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Leading The Situational Awareness Revolution
“ENGINEERS UP!”

From bridge layers to mine clearance, earth moving to countering IEDs, the combat engineers are equipped with a range of vehicles, technology and skills to keep the fighting units focused on the fight, as Stephen W. Miller finds out.

Engineers can tear down as well as build. Engineers from the US Marine 9th Engineer Support Battalion dismantled a HESCO barrier at Firebase Saenz in Helmand province, Afghanistan, Dec. 14, 2012.

Andrew Drwiega reviews some of the highlights of this year’s Tri-Service Defence & Security Show (6-9 November), held in Bangkok, Thailand. The event was opened by Thai Defence Minister General Prawot Wongsuwon. The AMR team toured the show every day publishing the Bilingual Show Daily News.

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MAKE IN INDIA

REGIONAL MRO CAPABILITY NEEDS TO BE FIXED

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Andrew Drwiega reviews some of the highlights of this year’s Tri-Service Defence & Security Show (6-9 November), held in Bangkok, Thailand. The event was opened by Thai Defence Minister General Prawot Wongsuwon. The AMR team toured the show every day publishing the Bilingual Show Daily News.

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Emerging international defence equipment exporters were out in force at the Defence and Security Show in Thailand (6-9 November 2017). It was notable that some of the manufacturers taking the biggest displays were part of national groups from South Korea, Turkey, the Ukraine, as well as the more traditional players such as China, France, Germany, Israel, Russia, the United Kingdom and the United States.

The past dominance of western manufacturers is clearly being challenged by rising new players who are increasingly willing to team with other nations to provide new and alternative systems and to share technology.

Japan’s Acquisition, Technology & Logistics Agency (ATLA) was a newcomer to the D&S show. Following the lifting of the Japanese defence export ban on 1 April, 2014, the Japanese government issued its Three Principles on Transfer of Defence Equipment and Technology as a guide to foreign exports.

In what is described as ‘an increasingly severe security environment’, and while still pursuing the objective of ‘peace and stability of the international community’, Japanese defence manufacturers will be allowed to sell equipment overseas while also pursuing joint military development programmes. However, there will be strict controls regarding any transfers to third parties and equipment sold or developed in a way that guarantees Japan’s own security as well as that of its close allies.

One example of this was the recent decision to donate five turboprop Beechcraft King Air TC-90 training aircraft from the Japan Maritime Self Defense Force to the Philippine armed forces to assist in maritime patrol and security operations.

Aircraft in particular are at the forefront of this export effort, with the Japanese Maritime Self Defense Force Kawasaki P-1 maritime patrol aircraft appearing in the UK at the Royal International Air Tattoo for the first time in 2015, presenting itself as an anti-submarine warfare aircraft.

More recently, at the Dubai Airshow (12-16 November) which immediately followed the D&S Show in Thailand, the Japanese Ministry of Defence (MoD) sent the newly designed and very spacious Kawasaki C-2 transport aircraft. Talks were alleged to be under way regarding the potential purchase of the aircraft by the United Arab Emirates. Japanese government guidance at the moment as to which nations will be on the approved list and how quickly any potential sale can be pushed through is unclear.

Although the Japanese public remains actively against war, the launching of increasingly powerful missiles by North Korea over their country added to the creeping expansion of China, particularly where Japan is concerned in the East China Sea, becoming a catalyst to rebalancing public opinion.

Japanese industry will be more mercenary regarding access to international customers. It is hard to see how the current projected trickle of defence cooperation and sales will not turn into a torrent, particularly when profits begin to roll into the coffers of defence manufacturers, and the government sees its export figures climbing.

Andrew Drwiega, Editor

Editorial

FROM TRICKLE TO TORRENT

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Andrew Drwiega, Editor
THE VALUE OF
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Mines don’t recognize borders, nor should the most advanced mine hunting solutions. Only Northrop Grumman’s advanced AQS-24 family of sensors deliver unparalleled performance with complete adaptability. From hardware versatility (deployable from helicopter or unmanned surface vessel) to increased speed in mission execution, the AQS-24 is the future of mine warfare. That’s why we’re a leader in advanced undersea technology.
For all the might of main battle tanks and other fighting vehicles, their progress can be stopped or slowed without the skills and specialist vehicles deployed by engineers.

by Stephen W Miller

Combat arms are often the primary focus and priority of armies. Main battle tanks, fighting vehicles and artillery are at the top of the lists in acquisition budgets. Without doubt these systems provide the combat power that decides the outcome of a battle. However, these systems can be compromised by natural obstacles like rivers and ravines or by man-made ditches, mines, and even downed trees. The effectiveness of improvised explosive devices (IEDs) in Iraq and Afghanistan also demonstrated the disruptive impact that such inexpensive actions can have on a modern military force. The denial of mobility can have a decisive impact on the operations of today’s combat capabilities based as they are on vehicles, manoeuvre and firepower. The primary tasks of combat engineers and their specialised equipment is to either to assure friendly force freedom of movement or rob an opponent of their mobility. These critical contributions are often under appreciated. Yet, their work can provide the edge that can compensate for friendly numerical disadvantage, halt the opponent’s momentum, and position them for destruction by fire.

Engineers have been a military force multiplier since the Roman Legions. Their activities facilitate smooth and unhindered friendly movement overcoming natural and man-made obstruction, enhance protection with fortifications and obstacles and even support establishing military infrastructure. The difference today is that many of these tasks are accomplished by specialised equipment. Sometimes these are advances to allow missions to be completed more easily and rapidly, like modern river and gap crossing systems, while others are in response to challenges of new battlefield threats and technologies, such as the IED. It could be said that the commodity of the combat engineer is ‘time’. He is either seeking to buy time by delaying the opponent or to reduce the time needed by friendly force to undertake a desired action. Even force protection can be quantified in “time” as entrenchments make the enemy spend valuable time and effort to neutralise defensive positions.
Technology and innovation have provided improvements in the execution of a number combat engineer’s mission tasks in the areas of gap crossing, counter-mine/IED, and mobility assurance. Let’s examine each in detail.

**Gap Crossing**

Just as rivers and other water course, ravines and ditches can halt force manoeuvre, so to can the ready capability to overcome these same obstacle be a significant tactical and operational advantage. Robbing an opponent of their assumed protection, particularly if he is not anticipating it can provide the element of surprise and completely disrupt his defence. Likewise the force that can take these in stride with minimum delay can retain momentum and the initiative. The key is having gap crossing equipment that has both the ability to stay up with the manoeuvre force and to rapidly deploy. The faster the gap can be breached the less time the opponent has to react to oppose the crossing and the greater the crossing attacker’s advantage.

In tactical bridging, the Armoured Vehicle Launched Bridge (AVLB) has been around for many years. Usually these are based on a Main Battle Tank (MBT) chassis with the bridge carried on-top and launched using hydraulic cantilever or scissors design. The challenge for AVLBs today is the 10 to 15 ton increase of the latest combat MBTs. The Chrysler M60A1 AVLB spans an 18m gap for Military Load Classification (MLC) 60, however, the General Dynamics M1A2 Abram’s is MLC 72 and the Krauss-Maffei Wegmann Leopard 2 MLC 70. MLC represents a combination of factors that include gross weight, axle spacing, weight distribution to the axles, and speed. The US Army awarded a contract in August 2016 to Leonardo DRS to provide the JAB (Joint Assault Bridge). This takes the M1A1 hull with heavy (M1A2) suspension and integrates a hydraulic launcher system to deploy the existing AVLB MLB 85 Scissor Bridge. Users of the Leopard 2 MBT will able to use the Panzerschnebelbrücke Leguan from Krauss-Maffei Wegmann which uses the Leguan bridge modules from MAN on the Leopard 2 chassis. Its deployment has the bridge ‘sliding’ horizontally across the wet or dry gap keeping a low silhouette. It can deploy in under seven minutes a 26m or two 14m spans, as well as up to 40m using ‘overlapping track layings’. The Leguan design has also been adapted to the M60/M47 for the Spanish Armed Forces, Polish T91/T72 for the Malaysian Armed Forces and to 8x8 MAN and 10x10 Sisu Trucks.

Light armoured forces could be considered to have an even more vital requirement for mobile gap crossing since mobility is critical to their effective employment and survivability. Their light vehicles are also a design challenge for the mobile bridge designer. Three companies - Pearson Engineering in the United Kingdom, KMW in Germany and General Dynamics Land Systems have perfected assault bridges for the light/medium armoured vehicles. Pearson’s spokesperson shared that their “Bridge Launch Mechanism (BLM) allows Combat Vehicles to lay bridges without permanently changing the vehicle’s role.” They have demonstrated BLM on the Stryker 8x8 M1132 Engineer variant. The BLM is installed on the vehicle bow where ‘it retains close contact with the ground, reducing the load transfer onto the vehicle and providing launch stability.’ KMW has also shown a 12m MLC 40 bridge for Striker which can be emplaced in two minutes. The GD Rapidly Emplaced Bridge System is actually designed to provide a 13.8m MLC50 assault bridge that can be transported on a 10-12 ton 8x8 tactical truck or the General Dynamics Stryker or MOWAG Piranha III wheeled armoured vehicles. The US Army fields 20 of the later.

Truck launched bridges offer benefits of lower cost and upkeep but are generally limited to support roles. However, they do replace assault bridges which are typically recovered to accompany forward combat forces. The truck bridges allow follow-on forces to keep up. Russia’s Uralvagonzavod (UVZ) offers the TMM-6 which has a 17m scissor bridge on the rear of a MZKT-7930 8x8 truck. The TMM-6 has the capability of connecting up to six units to cover a 102m wet or dry gap in 50 minutes. KMWs Leguan is also provided in truck launched versions with the benefit of using a common bridge span set. It is fielded on the MAN 8x8 with Norwegian, Dutch and Singaporean Armed Forces and on the Sisu 10x10 for Finland. Truck mounted units have the additional advantage of being readily adapted to disaster response, in fact KWM offers a kit to cover the gap between the treadways for civilian traffic.

**Mine Clearance**

Mines and IEDs have surfaced as a primary weapon of insurgents against regular military forces. Detecting and clearing these are arduous and dangerous tasks for the combat engineer who has turned to technology and mechanisation for answers. Mass use of minefields to hinder an attack are usually covered by enemy fires which means breaching them must be accomplished quickly so as to reduce friendly losses. To facilitate this both special fixtures for fitting to combat vehicles and specialty mine clearance vehicles have been introduced.

Pearson Engineering offers a Jettson Fitting Kit that can be installed on medium armoured vehicles that then allows them to mount a number of front end attachments in the field. These include...
the Straight Obstacle Blade, Surface Clearance Device, and Lightweight Mine Roller which provide organic counter-obstacle capability to the combat units. Similar systems are also available for main battle tanks with rollers or ploughs attached to the bow. However, combat engineers utilise vehicles optimised for assault breaching and path clearance. The US Marines have the M1 Assault Breecher Vehicle (ABV) M1150. Using the chassis of the M1 Abrams MBT it has a front-mounted 4.5m wide plough and M58 MICLIC rocket propelled linear explosive charges that will clear an eight metre wide lane 100m long when fired and then detonated. It can also fit Pearson’s surface mine ploughs, combat dozer blades, rapid ordnance removal systems, and lane marking systems.

Singapore Technologies takes another approach in its Trailblazer Counter-Mine Vehicle (CMV). The 30 ton tracked chassis deploys a rotating cylinder forward with chains attaching hammer-shaped steel heads. These pound the ground like a giant harvester detonating any mines in a 3.2m path. It also has the Kinetics Route Indicator System (KRS) that automatically marks the cleared lane.

Uralvagonzavod carries on the traditional Russian emphasis on battlefield engineering with a line of both counter-mine and counter-mobility tracked vehicles. The BMR-3MA Vepr (Boar) mine-clearing vehicle fits mine-rollers, mine ploughs and electronic signal jammers (against radio controlled IEDs) on to an Uralvagonzavod T-72 MBT chassis. They also offer the GMZ-3M, also MBT based, which will mechanically lay mines automatically recording through its on-board positioning the location of each.

Counter IED & EOD

The expanding presence of the IED and the diversity of ways that it has been deployed have seen the development of specialised counter-IED vehicles. These are designed to provide specific tools to detect, identify, and neutralise IEDs while protecting the clearance team. The General Dynamics Buffalo is widely noted due its wide use in Iraq and Afghanistan. Its armoured Vee-hull provides blast and shrapnel protection while armoured windows offer an outside view. The interior contains blast absorbing seats, signal jammers, space for EOD robots, and controls for its nine metre robotic arm and claw. The arm has thermal and day video cameras allowing the crew to safely check a potential IED. The vehicle increasingly uses small robots which are deployed from the rear of the Buffalo and remotely controlled to a suspected threat. Around 800 Buffalo’s have been produced and fielded by over six countries.

Route clearance is a tedious task, often being accomplished by soldiers on foot with hand held mine detectors. This is slow, dangerous and exposes the unit to enemy fires. The CSI Husky Mk III and 2G Vehicles Mounted Mine Detector (VMMD) produced by DCD Protected Mobility changes this. They have a forward NIITEK’s VISOR 2500 Ground Penetrating Radar (GPR) to detect mines and explosives with an optional See-Deep Metal Detector Array, and both GPS navigation and path marking. Its running gear, Vee-hull and protection defeat high blast effects. Husky clears a 3m path of metallic and non-metallic mines and IEDs at speeds of up to 50km/h. Husky and Buffalo are often used together in route clearance teams.

Combat Earth-Moving

The ability to move earth and rock while under enemy fire is an important capability. It allows ditches to be filled, logs, rubble and obstructions to be cleared, and banks to be graded for laying bridges. Construction bulldozers do not have the speed or, even if armoured, protection levels necessary to work with combat vehicles. Dozer blades fit to MBTs offer a solution but for more complex tasks a dedicated engineer vehicle is needed. The MBT has provided the base for Rheinmetall Landsysteme to offer a number of such vehicles. A Rheinmetall spokes person described the latest Kodiak Armoured Engineer Vehicle 3 as “using the Leopard 2 it is equipped with a hinged arm excavator with a quick-change device allowing mounting other tools including such as a universal gripper, hydraulic hammer or concrete crusher. Its expandable bulldozer blade has an innovative cutting and tilt angle but can be replaced with a mine-clearing system”. This last consists of Pearson’s Engineer Mine Plough (EMP), Lane Marking System (LMS) and Demeter magnetic signature device. These optional tools give the AEV 3 the ability to fill a range of combat engineer missions.

Russia’s IMR-1 and -3 series provide...
a similar earth and obstacle removal role. They are base on the T-72 and T-90 MBT chassis respectively with a 360 degree rotating multipurpose telescopic crane and multi functional bulldozer blade/mine plough. The crane has a manipulator that can perform as a bucket, a pull/push shovel, a scraper, or to grab items like logs, stumps or other heavy items. The Polish Maszyna Inżynieryno-Drogowa (MID) Bizon based on the PT-91 MBT provides a similar capability for the Polish and Malaysian Armies.

Most armies which have numbers of MBTs have recognised the importance of being able to clear the way for the tanks and the value of combat engineer MBTs in this role. Such vehicles are widely offered based on almost every MBT fielded. The availability of relatively modern surplus AEVs also makes this relatively easy to accomplish. The Indonesian Army, for example, acquired three Pionierpanzer Dash formerly used by the Bundeswehr. Flensburger Fahrzeugbau has also developed the WISENT 2, a multi-purpose, Leopard 2 based armoured support vehicle designed to be converted between an Armoured Engineering Vehicle (AEV) and Armoured Recovery Vehicle (ARV) in only five hours. This is attractive to some armies and Canada, Qatar, Norway and the United Arab Emirates have all fielded the system.

The United Kingdom’s Royal Engineers have chosen to use a medium 30 tonne class Combat Engineer Vehicle for this role. The Terrier, as the spokesperson of the developer BAE Systems confirmed, “has a front high-capacity bucket that can be used to clear obstacles, dig trenches and grab items. It also has a side mounted telescoping excavator arm with 3 tonnes capacity at maximum reach.” The front attachment can also be changed to a mine plough. Terrier has greater protection than the FV180 Combat Engineer Tractor it replaces and can operate in 2m of water.

**Engineer Squad Vehicles (ESV)**

Combat engineer effectiveness on the battlefield is predicated on their application of special skills and capabilities when needed. Thus, they must be able to move with the force they are supporting where ever it goes. They must have equivalent mobility and protection, as well as, space for mine detectors, explosives, and other equipment. An approach to this has been to reconfigure armoured infantry carriers to the needs of the engineer team or squad. Industry innovation in mission equipment that can be added to existing vehicles, like Pearson’s Straight Obstacle Blade, have allowed these ESVs to become vital engineering capabilities in themselves, as well.

The US Army M1132 Stryker model is an example of today’s ESVs. It matches the Stryker ICV including its Protector (RWS) Remote Weapon Station but is configured specifically for the combat engineer squad and its tasks. It can mount Pearson’s blades and mine clearance devices and it has a support trailer for engineer equipment and materials. It can also tow the trailer version of the MICLIC.

“**Engineers Up**”

Combat engineers are often called upon when the situation deteriorates whether it is an attack encountering an unexpected obstacle, troops facing a possible IED, or increasingly following the devastation caused by a hurricane or flood. Their ability to quickly and effectively respond and take necessary actions to bridge a river, clear a route, or delay an opponent can be critical to success or failure on many battlefields. Advances in engineering vehicles have enhanced the combat engineer’s importance with today’s ground forces.
The massive attack of Russian cruise missiles KALIBR (CALIBER) against the ISIL targets in Syria taken in November, 2015, from the surface ships of the Caspian fleet resulted not only in a burst of interest of the media worldwide, but also in the burst of interest of potential customers. The specialists have been familiar with the export modification of the KALIBR missiles, known as the CLUB, for more than 15 years. The following Navy-operated missile complexes are well known in the global market:

- the «Club – S» complex to arm submarines including the 3M-54E or 3M-54E1 anti-ship missile (3M-54E is the one with a supersonic terminal stage), the 3M-14E land-attack missile, and the 91PE1 anti-submarine ballistic missile. These missiles are placed in a watertight capsule to ensure their launch from a torpedo tube of a submarine;

- the «Club – N» complex to arm surface ships including the 3M-54TE or 3M-54TE1 anti-ship missile (3M-54TE is the one with a supersonic terminal stage), the 3M-14TE land-attack missile, and the 91PTE2 anti-submarine ballistic missile. These missiles are placed in a transport-and-launch canister to ensure their launch from either vertical or tilted launcher of a carrier ship.

Besides, these anti-ship and land attack missiles have been modified for use from aircraft carriers (complex CLUB-A) and for use from mobile launchers of the coastal defense systems (Complex CLUB-M).

All the CLUBs incorporate a high-accuracy land-attack cruise missile destined to kill stationary or relocatable targets on the enemy’s territory within the operational range.

This missile is equipped with a powerful 450-kg high-explosive warhead and has a combined control system providing reticent flight along the prescribed route basing on the information from inertial navigation system updated using the GPS/GLONASS signals. The flight over land is routed minding the terrain folds, bypassing air defense zones, at minimal altitude, and approaching a target from the prescribed direction. The logic of missile use allows to cause maximum damage to the targets that are considered pin-pointed like separate buildings or structures, as well as to those considered area-spaced (like air or sea terminals, clusters of military equipment). Everything that millions of people could see on their screens for CALIBR two years ago the export version of the missile may also demonstrate.
The missile launch is possible from unprepared grounds having slope not more than 3 deg, at the altitude to 1500 m, at practically any weather. The launcher may be shifted from the travel to the combat position in 15 min; a salvo of full ammunition set at six different targets is possible. These design solutions are taken to ensure such crucial advantages as high mobility, autonomous and easy operation, minimal number of separate combat units and, consequently, minimal cost of the complex.

Every country going to acquire this or that armament should take into account a multitude of factors like geographical position, military doctrine, level of personnel, financial possibilities, etc. The CLUB OEM propose various options of the complex carriers and armament to let potential customers choose the one most adequate to their resource and requirements. Anyway, when the country has such a weapon, any aggressor will think twice.

The CLUB OEM is going to show their new proposal, the CLUB-T complex, at the GDA 2017 International exhibition in Kuwait, December 12-14, 2017. This complex includes only a land-attack missile now designated 3M-14E1. But with that, all the equipment necessary for routing, working out and input of flight mission, missile pre-launch preparation and launch, communication, etc., is placed on a self-propelled launcher together with six missiles in transport-and-launch containers.
Considering the cost of MRO over the lifetime of a platform, it is only recently that this vital capability is being built up in Asia Pacific.

by Beth Stevenson

Asia-Pacific nations are increasingly acquiring a host of modern military platforms which are not only more costly to buy and operate, but need a correspondingly higher financial investment to pay for their through life costs.

Maintenance, repair and overhaul (MRO) budget commitment is often also paralleled by the need for mid-life upgrades to keep the equipment serviceable and relevant, and many millions of dollars are spent supporting programmes through decades of operational life.

Asia-Pacific is becoming increasingly aware of the need for the provision of MRO capacity, and investment is being made to generate local support and repair providers.

The geography and weather of the Asia-Pacific ranges from high mountains where engines can struggle to operate, through to an abundance of maritime islands (offering high corrosion rates) with the temperature usually hot and humid. All this adds more burden to the equipment being operated there, so the maintenance of these systems is key to them being effectively ready for operational use.

Additionally, due to the nature of political relations in the Asia-Pacific, military exercises are often carried out, which almost always use operational equipment which further impacts on the operational life of the platforms in use.

Vehicle MRO

The military vehicle MRO market is expected to be worth $24 billion in 2017, with growth of 3.67 percent CAGR leading to an increase to $34.4 billion by 2027, according to a report by Research and Markets.

This demand is expected to be led by the Asia-Pacific, which will take a 27 percent share of the market, followed by North America with 25 percent.

The cumulative market for global spending on military armoured vehicles and their MRO contracts is expected to be around $312.8 billion over this time, the report adds, and this demand is being driven by border disputes and a number of modernisation programmes underway by countries across the world.

This market is mainly divided into main battle tanks (MBT), infantry fighting vehicles, armoured personnel carriers, mine-resistant ambush protected vehicles, light multirole vehicles, and tactical trucks.

MBTs will account for 30 percent of the market, driven by large scale programmes in countries including India, China, Pakistan and other nations in the Asia-Pacific region, witnessed recently in Thailand with Ukrainian and Chinese tanks.

India is one example of a nation with a drive to bring technology in-country. Its ‘Make in India’ campaign is aimed at boosting technology transfer and increasing skilled employment.

In order to maintain the fleets of equipment that have been identified by the Indian Ministry of Defence as key to upcoming requirements, including fighters, submarines, helicopters and combat vehicles, the maintenance of these systems will likely be done in country to meet both the demand of supporting large numbers of systems, and to keep work in India.
It was also reported in August that India was planning to launch a programme to upgrade its T-90 tanks to increase its lethality by adding a new missile to the vehicle.

Some 1,000 examples of the Russian-built tanks are due to be upgraded, but while New Delhi is in discussions with Moscow regarding the upgrade, it is understood that there is a move to transfer the work to India in order to rely less on outsourced support.

The work will involve replacing the incumbent INVAR missile system with a gun-launched missile, reports claim, in order to add more capability. It is also looking to re-engine the vehicle to a more modular propulsion system to make it more agile.

Out of the tank inventory India operates, an initial number were built in Russia, with further examples being built under licence in India. This move to transfer more technology in-country is both a sign of the push for more Make in India initiatives, plus an indication of New Delhi’s decision to rely less on Russian technology and support its programmes indigenously instead.

Furthermore, India is also looking to acquire a new light tank to bolster the fleet, which is believed to be a move to further protect its territory against China, as border tensions in 2017 began to mount during a stand-off between the two nations over a plateau of land claimed by both China and India’s ally Bhutan.

Reports began to surface in September 2017 that a new tank was being considered, which would be lighter (at around 22 tons) than the others operated by India. This was triggered by the appearance of Beijing’s testing of its new Xinqingtan light tank earlier in the year in Tibet. Whether this would be an indigenous light tank developed by the state-owned Defence Research and Development Organisation (DRDO) or a foreign purchase depends on the perceived urgency of the requirement.

If a conflict with China emerged, India would need an agile tank to tackle mountainous terrain. Should India proceed with the foreign acquisition, technology transfer would be sought.

A relatively new player to this market, Japan has expressed an interest in setting up an MRO facility in India to support a potential buy of between 12-18 of its ShinMaywa US-2 amphibious search and rescue aircraft, as well as manufacturing parts in country, which would also cover exports should they come about.

China’s Power Projection

China has one of the strongest regional defence industries, and MRO is not missing from its priorities. It is also looking to influence its neighbours through defence investment to achieve its strategic aims.

In February, it was reported that Beijing had financed a new MRO facility in Cambodia, which is seemingly a political push for the nation.

Cambodia is a key allied target for China, which has an uneasy relationship with its neighbours and the United States. To this end, China has funded and transferred technology to Cambodia and the MRO facility is adding to this trend.

An example of a technology transfer was the delivery of 26 military trucks – alongside 30,000 uniform sets - to Phnom Penh in 2014, the former of which are likely to come under the remit of the new MRO facility.

A handover ceremony was held for this at the Trucking Battalion No. 99 facilities just outside Phnom Penh, during which the offerings were donated to the Royal Cambodian Armed Forces.

“China hopes that the aid will help ease the difficulties of the Royal Cambodian Armed Forces, and will further promote ties and cooperation between the armies and peoples of the two countries,” Bu Jianguo, Chinese ambassador to Cambodia said at the time, according to the Chinese MoD.

Australia, meanwhile, is carrying out its Land 400 programme, which is looking to modernise the nations’ combat vehicle capability under an $3.7 billion (AUS $5bn) effort.

Land 400 will provide the army with a combat reconnaissance vehicle (CRV), infantry fighting vehicle (IFV), manoeuvre support vehicle (MSV), and an integrated training system (ITS).

The replacement of the current fleet arguably raises questions about how MRO is carried out at present, as the vehicles are facing obsolescence issues that affect their ability to operate.

The main priority for the army is to replace its Australian Light Armoured Vehicle (ASLAV) fleet with 225 CRV under Phase 2 of the programme. This is due to obsolescence factors that the Australian Defence Force (ADF) describes as constraining tactical employment and increasing the cost of ownership: “These obsolescence factors cannot be mitigated through upgrade and without replacement starting in 2020, a capability gap will result”.

The IFV, meanwhile, will begin to replace the legacy M113AS4 armoured personnel carrier in 2025. The M113AS4 life of type is expected to continue until 2030, but it is not deemed fit for purpose due to its unsuitability against current and emerging threats, and it is not expected to be deployable for anything other than low intensity/low risk missions beyond 2025, according to the Australian MoD.

A significant element of the work is centred around industrial development in Australia, with both contenders for the current ASLAV replacement phase of the programme teaming with Australian industry and developing manufacturing and maintenance facilities locally.

One team pitching for the replacement comprises BAE Systems Australia, BAE Systems Hägglunds, and Patria Land Systems, which together is offering the AMV35 CRV. Besides the vehicle itself, at the heart of the team’s offering is the manufacturing facility, which would be located in Victoria, and will provide some 200 jobs.
Maintenance and repair capacity is being extended to support the Vietnam People’s Air Force Su-27s and Su-30s at Workshop 6, Factory A32 in Da Nang, Vietnam.

It would consolidate BAE’s maritime, aerospace and land businesses into one facility, and would initially cover manufacturing and simulation and training, but the plan would be to evolve it to cover the upgrade and maintenance of the vehicles over their lifespan that is expected to last around 30 years.

The company announced its plans for potential development of the site in August 2017, saying it would be based at Fishermans Bend in Victoria.

“Victoria’s defence industry is recognised for its world class capabilities and the companies that we have selected as partners have proven experience and leading-edge manufacturing capabilities,” BAE Systems Australia CEO, Glynn Phillips, said.

“Australian production, future upgrades and support of these world class vehicles will create long-term jobs and deliver strong, sustainable economic benefits throughout the community.”

In June 2017, BAE announced that it had signed contracts with Victorian defence industry companies worth $200 million, including Marand, MOOG Australia, Motec, AME Systems, RUAG Australia, DVR Engineering, Milspec and APV. They would participate in the M113AS4 replacement programme if selected.

BAE would use the site as the central point for land programmes for Canberra, plus potential exports in the future. The company is also the OEM of the M88 Hercules recovery vehicle, M777 155mm, 39mm towed gun, and the M113 armoured personnel carriers, all of which are operated by the ADF. It will additionally develop autonomous systems, electronic warfare technology, hypersonics, and systems such as the Nulka ship-based decoy.

BAE points to its naval sustainment business that provides MRO for the Royal Australian Navy’s ships as an example of how it can manage MRO support for the ADF.

The other contender for the Land 400 programme, Rheinmetall, is also putting plans in place to manufacture and support its Boxer CRV. It will base the work in Queensland if awarded the contract, which would provide 450 long-term jobs over the next decade.

In July 2017, it was announced that Rheinmetall Defence Australia would establish an Australia-New Zealand headquarters and a manufacturing and vehicle maintenance facility in South East Queensland.

Of the 225 CRV expected to be procured under this phase of the programme, 100 of these vehicles are expected to be located at the Townsville and Enoggera bases, both in Queensland.

“If it wins, Rheinmetall has committed to design, manufacture and maintain its Boxer CRV vehicle, as well as its existing defence manufacturing and maintenance business, in Queensland,” said Curtiss Pitt, Queensland treasurer and minister for trade and investment.

He added that the defence industry employs some 6,500 Queenslanders across the state, generating in excess of $3.17 billion (AUD $4.2bn) annually.

“Clearly this is big business for our state and we’re well equipped to meet the future requirements of the major global defence industries and that’s why we’re confident we can bring the contract to Queensland,” he added.

In order to supply the Boxer CRV to the army by 2022 if selected, Rheinmetall will have to complete the manufacture and MRO facility by mid-2020. A contract for this phase of the programme is expected to be awarded in the first half of 2018.

Regarding aircraft, on 29 August 2017, Elbit Systems announced that it had been awarded a contract worth some $123 million (£93m) to upgrade and overhaul a Northrop F-5 fleet. The Thai Air Force has had such a requirement and since 2015 has already upgraded 10 aircraft to F-5E Tiger IIs, completed in 2017.

Over a three-year period, Elbit has revealed that it will provide ‘cutting edge systems’ including head-up displays, an advanced cockpit, radars, weapon delivery and navigation systems, plus the Display and Sight Helmet System (DASH) IV head-mounted systems. This is leveraged on previous experience gained in upgrading F-5 fleets.

“We are proud to have been selected to perform this upgrade programme, building on our vast know-how and experience in F-5 modernisation projects,” explained Yoram Shmuely, Elbit Systems Aerospace Division’s general manager.

“We have witnessed a growing demand for similar upgrades, and we trust that further customers will follow, benefiting from a mature aircraft upgraded with the most advanced technology in the market.” Other Asia-Pacific operators of the F-5 fighter include Malaysia, Singapore, South Korea, Taiwan, Vietnam and the Philippines.

Vietnam seems to be following India’s lead in moving away from dependence on Russian support for its fleets, as Russia tries to shake its reputation for insufficient support of technology that it has transferred into the region.

The Vietnam People’s Air Force has sought the assistance of Ukraine to help bolster its A32 factory, reports claim, which will further the ability of the nation to support its own Sukhoi fighter fleets in country. The A32 was established so that Vietnam did not have to rely on overseas MRO of its fleets.

Defence sales to the Asia-pacific have for some time relied on a willingness from industry to embed development in the countries it is selling to, and this logically extends to the maintenance and support of the systems. However, to date this has focused mainly on older systems without higher technology.
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The demand for relatively lower cost trainer / light attack aircraft in Asian Pacific has been an attractive proposition to countries needing to upgrade legacy aircraft while providing dual-mission capability.

by Justin Bronk

The combat airpower market in the vast Asia Pacific region has been characterised by two major trends in the past decade and a half. The first is the success of the Russian Sukhoi Su-27/30/35 Flanker family of heavy fighters, and the second is an explosion of demand for cheaper aircraft which can perform the dual function of fighter lead-in trainer and light attack aircraft. Light combat aircraft such as the Yakovlev 130 / Aermacchi M-346, BAE Systems Hawk 208/9 and KAI T-50 have found great success amongst the smaller air forces in Asia Pacific. For many nations which face internal insurgencies, and whose armed forces are generally organised for relatively low level combat operations, light combat aircraft make ideal candidates to exercise airpower in the region.

In general, light combat aircraft are characterised by high subsonic speeds, significantly smaller size and lower operating costs when compared to frontline fast jet types, and the ability to employ an impressive arsenal of high tech air-to-ground and sometimes air-to-air weaponry from multiple external hardpoints. Since most are derived from lead-in fighter trainers, they typically possess forgiving flight characteristics and are designed to be intuitive for new pilots to master, which reduces training burdens and contributes to keeping accident rates lower than for the majority of their supersonic fast jet counterparts. However, on the flip side they are unable to offer the aerial deterrence capabilities of true fast jets against potential state opponents being too slow, unable to fly at extremely high altitudes, mount powerful radars or manoeuvre successfully with fast jets in a within visual range combat scenario.

Part of the reason, therefore, why light combat aircraft have proven so successful in recent years in the Asia Pacific defence market is the downgrading of many smaller nations' requirements for defence capabilities against their neighbours in traditional high end warfighting scenarios. Overwhelmingly, the rise of China as a modern military powerhouse aiming to compete directly with the might of the United States for influence in the region has forced many smaller nations to accept that conventional military defence capabilities are likely to be of little use if they ever found themselves on the receiving end of Chinese (or American) military pressure. At the same time, insurgencies have continued to be a thorn in the side of many regimes and insurgent groups have been able to leverage many advantages from advances in portable weapons systems technology and ‘crowd-sourced’ ISR capabilities in the form of ubiquitous mobile phones. This has fuelled demands for airpower capable of supporting ground forces or even conducting punitive strikes without needing to place ground forces at direct risk in extreme cases. Traditionally, helicopters have tended to fulfil this role better than fixed wing aircraft in lower intensity conflicts, but MANPADS proliferation especially from China and North Korea has made rotary winged assets more vulnerable than in previous decades.

BAE Systems Hawk 200 Series

At the proven, traditional end of the Light Combat Aircraft spectrum is the BAE Systems Hawk 200, a single seat attack-orientated derivative of the extremely successful Hawk T.1 lead in jet trainer. The Hawk 208 is the version designed to Royal Malaysian Air Force (RMAF) requirements and the Hawk 209 for the Indonesian Air Force. Both contracts were delivered during the 1990s and orders were for 18 Malaysian and 36 Indonesian aircraft.

The Hawk T.1 has long offered customers limited combat capabilities in addition to the aircraft’s primary role as an advanced fast jet trainer. The combination of excellent subsonic agility, good fuel efficiency and adequate load carrying capabilities on a low cost and reliable platform has ensured the basic Hawk airframe has seen huge export successes and the Asia Pacific is no exception. The most significant change made to create the Hawk 200 light combat aircraft series was that the front cockpit usually provided for student pilots was replaced by a new nose section containing a combat-oriented avionics suite including a slightly smaller derivative of the F-16 Fighting Falcon’s AN/APG-66 multimode pulse doppler radar and a Forward Looking Infra-Red (FLIR) sensor.

Upgraded fire control computers and enhanced hardpoint provision on the Hawk 200 allow the carriage and employment of a variety of potent Western air-to-air, air-to-surface and anti-ship weapons including the Sting Ray Torpedo, Paveway II laser guided bombs, AGM-65 Maverick anti-armor missiles, AIM-9 Sidewinder and AIM-132 ASRAAM heat seeking air to air missiles and radar-guided AIM-120 AMRAAMS. Perhaps just as importantly, the Hawk 200 comes equipped with a radar warning receiver (RWR) to allow it to detect potentially hostile radar signals, and chaff and flare dispensers to help decay incoming missile threats. These allow what was previously a trainer with limited combat capabilities to potentially operate not only in the face of reasonably well equipped insurgent forces at less serious risk than either rotary winged gunships or more ad-hoc armed trainers due to its flexible weapons fit and defensive aids, whilst still at a much lower cost than a traditional fast jet equivalent.

The Royal Malaysian Air Force (RMAF) uses its fourteen Hawk 208s for airspace patrols and enforcement work alongside its eight F/A-18D Hornets, 18 Su-30MKM Flankers and 10 Mig 29N/UBs. They have
proven useful for providing additional combat capabilities at limited cost, serving in No.6 and 15 Squadrons, both of which also operate the two-seat Hawk 108 trainer. Given the relatively small fleet sizes of the RMAF’s larger fighters, part of the Hawk 208’s value has been in reducing airframe fatigue burdens on the larger fighters. Five of the Hawk 208s also provided the backbone of airstrikes against Filipino insurgents occupying Tanduo in Lahad Datu district in March 2013, dropping unguided bombs and firing rockets to soften up insurgent defences ahead of a successful ground assault by Malaysian security forces.

**Alenia Aermacchi M-346 Master/Yakovlev Yak-130**

The M-346 and Yak-130 are derivatives of a common airframe design developed Alenia Aermacchi and Yakovlev between 1992 and 2000. The final production aircraft are extremely similar in terms of capabilities, airframe shape and export focus on the trainer/light combat aircraft niche. The Yak-130 entered service in 2010 and the M-346 in 2015 so both are excellent examples of the most recent trends in this aircraft category. The airframe design chosen for both aircraft combines excellent subsonic agility, low wing loading, twin non-afterburning high efficiency turbofan engines, large high visibility canopy over a twin-seat cockpit and 6000lb-class payload capacity on multiple hardpoints stressed for combat manoeuvres. Both incorporate modern glass cockpits designed to mimic those on the latest generation of frontline fighter aircraft, extremely capable fly-by-wire control systems and large leading edge wing root extensions (LERX) which, along with significantly better thrust to weight ratios, allow for controllability at much higher angles of attack compared to previous generations of lead-in jet trainers/light combat aircraft. The LERX also contributes to the aircrafts’ stability in flight even with relatively heavy ordinance loads relative to their small size.

Heavily marketed in the Asia Pacific, the M-346 has been acquired by the Republic of Singapore Air Force (RSAF) and the Yak-130 by the Bangladesh Air Force and Myanmar Air Force with more orders anticipated for both types as nations throughout the region look to replace their ageing F-5 Tiger IIs, Hawks, A-4 Skyhawks, L-39 Albatross and other similar types. The ability to be rapidly converted from their primary role as advanced jet trainers to light combat aircraft has been designed into both the M-346 and Yak-130 from an early stage of development, and the modern glass cockpit and electronics designed to accurately simulate the latest frontline fast jet types lend themselves well to the integration and use of a huge variety of precision guided munitions, air-to-air missiles and gunpods. Both aircraft can be equipped with defensive aids and the M-346 even incorporates duplicates of all main systems for redundancy along with the adaptive flight control profiles to help the aircraft sustain accidental or combat damage in flight and return safely to base. However, both are also the basis for dedicated light combat aircraft conversions despite their already impressive combat potential in their basic form.

Alenia Aermacchi has developed a prototype dedicated light combat aircraft designated the M-346F (Fighter Attack) which incorporates a new Grifo-346 radar, enhanced payload capability, radar cross section reduction features, tactical datalinks and defensive aids as standard. It is being specifically marketed in the Asia Pacific market as an aircraft capable of performing 90% of the functions of a full size supersonic fast jet but at a fraction of the operating and acquisition cost. Whether it, or any of the proposed light attack variants of the Yakovlev version such as the abortive Yak-131 find success in the region is still an open question but the success found by the final aircraft examined in this article suggest that their chances are good.

**Lockheed Martin/ KAI FA-50 Golden Eagle**

The KAI FA-50 Golden Eagle, developed for the Republic of Korea Air Force (ROKAF) in cooperation with the US defense giant Lockheed Martin, is at the upper end of the light combat aircraft spectrum – close to being a fully-fledged fast jet.

The KAI FA-50, developed for the Republic of Korea Air Force (ROKAF) in cooperation with the US defense giant Lockheed Martin, is at the upper end of the light combat aircraft spectrum – close to being a fully-fledged fast jet.
The Tri-Service Defence and Security Exhibition in Thailand ran 6-9 November at the Impact facilities in Bangkok. Here is a quick pictorial review of some of the show highlights.

by Andrew Drwiega

Thai military automotive Chaiseri revealed its upgrade package for the 4x4 Condor armoured vehicle which is in service with the Royal Thai Army and Malaysian Army. Chaiseri, which is partnering with Malaysian defence firm Deftech, showcased an armoured personnel carrier variant of the Condor that was enhanced at its main factory in the Pathum Thani province.

The Chaiseri stand with its range of armoured vehicles was one of the most impressive at the D&S Show.
The upgraded vehicle has a slightly increased combat weight of 14 tons, but is fitted with a new and more powerful 300hp powerpack providing a power to weight ratio of 21.5 hp/ton and a combat range of 600km. An improved air conditioning unit ensures that the three-person crew and seven passengers remain in optimal fighting condition. Additional armour protection as well as 76 mm smoke grenade launchers have been installed for increased survivability, while an optional automatic fire suppression system can be installed to enhance crew safety. The upgraded Condor is shown with a Chaiseri-developed manned turret armed with a six-barrelled minigun.

China North Industries Corporation (NORINCO) showed one of its VT4 main battle tanks (MBT), 28 of which are now being delivered to the Royal Thai Army thanks to a $147 million contract. The army also agreed to acquire a second batch of 10 VT4 MBTs in April 2017 for $60 million with these expected to be delivered in 2018. It is also expected to acquire a third batch of 11 tanks to take the full order to 49.

On of the most impressive stands was the Thailand Ministry of Defense’s Defense Technology Institute (DTI) display of unmanned aerial vehicles (UAVs). The DTI has a primary mission to research and develop large-scale military equipment for the Armed Forces and national security units paving the way for Thailand’s defense industry on the road to sustainability and self-reliance. UAS technology is one of the key targets included in a seven-year project stared in 2013 resulting in the development of a range of unmanned aerial systems.

Israel Weapon Industries (IWI) launching its new Tavor 7 rifle, a 7.62x51mm caliber weapon that is the newest member of its Tavor Bullpup rifle family. It is adapted for both military and law enforcement markets. The weapon will be available from the first quarter of 2018.

Finally, as you can see from the picture, the Asian Military Review team and I fully enjoyed producing four issues of the Tri-Service Asian Defense & Security Bilingual Show Daily.
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Conference: May 7\textsuperscript{th}, 2018
Exhibition: May 8\textsuperscript{th} - 10\textsuperscript{th}, 2018

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Pakistan has been fighting one war while preparing for another. It is keen to point out that its war with terrorism internally has been costly to both the military and civilians, and it has never taken its eye of what it perceives as the bigger threat, India.

by Brian Cloughly

President Trump’s ‘Remarks on the Strategy in Afghanistan and South Asia’ of 21 August, 2017 were regarded unfavourably by Pakistan. The government, opposition politicians, media and the army reacted forcefully to Mr Trump’s observation that the United States could “no longer be silent about Pakistan’s safe havens for terrorist organisations. We have been paying Pakistan billions and billions of dollars, at the same time, they are housing the very terrorists we are fighting . . . that must change immediately.”

Official refutation by Pakistan’s foreign ministry included the averral that “No country in the world has suffered more than Pakistan from the scourge of terrorism, often perpetrated from outside our borders. It is, therefore, disappointing that the US policy statement ignores the enormous sacrifices rendered by the Pakistani nation in this effort.” The National Assembly, in a rare show of cross-party unity, declared that it “unanimously rejects the unacceptable targeting of Pakistan by US President Trump.”

In a media release the Chief of Army Staff (COAS), General Qamar Bajwa, said “We have done a lot towards (achieving peace in Afghanistan) and we are fighting . . . that must change immediately.” COAS, General Qamar Bajwa, said “We have done a lot towards (achieving peace in Afghanistan) and we are fighting . . . that must change immediately.”

Accordingly, Pakistan’s defence posture, force structure development, and equipment procurement continue to focus on what it regards as its major threat. The Pakistan Navy (PN), long the most neglected service, is to receive four Chinese F-22P frigates being built in Pakistan. Other major acquisitions involving China include eight Type-054A/Type-041 submarines, of which four are to be built in Karachi, as are six Type-022 Houbei stealth catamaran missile boats and four Azmat Class fast attack craft of which the third was commissioned in July 2017. Under an agreement of June 2016 the PN’s three Agosta 90B (Khalid Class) submarines are being upgraded se-quentially by Turkey’s Savunma Teknolojileri Mühendislik ve Ticaret (STM).

SUICIDE BOMBINGS

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(“To August 17”)

Source: South Asia Terrorism Portal (India)
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The army continues to develop the al Khalid tank in conjunction with China, and in November 2016, a $600 million agreement was signed with Ukraine for supply of 200 engines and for technical support in maintenance and modernisation of other tanks and armoured vehicles. Among other Chinese equipment developed and manufactured in Pakistan are the HJ-8 ATGW system, the Type 54 heavy machine gun, and NORINCO's A-100 MLRS. All its 250 self propelled 155mm artillery guns are USA-supplied M109s or M110s, and most of its heavier towed artillery is similarly sourced.

The Pakistan Air Force (PAF), with 7 F-16s, had hoped to acquire a further two single-seat F-16C and six twin-seat F-16D Block 52 aircraft, but although it had been agreed that Pakistan would contribute only $270 million of their cost, with the remaining coming from US Foreign Military Financing (FMF), in May 2016 the State Department advised that Pakistan would have to put "forward national funds" for the purchase, after Congress objected to the FMF subsidy. It appears that the arrangement had lapsed, although in March 2017 the CAS said that talks with the US were continuing. The US is, however, abiding by the 2015 agreement to supply the army with 12 Bell AH-1Z Viper attack helicopters under FMS terms. A statement from Bell Helicopter confirmed that "the award for the 12 AH-1Z Vipers is a government to government transaction between Pakistan and the US as part of a Foreign Military Sales (FMS) Block 5-5 agreement to support the Pakistan Army with the world’s most advanced attack helicopter, the H-1, to aid Pakistan's national defense." In August 2017 the PAF accepted a request to provide two additional Turkish F-16s to support the Pakistan Army against the world’s most advanced attack helicopter, the H-1, to aid Pakistan's national defense. In August 2017 the PAF accepted a request to provide two additional Turkish F-16s to support the Pakistan Army against the world’s most advanced attack helicopter, the H-1, to aid Pakistan's national defense.

Although Airbus Helicopters (formerly Eurocopter) had been in discussions with the Pakistani Navy because it did not wish to be included, the arrangement fell through because the US must give pre-approval for any third party involvement in use of the aircraft, and declined to do so. As noted in the Asian Military Review in March 2017, Pakistan's Aviation Corps is acquiring eight Airbus H-125M Fennec armed reconnaissance helicopters to complement the US-supplied Vipers. Although Airbus Helicopters (formerly Eurocopter) is multinational, it is headquartered in Marseilles and the French government exercises considerable influence on its commercial activities. It thus appears that the comment by French defence minister Gerard Longuet in India in May 2011 that his country had decided to cease sales of military equipment to Pakistan because it did not wish to be regarded as "feeding Pakistan's military ambitions" may have been erroneous.

As noted in the Asian Military Review in March 2017, the PAF's aviation corps is acquiring eight Airbus H-125M Fennec armed reconnaissance helicopters to complement the US-supplied Vipers. Although Airbus Helicopters (formerly Eurocopter) is multinational, it is headquartered in Marseilles and the French government exercises considerable influence on its commercial activities. It thus appears that the comment by French defence minister Gerard Longuet in India in May 2011 that his country had decided to cease sales of military equipment to Pakistan because it did not wish to be regarded as "feeding Pakistan's military ambitions" may have been erroneous.

Although not as well-equipped as they would wish (especially the navy, although this will improve over the next decade), the armed services are competent and well-trained, and the army and air force are capable of a modest degree of interoperability. The major shortcoming lies in the highest command echelon because, as in India, there is no one person appointed with command responsibilities over all military forces. The Joint Chiefs of Staff Committee, chaired by the Prime Minister, the Defence Ministers and the Chief ministers of military forces is the apex body responsible for the formulation of military strategy and for the integration of military resources to respond to domestic and international threats.

Nevertheless, as noted in the Asian Military Review in March 2017, the PAF's Aviation Corps is acquiring eight Airbus H-125M Fennec armed reconnaissance helicopters to complement the US-supplied Vipers. Although Airbus Helicopters (formerly Eurocopter) is multinational, it is headquartered in Marseilles and the French government exercises considerable influence on its commercial activities. It thus appears that the comment by French defence minister Gerard Longuet in India in May 2011 that his country had decided to cease sales of military equipment to Pakistan because it did not wish to be regarded as "feeding Pakistan's military ambitions" may have been erroneous.

Although the army's focus on counter-terrorism operations has been a major factor in its efforts to develop modern weapons, the army continues to develop the al Khalid tank in conjunction with China, and in November 2016, a $600 million agreement was signed with Ukraine for supply of 200 engines and for technical support in maintenance and modernisation of other tanks and armoured vehicles. Among other Chinese equipment developed and manufactured in Pakistan are the HJ-8 ATGW system, the Type 54 heavy machine gun, and NORAIO's A-100 MLRS. All its 250 self propelled 155mm artillery guns are USA-supplied M109s or M110s, and most of its heavier towed artillery is similarly sourced.
LOGISTICAL LEGACY LEAVES ROOM FOR CHANGE

Although a market with traditionally low numbers, there are plenty of airframe manufacturers ready to react to any gap in the military freighter market.

by David Oliver

The world’s most successful post-war cargo/transport aircraft, the Lockheed Martin C-130 Hercules, first came to prominence in the Asia-Pacific region was when it was used for ‘hauling ass and trash’ in support of United States (US) forces during the Vietnam war. More than 2,600 have been built since the first C-130A was delivered to the United States Air Force (USAF) 60 years ago.

In the Asia Pacific region the Hercules remains in service with 15 air forces as multi-role medium transports. However, many of these aircraft are approaching obsolescence, with only the Royal Australian Air Force (RAAF), which incidentally was the first export customer for the C-130A in 1958, and the Indian Air Force (IAF) and the Republic of South Korea Air Force (ROKAF) operating the latest C-130J variant.

First flown in April 1996, the C-130J is powered by four 4,591shp (3,424kW) Rolls-Royce AE 2100D3 turboprops fitted with Dowty Aerospace R391 six-blade composite propellers and Lucas Aerospace FADEC, which provides 29 percent more take-off thrust and are 15 percent more fuel efficient. The standard complement for the two-man crew C-130J-30, as supplied to Australia, India and South Korea, is 128 troops, 93 paratroopers, 97 stretcher patients plus four medical attendants, or 79 passengers on palletised airline seating. The C-130J-30 can carry a maximum payload of 11,000lb (5,000kg), 1,800 nautical miles (nm), 3,334 km. However, at a reported price tag of more than $60 million, many nations have decided to downsize when looking for early C-130 replacements with the twin-turboprop Airtech CN-235, Airbus Defence & Space C-295 and Lockheed Martin C-27J Spartan as the leading contenders. The former is the clear winner with seven Asia-Pacific countries operating the latest CN-235M which first flew in November 1997, is in service with the Indonesian Air Force (Tentara Nasional Indonesia-Angkatan Udara, TNI-AU) and Philippine Air Force (PAF), the Royal Thai Army and the Vietnamese People’s Air Force (VPAF). Powered by two 1,750shp (1,305kW) General Electric CT7-9C turboprops, two-crew it can transport 71 troops or 24 stretchers with four medical attendants, or 20,400lb (9,250kg) of freight over a 1,335 miles (2,150 km) range.

Developed from the FIAT G222 short-take-off and landing (STOL) medium transport by AlemiaAermacchi and Lockheed Martin, the now Leonardo twin-engine C-27J Spartan has only attracted two Asia-Pacific customers, the RAAF and the Republic of China Air Force has accommodation for up to 57 fully equipped troops, or 18 stretchers with two medical attendants. It can carry a maximum payload of 13,117lb (5,950kg) over a range of 394nm (730km).

A stretched derivative of the CN-235M is the C-295 which first flew in November 1997, is in service with the Indonesian Air Force (Tentara Nasional Indonesia-Angkatan Udara, TNI-AU) and Philippine Air Force (PAF), the Royal Thai Army and the Vietnamese People’s Air Force (VPAF). Powered by two 2,645shp (1,972kW) Pratt & Whitney Canada PW127G turboprops, with two-crew it can transport 71 troops or 24 stretchers with four medical attendants, or 20,400lb (9,250kg) of freight over a 1,335 miles (2,150 km) range.

The Indian Air Force has ordered the last Boeing C-17A Globemaster III built to add to its fleet of 10 airlifters, eight of which are operated by the RAAF.
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Force (ROCAF). With a two-pilot crew the C-27J is capable of accommodating a maximum of 68 fully equipped troops or 46 paratroops, while the cargo version can carry up to 22,000lb (10,000kg) of freight with a maximum range of 1,150 miles (1,850km). The C-27J is powered by two 4,635shp (3,458kW) two Rolls-Royce AE 1200D2 turboprops giving it a maximum speed of 314kts (583 km/h), is able to land in only 1,110 feet (340m).

However, these three types are facing new competition from Brazil. The Embraer KC-390 twin-jet tanker transport is being developed for the Brazilian Air Force (Força Aérea Brasileira, FAB) and in June this year completed a 10-country demonstration tour that included Malaysia, Australia and New Zealand. The KC-390 is a multi-mission aircraft with a rugged design to withstand operations from semi-prepared and damaged runways, as well as in harsh environments, varying from the hot and humid Amazon forest down to the freezing cold Antarctic continent, as well as in hot and sandy desert conditions.

Cruising at 533kts, Embraer claims that the KC-390, powered by two 31,330lb (14,214kg) International Aero Engines (IAE) V2500-E5 two-shaft high-bypass turbofan engines, is capable of delivering more payload faster than any airplane in the medium airlift market. It can carry 80 fully equipped troops, 66 paratroopers or 74 stretchers with eight attendants and with a 50,700lb (23,000kg) cargo payload, the KC-390 has a range of 1,500 miles (2,440 km). The aerodynamic configuration has been designed to reduce drag delivering high speed and high altitude cruise capabilities as well as providing enough lift for low speed operations such as helicopter aerial refueling and short airstrip operation.

In the tanker role, it can conduct day and night aerial refueling capability with the aid of observer windows and night vision cameras. The KC-390 will have provision for under wing Cobham 912E aerial refueling pods each of which provides a fuel transfer of up to 400 US gallons per minute. Removable auxiliary fuel tanks can be installed in the fuselage to expand the aircraft fuel of load capacity or range performance.

In November 2016, Embraer responded to a Request For Information (RFI) for the Royal New Zealand Air Force’s (RNZAF) future air mobility and future air surveillance capability requirements to replace its C-130H and P-3K2 Orion maritime surveillance aircraft. Embraer demonstrated the KC-390 to the RNZAF during its worldwide tour after the 2017 Paris Air Show.

When the Japan Air Self-Defence Force (JASDF) issued a requirement for medium transport to replace its C-130H aircraft, it selected an indigenous design that closely resembled, but in fact predated, a larger KC-390 with shoulder-mounted swept wings, high T-tailplane and a rear loading ramp. The Kawasaki C-2, powered by two 60,000lb (27,215kg) thrust General Electric CF6-80C2K turbofan engines mounted on short under wing pylons, first flew in January 2010. The C-2 is also equipped with a full glass cockpit, fly-by-wire flight controls, a high-precision navigation system, and self-protection systems.

It has a large internal cargo deck, which is furnished with an AAR Cargo Systems/ShinMaywa automated loading/unloading system to reduce workloads on personnel and ground equipment. Designed to have a minimum payload of 57,320lb (25,955kg) the C-2 has a STOL capability permitting to take-off from a 7,800ft (2,300m) field length. The JASDF has a requirement for 60 C-2s but only 20 have been ordered to date with a low rate of production.

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An-32 using western technology, the An-16 Lockheed Martin Hercules transport & Space A400M cargo/transport aircraft Technology (KACST). It has a high-wing design with a T-tail and rear loading ramp similar to that of the KC-390, and is powered by two 17,336lb (7,880kg) thrust Ivchenko-Progress D-436-148FM turbofan engines. Equipped with a glass cockpit and fly-by-wire flight controls, the An-178 is capable of carrying 75 fully armed troops or up to 33,000lb (15,000kg) over a range of 3,780km (2,400 miles) at 650kts. Antonov and Taqnia Aeronautics have signed a Memorandum to deliver 30 An-178s to the Royal Saudi Air Force (RSAF).

The same two companies have also launched a new variant of the Soviet-era An-32 using western technology, the An-142D. Based on an upgraded airframe, the An-132D is powered by two 5,071shp (3,780kW) Pratt & Whitney Canada PW150A turboprops driving the Dowty six composite-blade R408 propeller system giving it a cruising speed of 286kts (530kmh) at a maximum cruise altitude of 31,000ft (9,500m) carrying 50 fully equipped troops or a maximum payload of 20,565lb (9,484kg). The programme was launched in May 2015 with the prototype flying in March 2017 and six have been ordered by the RSAF. The An-132D may have limited success in the Asia-Pacific market with current An-26/32 operators such as the air forces of Bangladesh, Laos, Sri Lanka and Vietnam.

While downsizing may be the answer for many armed forces, few are able to acquire strategic airlifters. Malaysia led the way by acquiring four Airbus Defence & Space A400M cargo/transport aircraft to supplement its fleet of ten C-130H and six CN-235 aircraft. Able to carry up to 116 fully armed troops or up to 81,570lb (37,000kg) of cargo, the A400M is powered by four Europrop International 13,000lb shp (9,695kW) TP400-D6 turboprops driving eight-blade composite propellers. The only other Asia-Pacific country to purchase the A-400M to date is Indonesia which has ordered five aircraft again to supplement, or replace, its large fleets of C-130B/H Hercules and CN-235s. The A400M can also act as a tanker when fitted with two wing mounted hose and drogue under-wing refuelling pods or a centre-line hose and drum unit.

A step up from the Airbus A400M is the Boeing C-17A Globemaster III heavy airlifter. Capable of carrying up to 171,000lb (77,500kg) of cargo or accommodating up to 137 fully armed troops or 102 para troopers, or 34 stretchers plus 54 walking wounded and attendants in the MEDEVAC role. Its four 44,400lb (18,325kg) thrust Pratt & Whitney F117-PW turbofans give the C-17A a cruising speed of 513kts at an altitude of 28,000ft (8,535m) and a range of 2,785 miles (4,480 km) which can be doubled with in-flight refuelling.

As with the C-130, the RAAF was the first Asia-Pacific customer for the C-17A, the first of eight Globemaster IIs was delivered in November 2006. In June 2009, the IAF selected the C-17A for its Very Heavy Lift Transport Aircraft requirement and confirmed an order for 10 aircraft plus an option for six more in February 2011. However, the IAF took a long time to take up its option on the six additional aircraft and by the time it approved their purchase, the option was no longer available as C-17A production was terminated in 2015. However, in June 2017 the US State Department approved the sale of the last ‘white tail’ C-17A to be produced.

The closing of the C-17A production line has proved to be a problem for both the RAAF and IAF which are looking to increase their strategic airlift capabilities. Although some USAF Globemaster IIs may be sold off in the future this is only likely to happen when there is a viable replacement airlifter on the horizon.

Another newcomer in field is the Y-20 project that is part of an initiative to build China’s large transportation aircraft under the Medium-and Long-Term National Science and Technology Development Programme 2006-2020. Two major Chinese aviation companies, Shaanxi Aircraft Corporation and Xi’an Aircraft Corporation, expressed interest to develop the Y-20 aircraft, and Xi’an was announced as the manufacturer of Y-20 in 2007. The first of five prototypes flew on 26 January 2013 powered by four Russian 23,150lb (10,500kg) thrust Soloviev D-30KP2 two-shaft low-bypass turbofan engines.

Externally resembling the C-17A with engines mounted on short pylons under shoulder-mounted wings developed by the Ukraine’s Antonov Design Bureau, a high T-tailplane and a large rear loading ramp, the 200-ton airlifter has been designed to replace People’s Liberation Army Air Force (PLAAF) Russian Il-76/78 tanker transport aircraft.

The Xi’an Y-20 is China’s first indigenous heavy-lift jet transport, which could also serve as an aerial refueling tanker or airborne early warning (AEW) aircraft, and it is the largest military aircraft currently in production. Composite materials are widely used in the airframe to keep the weigh low. It has been reported in the Chinese media that the go-ahead for production of the Y-20 it would be powered by the Chinese-built 30,864lb (14,000kg) thrust Shenyang-Liming WS-20 high-bypass turbofan engines to enable the airlifter to achieve its maximum payload of 146,000lb (66,363kg).

However, the Chinese has always been behind the curve when it comes to developing state-of-the-art powerplants and although the PLAAF has a requirement for hundreds air strategic airlifters, no firm production numbers for the Y-20 have yet been announced or any in-service date.

Although the airlifter market in the Asia-Pacific region is relatively small, there will be a battle between manufacturers to find the ultimate replacement for the ubiquitous C-130 Hercules.
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