

# **militær***Teknikk*<sup>®</sup>

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NORWEGIAN DEFENCE AND  
SECURITY INDUSTRIES ASSOCIATION



**FSi**

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## TRIDENT JUNCTURE: IMPORTANT SIGNALS

The giant NATO exercise “Trident Juncture” currently taking place in Norway and in the adjoining coastal areas, sends a number of important signals.

First and foremost, the exercise is a strong confirmation that the NATO nations are willing to commit significant resources to exercising together. All in all, 30 nations will be taking part in the exercise, including the non-member countries Sweden and Finland. This means that practically all of the 29 NATO member countries are taking part in the exercise, sending a forceful signal that the NATO alliance is standing fast and strong. This signal is further amplified by the location of the exercise, way remote in the North, far from the core interest areas of most of the member nations. And yet, the countries are choosing to spend their resources on participation in exercises under the NATO banner. For many of the NATO member nations, these resources must also come from already very tight defence budgets.

From various quarters, the question has been raised as to whether the USA is supporting the NATO co-operation in the same manner as before. The sometimes less than diplomatic language from President Trump over recent years has given cause for some considerable concern in this matter among the European NATO countries. However, the Trident Juncture exercise clearly indicates that the USA remains firmly committed to the NATO alliance. The Americans are sending a huge contingent to take part in the exercise together with their European allies, and nothing says this more strongly than the US Navy sending its massive aircraft carrier, USS Harry S Truman into the fray. This is one of the biggest aircraft carriers in the US Navy, and vessels of this calibre have not taken part in NATO exercises in Norway since the Cold War.

For Norway, the exercise is ample confirmation that the NATO countries, and not least the USA herself, are recognising the importance of the Northern regions. The Northern regions have always been the cornerstone for the configuration and building of Norway’s national defence. The Trident Juncture exercise says clearly that NATO will come to our aid in these areas, in the event that a conflict should arise. And what is more, the exercise offers our allies valuable practice in carrying out operations under Norwegian conditions.

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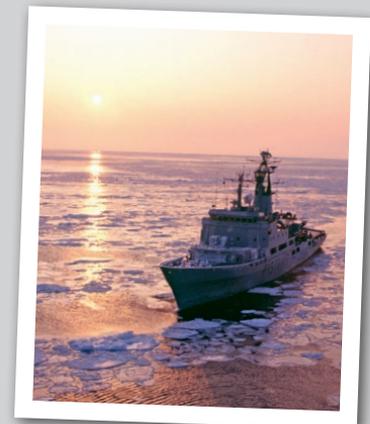
### Coverphoto:

#### Sunset for coast guard vessels.

The almost 40 years old Norwegian Coast guard vessels of the Nordkapp class are being replaced. The contract for the new vessels was awarded this summer.

In the photo, KV Andenes is sailing through ice floes in Arctic waters.

Photo: FMS





The coast guard ships will be 136 meters in length, with a beam of 22 meters. The hulls will be built in Romania, while the vessels then will be completed and equipped at the Vard Langsten facility in Tomrefjorden south of Molde, some 200 km south-west of Trondheim

# THREE NEW COAST GUARD VESSELS

On the 25th of June, the Vard Langsten shipyard was awarded the contract for the building of three new helicopter-carrying Coast Guard vessels with polar ice reinforced properties. The new ships will be replacing the current Nordkapp class, which was built in the early 1980's.

The contract value with the shipyard amounts to some 5.2 billion NOK, or 500 million euro, while the total cost expectation for the project is around 6.8 billion NOK, or 650 million euro. The total cost will in addition to the shipyard cost be covering other procurements, the operating cost for the project, and allocations for uncertainty and risk.

The delivery of the new vessels has been pushed ahead a bit, so that the Defence is now planning to take over the vessels during the period of 2022 to 2024.

## The new Coast Guard vessels

The Norwegian Government decided early on that the new coast guard vessels should be built at a Norwegian yard. At the outset, six shipyard groups were pre-qualified for the assignment, but when the deadline for bidding ran out on March 15th in 2017, only three had chosen to submit their offers. These three were:

- Weston Group AS, Ølensvåg
- Kleven Verft AS, Ulsteinvik
- Vard Group AS - Langsten, Tomrefjord

Among these three, Varg Langsten was selected.

In the competitive basis that was submitted to the pre-qualified yards for the delivery of the coast guard vessels, there was also included a reference concept drawn up by Defence Materiel Maritime Capabilities, in collaboration with LMG Marin AS.

Vard chose to base its offer on the reference concept and has made only a few modifications to the concept – with a view to optimising the performance in order to ensure that the requirements of the specification would be met.

## Requirements to the new Coast Guard vessels

The Defence has drawn up a comprehensive list of requirements to the new Coast Guard vessels. The vessels will be reinforced against ice, particularly with a view to operations in the northern Arctic areas. The vessels must nevertheless be

## FACTS

Vard Group AS, formerly STX Europe, is a shipbuilding concern with head office located in Ålesund. The Italian yard group Fincantieri is a majority owner in the concern. Vard owns five shipyards in Norway, two in Brazil, two in Romania and one in Vietnam.

The Vard Group is a major player in the field of building specialised vessels. They have previously built, for example, the KV Svalbard and the new 'spy ship' for the intelligence services, Marjata.

## FACTS

### THE NEW COAST GUARD VESSELS ARE BEING BUILT TO ICE CLASS PC 6 (POLAR CLASS 6).

**Polar Class (PC)** refers to the ice class assigned to a ship by the International Association of Classification Societies (IACS). Seven Polar Classes are defined in the rules, ranging from PC 1 for year-round operation in all polar waters, to PC 7 for summer and autumn operation in thin first-year ice. PC 6 is described as "Summer/autumn operation in medium first-year ice which may include old ice inclusions".



*The new vessels are being built to the strictest DNV GL requirements for environment protection and emissions control, including all future emissions requirements that are in planning for future introduction. The Norwegian Coast Guard is the primary state authority exerciser at sea, managing the maritime safety and security together with other agencies with responsibilities in the maritime domain. The Coast Guard currently operates a fleet of 13 vessels, four of which are helicopter carriers, operating in the entire Norwegian maritime interest area, including arctic waters. The vessels are daily performing sovereignty assertion, search and rescue, resource management and oil conservation.*

capable of operating all over the globe, in sea temperatures from minus 2 degrees to +32 degrees C, and under air temperatures from -30 to +40 degrees C, with relative humidity ranging from 20 % all the way up to 100 percent.

Strict requirements are also posed in the area of seaworthiness and seagoing properties. All operations must be doable in sea grades up to and including 5, corresponding to a mean wave height of 2.5 to 4 meters. Regarding sailing speed, the Defence has set the minimum requirement for full speed to 22 knots, which is to say that the vessels must be capable of at least 22 knots or more. The optimised sailing speed for cost-effective cruising will be approximately 14 knots.

In comparison, the Nordkapp class will do a maximum speed of about 21 knots.

The new Coast Guard vessels should be able to operate for up to 8 weeks under a normal operations profile, carrying a crew of 55 persons, including helicopter crews and pilots. The total accommodations capacity on board will be about 100 persons, however.

The number of personnel on board is about the same as for the Nordkapp class.

Carried on board will also be two fast man-over-board craft, and there is an

additional requirement to host two further boats for special operations.

The vessels must have towing capabilities and must be able to stow containers on deck.

### Helicopter capacity

The on-board helicopter, an NH 90, must be able to carry out night-time as well as daytime operations, and must be able to take off and land in sea grades up to 5, with wave heights of up to 4 meters. On board there will naturally also be a hangar for the NH 90 helicopter, including the necessary service and maintenance facilities.

The helicopter deck will have the strength and space to land a helicopter up to the size of an AW 101. The AW 101 is the helicopter that has been chosen as the new Search and Rescue (SAR) helicopter for Norway. There is not, however, a requirement that the AW101 must be able to take off and land in sea grade 5, but if the AW101 is equipped accordingly, there will be the possibilities to conduct hoisting operations and refuelling.

### Hospital and oil spill containment

On board the new Coast Guard vessels, there will also be hospital facilities, corresponding to that which in the NATO terminology is called Role 1. Role 1

medical support is that which is integral in or allocated to a small unit, and will include the capabilities for providing first aid, immediate lifesaving measures, and triage.

Furthermore, the vessels will be equipped to handle oil spill containment, with both protective gear (supplied by the Coast Authority) and storage capacity for retrieved oil.

### Military capacities

While the current Nordkapp class carries a 57 mm cannon on the foredeck as its main armament, the new vessels are planned to be armed with a 40 mm L-70 cannon. Work is ongoing to study the feasibility of overhaul and re-use of a 40 mm cannon already in stock with the Defence. In addition, the coast guard ships will have lighter armaments in the form of machine guns.

The new Coast Guard vessels will be equipped with a military tactical management system (TMS), including helicopter control capacity, as well as military communications systems.

Above and beyond all this, the new vessels will be equipped with various sensors and ICT systems, and will carry comprehensive CBRN protection (Chemical, biological, radiological and nuclear). ■■

# US ARMY TESTS NAVAL STRIKE MISSILE

On July 12 this year, the U.S. Army successfully launched the Naval Strike Missile (NSM) and struck the *USS Racine* (LST-1191) *Newport-class* tank landing ship target during a live fire exercise. The test was executed as a part of the month-long Rim of the Pacific (RIMPAC) 2018 multi-national exercise.

The Army fired a Naval Strike Missile from a Palletized Load System truck, hitting a decommissioned ship at sea, 63 miles north of Kauai. The demonstration aligns with the Army's strategy to enhance operations across land, air, maritime, space, and cyberspace domains.

Discussions of multi-domain battle began in 2015 after US Department of Defense were interested in advancing operations across multiple domains to exploit opportunities on a rapidly changing battlefield. By employing land-based

anti-ship missiles, the Army could potentially target enemy ships and restrict movement in the maritime domain.

In 2015, AMRDEC (The U.S. Army Research, Development and Engineering Command Aviation & Missile Center) began to investigate and identify options that could be pursued to provide such a capability in the near-term; one of the options identified was the Naval Strike Missile.

In 2016, the AMRDEC selected the NSM for future testing and initiated a FCT (Foreign Comparative Testing) effort. Within the FCT program the US Army test

and evaluate items and technologies from allies and other friendly nations that may fill an Army capability gap.

The FCT program supports international cooperation and helps reduce the US Armed Forces overall acquisition costs by providing funds to formally test and evaluate foreign non-developmental items, commercial-off-the-shelf items, or technologies which are in the late state of development that may satisfy U.S. military requirements. ■■

## FACTS

RIMPAC, Rim of the Pacific, is the world's largest international maritime exercise providing a unique training opportunity that helps participants foster and sustain cooperative relationships that are critical to ensuring safety at sea and security on the world's oceans. RIMPAC 2018 is the 26th exercise in the series that began in 1971.



US Army fired a NSM missile from a M1975 PLS truck. The NSM (Naval Strike Missile) is an anti-ship and land-attack missile developed by the Norwegian company Kongsberg Defence & Aerospace (KDA) in partnership with U.S.-based Raytheon Missile Systems. NSM has an operational range of 185 km (115 mi; 100 nmi) plus. The length of NSM is 3.95 m (13.0 ft) and the weight is 410kg (900 lb), with a 125 kg (276 lb) HE blast-fragmentation warhead. Current operators are the Norwegian Navy and the Polish Coastal missile division (truck launched missiles). NSM has also been chosen by the US Navy, the Malaysian Navy and the German Navy.  
Photo: David Hogan, AMRDEC WDI



Naval Group - Photo credit: @Naval Group - Design: ScanK

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# SUCCESSFUL TEST OF THE JSM

The development of the Joint Strike Missile (JSM) is now completed. In March a missile with seeker and warhead was tested against a land target.

The JSM has proven advanced properties and has passed all the qualifying tests.

An important milestone has now been achieved, with the Joint Strike Missile passing the last of its planned tests in the missile qualification programme. The development phase of the JSM is now in its final stage and is scheduled for completion in autumn 2018.

-This is very good news for the Norwegian Armed Forces and Norwegian industry. What is now remaining is the integration of the JSM on the F-35 in what is known as the Block-4 update, says

Program Director Morten Klever of the Ministry of Defence.

## Technical integration of the JSM in F-35 combat aircraft

The integration of JSM in the aircraft is vital for Norway to be fully operational with the F-35 in 2025. The JSM will ensure that the Norwegian F-35 has a real combat capability towards any type of well-defended land- and naval targets.

As a part of the development of the missile, a Legacy Flight Test Programme was carried out, during which a number of missiles were dropped in order to qualify the missile in preparation for integration with the F-35.

Missiles have been released from an US Air Force F-16 aircraft at the Utah Test & Training Range as part of a test programme running between 2015 and 2018.

The most recent tests were completed in March of this year, with the seeker and the warhead implemented. The test was conducted on a land-based target, with a successful result.

Once development is complete, the Norwegian Armed Forces will acquire a number of test missiles to be used for integration with the F-35 in what is known as the Block-4 update. The integration of the JSM will be managed by the Joint Program Office (JPO) in cooperation with the main supplier, Lockheed Martin.

Several of the nations that will be procuring F-35s have similar operational needs to Norway, and have shown considerable interest in the JSM. ■■

*The effect on a rather small target like a truck is completely devastating.*

*Photo: Kongsberg Group*



*The missile was launched from an F-16 fighter approximately 200 km away from the target area. The missile navigated along a pre-programmed track towards the position of the target. In this test, the real target, the truck, was mowed 100 meters away from the pre-programmed position of the target and a decoy target (the container) was placed in the original target position. This to test if the missile was capable of identifying the real target in-flight, and adjusting its point of impact. And as seen in the photo, the JSM is not easily fooled.*

*Photo: Kongsberg Group*

# TRIDENT JUNCTURE 18



More than 50,000 soldiers from more than 30 nations are participating in exercise Trident Juncture 18. The exercise will take place in central and eastern Norway and the surrounding areas of the North Atlantic and the Baltic Sea, including Iceland and the airspace of Finland and Sweden.

**T** Trident Juncture is one of the largest military exercises ever held in Norway since the cold war. During some hectic weeks this October and November, around 50,000 participants, 150 aircraft and about 60 naval vessels and up to 10,000 vehicles from all over NATO and its partners will be coming to Norway. The exercise will test the whole military chain – from troop training at the tactical level, to command over large forces. It will train the troops of the NATO Response Force and forces from other allies and partners, ensuring they can work seamlessly together.

Large exercises like Trident Juncture 18 are necessary for our ability to deploy and receive troops, and undertake large-scale military operations under challenging conditions. Exercises like this make NATO better prepared to counter any aggression, if necessary.



The cold and wet weather will pose additional challenges for NATO troops, and will train them to operate in extreme conditions.  
Photo: FMS

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The aircraft carrier USS Harry S Truman will be participating in Trident Juncture 18.

Photo: U.S. Navy/ Kristina Young

The live training will be conducted from 25 October to 7 November 2018. A command post exercise (CPX) will be held 14–23 November 2018.

Norway offered to host Trident Juncture 18, and NATO accepted the offer more than four years ago. Norway has a long tradition of hosting major allied and multinational military exercises.

This exercise has air, sea and land elements, and Norway offers the possibility to train realistically in all of these domains. Admiral James G. Foggo III, Commander of NATO Joint Force Command Naples, is responsible for conducting the exercise. ■■

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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

## FORSVARSEVNE, INNOVASJON, RINGVIRKNINGER – EKSPORT AV FORSVARSMATERIELL SKAPER STORE VERDIER

Løpet av de nærmeste månedene skal Stortinget behandle den årlige meldingen om eksport av forsvarsmateriell fra Norge. Statistikken viser at eksporten fra Norge økte med over 30% fra 2016 til 2017. Det er bra for forsvarsevnen, for nasjonal verdiskapning og for teknologisk og industriell utvikling, og det skaper interessante høyteknologiske arbeidsplasser i alle deler av landet. Uten eksport er det ingen forsvarsindustri i Norge. Derfor er det helt avgjørende at behandlingen av meldingen sikrer at Utenriksdepartementets forutsigbare praktisering av eksportregelverket, blir videreført.

Norges, samfunnets og innbyggernes sikkerhet forutsetter at Forsvaret med troverdighet kan hevde suverenitet, avskrekke og gjennomføre effektive militære operasjoner. Derfor må Forsvaret ha materiell og systemer som fungerer under norske forhold. Det handler om løsninger som kan realiseres med begrensende ressurser, og som sikrer at oppdragene kan løses også når klimaet og topografien viser seg fra sin mest krevende side. Det er ikke en selvfølge at forsvarsmateriell som utvikles av andre nasjoner med utgangspunkt i deres egne krav, uten videre kan møte Forsvarets behov. Norsk forsvarsindustri rolle er derfor å utvikle og levere løsninger som møter Forsvarets behov, når det ikke uten videre kan anskaffes i markedet, og å forbedre, oppdatere og tilpasse materiell som allerede er i bruk.

Det norske markedet er imidlertid for lite til å kunne opprettholde

nasjonal industri som er kritisk for forsvarsevnen. Det er også for lang tid (20 - 40 år) mellom hver gang Forsvaret anskaffer et større system, til at det er mulig å opprettholde en nasjonal industri som understøtter Forsvaret, hvis ikke industrien kan videreutvikle seg gjennom utvikling og leveranser av materiell og systemer til kunder utenfor Norge.

Derfor er eksport av forsvarsmateriell helt nødvendig for forsvarsevnen. I tillegg er det slik at leveranser til utenlandske kunder ofte innebærer videreutvikling og oppgradering av materiell utviklet for Forsvaret. Det kommer Forsvaret til gode når tiden er inne til å oppgradere og levetidsforlenge materiell og systemer. Eksport bidrar dermed også til å redusere levetidskostnadene for Forsvaret og til at systemene forblir relevante vesentlig lengre enn dersom Forsvaret hadde vært eneste bruker.

Forsvarsindustrien er store og små bedrifter i lokalsamfunn i alle deler av landet. Om lag 5000 arbeidstagere er direkte sysselsatt i utvikling og produksjon av forsvarsmateriell. Dette er attraktive arbeidsplasser i noen av Norges mest avanserte utviklings og produksjonsbedrifter. Innovasjon, høyteknologi, kvalitet og industriell utvikling er kritiske suksessfaktorer. Det gir betydelig «spinoff» i form av gjenbruk av teknologi og prosesser i industriell virksomhet for sivile formål. Forsvarsindustrien er en lønnsom og fremtidsrettet innovasjonsdrevet industri med et betydelig potensial for videre vekst.

Eksport av forsvarsmateriell forutsetter tillit hos den utenlandske kunden. Kontrakter om leveranser av forsvarsmateriell omfatter svært langvarige forpliktelser, ofte 20-30 år. Valg av leverandør innebærer derfor, for enhver nasjon, at det etableres et langsiktig avhengighetsforhold til som nasjonens forsvarsevne avhenger av. Det gjelder også de nasjonene norsk forsvarsindustri leverer til.

Derfor er det helt avgjørende at rammebetingelsene for eksport er stabile og forutsigbare. Ensidige norske tiltak, som innebærer vesentlige endringer i praktiseringen av eksportkontrollregimet vil få svært negative konsekvenser for norsk forsvarsindustri og de utenlandske kundene. For kundene vil det kunne svekke forsvarsevnen og få store økonomiske konsekvenser som følge av å skulle måtte erstatte materiell fra Norge, lenge før levetiden er nådd, med andre løsninger. Mange nasjoner anser også handel med forsvarsmateriell som en strategisk relasjon som er med å definere de mellomstatlige relasjonene til Norge.

Vesentlige endringer i praktiseringen av eksportkontrollregimet vil ødelegge tilliten til Norge i det internasjonale forsvarsmarkedet. Det vil ikke kunne begrenses til den nasjonen som eventuelt blir direkte berørt, men skape generell usikkerhet om hvorvidt Norge og norsk forsvarsindustri er til å stole på og om industrien er i stand til å vedstå seg sine forpliktelser som leverandør av kritiske forsvarssystemer som skal fungere i mange ti-år. Norsk forsvarsindustri vil også bli

vesentlig mindre attraktiv som partner i internasjonale samarbeidsprosjekter der Norge deltar for å dele kostnader med andre nasjoner.

Skulle rammebetingelsene bli vesentlig endret vil det innebære omfattende kapasitetstilpasninger, nedbemanning, redusert lønnsomhet og, aller viktigst, forsvarsevnen vil bli svekket som følge av at muligheten til å dele kostnader om vedlikehold, oppgradering og videreutvikling av Forsvarets systemer med andre nasjoner blir redusert. I tillegg vil en nedbygging av forsvarsindustrien i Norge innebære at Norge gjør seg helt avhengig av de store internasjonale aktørene også på områder der det er bred enighet om at det av nasjonale sikkerhetsinteresser er behov for en nasjonal industri. Forsvarets behov vil imidlertid ikke bli endret som følge av dette og det vil derfor også ha som konsekvens at Norge må finansiere utvikling av teknologi og materiell hos utenlandske leverandører, uten at dette bidrar til nasjonal teknologisk eller industriell utvikling. Det som eventuelt utvikles for norske skattebetaleres penger vil da også være underlagt eksportkontrollregimet i nasjonen utvikling og/eller produksjon finner sted og ikke det norske eksportkontrollregimet.

Å videreføre en forutsigbar og stabil praktisering av eksportkontrollregimet, slik Utenriksdepartementet ivaretar dette på i dag, er derfor i Statens, Forsvarets og industriens interesse og det bidrar til å sikre vekst og arbeidsplasser i høyteknologiske virksomheter i alle deler av landet.



P.O. Box 5250 Majorstuen,  
NO- 0303 Oslo. NORWAY

Tel: + 47 23 08 80 00  
Telefax: + 47 23 08 80 18

E-mail: fsi@nho.no  
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# SUPPLIER SEMINAR AND EXHIBITION AKERSHUS 2018

This year's Supplier seminar and exhibition was held at the Akershus fortress in Oslo on the 29th and 30th of August, and marked the eleventh such event in the series. Over the course of these years, the numbers of both exhibitors and visitors have increased considerably.

The supplier seminar and exhibition is the most important meeting place in

Norway for Norwegian defence suppliers, in particular for the smaller defence contractors, but also a significant venue for foreign suppliers looking for Norwegian collaborating partners.

The exhibition was opened by political advisor to the Ministry of Defence, Ms Marte Ziolkowski. In her opening statement, she emphasised the importance

for Norway of having its own defence industry, and that the Government is concerned that Norwegian industry should be able to compete on level terms with foreign rivals.

– The Government has accordingly no plans to modify Norwegian rules for exports of military materiel, said Ziolkowski in conclusion. ■



Deputy Chairman of the FSI Board, Gudmund Kjærheim, and political advisor to the Ministry of Defence, Ms Marte Ziolkowski, opened the FSI fair together. Photo: MilitærTeknikk



Comrod AS has for many years been supplying antennas for military and civilian applications all over the world. Karen Bergitte V. Malmberg (left) and Yngve Hæreid from Comrod.



Preben Suphammer (left) and Einar Østli from Jak. J Alverberg AS in Norway. Jak J. Alverberg is a provider of high-quality paint systems, and a regular supplier to both the Army, the Navy and the Air Force. The company was established in 1917, and celebrated its hundredth anniversary last year.



FossTech AS is a developer and manufacturer of products for extreme environments, with extensive experience from many deliveries to the Armed Forces. Based on their experiences from extreme environments, the company recently won a contract with the road authority Vegvesenet to supply 250 connection boxes for the road lights along the E6 highway. The connection boxes will be located in culverts alongside the road, where they will be exposed to water, road salt, sand, dust, frost and heat. Geir Hennesen from FossTech AS is holding up a connection box like the one developed by his company for Vegvesenet.



Based in Trondheim, Maritime Robotics is a provider of unmanned solutions, both on the surface and in the air. Einar Storli (left) and Eirik Evjen Hovstein from Maritime Robotics presented technology for UAV's that the company has developed.



Thomas Binnie (left) and Verner Fuchs from Tinex as. TINEX, founded in 1991, is a local Norwegian full-service technology company that represents international companies within the areas of Defence & Security, Public Transport and Communications.



Anders Svanlund from H. Henriksen AS. Under the brand name of REBS, the Tønsberg-based company Henriksen AS has over many years developed and delivered items like hooks and ladders used for example in the boarding of a ship up and over its side. The customer base includes various Special Forces.



Transportation of highly contagious patients. EpiShuttle is a modular, single patient isolation system, developed by EpiGuard, a Norwegian innovation company established in 2015. The EpiShuttle can be operated in both a negative pressure mode and a positive pressure mode. – Negative pressure inside the isolator prevents contaminated air from leaking out, and positive pressure prevents contaminated outside air from leaking into the isolator, explains Henrik Aase from EpiGuard.

# FAR AND DFARS; RULES FOR CONTRACTS WITH US AUTHORITIES

The United States of America is currently the overwhelmingly biggest market for Norwegian defence industry, and significantly bigger than the home market. And the sales of Norwegian defence materiel to the US Defence is increasing.

For anyone with a desire to enter the American defence market, being well versed in both the FAR (Federal Acquisition Regulation) and DFARS (Defense Federal Acquisition Regulation Supplement) is of crucial importance. Perhaps this was a reason for the massive interest in this year's FAR/DFARS seminar in Oslo, attracting more than 150 delegates.

Steve Knight, a partner in the Washington DC based law firm of Smith Pachter McWhorter emphasised the significance of understanding the different roles in a contract

with American authorities. And in particular, understanding the role of the Contracting Officer.

– The contracting officer has a major role in a government contract. The contracting officer is the one who signs on for instance changes and other claims within the contract. We have had examples of engineers from the contractor working together with engineers from the US government agency, coming up with changes and improvements in the project, Knight explains. – The changes led to extra costs for the contractor, but the governmental customer turned down the contractor's

claims. There was no signature of the contracting officer confirming the changes, and the contractor did therefore not get paid for the extra work, suffering a severe loss.

In the workshop part of the seminar, Dave Kaplan and Mark LoManto reviewed the more practical sides of submitting a bid to American government agencies. Kaplan and LoManto both work for MLWeekes & Company PC, a firm specializing in government accounting matters. Among other issues, Kaplan and LoManto gave an overview of the requirements applicable to an "adequate" offer, and where these requirements can be found. The pair went on to describe how the businesses must present their costing data in connection with negotiable contracts, and how these costs should be split up into diverse single elements.

Norwegian businesses were also there to share their experiences from sales to the US Defence. Anne Haugen-Flermoe, senior vice president for Legal Affairs at Nammo, presented a scenario where you are looking to enter into a subcontract in support of a prime, and your contract is for a non-commercial product.

– First of all, read your RFQ documents and contract documents thoroughly, and identify your risks, Haugen-Flermoe emphasised, and listed up a number of risks that the contractor has to consider.

– And contracting under FAR/DFARS adds an additional layer of risk, even for a subcontractor, as for instance FAR/DFARS regulations in the prime contract flow down to the subcontractor, Haugen-Flermoe said in conclusion. ■■



Steve Knight, partner in the Washington DC based law firm Smith Pachter McWhorter has worked with the FAR/DFARS regulations for many years. Photo: MilitærTeknikk



Dave Kaplan and Mark LoManto from MLWeekes & Company PC. In the middle, Anne Haugen-Flermoe from Nammo. Photo: MilitærTeknikk

## DKF WORKING MEETING IN OSLO

On the 25th of September, DKF e.V., a European association focusing on offset and reciprocal trade practices, in cooperation with FSi hosted a working meeting for Norwegian and European defence industries. In the context of industrial cooperation programs the participants did not only get acquainted with the different aspects of the joint German-Norwegian purchase of submarines, but also learned to explore other possible fields of cooperation.

**T**hor-Vidar Indreeide from the Norwegian Ministry of Defence gave a presentation of German-Norwegian armaments cooperation.

The main cooperation program is of course the new identical submarines for the German and Norwegian navies. This program has already led to other areas of cooperation. So far, purchasing and further development of the Kongsberg Naval Strike missile (NSM) has been one key area of cooperation.

-We are looking into developing the next generation of the NSM with longer range and upgraded sensors. This missile will be onboard three German navy ship classes, in addition to be-

ing the main weapon onboard the Norwegian Fridjof Nansen frigates, Indreeide stated initially.

For the time being, both the Norwegian and the German governments are actively pursuing additional areas of cooperation.

-One possibility that has been identified is naval mine warfare. We are looking into establishing a sort of common German-Norwegian naval mine warfare toolbox, where both nations together can develop tools and feature units for naval mine warfare.

We are also finding promising opportunities for cooperation within the land domain, Indreeide continued, and mentioned main battle tanks and

support vehicles like bridge layers, engineering vehicles and logistic vehicles. Further on we are looking into cooperation regarding ground based air defence/ short range air defence.

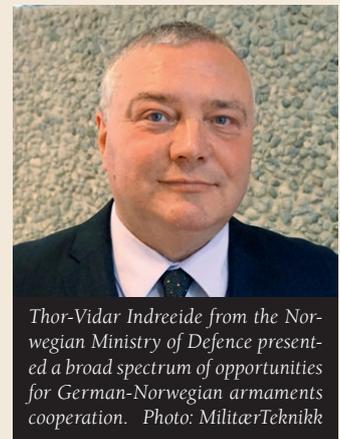
In addition within the land domain, tactical information infrastructure is an area where Germany and Norway may find cooperation opportunities. In this area, the Netherlands have expressed interest in participating, opening for a three-nation cooperation.

-In all the areas we have been looking into, Norwegian Industry has a strong position and the competence to participate in a Norwegian-German cooperation, Indreeide said in conclusion. ■■

### FACTS

DKF is an association providing an international platform to share knowledge and best practice in the fields of industrial participation & cooperation. DKF itself does not represent industry, nor has it any mandate to express a position versus any European or national policy – this is up to its members itself.

DKF has grown into a European organization with many important defence companies discussing a broader range of subjects related to competitiveness of supply chains involving European subcontractors, such as digitalization.



Thor-Vidar Indreeide from the Norwegian Ministry of Defence presented a broad spectrum of opportunities for German-Norwegian armaments cooperation. Photo: MilitærTeknikk



The DKF hosted the meeting. From left; Kenan Kurtovic (General Dynamics), Silvia Bergmann (Airbus) Ivan Bannwart (ABB), Marius Müller (Rheinmetall), and Markus Bauer (Thales). Photo: MilitærTeknikk

# THE TRI-AXIAL COOPERATION, VERSION 2.0

The so-called Tri-Axial Cooperation has for many years been one of the cornerstones in the development of Norwegian defence materiel. The co-operation is often pictured as a triangle, where each corner is represented respectively by the Armed Forces, the FFI (the Norwegian Defence Research Establishment), and the industry.

The Tri-Axial Cooperation has been a key figure in the development of notable systems like the Naval Strike Missile (NSM), and the ground-based air defence system NASAMS.

Over recent years, however, it has been pointed out that the especially the innovation process within the Tri-Axial Cooperation is running too slowly. For this reason, the FMA (the Norwegian Defence Material Agency), the FSi (the Norwegian defence and security industries association) together with the FFI have drawn up a proposal for a further development of the triangular model. This proposal was recently presented as the "Tri-Axial Model version 2.0".

Øyvind Sjøvik from the FFI presented how the Tri-Axial Cooperation has been a cornerstone of Norwegian missile development through a period of almost 60 years, emphasising

not least the significant role that the FFI has held and still holds in this development effort. The main criteria for development projects to succeed, is above all that the Armed Forces presents a clear requirement definition, said Sjøvik, adding that long-term financing and competent professional environments should be included among the key criteria for success.

Gudmund Kjærheim from Flir UAS represented the second corner in the triaxial model – the defence industry.

Flir UAS has developed and is manufacturing the micro UAV Black Hornet, which as of today has been delivered to some 30 buyer countries.

– We are about to launch the third generation of the Black Hornet, Kjærheim said in his opening statement, adding that in this field, development runs at a high pace. We are expecting a lot of the technology that we are using in today's Black

Hornet, to be obsolete within 5 to 6 years. When many national armed forces have procurement processes lasting the same 5 to 6 years, this illustrates the need to speed up the procurement process, Kjærheim pointedly stated.

Col. Bjørn Stai presented the Tri-Axial Cooperation as seen from the third corner – the Armed Forces.

Stai has previously worked for many years with ground-based air defence systems, and has been representing the user side in the development of the air defence system NASAMS.

– During the years when I worked with air defence, I would say that the strategic collaboration between the Armed Forces, FFI and the industry, that is to say Kongsberg, has almost permeated the air defence environment in the Air Force. – And all three parties have benefited greatly from this cooperation, Stai concluded: – The Air Force currently has a state-of-the-art air defence system still being further developed; the FFI has nurtured a highly competent and viable research environment, and the Kongsberg Group has leaped from one customer at home to 13 customers spanning the globe.

Torgeir Mørkved from the FFI presented the main elements in the Tri-Axial Model version 2.0, emphasising for openers that the strong aspects of the triaxial model that has been working well, need to be taken care of and sustained.

– But we need to include some supplementary functions, Mørkved explained, pointing particularly to increased exploitation of commercial civilian technology, better utilisation of the potential in small and medium businesses, improved collaboration between industry, research environments and users when it comes to testing and experimenting, plus the development of flexible financing mechanisms capable of adapting to smaller businesses and enterprises.

If we can enhance the triaxial model with these supplementary features, we should be able to realise faster innovation processes, and the Defence establishment can come in fuller contact with and benefit from the rapid development of civilian technology. And we have a huge competitive advantage in Norway, said Mørkved in closing. – Compared to many other nations, we have a high degree of mutual trust and respect between the Armed Forces, the FFI and the industry.



Col. Bjørn Stai from the Armed Forces, Gudmund Kjærheim from Flir UAS, and Øyvind Sjøvik from the FFI presented their experiences with the Tri-Axial Cooperation from the three different "corners".

Photo: MilitærTeknikk



Torgeir Mørkved from the FFI presented the key elements of the Tri-Axial Model version 2.0.

Photo: MilitærTeknikk

## FSi SMB CORPORATE PRESENTATION:

# OBSIMA

## technology



### The company's technology, products/services/competences as of today:

Obsima Technology AS specializes in projecting, delivering and maintaining:

- Shooting equipment (range targets, simulators, accessories, etc.)
- Shooting lanes (bullet traps, ballistic protection, ricochet protection, noise reduction etc.)
- Shoot houses (complete live fire training facilities and shooting ranges)
- Radio accessories
- Meteorology sensors

#### History:

Obsima Technology AS, "Obsima", was established in 1998 by Leif Haugland. The first contract was delivery of simulators, range targets and bullet traps to Norwegian Army training facility. The company was also an innovator in design and delivery for modern bullet traps which improved the indoor air quality for the shooters significantly. In 2004, the military part of Obsima Technology AS was sold to Vinghøg AS (now Rheinmetal Vinghøg AS). In 2006/2007 Vinghøg AS sold Obsima to Leif Haugland through an MBO, and Obsima Technology AS were re-located and re-established with two new owners. Obsima Technology AS has in recent years in addition to selling equipment also focused on being an integrated maintenance and logistics partner for the Norwegian market contracted by the companies that provide simulators, training

houses and target materials. The company has an operating logistics organization of 5 service engineers. In 2018 Obsima has recently opened a new office close to Camp Rena. In addition to the shooting range and simulator marked, Obsima Technology AS also sell radio accessories and meteorology sensors.

#### The company's organisation, employees, owners:

Obsima Technology AS is owned by 4 private shareholders through Obsima Holding AS with Leif Haugland as the largest shareholder (50%). The current number of employees is 11. Obsima Technology AS have offices both in Gjerdrum (main office with 5 employees) and at Rena (6 employees).

#### The company's involvement in the defence market:

Obsima Technology AS is a complete supplier of shooting



and training facilities. A number of partners and manufacturers have signed exclusive agreements with Obsima Technology for sales in Norway and Sweden. Obsima Technology AS has established itself as an important player within its specialized fields of material and operating services for shooting and training facilities with the Defence and Police/Emergency Services as primary customers.

#### The company's standing as a member of the FSi:

Since: 2008

#### Why maintain the membership in FSi?

Access to an arena for contact with customers and potential manufacturing partners.

#### How does the company make use of its membership in the FSi?

An arena for contact with customers and potential manufacturing partners. Participation at important seminars and gatherings where the key stakeholders in the Norwegian Defence organisation and the industry meet and share information.

# NUCLEUS COMPLETES SUCCESSFUL FIRST LAUNCH

On Thursday 27 September Nammo successfully completed the first launch of Nucleus, a sounding rocket powered by its new hybrid rocket motor.

Nucleus was launched from Andøya Space Center in Northern Norway, and reached an altitude of 107.4 km. That made it not only the first rocket powered by a Norwegian motor design to cross the Karman line, the commonly recognized border to space, but also the first European hybrid rocket motor to do so in more than 50 years.

The Hybrid Rocket Motor powering Nucleus has been developed by Nammo at Raufoss in Norway, and could potentially power a whole new generation of smaller European launch vehicles.

-Even though hybrid rockets have been around since the thirties, a number of technical challenges have remained. We are proud that we have been able to solve these, and get the concept to work for the first time, said Adrien Boiron, lead engineer on the Nucleus project.

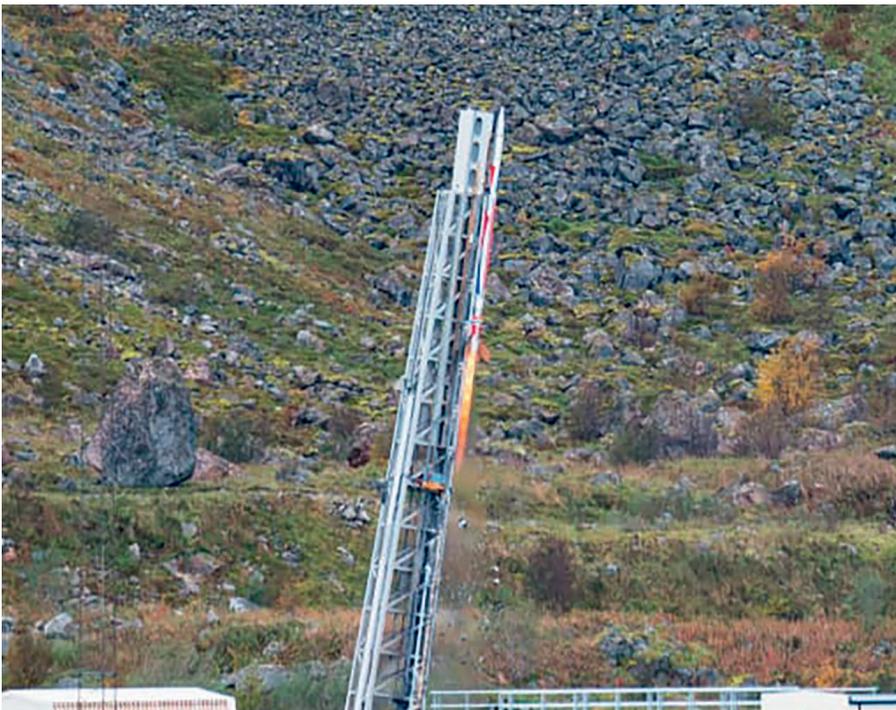
Nucleus is a sounding rocket, designed to lift scientific instruments into the upper layers of the atmosphere. The hybrid rocket motor propelling it, however,

can be scaled up to lift a wide range of payloads, including small satellites into low earth orbit.

Nammo is hoping that the new propulsion technology demonstrated with Nucleus will be able to power future launch vehicles for small satellites.

-Over the next few years there are plans to launch thousands of small satellites. The benefit of our new hybrid rocket motor is they can lift them into orbit with the accuracy of a liquid fueled engine, but without the associated complexity and costs, making it ideal for smaller European launch sites," said Onno Verberne, Nammo's VP of Business Development for space.

Today, only a select few nations – Russia, India, China, USA, France and Japan – have the capacity to build launch vehicles for satellites and send them into space from home bases. If the technology demonstrated in the Nucleus is successful, Norway has the potential to join them. ■■



Nucleus at the moment of launch from Andøya Space Center.

Photo: Nammo



The Nucleus rocket is 9 meters long and has a total weight of around 800 kg. The motor gives a thrust of 30 kN (3 tons). The planned future version of the engine would give 75-100 kN of thrust.

## – BULLETIN BOARD FOR DEFENCE, INDUSTRY AND TRADE –



The first flights with external stores were conducted over the Baltic Sea at the beginning of July. Besides two of the IRIS-T air-to-air missile, the aircraft carried five pylons designed and built together with the Swiss company RUAG Aerostructures. Photo: Saab

### Gripen E in the air with Swiss pylons

Saab's Gripen E programme continues to make progress. The Gripen aircraft with designation 39-8 has conducted a number of successful flights carrying external stores, including pylons from the Swiss company RUAG Aerostructures.

Gripen E's pylons are installations by which additional tanks for fuel, surveillance

systems or guided weapons can be attached under the aircraft. Eight pylons are supplied per aircraft. These technologically sophisticated components include both electronic as well as mechanical systems and must meet the highest demands regarding aerodynamics and load capacity.

### Hands-free combat diver navigation system

Global subsea engineering company James Fisher and Sons (JFD) and the US Navy have unveiled the Shadow NAV advanced combat diver navigation module.

Equipped with a diver's standard half mask, the new navigation system offers a clear visual display of a combat diver's

compass heading, depth and time even in near-zero visibility environments.

With the use of the system, divers might not be required to carry a handheld or tactical swim board, which to date has created serious limitations to potentially dangerous underwater military combat operations.



The mask-mounted head-up display provides combat divers with an unrestricted and continual visibility of accurate information in poor visibility conditions. Photo: JFD

### RAF Typhoons intercept Russian bombers

Typhoon fighter jets deployed with the Royal Air Force (RAF) have successfully intercepted two Russian long-range bomber aircraft that were flying towards UK airspace.

The Russian Tu-160 Black-jack bombers did not communicate with UK air traffic control as they were approaching the

airspace, making them a hazard to all other aviation.

In July, the RAF Eurofighter Typhoons based in Romania operated from the Mihail Kogalniceanu Air Base near Constanta to successfully intercept Russian Su-24 Fencer aircraft that flew near Nato airspace over the Black Sea.



Photo: RAF

### Air combat training system for F-35 jets

Cubic Global Defense has secured a contract for the delivery of its latest-generation air combat training system (ACTS) for the F-35 Lightning II joint strike fighter aircraft.

Contracted by Lockheed Martin, the award will involve the supply of more than 500 units of the F-35 training subsystems by Cubic.

Deliveries are slated to be carried out over the next four years as part of Lockheed Martin's F-35 aircraft production Lot 12 to Lot 14.

The combat training system designed for the F-35 jets comprises the P5 combat training subsystem configuration (IS) and the P5 ground software.

Cubic Global Defense president Dave Buss said: "Fifth-generation aircrew require a

complex training scenario to prepare them for combat operations in a contested environment.

With this next-generation air combat training system, F-35 fighter pilots can receive not only a dedicated training system to accurately capture exercise data but also have the capability to train with fourth-generation aircraft that carry wing-mounted pod version of the P5CTS.

Cubic and its principal sub-contractor Leonardo DRS will continue to manufacture and maintain the embedded P5 solution for the F-35 internal training subsystem.

The Airborne and Intelligence Systems business division of Leonardo DRS is responsible for the design and production of the airborne P5CTS internal subsystem.

## Northrop Grumman unveils Vanguard panel-based radar system

Northrop Grumman has unveiled its Vanguard open architecture radar system for potential use in a wide range of missions and platforms.

The new multi-function system features a modular, panel-based structure, with each radar panel representing a flexible building block that can be customised to meet different mission requirements.

Each radar panel has the capability to function independently as its own radar and can also be connected with the desired number of other radar panels to form one single, larger radar array.

The panels are also field-replaceable, which helps provide lifecycle cost savings and avoids long maintenance delays that prevent operation.



The same Vanguard radar building block can be used by both large and small systems, thereby facilitating quick and cost-effective production and maximum system maturity. Photo: Northrop Grumman

## Robots to 3D print parts for US Navy

The US Navy has awarded a new contract to Lockheed Martin to conduct studies and customise multi-axis robots that use laser beams to deposit material and produce metal components.

In collaboration with the US Navy's Office of Naval Research, the company is exploring opportunities to apply artificial intelligence (AI) for training robots to independently oversee and optimise additive manufacturing of complex parts.

Lockheed Martin project manager Brian Griffith said: -We will research ways machines can observe, learn and make decisions by themselves to make better parts that are more consistent, which is crucial as 3D printed parts become more and more common.

-Machines should monitor and make adjustments on their own during printing to ensure that they create the right material properties during production.



Photo: Lockheed Martin



Developed by Leonardo's Aircraft Division, the Aermacchi M-345 aircraft is capable of performing operational roles with a high-speed manoeuvring capability in high altitudes, modern avionics systems, and high load capacity and performance. Photo: G.M. Anzellotti/ Italian Air Force

## Weaponised M-345 jet trainer

Paramount Group has signed a Letter of Intent with Leonardo to jointly develop a weaponised configuration of the M-345 military trainer aircraft.

Under the deal, the two companies intend to build an operational configuration of the jet trainer to be marketed in the African market.

Paramount Advanced Technologies chief executive officer Ralph Mills said: -We are very excited to launch and demonstrate our Smart Weapons

Integration on Fast-Jet Trainers (SWIFT) mission system alongside the African debut of Leonardo's M-345 jet trainer.

SWIFT is focused on current threats and current customer requirements. It offers low acquisition and operation costs and is suitable for non-conventional or asymmetric warfare.

The platform can be described as short timeframe, light combat and surveillance solution utilising the best of the best in the defence industry."

## Gripen Director for Switzerland

Saab has appointed Martin P. Büsser to head up the Saab Gripen team in Switzerland. Martin, previously Senior Vice President of Sales and Marketing at Ruag Aviation, assumed his position on October 1.

The main task for Martin will be to lead Saab's participation in the on-going procurement of new fighter aircraft for the Swiss Air Force. This includes supporting industrial cooperation with Swiss industry, partner companies and science.

## Mine hunting solution to Belgium and the Netherlands

Naval Group and ECA Group recently established a technological and commercial partnership in the field of unmanned mine warfare. ECA Group is an expert in naval drones and unmanned systems and one of the global leaders in this sector for the last 50 years

The first practical application was completed as part of the response to the consultation launched by Belgium for a Belgian-Dutch cooperation for the supply of 12 mine hunters.

Mine hunting practices are being revolutionized through the massive use of unmanned systems operating on the surface, in the air and in the sea. This paradigm shift will lead to transformations that will affect naval forces as a whole. The future mine warfare capability should be established, and then develop, based on threats and technological progress in the areas of staff, equipment, interoperability and organization, concepts and doctrine, infrastructures and logistics.

## Rohde & Schwarz radio communications at Singapore Changi Airport

The Civil Aviation Authority of Singapore (CAAS) has awarded a contract to Rohde & Schwarz, to upgrade and expand the Air Traffic Control (ATC) radio communications system at Singapore Changi Airport. The enhanced system will further strengthen safety for airlines and passengers. As part of the contract, Rohde & Schwarz is required to provide auxiliary equipment, software, project management, training as well as after-sales services for a 15-year period to CAAS.

Rohde and Schwarz, a global manufacturer of infor-

mation and communications technology products, will install more than 240 R&S Series 4200 VHF/UHF radios at Changi, including at the new radio stations to be built at Changi East. Besides providing high-quality voice connections between pilots and air traffic controllers, these radios also deploy a new technology called Detection of Simultaneous Transmissions (DSiT). DSiT enables the detection and notification of simultaneous radio calls to air traffic controllers who can communicate with two counterparts at the same time.

## UK launches Defence Arctic Strategy

UK Defence Secretary Gavin Williamson has launched a new Defence Arctic Strategy to address the increasing opportunities and threats present in the region.

The change in natural environment in the Arctic and High North makes the region more accessible, significantly changing the security environment and increasing the need for military defence.

The new strategy will help enhance the focus of the UK Ministry of Defence (MoD) on the Arctic region, and will put the Arctic and the High North central under the security of the country.

Williamson said: -As the ice melts and new shipping routes

emerge, the significance of the High North and Arctic region increases.

-Russia, with more submarines operating under the ice and ambitions to build over 100 facilities in the Arctic, are staking a claim and militarising the region. We must be ready to deal with all threats as they emerge.

As part of the Defence Arctic Strategy, British Royal Marines will carry out cold weather training in collaboration with Norway.

The strategy will be integrated into the defence plan of Norway, providing British troops with an opportunity to train alongside a major allied nation.

Next year, four Eurofighter Typhoon combat jets will be deployed by the UK Royal Air Force (RAF) for the first time to patrol Icelandic skies, enabling the country to work in close collaboration with allies to deter aerial threats to Euro Atlantic security.

In 2020, a new fleet of P-8 Poseidon sub-hunting aircraft will be deployed to help combat a wide range of emerging threats and address the increasing submarine activity in the Arctic.



Royal Navy submarine HMS Trenchant breaks through the ice at the Arctic. Photo: Royal Navy/ Crown

## Arthur Support Contract from South Korea

Saab has signed a contract with South Korea's Defence Acquisition Program Administration (DAPA) regarding support for the Arthur Weapon Locating System. This Performance Based Logistics (PBL) contract includes spare parts supply and support for the Republic of Korea Army and Marine Corps. The contract value is approximately 500 million SEK and the contract period 2018-2023.

Saab made the first delivery of Arthur systems to South Korea in 2009, and have had annual support contracts for these systems in place since 2012. Saab

also participated in delivery of additional Arthur systems from 2012 within a Technical Cooperation Programme (TCP) with the Korean company LIG Nex1.



South Korea is the largest operator of Arthur Weapon Locating System. Photo: Saab

## Black Hawk maintenance in Sweden

Patria Helicopters AB has received an order for Hkp16 (Black Hawk) maintenance taking place in Linköping, Sweden as the Swedish Defence Materiel Administration FMV was realising their option.

Patria and the FMV signed an agreement in 2014 on the

support of the Swedish Armed Forces Hkp16 Black Hawk helicopters' maintenance in Linköping. The agreement covered the period 2015-2017 with an option for extension through 2020. Estimated value of the agreement, including options, was approximately 25 MEUR.

## Guided munition for Carl-Gustaf system

The US Army has awarded a contract to Saab and Raytheon to demonstrate a new Carl-Gustaf weapon system guided munition.

Under the deal, the two companies will jointly demonstrate the ability of the guided munition with three all-up-round test firings against threat-representative targets.

The new munition has been designed to address a US Special Operations Command require-

ment to upgrade and enhance the capability of the Carl-Gustaf weapon.

The ammunition features advanced warhead that penetrates light armour, bunkers and concrete structures while minimising collateral damage.

Built by Saab, the man-portable, shoulder-launched Carl-Gustaf is used by the US Army and other ground forces of more than 40 other countries.



The munition is intended to enable ground troops to engage multiple targets precisely at distances up to 2,000m, including moving targets. Photo: Saab

## Carl-Gustaf ammunition from Estonia

Saab has received an order from the Estonian Centre for Defence Investment on ammunition for the Carl-Gustaf system. The order value is 186 MSEK and deliveries will be made during 2018-2019.

The order is placed under a Framework Agreement signed with the Swedish Defence Materiel Administration where Estonia has the possibility to place orders from Saab.

## Patria acquired Patricomp from Spanish Aernnova

Patria Aerostructures Oy, a fully owned subsidiary of Patria Oyj, completed the acquisition of all the shares in Patricomp Oy from Aerometallic Components SAU. Patricomp operates in aircraft sheet metal part manufacturing, surface treatments and

assemblies. Patricomp net sales were 6.6 million euros in 2017. Patricomp is located in Halli, Jämsä and employs some 50 employees. The parties have agreed not to disclose the final transaction value.

## Patria launched a new vehicle - Patria 6X6

Patria 6X6 is a successor to the Pasi Armoured Personnel Carrier and to complement the vehicle fleets of customers of the legendary Patria AMV 8X8. Patria 6X6 is a multipurpose transport vehicle. The chassis structure is based on the same components as the AMV, but with one less axle. The vehicle is driven by all three axles and steered from the front two, or all three, depending on its equipage. Optional equipage can be added to bring the 6X6 closer to the AMV. For example, various ballistic and mine protection levels, weapon systems, self-protection systems and other interior equipment are available.

Boarding and leaving the 6X6 is easy. In addition to the crew of 2-3 persons, the vehicle has seats for ten combat troops, depending on its purpose and layout.

### PATRIA 6X6

- ▶ **Length:** 7.5 m
- ▶ **Height:** 2.5 m
- ▶ **Width:** 2.9 m
- ▶ **Maximum total weight:** 24 000 kg
- ▶ **Top speed:** 100 km/h
- ▶ **Swimming capability:** optional
- ▶ **Fording depth:** 1.5 m
- ▶ **Rang:** 700 km
- ▶ **Engine power:** 294 kW



The new Patria 6x6

Photo: Patria

## Gripen Proposal to Bulgaria

On 1 October, the Swedish Defence Material Administration submitted the Swedish Gripen proposal to the Bulgarian Ministry of Defence. The Swedish offer consists of eight new fully NATO-interoperable Gripen C/D fighter aircraft to equip the Bulgarian Air Force.

Sweden, South Africa, Hungary, Czech Republic and Thailand. With Gripen, NATO member states Czech Republic and Hungary successfully participate in NATO missions and joint exercises with other NATO countries.

The Swedish offer consists of eight new NATO interoperable Gripen aircraft with the latest MS20 configuration, which can be delivered to the Bulgarian Air Force within a short time period, with the first aircraft delivered within 24 months of contract signature. Training of pilots and technicians is included and with the offer full QRA capability will be achieved within the budget framework.



The development of the Gripen C/D is on-going and the system will remain operational for at least another 30 years. Photo: Saab

Gripen C/D is in operational service with the air forces of

## IAI wins robotics contract

Israel Aerospace Industries (IAI) won a contract for conversion of Caterpillar Dozers into autonomous dozers that will be commissioned for complex engineering tasks in threaten areas. This is a significant military robotics contract reflecting the preparations undertaken for the challenges posed by the future battlefield.

The new autonomous system mounted on the Caterpillar Dozer's, belongs to a family of robotic solutions developed by IAI. It incorporates IAI's robotic technology, which can be integrated in a range of platforms based on the customer's operational needs.



Photo: IAI

## GlobalEye off to a flying start during 2018

Saab's GlobalEye has achieved a number of significant milestones in 2018, commencing with the rollout of the first aircraft in February 2018. GlobalEye is an Airborne Early Warning & Control (AEW&C) aircraft that is a true swing role multi-mission solution. It combines multiple sensors and sophisticated data fusion into an intuitive mission system on the Bombardier Global 6000 jet with fully networked communications. This capability gives flexibility across the full mission spectrum in peacetime to warfighting, and particularly benefits joint

force commanders managing combined air, sea and land operations.

The development and production contract for GlobalEye was awarded at the Dubai Air Show November 2015 by the United Arab Emirates with an initial order for two systems. An additional order by the UAE for a third system was announced in 2017. GlobalEye brings extended detection range, endurance and the ability to perform multiple roles with one solution, including tasks such as search & rescue, border surveillance and military operations.



Photo: Saab

## Autonomous IEDs Detection and Neutralization System

Israel Aerospace Industries has completed the development of an autonomous improvised explosive device detection (IED's) system. The system, is a robotic engineering scout, installed on a robotic platform made by IAI, and integrates a combination of multiple sensors, for detecting improvised explosive devices. The system is detecting IEDs

placed and hidden in complex areas, engage and remove them as necessary using the blade installed on the vehicle. The system operation, maneuver and detection are done autonomously without danger to human life. The system is scheduled to be transferred for trial and evaluation purposes.



An explosive device detection system of the SAHAR family installed on a "LR-II" vehicle  
Photo: IAI

## Additional Argus soldier systems to Canada

The Canadian Armed Forces have exercised options under the Integrated Soldier System Project (ISSP) to procure an additional 1,256 Rheinmetall Argus soldier systems, which will be delivered in 2019. This order is worth CAD22 million (14.3 million Euro).

The Canadian government initially contracted with Rheinmetall to start the qualification phase of the Canadian Army's Integrated Soldier System (ISS) in 2015, which it has successfully completed in the meantime. The final production phase of the Argus soldier system is now underway,

with 1,632 units slated for delivery this year.



Photo: Rheinmetall

## Upgraded TOW anti-tank missile

The US Army has awarded a contract to Raytheon for the development of a new propulsion system for the tube-launched, optically tracked, wire-guided (TOW) missile.

Valued at \$21m, the contract will involve performance enhancements and upgrades to the anti-tank missile for a period of three years.

Through the contract, performance upgrades will be integrated into all variants of the TOW weapon system, including the top and direct attack 2B, direct attack 2A and Bunker Buster missiles.

-Improving TOW's propulsion system will increase range and deliver enhanced protection for ground troops while providing them with

more capability, said Raytheon Land Warfare Systems vice-president Kim Ernzen.

The TOW missile is a long-range, heavy-assault precision anti-armour, anti-fortification and anti-amphibious landing weapon system used by forces across the world.

The upgrade programmes will help the missile remain in the US army's inventory until 2050.

To date, Raytheon has delivered more than 690,000 TOW missiles to the US and allied warfighters and is deployed with more than 20 international armed forces and integrated on to more than 15,000 ground, vehicle and helicopter platforms.



Raytheon's TOW missile

Photo: US Army

## Lithuania Upgrades RBS 70

Saab has received two orders from the Ministry of National Defence Republic of Lithuania for improved missiles and BORG night-capability sights for the RBS 70 system. The order value amounts to approximately SEK 100 million and deliveries are expected to take place starting in 2019.

The Lithuanian Armed Forces are already users of the RBS 70 system and are now acquiring improved capability with greater range, higher altitude coverage and an enhanced effect against armored targets as well as night time capability.

The Saab portfolio of very short-range ground based air defence missile systems comprises of the RBS 70 and the further enhanced RBS 70

NG. Nineteen countries have procured more than 1,600 RBS 70 systems, including more than 18,000 missiles.



Photo: Saab

## A thousand more trucks for Australia

Rheinmetall has been selected to supply the Australian Defence Force with more than a thousand additional military trucks and modules. The contract is worth 430 million Euro. The Commonwealth of Australia has thus acted on a procurement decision already announced in July 2018.

Delivery is scheduled to commence in 2019 and be complete in 2024.

The latest purchase forms part of Australia's Land 121 Phase 5B project. Rheinmetall has already proved its mettle

in earlier phase of the project, 3B, under which it is currently supplying Australia with 2,500 medium- and heavyweight military trucks worth a total of 1.2 billion Euro.



Photo: Rheinmetall

## HSwMS Gotland Relunched After Mid-Life Upgrade

After a comprehensive mid-life upgrade (MLU) to meet tomorrow's naval challenges, the submarine HSwMS Gotland has been relaunched and is ready to start her sea trials.

Due to this MLU, the Gotland submarine has capabilities that will be found in the next generation of Swedish submarines, the A26.

The Gotland was designed and built by Kockums in Malmö in the early 1990's and commissioned in 1996. The mid-life modification consists of upgrades of onboard systems and technology, sustaining the submarine's operability, and ensuring service to Sweden beyond 2025.

The upgrade process entails many important systems, such as the Stirling Air Independent Propulsion (AIP). Sensors and management system are replaced with updated versions. Even the traditional optical periscope is replaced with a new optronic mast.

### MLU OF GOTLAND

- ▶ **Length overall:** 62 m
- ▶ **Beam:** 6.2 m
- ▶ **Displacement:** 1580 tons (surfaced)
- ▶ **Weapons:** Torpedoes, bow tubes, swim-out
- ▶ **Propulsion:** Single-shaft, diesel-electric and Stirling AIP
- ▶ **Endurance:** Weeks (submerged)
- ▶ **Hull:** Single pressure hull, two pressure tight compartments
- ▶ **Crew:** 25
- ▶ **Mid-life Upgrade:** Submarine is cut open in the mid-tank section, adding a new section including sea water cooling, fresh water cooling, water chiller units
- ▶ **Improved capabilities:** Stirling AIP MkIII, Masts, Sensors, Communication, Special Ops
- ▶ **New rules and regulations:** IMO, Security, Crew Comfort
- ▶ **End-of-life and obsolescence issues:** Combat and Ship's Management Systems

## India conducts flight tests of Agni 5 ballistic missile

India has successfully flight tested the long-range ballistic missile Agni 5 from Abdul Kalam Island, formerly known as Wheeler Island, off the Odisha coast.

Indigenously developed by the Defence Research and Development Organisation (DRDO), the missile took off from mobile launch pad number four of the Integrated Test Range in the Bay of Bengal, defence sources said.

During the sixth flight test, the entire range of radars, electro-optical tracking stations and telemetry stations followed the weapon throughout the course of the trajectory, reported the Press Trust of India (PTI).

According to a DRDO official, the Agni 5 trial tested several new home-grown technologies, such as navigation systems, very high accuracy Ring Laser Gyro based inertial navigation system (RINS) and the advanced micro navigation system (MINS).

With a strike range of 5,000km, the missile is capable of turning towards the earth after reaching the peak of its trajectory and continuing its journey towards the intended

target with an enhanced speed supported by the earth's gravitational pull.

The missile path is accurately determined by the advanced on-board computer and inertial navigation system.

On 19 April 2012, India conducted the first test of Agni 5, while the second was conducted on 15 September 2013, the third on 31 January 2015, fourth on 26 December 2016, and the fifth on 18 January this year.



Agni 5 missile flight testing. Photo: Press Information Bureau/Government of India/Ministry of Defence

## US Navy welcomes Triton UAS to fleet

Northrop Grumman's MQ-4C Triton unmanned aircraft system (UAS) has been officially welcomed into the US Navy fleet, marking the beginning of its flight operations.

Naval Base Ventura County (NBVC) Point Mugu serves as home to the maintenance detachment of the US Navy's first unmanned patrol squadron, Unmanned Patrol Squadron (VUP)-19 DET Point Mugu.

Maintenance personnel are currently carrying out training and tests on the MQ-4C Triton system before its planned deployment to Guam later this year.

Point Mugu has completely renovated an existing hangar in order to accommodate up to four Triton UAS units, which feature a 42 meters wingspan.

The first two aircraft are currently situated at Point Mugu.

The MQ-4C Triton is an unmanned intelligence, surveillance and reconnaissance aircraft featuring an autonomous capability.

The aircraft can be piloted from a ground station and is capable of flying for up to 24 hours, reaching altitudes of up to 55,000ft (ca 17,000 meters)

It is primarily based on the Global Hawk UAS system and its autonomous operations are supported by land-based command and control mission planners and sensor operators.

Additionally, the MQ-4C Triton is equipped with a robust mission sensor suite that offers 360° coverage on all sensors in order to offer unprecedented maritime domain awareness for the US Navy.



The first two operational MQ-4C Triton aircraft at Naval Base Ventura County, Point Mugu. Photo: Northrop Grumman

## US DoD and Lockheed cut F-35 price

The US Department of Defense (DoD) has awarded an \$11.5bn contract to Lockheed Martin for the production and delivery of a total of 141 units of F-35 Lightning II joint strike fighter aircraft.

The per unit price of the F-35 has been reduced for the 11th consecutive year, with the cost this year being the lowest in the history of the aircraft development programme.

With the cut, the cost of an F-35A aircraft in Low-Rate Initial Production Lot 11 (LRIP 11) has been quoted at \$89.2m, including engine and fee, representing a 5.4% reduction from the \$94.3m per unit cost in LRIP 10.

Similarly, the unit cost of F-35B short-take-off and land-

ing variant has been reduced by 5.7% to \$115.5m from \$122.4m in the previous year.

The F-35C unit cost in LRIP 11 was cut down by 11.1% to \$107.7m from the \$121.2m unit cost for the carrier in LRIP 10.



As production ramps up, and additional cost savings initiatives are implemented, Lockheed Martin aims to reduce the cost of the F-35A to \$80m by 2020, which is equal to or less than legacy aircraft, while providing a major leap in capability.

Photo: US Air Force/J. Nimmo Sr.

## IMP AEROSPACE AWARDED P-3 ORION MAINTENANCE CONTRACT

IMP Aerospace has been awarded a contract by the Norwegian Defence Logistics Organisation (NDLO) following an international competitive bidding process for the maintenance of the P-3 Orion Maritime Patrol Aircraft fleet operated by the Royal Norwegian Air Force (RNoAF). This multi-year contract includes additional In-Service Support (ISS) work beyond maintenance inspections and will be performed at IMP's operations in Halifax, Nova Scotia.

The P-3 Orion aircraft perform strategic patrol missions for the RNoAF in the detection of submarine threats, search and rescue support, littoral surveillance, as well as economic zone and shipping lane protection off the coast of Norway.

IMP Aerospace has developed a close relationship with the RNoAF over the past decade and has a solid working knowledge of their P-3 aircraft maintenance requirements.

## Airbus collaborates with Wilhelmsen to develop unmanned aircraft systems for maritime deliveries

Airbus and Wilhelmsen Ships Service have entered into a strategic collaboration to drive the development of an end-to-end service for safe deliveries of parcels with an unmanned aircraft system (UAS), in the maritime industry. In the project, named Skyways, shore-to ship pilot trials, is expected to commence in third quarter of 2018

Skyways is an experimental project aimed at developing a safe and commercially viable aerial unmanned delivery system for use in dense urban cities in its first trial phase. The project is being led by a team in Singapore, where plans are progressing towards the launch of a first trial system at the National University of Singapore in July.

Under this collaboration, Airbus is the overall Skyways system architect and provider, contributing its expertise in aeronautical vertical lift solutions and experiences from its first trial phase, to develop the UAS for shore-to-ship deliveries. The UAS is an innovative system-of-systems that includes aviation-standard UAVs, ground control stations, air navigation systems, and operational and maintenance

procedures. Wilhelmsen, with its wealth of experience in ship agency services, will develop and provide customer services, and ensure compliance of the UAS operations with maritime safety and security regulations.

The initial two-week shore-to-ship pilot trial will begin in the third quarter of 2018, delivering parcels to vessels anchored off the coast of Singapore – one of the world's busiest ports. Command and delivery centres will be set up at the pier to facilitate the deliveries, with an initial delivery range of up to 3km from the shoreline. A second delivery station will be positioned at an open space in Marina South to extend delivery coverage to more anchored vessels.

While drones have already been mooted as one way to deliver items on shore and at sea, the use of UAS in the maritime industry shapes the possibility to enlarge existing ship agency services' portfolio, increase productivity by up to six times, lower delivery costs by up to 90%, reduce carbon footprint, and significantly mitigate risks of accidents associated with launch-boat deliveries.

## Qatar makes NH90 helicopter contract effective

The 3bn Euro contract for the delivery of 28 units of the NH90 medium twin-engine multirole military helicopters to Qatar has become effective.

The Ministry of Defence of Qatar has made the first advanced payment for the deal.

Under the deal, Leonardo serves as the overall prime contractor to the consortium NHIndustries and will be responsible for the complete management of the entire NH90 delivery programme.

The contract for the 28 NH90 military helicopters between the Ministry of Defence of Qatar and the consortium was signed on March 14th.

Leonardo will provide Qatar with two different variants of the NH90 multirole military helicopter, 12 NH90 NATO Frigate Helicopter for naval operations and 16 NH90 Tactical Transport Helicopter to conduct land-based operations.

Deliveries of the aircraft are expected to commence before June 2022 and will continue until 2025.



Photo: NHIndustries

## NH90 helicopter landings on ships in open sea

The Royal Norwegian Navy has tested NH90 helicopter landings on ships in order to assess ship helicopter operational limitations.

Carried out in the North Sea, the navy successfully evaluated whether the NH90 military helicopters could land safely on two navy ships in open sea.

The tests were completed in one week and were overseen by NLR, together with Dutch company AeroMath.

During the event, a total of 308 helicopter landings were performed, with an average of one landing every four minutes.

Tests were conducted using a method developed by Netherlands Aerospace Centre (NLR) in collaboration with the Royal Netherlands Navy.

The method enabled the Norwegian Navy to conduct the trials at significantly lower costs while providing the service with a cost-effective solution that would help enhance the performance of civil and military operations carried out using helicopters.

In the 1980s, the Netherlands Navy selected NLR to develop a test method for significantly reducing the number of test hours at sea so as to lower the costs of testing.

The method includes testing navy vessel models in a DNW wind tunnel to obtain a picture of the airflow around the vessels.

In addition to ensuring cost-effective deployment of helicopters in civil and military tasks, the NLR method will help ensure aircraft safety at sea.

The second phase of the project involves shore-based trials that expose helicopters to different wind speeds on land.



Flight deck officer overseeing NH90 landing on board Norwegian vessel.  
Photo: Netherlands Aerospace Centre

## Sea Giraffe on Five Classes of U.S. Ships

Saab has received an order from the U.S. Navy to supply the Sea Giraffe AMB Multi Mode Radar (MMR) for the Navy's Expeditionary Sea Base (ESB) class ship USNS Hershel "Woody" Williams, ESB 4. The sale also includes Saab's 9LV Naval Combat System for radar control and display delivering enhanced situational awareness as well as Identification Friend or Foe (IFF) capability.

The ship will be operated by the U.S. Navy's Military Sealift Command. In 2017, the U.S. selected Saab's Sea Giraffe MMR for the U.S. Coast Guard's newest class of ship, the Offshore Patrol Cutter. The MMR is a 3D, electronically scanned phased array radar

providing high-radiated power, selectable waveforms, and modern signal processing to consistently achieve high performance across various marine environments.

The work will be carried out during the period of 2018-2020 at Saab in Gothenburg, Sweden and Syracuse NY, U.S.



Sea Giraffe.

Ill. Saab

## UH-60M Black Hawk helicopters for Latvia

The Ministry of Defence of Latvia is planning to acquire four new UH-60M Black Hawk medium-lift utility helicopters from the US for a total value of approximately 175m Euro.

If purchased, the new Black Hawk helicopters will replace the existing helicopter fleet while strengthening the Latvian forces' combat capabilities.

The potential intergovernmental agreement between the two countries will also include purchase of associated equipment and provision of installation services.

Potentially to be co-financed by the US from its support programmes, the deal will also include pilot training, crew members and technical personnel, delivery of spare parts and maintenance, full technical documentation and software licences.

Acquisition of the helicopters will help strengthen compatibility with the US forces stationed in Latvia and continue the existing joint training programmes between the military units.

To be fitted with advanced combat weapons systems, the new UH-60M Black Hawk helicopters will provide the Latvian armed forces with rapid response and lift capabilities, thereby enabling the country to reach its determined operational goals.

The aircraft will also be capable of conducting troop and equipment lift, in addition to providing crisis support, medical evacuation, search and rescue, and other support missions, including aerial firefighting, in all weather conditions.

The National Armed Forces of Latvia is expected to receive its first set of UH-60M Black Hawk helicopters in 2021.



A UH-60 Black Hawk in Afghanistan. The Black Hawk is reliable helicopter, combat proven in a number of conflicts.

Photo: Staff Sgt. V. Hall, U.S. Army

## RAF's Typhoons with New Smart Self-Protection System

Saab has received an order from BAE Systems for development of a new pyrotechnic smart self-protection system for the Eurofighter Typhoon aircraft to defeat radar- and IR-guided threats.

The order is part of a framework agreement with BAE Systems consisting of development, production, support and future sales of the Smart Dispenser System (SDS), a pyrotechnic smart self-protection system for the Royal Air Force's (RAF) Typhoons and future Eurofighter opportunities.

SDS is the latest generation in Saab's BOP family of pyrotechnic countermeasure dispensers. BOP is in-service on fighters and other combat

aircraft types, and has been proven over several decades including on active operations.

Saab has been a close partner to the RAF for nearly forty years, providing products and services across the air power spectrum. Counter-measure dispensing technologies have been provided by Saab to the RAF, alongside leading edge radars and sensors, for decades to protect aircraft such as Harrier, Tornado and Typhoon.



*Eurofighter Typhoon.  
Photo: Jami Hunter*

## Rostec demonstrates operative passive exoskeletons for Russian Army

Rostec has demonstrated its new operative passive exoskeletons for the first time to be used for the Russian Army's new-generation of Ratnik combat suit.

The Russian Army has already trialled the exoskeletons in combat environment conditions.

Rostec Armament Cluster industrial director Sergey Abramov said: "This prototype has already been tested during real military operations.

Co-developed by the Central Research Institute for Precision Machine Building (TSNIITOCHMASH), a part of Russia's Rostec State, and GB Engineering, a fully operative passive exoskeleton helps increase physical abilities of a soldier, protects joints and the spine, and can be adjusted to the height of a soldier.

Made of lightweight carbon fibre, the exoskeleton is a mechanical device with levers and swivels in the shape of human joints.

It helps support the musculoskeletal system when a person carries weights up to 50kg during long marches and assaults.

The passive exoskeletons are completely autonomous and require no power sources, servomotors, electronics and sensors.



*Operative exoskeleton for Russian Army's Ratnik combat suit.  
Photo: Anton Tushin/Rostec*

## Estonia launches competition to develop new weapon systems

The Estonian Ministry of Defence (MoD) has launched a new competition for the development of future weapon systems.

The Defence Innovation competition has been designed to encourage Estonian enterprises to come up with new ideas to produce high-export potential weapons systems, ammunition and munitions or other associated products.

In July this year, the Estonian Parliament passed the amendment to the Weapons Act allowing private enterprises in the country for the first time to produce and handle military weapons and ammunition.

The competition has been launched with an aim to promote the amendment to the weapons law and help strengthen Estonia's defence industry sector.

Estonian Defence Ministry chief defence industry officer Eneli Saabas said: "Our success

parameter for the competition is to get at least three to four new and innovative products that can be marketed in Estonia and abroad".

The competition will see the participation of companies that are registered in Estonia.

The winning firms would receive a government contribution of 500,000 Euro and will be responsible for carrying out product development and testing with the Estonian Defence Forces.

The total budget of the projects is expected to reach more than 1m Euro, while the maximum support for a single project will be up to 200,000 Euro and state support can be a maximum of 45% of the cost of the development project.

The applications for the competition are being evaluated by a committee comprising representatives from the MoD, defence forces, business organisations and outside experts.

## UK MoD relaunches tender for the Type 31e frigate

The UK Ministry of Defence (MoD) has relaunched a tender for the development of the Type 31e frigate or General Purpose Frigate for the Royal Navy.

The MoD has confirmed that it has issued a prior information notice for the construction of the new Type 31e fleet.

The plan to resume the development programme follows the UK MoD's previous decision to suspend plans to acquire the proposed low-cost Type 31e frigate for the navy.

The MoD has now confirmed that the plans to buy the first batch of at least five new Type 31e vessels remains unchanged.

According to the defence department, the five new ships will be put into service with the navy to replace the existing fleet of five Type 23 vessels.

The first vessel of the planned Type 31e frigates is expected to be in service with the UK Navy by 2023.



*BAE concept for the Royal Navy's Type 31 frigate.*

*Ill: MatthewTarbard*

## And More Sea Giraffe AMB for U.S. Navy

Saab has received an additional order from the United States (U.S.) Navy to supply the Sea Giraffe AMB Multi Mode Radar (MMR) for the U.S. Coast Guard's newest class of ship, the Offshore Patrol Cutter (OPC).

The MMR system is a three dimensional, electronically scanned phased array radar

providing high-radiated power, selectable waveforms, and modern signal processing to consistently deliver the highest performance across various maritime environments and missions. Saab received the initial order for the MMR for the Offshore Patrol Cutter from the U.S. Navy in 2017.

## Saab to Upgrade Royal Thai Air Force Air Command and Control System

Saab has received an order from the Royal Thai Air Force to upgrade Thailand's national Air Command and Control System which is based on Saab's 9AIR C4I.

Saab will upgrade and further enhance the Royal Thai Air Force's Air Command and Control System (ACCS) which is based on Saab's 9AIR C4I product and has been in operation with the Royal Thai Air Force since 2010. The system is a core part of Thailand's network centric air defence capability which also includes Saab's Gripen fighter,

Erieye airborne early warning system and tactical data links.

The ACCS upgrade combines new hardware and software that will sustain, enhance and expand the system's nationwide capabilities for future operations. The work will take place at Saab in Järfälla, Sweden and the contract will run until 2020.

9AIR C4I is Saab's tactical air operations command and control system. It provides situational awareness and complete control of weapons, sensors and communications.

## Russia's Tupolev delivers upgraded Tu-22M3M missile carrier bomber

United Aircraft Corporation's Tupolev has delivered the first fully upgraded Tu-22M3M long-range missile carrier bomber to the Russian Aerospace Forces for series of ground and flight tests.

The upgraded Tu-22M3M missile carrier bomber was launched during an official ceremony held at Kazan aviation plant, an affiliate of Tupolev.

As part of the aircraft modernisation, the Tu-22M3M bomber has been fitted with an advanced digital avionics system based on the domestic hardware components, along with an advanced on-board information and control system with digital indication in the cabin and crew intelligent assistant functions.

In addition, the aircraft has been installed with a new navigation, communication, aiming equipment, engines and fuel mechanisation control, as well as an electronic warfare facility.

Designed as the modified variant of Tupolev's Tu-22M3, the Tu-22M3M bomber is a multimode aircraft equipped with different armaments such as cruise missiles, free-fall and guided bombs.



Tupolev's Tu-22M3M long-range missile carrier bomber.  
Photo: PJSC Tupolev

## Australian Order for Carl-Gustaf M4

Saab has received an order for deliveries of the new Carl-Gustaf M4 multi-role weapon system to the Australian Army. This is Saab's sixth customer since its launch in late 2014. Deliveries will take place during 2020.

The new version retains all the effectiveness and versatility of the proven Carl-Gustaf system while introducing a range of

major enhancements. These include a lighter weight design (weighing less than 7 kg), a round counter, improved safety and intelligent features, such as compatibility with future intelligent sighting systems and programmable ammunition, which collectively offer significant operational improvements for the soldier. The weapon is fully backward compatible with all ammunition types.

## RBS15 Ship System for German Navy's New Ships

Saab has received an order from its German partner Diehl Defence for the Anti-Ship Missile RBS15 Mk3 ship system. The order value is approx. MSEK 160 with several priced options related to Integrated Logistic Support (ILS) and IT Security. Deliveries will take place during the period 2019 to 2024.

Recently the German Navy made a procurement to buy additional K130 class ships, this order comprises onboard ship systems for these. The order contains the necessary infrastructure to equip the ships with the RBS15 missiles. The order was received from Diehl

Defence, industrial prime for the RBS15 procurement in Germany. The contractor is a German consortium of three shipyards named ARGE K-130.

The RBS15 missile system family is one of the market's most flexible and effective armaments. For almost 30 years, the RBS15 missile family has provided fleets, coastal batteries and air forces with advanced anti-ship capabilities. The RBS15 is jointly produced by Saab and Diehl Defence GmbH & Co and serves with armed forces from Sweden, Finland, Germany, Poland, Croatia, Thailand and an undisclosed country.

## Australia orders 211 Boxer wheeled armoured vehicles

Australia has awarded Rheinmetall an order for 211 Boxer wheeled armoured vehicles worth a total of 2.1 billion Euro (AUD3.3 billion).

The Boxer vehicle is already in service with, or being procured by, the armed forces of Germany, the Netherlands and Lithuania. The Australian Armed Forces introduce several variants of the Boxer with the reconnaissance variant – accounting for 133 of the 211 vehicles – equipped with Rheinmetall's Lance turret system and armed with a 30mm automatic cannon.

Rheinmetall is co-operating closely with Australian defence industry and more than 40 Australian companies will be included in the programme.



# U.S. AIR FORCE SELECTS SAAB AND BOEING T-X TRAINER

The U.S. Air Force has awarded Boeing USD 9.2 billion for the development of a new advanced pilot training system that will help train fighter and bomber pilots for generations to come. Boeing is the designated prime contractor for the Advanced Pilot Training Program. Saab is a risk-sharing partner with Boeing in the development of the T-X aircraft. At this stage, Saab has not received an order from Boeing.

**T**his selection allows our two companies to deliver on a commitment we jointly made nearly five years ago, says Håkan Buskhe, President and CEO of Saab. -It is a major accomplishment for our partnership with Boeing and our joint team, and I look forward to delivering the first trainer aircraft to the U.S. Air Force.

The initial USD 813 million contract to Boeing covers the engineering and manufacturing development (EMD) of the first five aircraft and seven simulators.

Saab and Boeing designed, developed, and flight-tested two all-new, purpose-built jets - proving out the system's design and repeatability in manufacturing and training capability.

## Boeing/Saab T-X

The Boeing/Saab T-X is a single-engine advanced jet-trainer with a twin tail, tandem seating, and a retractable tricycle

landing gear. The aircraft is powered by a General Electric F404 afterburning turbofan engine. The twin-tails provide better stability and control and the aircraft is capable of in-flight refuelling.



## SAAB RECEIVES ORDER

### Saab Receives Order from Boeing for the Advanced Pilot Training Aircraft T-X

Saab has received an order from Boeing for the Engineering and Manufacturing Development (EMD) phase for the Advanced Pilot Training Aircraft, T-X. The value of this order is approximately MUSD 117.6. The order will run until 2022.

The T-X programme is divided into multiple phases. This order concerns the first phase, EMD, in which Saab and Boeing industrialise the T-X aircraft together with the customer. EMD includes testing, U.S. military flight certification and delivery of five jets. The EMD phase will be followed by a serial production phase.

Boeing is now clear to begin placing orders with its suppliers, including Saab. More than 90 percent of Boeing's offering will be made in America, supporting more than 17,000 jobs in 34 states. ■■

The aircraft was first revealed on 13 September 2016. The first Boeing/Saab TX-1 aircraft flew on December 20th 2016.

## T-X TRAINER, SPECIFICATIONS

- ▲ **National origin:** Sweden/United States
- ▲ **Manufacturer:** Boeing/Saab Group Status: Development
- ▲ **Number built:** 2
- ▲ **Crew:** 2
- ▲ **Engine:** 1 × General Electric F404 Afterburning turbofan, 11,000 lbf (49 kN) thrust dry, 17,700 lbf (79 kN) with afterburner

## T-X PROGRAM

The T-X program has been established to enable the United States Air Force to buy a new two-seat jet trainer for fast-jet training to replace the Northrop T-38 Talon; the average age of the T-38 fleet is over 50 years. About 350 aircraft are expected to be ordered to replace the T-38, but further purchases could push the overall purchase to over 1,000.

The USAF's has been developing requirements for the T-38 replacement program since 2003.

The driving requirements for the new trainer will be to help prepare pilots for the increased complexity in some areas, particularly information management, that are a part of fifth generation jet fighters like the F-22 Raptor and

the F-35 Lightning II. The Air Force first viewed this as unnecessary and costly, but industry analysis showed it to be cheaper in the long run. The aircraft and simulation system will have to fulfill several basic training roles; basic aircraft control, airmanship, formation, instrument and navigation, advanced air-to-air, advanced air-to-ground, and advanced crew/cockpit resource management. Furthermore, there are five advanced training roles that the system is expected to fulfill; sustained high-G operations at 6.5–7.5g, aerial refuelling, night vision imaging systems operations, air-to-air intercepts, and data-link operations.

Program requirements focus on life-cycle costs rather than just purchase price.

The Air Force has been considering of adapting the T-X aircraft to perform light attack and close air support, as replacement of the A-10 Thunderbolt II. However, in 2016, the Air Force decided to pursue other aircraft for the close air support role.



A T-38 Talon over Edwards Air Force base.  
Photo: U.S. Department of Defense

# PREVIOUS CONTENDERS FOR THE T-X PROGRAM

## Leonardo T-100

Italian aerospace company Leonardo S.p.A. (formerly Alenia Aermacchi) is part of a bid with its M-346 Master. The company was offering a variant of the aircraft as the “Leonardo DRS T-100 Integrated Training System” for the competition. Alenia anticipated moving the final assembly location from Italy to the United States if it won the competition.



M-346 Master

Photo: Gian Marco Anzellotti

## Stavatti Javelin

Stavatti Aerospace announced on 31 March 2017 it submitted the Javelin for the T-X competition. The Javelin is a new single-engine, two-seat, military trainer jet and Very Light Fighter (VLF) aircraft derived from the Aviation Technology Group Javelin Mk-30.



Javelin

Ill. Stavatti Aerospace



Korean KAI T-50

Photo: Korean Air Force

## Lockheed Martin/KAI T-50 Golden Eagle

Lockheed Martin with Korea Aerospace Industries (KAI) proposed their KAI T-50 Golden Eagle, which first flew in 2002, for the T-X program. While the T-50 was explicitly designed and built for the South Korean trainer requirement, Lockheed Martin officials acknowledged that the aircraft was designed with replacing the Northrop T-38 Talon in mind. Lockheed and KAI proposed the T-50 with few changes in the avionics. In addition the proposed T-50 trainer had the ability for aerial refuelling,

Plans were in place to build a new assembly line in the United States for manufacturing the T-50 for the United States Air Force instead of manufacturing them in South Korea, should the Lockheed Martin/KAI team win the contract.

## Sierra Nevada/TAI Freedom

Sierra Nevada Corporation (SNC) and Turkish Aerospace Industries (TAI) were also considering offering a new aircraft for the T-X program based on TAI Hurjet trainer. The companies formed the Freedom Aircraft Ventures LLC in Centennial, Colorado to develop a lightweight, all-composite trainer for the competition.



TAI Hurjet

Photo: TAI

## Textron AirLand Scorpion

Textron AirLand, a joint venture between Textron

and AirLand Enterprises, developed the Textron AirLand Scorpion light attack jet which had potential as a candidate for the T-X program. Textron stated that with some modifications, such as swapping the two engines with a single engine and changing the wings, the aircraft would be an ideal match for the T-X role. However, in September 2015 Textron AirLand revealed it would not offer a version of the Scorpion for the program due to changing Air Force requirements, moving from a low-cost advanced jet trainer requiring little development to a high-performance trainer.



Textron AirLand Scorpion

Ill: Textron/Airwolfhound

## Northrop Grumman/ BAE Systems

Northrop Grumman with partners BAE Systems, L-3 Communications, and Rolls-Royce, initially had intentions of proposing an updated version of the Hawk T2/128 for the T-X program. Northrop Grumman assumed prime responsibilities for the team in 2014.

Although the basic Hawk (T1) design dates back to the 1970s, the only parts shared between the T1 and T2 versions are the canopy and airbrake, making the T2 version essentially a new aircraft. The Northrop Grumman team was expecting this to be a low-risk, low-cost strategy for the competition.

However, in 2015, it was reported Northrop Grumman had secretly begun a new clean-sheet design to closely match the evolving T-X requirements. On 19 August 2016 in Mojave, Northrop Grumman publicly revealed a model of its T-X concept powered by a single GE F404-102D engine. On 1 February 2017, the companies announced they would not submit a proposal for the T-X program.



Hawk T2/128

Photo: BAE systems



Northrop Grumman T-X concept

Ill: Northrop Grumman

# Den beste løsningen

AW101

Helikopteret AW101 er klasseledende i den mellomstore til tunge kategorien helikopter, og har fløyet mer 420.000 timer, i oppdrag over hele verden, fra Arktis til Antarktis.

Helikopteret er designet for å tilfredsstille de strengeste kravene til rekkevidde, nyttelast, ytelse og sikkerhet under de aller mest krevende forhold. AW101 har oppvist en effektiv rekkevidde på over 900 nautiske mil, kan etterfylle drivstoff i luften, kan frakte opptil 38 soldater på kollisjonssikre seter, og er utstyrt med det nyeste av instrumentering for å minimalisere pilotenes arbeidsbelastning og oppnå maksimal sikkerhet.

Kostnadseffektiv, livsløpsdekkende support er tilgjengelig sammen med omfattende brukeropplæring basert på bred operativ erfaring, for å oppnå effektiv drift og operativ suksess.

AW101 er inspirert av visjonen, kreativiteten og skaperevnen til den store mesteroppfinneren: Leonardo bidrar fremdeles til å skape morgendagens teknologi.

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The EMBT, or European Main Battle Tank. The EMBT combines the chassis of Germany's Leopard 2A7 tank with the turret of France's Leclerc. Photo: KNDS Group

# EUROPEAN MAIN BATTLE TANK

This summer, the French- German KNDS Group (Krauss-Maffei Wegmann + Nexter Defense Systems) presented the European Main Battle Tank, or EMBT. The EMBT combines the chassis of Germany's Leopard 2A7 tank with the turret of France's Leclerc.

As of today, the EMBT is a technology demonstrator, but with further development, the EMBT is according to KNDS a short-term response to the operational need of the market for high-intensity battle tanks.

Because the EMBT was put together from the components of existing vehicles, the prototype was completed less than three years after KNDS was formed.

The hull, engine and entire chassis comes from the Leopard 2A7 and were modified to host the compact and light turret with automatic loading from the Leclerc.

The standard Leopard 2A7 has a three-person turret armed with a manually loaded 120mm smoothbore gun, whereas the Leclerc turret is fitted with a 120mm smoothbore gun fed by a bustle-mounted automatic loader.

The Leclerc turret is lighter and more compact, which reduces the combined weight by six tons. This means that the lighter turret leaves about 6 tons of extra weight capacity that customers can use to carry additional equipment.

The chassis and turret were integrated at Nexter's facility at Roanne

(central France), where Leclerc production was originally undertaken.

The EMBT has undertaken mobility trials and firing trials with 22 rounds fired from the 120mm smoothbore gun.

According to French media, Italy has expressed interest in purchasing the EMBT.

## The Main Ground Combat System project

While the EMBT is just a demonstration project, it does position KNDS as a contender for the next European tank. France and Germany have since 2012 teamed up for the Main Ground Combat System, which will replace the Leopard 2 and Leclerc around 2035. But several commentators note that the date could well be brought forward, as the designs of both the Leclerc and the Leopard 2A are getting old, and at some point upgrading will no longer be an alternative.

France and Germany are also working on the Common Indirect Fire System, a self-propelled artillery piece that will replace the German PzH2000, a tracked 155-millimeter howitzer, and the French CAESAR, a wheeled 155-millimeter piece. ■

## 130MM TANK GUN

The German company Rheinmetall unveiled in 2016 a demonstrator of a 130mm smoothbore gun for a future main battle tank. According to the company, the increase of 8 percent in calibre results in a plus of 50 percent more kinetic energy over the 120mm gun from Rheinmetall, installed in thousands of tanks worldwide.

The 130mm gun, which was financed entirely by Rheinmetall, weighs more than 3.5 tons, compared to the approximately 3-ton 120mm gun, and uses a cartridge of more than 30 kilograms at about 1.3 meters long. Given these enhanced parameters, Rheinmetall believes the weapon can only be used with an automatic loader and a new turret design.

Since 2016, the 130mm demonstrator has been used in further development efforts. In a direct live fire comparison with the standard 120mm L55/L55A1, the energy and output were confirmed. The trials included firing against targets with modern armour.

The medium-term objective is the fabrication of an unmanned 130mm demonstrator turret featuring automated ammunition loader, intended not only for use in the Main Ground Combat System (MGCS) project, but which can also be offered as a combat performance upgrade to all Leopard 2 user nations.



130mm tank gun

Photo: Rheinmetall

# HEAVY MACHINE GUN FOR THE NORWEGIAN ARMED FORCES

The Norwegian Defence Material Agency (NDMA) is currently evaluating candidates for new 12.7 millimetre heavy machine gun (HMG) for the Norwegian armed forces.

The NDMA is planning on entering a 7-year framework agreement with a single supplier. The estimated volume is up to 1300 heavy machine guns, corresponding to the renewal of all 12.7 mm heavy machine guns in the armed forces' inventory. The first order under the framework agreement, however, will have an estimated maximum volume of 1100 units.

In addition, the supplier must commit to providing weapons and spare parts for a period of 15 years after the last order is placed.

## Ammunition

The new HMG must be able to use all standard 12.7 x 99 millimetre (Cal. 50) ammunition. As of today, Norway is mainly using NAMMO ammunition, including the NAMMO 12.7 mm Multi Purpose ammunition.

The Norwegian Armed Forces currently uses their 12.7 millimetre heavy machine guns on NM 152 (Vinghøg/Rheinmetall) soft mounts, Kongsberg RWS (Remote controlled Weapon Station)

Protector Nordic Mounts, and RWS Sea Protector Mounts. Candidates offering a machine gun that is adaptable to these mounts, can be expected to hold an advantage in the competition.

## The M2 Browning

M2 Browning 12.7 x 99 mm Machine Gun (Browning .50 Calibre Machine Gun) is a heavy machine gun designed towards the end of World War I by John Browning. It has a long combat history, and was much used during World War II, the Korean War, the Vietnam War, the Falklands War, the Soviet-Afghan War, the Gulf War, the Iraq War and the War in Afghanistan in the 2000s and 2010s. It is the primary heavy machine gun of NATO countries.

The M2 12.7 x 99mm Heavy machine gun in the Norwegian armed forces, commonly just referred to as the "twelve-seven", was manufactured from 1940 to 1993, based on an upgraded design from the 1930s. The rate of fire of the Norwegian version of the "twelve-seven" is 450-575 rounds per minute, and the maximum practical fire range is about 2000 meters.

## Possible candidates

The names of the companies competing for the Norwegian heavy machine gun contract have not been officially published.

However, over the years, a number of companies all over the world have been making 12.7 mm machineguns, mainly based on older designs. As of today, it is probably only a few companies that deliver upgraded and modern 12.7 mm machine guns.

Of these, the most likely European contender to the Norwegian contract is probably the Belgium based FN Herstal with their FN M2HB-QBC (QCB= Quick Change Barrel). FN Herstal has previously delivered light machineguns (MINIMI) to the Norwegian Army.

In the US, General Dynamics worked on an upgrading program for their 12.7 mm machine gun, but this program was terminated in 2012. That leaves the rather minor company Ohio Ordnance Works with their 0.50 m2hb QCB as a possible US contender for the Norwegian contract.

Outside NATO, the South Korean company S&T Dynamics has for decades been making the American M2 Browning Heavy Machine Gun under licence, named the K6 in Korea. The Koreans has in recent years done significant design upgrades on their K6 heavy machine gun. ■■



The FN Herstal M2HB-QBC is an example of a modern 12.7mm HMG.

Photo: FN Herstal

# MAUD MAY NOT REACH HOME FOR CHRISTMAS

The Norwegian Defence Materiel Agency is in the final stages of resolving the task we have been given with the procurement of the logistics ship “Maud”, and the vessel is nearing completion at the shipyard of Daewoo Shipbuilding and Marine Engineering in South Korea.

— **W**e are currently in the phase where we are running quality assurance to ensure that the vessel may be entered into operations with all safety and security issues well in hand, while also verifying that the vessel possesses the qualities and properties that are both required and contracted, says the head of Maritime Capabilities, Flag Commander Thomas T. Wødvang. – A sailing was done in September as a final stage of the test and verification programme, and the formal delivery of the vessel is expected to be made shortly after this.

– The Armed Forces will carry out the necessary training and check-out of personnel before the home voyage. We are confident that the Navy will be taking delivery of a very high-quality vessel that will offer the Navy and the frigates in particular greater operational endurance as a result of the enhanced provisioning capacity, both nationally and as a support vessel to NATO operations.

Soon after the takeover, the voyage home will begin, and the cruise is planned to take about 90 days. During the voyage home, testing of the vessel will continue, alongside training and exercising of the crew. The “Maud” will accordingly not arrive in Norway until about Christmas time. ■■



*The logistic vessel KNM Maud will be by far the largest ship in the Norwegian Navy.*

*Photo: Norwegian Navy*

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**Editor-in-Chief/Ansvarlig redaktør:**

M.Sc./Siv.ing. Bjørn Domaas Josefsen  
E-mail: b.josefsen@mil-tek.no

**Editorial Office/Redaksjon:**

Tel. (+47) 901 83 211

**Advertising Office/Annonser:**

Krokliveien 66, N-0584 OSLO  
Tel. (+47) 901 83 211

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