pilots on the fifth-generation combat aircraft, thus meaning it could be 18 years before Taiwan could fly the F-35.

The F-16V configuration provides advanced combat capabilities in a scalable and affordable package. Photo: Lockheed Martin / Randy Crites

Shark skin to build faster aircraft

The US Army has funded research to study the skin of the shortfin mako shark as part of efforts to construct faster aircraft and helicopters.

Also known as the 'cheetahs of the ocean', mako sharks can achieve speeds of up to 112-129 km/h (70mph or 80mph).

The investigation is expected to provide insights into how the mako shark is able to achieve high speeds. Results could help engineers in understanding how the pressure drag on aircraft can be reduced and make them more agile and responsive.

The research is being carried out by aeronautical engineer Amy Lang of the University of Alabama.

Lang, along with colleagues, has studied how the nearly 0.2mm-sized scales can flex at angles more than 40° from the shark's body.

These flexible scales are located in particular areas of the shark's body and help the animal control flow separation to reduce pressure drag.

The research team conducted water tunnel experiments using real mako shark skin samples. The skin samples were taken from the shark's flank region.

Lang explained: "We set up an experiment in the tunnel with a measured amount of flow separation induced on a smooth surface. Then we replaced the smooth surface with shark skin and re-quantified the flow separation.

In all cases with the flank skin, we saw the size of the separated flow region reduced significantly by the presence of the skin.

The research work was also funded by Boeing.

Shortfin mako sharks can achieve speeds of up to 129 km/h. Photo: Mark Conlin, SWFSC Large Pelagics Program

IBCS contract for Poland's Wisla programme

Northrop Grumman has secured a $713m contract with the US Army to manufacture integrated air and missile defence (IAMD) battle command system (IBCS) for Poland.

The foreign military sales contract is for the first phase of Poland's Wisla medium-range air and missile defence programme.

Under the contract, Northrop Grumman will produce IBCS engagement operations centres for integration with IBCS battle management software to increase the combat ability of sensors and weapon systems.

The company will also supply the integrated fire control network relays and IBCS network-enabled command and control for four firing units.

Delivery of the IBCS engagement operations centres and network relays will be carried out by Polish Jelcz vehicles.

In March last year, Poland became the first international partner country to buy the IBCS. The IBCS provides wider area surveillance and broader protection areas by integrating sensors and interceptors.

The second phase of Poland's Wisla programme would involve the purchase of additional Patriot fire units, in addition to gallium nitride-based 360° active electronically scanning array radars and the low-cost interceptor missile SkyCeptor

US Army to delay BAE howitzer

The US Army is reportedly set to delay its approval of the full production contract for BAE Systems' M109A7 self-propelled 155mm howitzer.

The service had already delayed its decision on a contract for the full-rate production of the howitzer, which was supposed to be announced in July.

US Army spoksman stated recently that the BAE has made progress, but they're still not at the point where they've show 'both a consistent rate and a consistent level of quality'.

BAE Systems' progress on the $8.1bn programme is currently being monitored by the Defense Contract Management Agency.

To date, the US Department of Defense has awarded contracts for the purchase of a total of 162 sets of howitzers and ammunition haulers.

Around 576 M109A7-howitzers and ammunition carriers are planned to be acquired by the army.

Meanwhile, BAE spokes-woman Kelly Golden said -We have enhanced the weld and fabrication processes across our entire manufacturing network. As part of these improvements, we implemented a 100% in-station weld inspection across our facilities and are now delivering defect-free vehicles to the Army at a higher rate.

The M109A7, produced by BAE Systems, will replace the current M109A6 Self-Propelled Howitzer, formerly known as the Paladin Integrated Management program, as one of the Army's most critical combat vehicle modernization programs. *Photo: BAE Systems*

Update Australian Army C-RAM Capability

In late December, Saab received an order from the Capability Acquisition Sustainment Group (CASG) on behalf of the Australian Army to update the Wireless Audio Visual Emergency System (WAVES) equipment for the Counter Rocket, Artillery and Mortar (C-RAM) System. The WAVES equipment provides early warning audible and visual alerts when the C-RAM sensors detect and identify an incoming threat within an exclusion zone.

The C-RAM capability (which comprises of multiple sensors, C2 nodes and warning systems) is an essential capability to protect friendly forces from hostile fire by detecting and warning against small, mobile and hard-to-find threats such as rockets, artillery and mortar fire. The Commonwealth's C-RAM solution is built around the Saab Giraffe Agile Multi-Beam (AMB) radar which is part of a family of ground-based radars that can detect a range of incoming threats, from mortar and artillery rounds and rockets to small drones and fast moving aircraft.

CROWS contracts valued 805 MNOK

Kongsberg Defence & Aerospace AS (KONGSBERG) has received a number of contracts in December 2018 worth 805 MNOK.

This is in accordance with the CROWS IDIQ (Indefinite Delivery/Indefinite Quantity) frame contract with the US Army announced September 14, 2018. The contracts also includes the Low Profile CROWS configuration, spare parts, and repair and reset of already delivered equipment totaling 620 MNOK.

With nearly 20,000 systems sold, KONGSBERG is the world-leading provider of remote weapon stations.

M153 CROWS mounted on a US Army M-ATV. *Photo: US Army*

C-5 fleet modernisation

The US Air Force (USAF) Rapid Sustainment Office (AF RSO) has formed a partnership for sharing of best practices related to C-5 Galaxy modernisation and reliability processes.

Partners in the collaboration include the AF RSO, the C-5 System Program Office, Delta Air Lines and the Georgia Institute of Technology.

Delta and Georgia Tech will be responsible for sharing commercial best practices for the C-5 programme.

Over the next six months, Delta and Georgia Tech will deliver recommendations to modernise aircraft maintenance and reliability processes across the USAF, based on Delta's innovative processes.

Bilde 2 A US Air Force C-5 Galaxy. *Photo: Lockheed Martin*

STADT signs contract for a new Navy project for a NATO country

Electrical propulsion systems for military vessels are forging ahead, and with its patented STEALTH technology based on Lean Propulsion, STADT has now signed an important contract for a large, new military vessel.

Scope and details about the project are not being publicised yet, but this is a very significant contract, for which STADT has prevailed in competition with much larger international suppliers. Among the decisive competitive advantages of the STADT Lean Propulsion technology is that it is noiseless in all manners, it is compact, and it needs no cooling. This ensures more power to the propellers, with an energy saving of up to 6% over the competitors to STADT on electric propulsion. Accordingly, the ships equipped with STADT technology will be very environment friendly, with both energy consumption and climatic emissions reduced to half that of previously used propulsion technology on military vessels.

In 2018, STADT delivered a large system to SAAB in Sweden, and this too was for a military ship. With the new contract, STADT reaffirms its position on the military ship market. Hallvard Slettevoll, general manager for STADT AS, believes that more defence contracts will be coming in soon.

STADT is also noticing a lot of interest from the commercial shipping market internationally, where there is a large spectrum of ships with a need for some environmentally friendly type of electric propulsion or other. Many of the projects are bases on LNG as their source of energy, often in combination with diesel and batteries. STADT delivers fully integrated solutions, up to and including propeller systems in collaboration with its partners. The STADT technology is scalable up to very high power levels, effectively covering the propulsion needs of ships in virtually all sizes.

The first hot firing from the F-35

The beginning of March saw the first hot firing of live missiles from the F-35 in Norway.

The shooting was conducted by the 332 Squadron working in collaboration with the TTT Squadron (Testing, Training and Tactics) as well as the maintenance and logistics organisations. The exercise was carried out at the firing range of Halten, north west of the Ørland Air Station, and it was the first of its kind from an F-35 in Norway.

The missiles that were fired were of the type designated AIM-120, a radar-controlled air-to-air missile (AMRAAM), and is an uprated version of the one being used on the current F-16. In conjunction with the sensors on the F-35, the missile can be used to engage aircraft that are beyond line of sight, way before the F-35 itself gets detected.

The aircraft comprises a total of 11 different attachment points for weapons, called weapons stations. Four of the weapons stations on the F-35 are internal, allowing the fighter to carry from two to eight air-to-ground weapons as well as two radar-controlled air-to-air missiles.

F-35 RNORAF Live firing with AMRAAM missile.
Photo: Helge Hopen/ Forsvaret

Europe nearing goals

With overall European spending up, hitting a five-year high of 1.51 percent of GDP, Britain, Estonia, Greece, Latvia, Lithuania and Poland met the 2 percent goal, according to the NATO 2018 annual report. Bulgaria, the Baltics and the Netherlands pumped in an extra 20 percent in 2018 compared to 2017.

Europe in general has been pushed into more military funding following the 2014 Russian annexation of Ukraine's Crimea, Islamist militancy and Trump's demands for sharing the cost of defending Europe.

Members have promised to try to hit the target by 2024 but slow progress has angered Trump, prompting him in August last year to threaten pulling out of the alliance if they didn't boost spending immediately.

European states have argued security is not just about spending targets. Added to that, despite welcome growth rates, rising GDPs have made meeting the relative figure difficult.

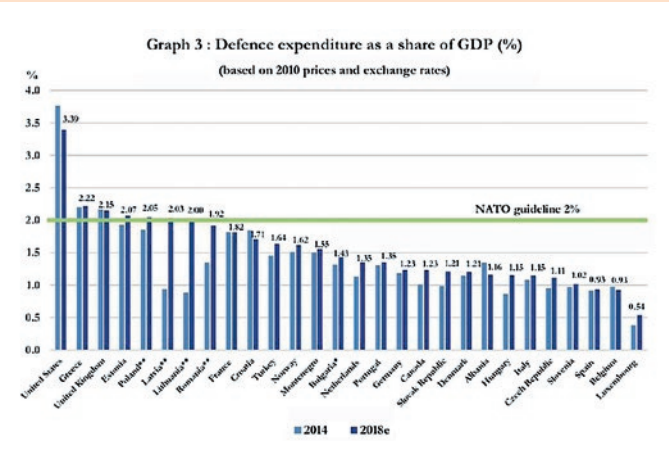
German spending stable

Europe's largest economy, Germany, invested an additional 1.5 billion EURO ($1.7 billion) in defense last year, raising the figure to almost 42 billion EURO ($47 billion) and keeping its rate as a percentage of GDP stable at 1.23 percent.

That leaves Germany at the lower end of the spectrum, with the US at 3.39 percent, while Belgium and Spain remain below 1 percent of economic output. Spending in Canada fell by almost 11 percent last year.

NATO head Jens Stoltenberg said the increase showed "we are moving in the right direction." He had previously argued NATO is undergoing a significant shift in spending as it seeks to deter Russia and undergoes its biggest modernization in decades.

From 2016 to 2020, NATO states excluding the US are expected to increase defense budgets by $100 billion.



Nammo's British Rocket Engine Powers Israel's Mission to the Moon

When SpaceIL's Beresheet Lunar Lander blasts off from Cape Canaveral on a SpaceX Falcon 9 later this week it will carry a rocket engine designed and built at Nammo's facility at Westcott in the UK. Known as the LEROS 2b, and originally designed for satellites and deep space missions, the engine will power the Lander during its transfer to the Moon, place it into orbit around the moon, and ensure a safe landing on the lunar surface. Finally, the rocket will be used to 'hop' and move the Lander to another location on the moon approximately 500 m from its original landing point.

Beresheet Moonlander.
Photo: SpaceIL

Nammo Westcott in Buckinghamshire was chosen by SpaceIL as the provider of the main rocket engine in 2015. Modifications made to the LEROS since then include shortening the nozzle to ensure it will fit within the spacecraft and, crucially, not hit the surface of the moon when the Lander touches down.

Nammo's engineers have also increased the thrust of the engine to give it sufficient power to land safely. Finally, they have verified that the engine is able conduct multiple so-called "hot re-starts" during landing and the 500 meter hop on the Moon.

LEROS engines have already powered missions to Mars, Mercury and Jupiter, but never to the Moon, and certainly never powered a landing.

RBS 70 NG for Brazilian Army

Saab has signed a contract with the Brazilian Army for deliveries of RBS 70 NG – the latest generation of the RBS 70 man-portable air defence system.

In addition to the RBS 70 NG system, the order also includes training systems, camouflage systems and other associated equipment. This is the Brazilian Army's first order of the latest RBS 70 NG version and marks a significant upgrade to their air defence capability. Their existing RBS 70 inventory has been in service with the Brazilian Army since 2014. The system had a big role in 2016 as it was a part of the protection of the 2016 Olympics in Rio de Janeiro, Brazil.

RBS 70 system has an impressive track-record on the market with more than 1,600 launchers and over 18,000 missiles delivered to nineteen countries.
Photo: Saab

Carl-Gustaf M4 to the U.S. Army

Saab and the U.S. Army have signed a multi-year framework agreement for delivery of the Carl-Gustaf M4 weapon system (designated M3E1 in the US). The first delivery order amounts to USD 19 million (Approximately 170 MSEK) with deliveries expected in 2019.

The recently signed framework contract has a duration of 3 years and gives the U.S. Army the opportunity to place orders for Carl-Gustaf M4 systems for a total value of approximately 380 MSEK.

The Carl-Gustaf M4 (designated M3E1 in the U.S.), reduces the launcher weight from 10 kg to less than 7 kg, among several other significant improvements.
Photo: Saab

Order for 9LV Fire Control System from Norway

Saab has received an order from Vard Group A/S for delivery of the 9LV Fire Control System (FCS) including the Fire Control Director Ceros 200 to the Norwegian Coast Guard's new Jan Mayen class vessels.

The 9LV FCS is used to detect, monitor and combat threats with unpreceded accuracy.

Vard Group is building the Jan Mayen class vessels with the first delivery planned for 2022. Saab will undertake the work in Järfälla, Sweden.

The 9LV FCS provides rapid, reliable defence against any threat in any environment, including advanced sea-skimming missiles and asymmetric surface threats. One of the core components, Ceros 200, is based on radar and optronic technology which gives the system very high precision in all weather conditions. It is used on more than 200 ships around the world.

Communication System to Norwegian Coast Guard Vessels

Saab has signed a contract with Vard Group AS to take on the communication integrator role for the Norwegian Coast Guard project P6615.

Saab will provide the Norwegian Coast Guard's three newly ordered vessels with Saab's complete Integrated Communication System, TactiCall, consisting of both internal and external communication.

TactiCall is based on voice over IP technology and interconnects all communication technologies regardless of radio band, frequency and hardware.

Support Contract for Giraffe AMB with France

Saab has signed a contract with the French Ministry of Defence's Direction de la Maintenance Aéronautique (DMAé) regarding support for the surface based radar system Giraffe AMB.

DMAé is responsible for the operational maintenance of the French Ministry of Defence's aeronautics equipment. The contract, which includes support, maintenance and spare parts, covers an initial two-year period from January 2019 to January 2021, with options to extend for up to five additional years, to 2026.

Saab delivered the Giraffe AMB systems to France in 2006. *Photo: Saab*

US senators table bill to halt transfer of F-35 fighter jets to Turkey

Four US senators have introduced a bill that seeks to block the transfer of F-35 Joint Strike Fighter aircraft to Turkey until Ankara gives up on the deal to procure S-400 air defence system from Russia.

Turkey is a key partner in the multinational Joint Strike Fighter programme, supplying parts for the stealth aircraft.

The US and its Nato allies fear that the procurement of the Russia defence systems by Ankara will affect the security and capabilities of the F-35 aircraft. Especially US fears that the radar on the Russian S-400 missile system would learn how to spot and track the F-35.

Turkey is expected to receive the F-35 towards the end of 2020, while the first S-400 delivery is scheduled for July.

The US also offered the Patriot anti-missile system as an alternative.

The US is also contemplating the removal of Turkey from the F-35 programme

Danish Army Orders Camouflage

Saab has received several orders from Danish Defence Acquisition and Logistics Organization for Static Camouflage Systems. Deliveries are expected to take place in 2019.

The Royal Danish Army has been a user of Saab Barracuda's signature management systems for more than 25 years. The new orders contain static camouflage systems, which is an advanced multispectral camouflage net that provides unrivalled signature protection for vehicles and other objects in static positions.

Saab Barracuda camouflage solutions offer multispectral protection. Everything from ultra-violet, visual, near infrared, short wave infrared to thermal sensors and radar. *Photo: Saab*

NorLense Awarded Nato Support and Procurement Agency (NSPA) Contract

NorLense Shelter Solutions has been awarded a contract with the Nato Support and Procurement Agency (NSPA) following an international competition for the acquisition of an 800-person rapidly deployable camp for a Nato nation.

The camp will be delivered in September 2019 and consists of tented living accommodation based on NorLense SWIFT high-pressure inflatable tents, together with associated camp equipment. As an option, NorLense will also provide full life cycle support for the equipment and set-up / tear down service of the camp through a national partner.

NorLense AS shelter sales manager Robin Mattsson said: "This is a real vote of confidence from NSPA of our SWIFT tent system and capability as a company to provide complete camp solutions. The contract demonstrates that we have the skills to win international tenders based on our technical competence and pricing structure."

The tented living accommodation will be equipped with HVAC, electrical distribution, lighting, fire safety equipment and furniture. It is designed for being configured and loaded quickly for a specific mission and for continuous operation with minimum maintenance under harsh field operations.

SWIFT tents provide a minimum of 10 years of life and use a rapid and modular system specially designed to meet the though demands of high mobility and comfort in all type of climates. It is a complete one-piece solution with no loose parts, integrated floor and complete high-pressure air beam structure. The unique structure contributes to rapid and easy deployment / take down for users in the field and minimise the risk of operations errors with missing or broken parts.

NorLense tents. *For over 15 years, NorLense have been producing inflatable tents based on their unique high-pressure technology and providing complete camp solutions. The NorLense high pressure inflatable tents have accommodated military, humanitarian and emergency organisations worldwide, achieved acknowledge for their high quality and easiness to use, being reliable in all type of climates and weather conditions.* *Photo: NorLense*

NASAMS for Australia

Raytheon Australia and Kongsberg Defence & Aerospace (KONGSBERG) have announced that the National Advanced Surface to Air Missile System, NASAMS, was selected for the Australian Government's Short Range Ground Based Air Defence program known as LAND19 Phase 7B. KONGSBERG is a subcontractor to Raytheon Australia.

NASAMS was in 2017 chosen for a Single Supplier Limited Tender process and has gone through a Risk Mitigation Activity. NASAMS is a fully networked and distributed system allowing the Australian Army to counter complex air threats beyond visual range and, considerably increase protection of Australian soldiers.

NASAMS network units. *NASAMS is the most sold air defence system in its class in the last 10 years.* *Ill.: KDA/ Raytheon*

F-16 to Morocco

The US State Department has granted approval for a potential sale of 25 F-16C/D Block 72 Fighting Falcons to Morocco in a deal valued at around $3.78bn.

Weapons to be sold under the possible sale include 30 M61 Al Vulcan 20mm guns, 50 LAU-129 multi-purpose launchers, 40 AIM-120C-7 advanced medium-range air-to-air missiles (AMRAAM), 40 AIM-120C-7 guidance sections, and three GBU-38/54 JDAM tail kits.

Furthermore, Morocco has requested to upgrade its 23 existing F-16C/D Block 50/52s to the F 16V configuration.

Expanding Czech Tactical Training System

Saab has received an order from the Czech Republic's Ministry of Defence to expand the Czech's instrumented Saab GAMER laser based training capability. Deliveries of the new system will start in the end of 2019 and continue during 2020. The order value is MSEK 108.

The Czech Army acquired the first Instrumented Saab GAMER system in 2011 for the Pandur IFV and performed upgrades during 2016 for laser code interoperability (U –LEIS). With this new expansion the Czech Army has a training system that meets their training needs.

Saab's laser simulators are used by the British, German, Swedish, Norwegian, Dutch and US Armed Forces. The system is the NATO standard gunnery and combat simulator for armoured vehicles and anti-tank weapons.

Data Response contact in Norway of 18 MNOK

Data Respons has received a contract of NOK 18 million with a customer within Space, Defence & Security segment.

The contract comprise development and delivery of advanced communication solutions with high security requirements that will be operating in challenging conditions. The deliveries will take place in 2019 and we see a great potential with this customer in the years to come.

- We have a long-term perspective on our customer relations and work closely with our customers – from idea and development to delivery and support throughout the lifecycle of the product. These types of customised solutions are system critical to our customers and requires in-depth domain knowledge and engineering competence. This order also confirms the strong development we see in the Norwegian market at the beginning of 2019, says Kenneth Ragnvaldsen, CEO of Data Respons ASA.

"Helge Ingstad" has been salvaged

On the 3rd of March, the ill-fated frigate KNM «Helge Ingstad» arrived at the Haakonsvern navy base, on the deck of the barge "Boabarge33".

HNoMS Helge Ingstad was involved in a collision with the oil tanker Sola TS, just outside the coast north-west of Bergen in on the western Norwegian coast, on 8 November 2018.

Due to the damage to the frigate it was moved to shallow waters and the crew was evacuated. Eight crew members were taken to hospital and treated for minor injuries.

The Norwegian frigate HNoMS Helge Ingstad is part of the Standing NATO Maritime Group One (SNMG1). The ships were sailing in and around the fjords, following their participation in exercise Trident Juncture 2018, which ended on 7 November.

The Norwegian Navy will now be surveying in detail the damages incurred by the frigate, prior to a final decision on what will be the further fate of the vessel. If repairs and restoring the frigate to operational duty isn't a viable path, the Defence and the Ministry will be evaluating alternative solutions. Several options have been voiced, including the procurement of a new frigate, or spending the money on an extra submarine.

KNM Helge Ingstad om\n the barge deck.
Photo: Bendik Skogli/ Norwegian Armed Forces

US Navy's Ford aircraft carrier delayed

Delivery of the US Navy's nuclear-powered aircraft carrier USS Gerald R Ford (CVN-78), to the fleet is being delayed for three months than originally expected due to faulty nuclear propulsion and elevators.

The Ford will not join the fleet until October this year.

Last July, the new super-carrier began undergoing its 12-month post-shakedown availability (PSA) process at Newport News Shipbuilding in Virginia. It was initially expected to complete its 12-month review after sea trials in July this year.

The technical glitches were detected during sea trials that part of a PSA.

The nuclear-powered aircraft carrier is considered to be an expensive warship in the US, carrying a price tag of $13bn.

Ford is the first of a new generation of aircraft carriers to replace the Nimitz-class carriers.

CVN 78 is the first new aircraft carrier design in four decades in the US.

Nuclear-powered aircraft carrier USS Gerald R. Ford (CVN-78) is being delayed for three months. *Photo: US Navy/R. Leoni*

GMLRS contract to Lockheed

The US Army has awarded a $1.13bn contract to Lockheed Martin for the production of guided multiple launch rocket system (GMLRS) rockets.

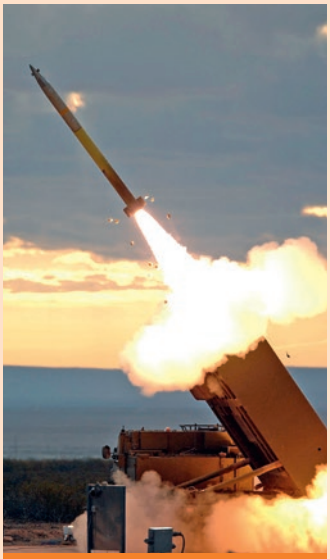
The contract covers the manufacture of more than 9,500 GMLRS unitary and alternative-warhead (AW) rockets and over 300 low-cost reduced-range practice rockets (RRPRs).

It will require the company to supply GMLRS rockets for the US Army and international customers.

Each GMLRS all-weather rocket is designed for integration into Multiple Launch Rocket System pods and fired from Lockheed Martin's High Mobility Artillery Rocket System or M270 family of launchers during combat missions.

GMLRS Alternative Warhead was developed to service area targets sets without manufacturing unexploded ordnance.

The GMLRS unitary rockets exceed the required combat reliability rate and the RRPR are suitable for smaller testing ranges and allow limited flight range training with realistic, full-motored rockets.



Launch of GMLRS. *Photo: Lockheed Martin*

India tests anti-satellite missile

India has demonstrated the capability to launch an anti-satellite missile to destroy low-Earth orbit (LEO) satellites through a test.

The test involved a ballistic missile defence (BMD) interceptor missile that was developed by the Defence Research and Development Organisation (DRDO).

During the test, the missile engaged an Indian orbiting target satellite in LEO in 'hit to kill' mode.

The BMD interceptor missile system involved a three-stage missile and two solid rocket boosters.

Based on data from range sensors, the DRDO has confirmed that all mission objectives were fulfilled as expected.

Saab Expands Ties With Indian Aerospace Firms for Gripen Aerostructures

Saab has taken another important step forward to expand its footprint and aerospace ecosystem in India by signing new Memorandums of Understanding (MoUs) with three of the country's leading aerospace manufacturers; Dynamatic Technologies Limited, CIM Tools Private Limited and Sansera Engineering Limited.

The MoUs with CIM Tools and Sansera expand the existing working relationships with Saab on commercial aerostructures to the Gripen fighter and other defence-related products in the Saab portfolio. The MoU with Dynamatic is a starting point to explore future joint opportunities in commercial and defence-related aerostructures work, including Gripen.

Norway procures Leguan bridge layers

The Norwegian Defence Materiel Agency (NDMA) has signed an agreement with Krauss-Maffei Wegmann (KMW) for the procurement of six Leguan bridge layer systems on a Leopard 2 chassis. In addition to the vehicle systems, training simulators and a peripherals package are also part of the procurement project. The contract is valued at 490 MNOK and delivery of the first units is expected in 2023.

The new bridge layers will replace the Norwegian Army´s current bridge layers based on the Leopard 1 chassis.

Norway has been using the Leguan on Leopard 1 basis for over 20 years, and is now the eighth nation to be proceeding to the next generation of a powerful Leguan system on the Leopard 2 chassis.

The new bridge layers are to a great extent based on the configuration of the bridge layers acquired by the German Army and the Dutch Army.

To date, armies from 18 countries have opted for the Leguan bridge system.

The Leguan bridge layer can configure one bridge of 26 meters length or two of 14 meters length (photo). *Photo: KMW*

Artist's impression of the Saab-Damen design for the replacement of the Royal Netherlands Navy Walrus-class submarines. *The expeditionary submarine builds on the capabilities of the Swedish A26 combined with Dutch Submarine technology and puts into practice the experience of the Dutch designed Walrus submarine class and of the Swedish designed Collins-class submarine, in-service with the Australian Navy. Key technology includes Saab's unique Air Independent Propulsion System based on the Stirling engine.* *Ill: Saab*

THYSSENKRUPP AND NAVANTIA OUT OF THE NETHERLANDS' SUBMARINE COMPETITION

The Dutch government has dropped the German shipbuilder ThyssenKrupp and Spanish Navantia from its bid contest to provide new submarines for the Royal Netherlands Navy.

The government is expected to make a purchase decision very soon. The Swedish-Dutch combination, Saab-Damen, and the French Naval Group are the only competitors left, Noordhollandsdagblad reported last week, quoting "unnamed sources".

– In the middle of last year, the talks suddenly stopped," says Holger Isbrecht of ThyssenKrupp Marine Systems. – The Netherlands then came up with a new Defence Industry Strategy, in which there was a great deal of effort to protect the Dutch maritime industry.

– There are concerns about the German partner in the Dutch ministries of defence and economic affairs, says a person who is not authorized to speak openly on this subject. – It is a project for the long term, thirty to forty years. The government would prefer to work with a trusted partner. In addition, it is clear from navy circles that submarine 212CD from ThyssenKrupp does not meet the Dutch requirements.

Holger Isbrecht denied this, countering with: – We are flexible and want to meet all the requirements.

According to the German shipyard, the functionality of their boats has been proven. But the functionality of the Saab-Damen alternative has yet to be proven.

Saab and the Dutch shipbuilder Damen Shipyards Group have joined forces to develop an expeditionary submarine for

the Netherland´s Walrus Replacement Programme (WRES). Saab and Damen want to build replacement submarines for the Dutch Walrus class, in a balanced cooperation between the Netherlands and Sweden.

The other remaining competitor, the French defence contractor Naval Group, has joined forces with Dutch shipbuilder Royal IHC in a bid to secure a contract for the Royal Netherlands Navy's submarine replacement project.

Naval Group would define the submarine design with the Dutch authorities, while Royal IHC would be appointed to perform the construction and outfitting of the end product in collaboration with the Dutch maritime sector. Over the next months, Naval Group and Royal IHC will reinforce their partnership with the review of building sites in the Netherlands and by engaging with Dutch industry partners.

The Netherlands is expected to award the first contract in 2021 with the first submarine arriving in 2027.

Saab group has for years been working on creating warm and elegant design for the living quarters in their submarines. An air-independent submarine can stay submerged for up to 15-20 days, and a friendly interior is seen as crucial to reduce crew stress and fatigue during long, submerged missions. *Ill. Saab*

JSM JOINT STRIKE MISSILE FOR JAPAN

Kongsberg Defence & Aerospace has entered into a contract with Japan for the initial deliveries of JSM (Joint Strike Missile) for their fleet of F-35 fighter aircrafts.

The JSM development started in 2008 and was completed in mid-2018 after a series of successful validation test firings.

The JSM will be acquired for Japan's fleet of 42 Lockheed Martin F-35A fighter jets, for which JSM integration to the F-35 is planned around 2021.

According to several reports, Japan may use the F-35 with the JSM missiles for possible strikes against North Korean targets, should the latter launch its ballistic missiles against Japan. However, Japanese government officials state that Japan's stance toward attacking land-based targets on foreign soil has not changed.

Japan´s pacifist constitution limits Japan's involvement in a conflict to self-defence in response to being attacked. And even if the procurement of JSM is within the constitution, acquiring a capacity that could also be used in offensive operations is still regarded as politically sensitive.

But the Japanese governments emphasizes that the U.S. military is responsible for any counter-strikes against an adversary in the event of an attack on Japan in line with the Mutual Defense Treaty between the two countries.

The Japanese government has nevertheless flagged possible changes to the war-renouncing Article 9 of the constitution, although details of the possible changes have not been made public.

The JSM is the only long-range sea and land target missile that can be carried internally in the F-35, and is thereby ensuring the aircraft's low-signature (stealth) capabilities. JSM is a new missile that will expand the overall capabilities of the F-35. No other weapon on the market today can perform the same types of missions.
Art impression by Kongsberg Group

GRIPEN TO FINLAND?

Saab has submitted its proposal for the Finnish HX fighter procurement to the Finnish defence procurement agency. The proposal comprises 64 Gripen aircraft, both single-seat Gripen E and dual-seat Gripen F.

The Finnish HX Fighter program is set up to replace the current Finnish Air Force fleet of 66 F/A-18 C/D Hornet fighters. The planned service life of the Hornets will end during the period of 2025 to 2030.

As part of the proposal, Saab offers a substantial weapons and sensor package as well as transfer of maintenance, repair and overhaul capabilities to local industry, production of aircraft and an establishment of a Gripen sustainment and development centre in Finland.

In April 2018, the Finnish Defence Forces sent a Request for Quotation (RFQ) to the governments of France, Great Britain, Sweden and the United States, to be forwarded to five manufacturers of multi-role fighters in these countries. The aircraft types in question are the Boeing F/A-18 Super Hornet (United States), Dassault Rafale (France), Eurofighter Typhoon (Great Britain), Lockheed Martin F-35 (United States) and Saab Gripen (Sweden).

The deadline for submitting replies was set at the end of January 2019. The Defence Forces' Logistics Command received a preliminary RFQ for all five aircraft types.

The Finnish procurement decision is anticipated in 2021.

GRIPEN E TO SWITZERLAND?

Saab has submitted its proposal for the Swiss New Fighter Aircraft procurement to Armasuisse, the Swiss defence procurement agency. Saab offers Gripen E and a comprehensive industrial participation programme for Swiss industry corresponding to 100 percent of the contract value.

The Swiss Air2030 program is set up to replace the Swiss Air Force ageing fleet of Boeing F/A-18C Hornets and Northrop F-5 Tigers. The program value of approximately 8 billion Swiss francs includes aircraft and ground-based air defence.

Besides Gripen E, the contenders to the Swiss fighter contract are Eurofighter, Boeing's F/A-18 Super Hornet, Dassault's Rafale and Lockheed-Martin F-35A.

Switzerland wants new planes to be delivered by 2025. Armasuisse has asked the manufacturers to submit pricing for 30 or 40 planes, including logistics and guided missiles, among other criteria for the bids.

Switzerland, which last fought a short war in 1847, has struggled to convince its citizens to support a deal for new planes.

Back in 2014, around 52 percent voted against a 3.5 billion franc government proposal to buy 22 Gripen fighter jets from Saab. A renewed vote on the new program is also expected.

The Swiss F-5E Tiger fighters entered service in 1978. *Photo: Peng Chen/Wiki*

NORWAY BUYS 12.7 MM MACHINE GUN FROM THE USA

M2A2 with optional M3 tripod with Pintel and Traversing Elevation Mechanism. *Photo: U.S. Ordnance*

Norway has entered into a frame agreement to procure up to 1300 units of 12.7 mm heavy machine guns from the American company U.S. Ordnance. The agreement will run for seven years, with a further 15 years of post-deliveries of spare parts and accessories.

At the same time as the frame agreement was signed, a firm order was placed for deliveries to a value of 150 million NOK, or 15 MEUR. The manufacturer is accordingly able to start production of the weapons right away.

The new weapon is designated M2A2N, and is a replacement for the current 12.7 mm unit that was provided to Norway by the USA after the second World War.

– Entering into this frame agreement at this time gives us a high degree of flexibility, and with the short delivery times from U.S. Ordnance we are able to place orders and have the materiel delivered within just a few months, says Brigadier and Chief of Defence Materiel Land Capabilities, Morten Eggen.

In addition to performance, operational reliability and price, the ability to deliver quickly was an important factor in the choosing of U.S. Ordnance as supplier.

Deliveries of the M2A2N will begin in 2019 and concluded in 2020. The job of procuring the supporting systems will start right away, so the Defence will get a holistic and modern solution. Defence Materiel will among other things procure a new overcarriage (soft mount), a recoil enhancer kit, and make adaptations to fit the new weapon to the weapons stations currently used by the Defence.

The Defence has for several years been struggling with the current 12.7 mm machine gun. The new weapons will improve performance all round, with a much more reliable weapon, with a more stable firing rate, barrels with longer service life, and a much improved flame suppressor.

U.S. Ordnance has established itself as a major supplier of machine guns. The United Stated Defence entered into a frame agreement in 2018 for deliveries of the 12.7 mm gun to the US Army.

M2A2

The U.S. Ordnance M2A2 machine gun is an air-cooled, belt-fed machine gun that fires from a closed bolt and operates on the short recoil principle with fixed headspace and timing. It is capable of both sustained automatic and accurate single-shot fire. It can be mounted on a vehicle, boat, helicopter or other aircraft. Ammunition may be fed from either the left or right side of the gun, making it suitable for use by both infantry and in armoured vehicles.

The M2A2 weapon system has been tested to well over 50,000 rounds. Its single-breech lock system allows for field rebuild, eliminating the need for depot-level maintenance during its lifetime and thereby greatly reducing logistical support.

Only one person is needed to change the M2A2 barrel, thereby reducing exposure to enemy fire and quickly readying the weapon for continued operation.

SPECIFICATONS

- **Calibre:** 12.7x99 mm NATO (.50 Cal.)
- **Maximum Effective Range:** 1829 meters (2000 yds)
- **Maximum Range:** 6767 meters (7400 yds)
- **Muzzle Velocity:** 929.64 m/s (3,050 fps)
- **Rate of Fire (cyclic):** 450-635 rpm
- **Weight of Gun:** 38.10 kg (84 lbs)
- **Weight of Barrel:** 11.79 kg (26 lbs)
- **Length of Gun:** 165.43 cm (65.13 in)
- **Length of Barrel:** 114.30 cm (45 in)
- **Operational Temp:** -54C (-62.5F) to +63C (145.5F)
- **Number of users:** 8

Art impression of the 30 mm x 173 APFSDS-T Mod 1 "Swimmer". Photo: Nammo

THE BULLET THAT SWIMS THROUGH WATER

While traditional ammunition is either stopped or deflected when it hits water, Nammo's 30 mm Swimmer (APFSDS-T MK 258 Mod 1) swims straight through water, thanks to a ground-breaking design on the supercavitating projectile developed in cooperation with the US Navy.

25 years ago, Norway became one of the first European countries to acquire an infantry fighting vehicle with a 30 mm x 173 gun, the CV9030N. At the same time, Raufoss Technology AS, now a part of Nammo, negotiated a contract with the Norwegian Army to develop a new generation of 30 mm ammunition. Today, with 30 mm guns becoming more prominent than ever, the experience gained through this early work has allowed Nammo, through its Strategic Alliance Agreement (SAA) with General Dynamics Ordnance and Tactical Systems (GD-OTS), to become one of the main providers of 30 mm ammunition for the US Armed Forces. Following the recent signature of agreements with the US Army and the US Navy, both services are now adopting Nammo's 30 mm APFSDS-T MK 258 Mod 1, or "Swimmer", for use from a multitude of platforms, including the US Army's latest addition, the Stryker variant known as "Dragoon".

Ammunition used by vehicles generally falls into three categories – armor piercing (APFSDS), for use against other vehicles; High Explosive Incendiary (HEI), for use against lighter targets and aircraft and target practice (TP) rounds, that allow cost-effective training.

Nammo today offers ten different types of 30 mm x 173 ammunition across all three categories.

The Swimmer round falls into the category of sub-caliber kinetic energy penetrators. These can most easily be described as arrows made out of very heavy materials that use the force of the impact rather than explosives to punch through armor. Traveling at speeds of more than 1 km per second, the energy generated by the impact melts the armor of the vehicle into a fluid and the arrow "swims" through the armored side of the vehicle. In the case of the Swimmer, the force of the arrow is sufficient to defeat anything except main battle tanks.

What makes the Swimmer unique, however, is the combination of powerful armor penetration and its ability to swim straight through water. This effect has until now been considered impossible to achieve by ammunition fired from air through water.

Traditional ammunition is either stopped or deflected when it hits water. In a worst case scenario, a projectile could hit the surface, bounce off and hit something else. The Swimmer avoids the ricochet in water problem through the use of a supercavitation nose design. This means that the projectile creates a bubble of steam around itself big enough to pass through, substantially reducing the friction that stops traditional ammunition. This enables the Swimmer to be used in defense of either ships or coastal areas against submerged and surface mines, small underwater vehicles, torpedoes and even small fast attack crafts that might be concealed by waves. This is valuable not only for naval vessels, but also for land vehicles defending harbors, bridges or other key locations.

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