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Complete Guide

by **armada**

Special Operations Equipment



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Special Air Delivery



The Sikorsky MH-53J Pave Low III will be replaced by the Bell Boeing CV-22B

Air support for special operations forces (SOF) has so far relied largely on adapting fixed- and rotary-wing manned/unmanned aircraft that were originally developed for other uses. The growing importance of such operations is now producing some aviation assets aimed specifically at this application.

Roy Braybrook

Following the attacks of 11 September 2001, America's Special Operations Command (Socom) was assigned the lead in the 'Global War on Terrorism'. Socom's procurement spend has subsequently expanded from a modest \$ 788 million in FY01 to \$ 1.53 billion in FY06, and is heading toward a peak of \$ 1.83 billion in FY08.

Much of this budget is being spent on SOF-specific modifications to off-the-shelf aircraft. However, Socom now has funding to plan new assets dedicated to its special needs. Projects under consideration include more survivable gunships, light strike aircraft for Coin (Counter-insurgency) operations, tankers to support covert low-level helicopter missions, and lightweight air-to-ground guided weapons to be carried by small drones.

Gunships

The current US Air Force Special Operations Command (Afsoc) gunship inventory consists of eight old Lockheed Martin AC-130H 'Spectres' and 17 newer AC-130U 'Spookies'. The AC-130H is armed with a side-firing 40 mm Bofors gun and 105 mm howitzer, while the AC-130U adds a 25 mm General Dynamics GAU-12/U Gatling. From 2008, the AC-

130U is to be equipped with two 30 mm ATK-built Mk 44 Bushmaster II chain guns, replacing the 25 mm and 40 mm weapons. The Mk 44 fires at 200 rd/min and offers a variety of ammunition types, including an airburst round under development for the US Marine Corps.

Beginning in 2009, AC-130Us are to be given new centre-section wing boxes, facilities to improve collaboration with drones and the Lockheed Martin GMS2 multi-spectral target designation system. Two other near-term upgrades planned for the AC-130 (and the MC-130H tanker/transport) have been cancelled to provide funding for more urgent programmes. Those terminated were Socom's High Power Fiber Optic Towed Decoy and the Common Avionics Architecture for Penetration (Caap) programme, which was to have included a low probability of detection terrain following/avoidance radar. Caap funds were diverted to improving the Northrop Grumman APN-241 weather/navigation radar, adding terrain-following/avoidance.

It may be noted that in January 2007 Socom awarded Raytheon a \$ 135.4 million contract to develop the Silent Knight terrain-following/avoidance radar, which will initially be applied to the Boeing MH-47G, and only much later to the Sikorsky MH-60M, Lockheed Martin MC-130H and Bell Boeing CV-22 Block 30 (though evidently not the AC-130).

PSAS/NGG

Afsoc would like to field a new gunship with significantly better survivability around 2015. The series of designations applied have included Persistent Surface Attack System and more recently Next Generation Gunship (NGG). It will be required to provide faster response than the AC-130, and have variable effects (lethal to non-lethal) and some stealth features such as retractable guns, to make possible day/night, rather than night-only, operations.

The 105 mm gun will be deleted and precision attack is to be emphasised. There are predictions that the NGG will have a 120 mm mortar firing laser-homing projectiles, and a 'very small missile' of around 20 kg, which is the current weight of the laser-guided Northrop Grumman Viper Strike.

In October 2006 Boeing began flight trials with a low-power, solid-state laser mounted in a ventral turret on a C-130H

Cover

Today, special operations can involve forces from several nations, as exemplified by this US Navy LCAC driving into the well deck of the French Navy's *Tonnerre* helicopter carrier. Small hovercraft are ideal to deliver men and equipment, including light vehicles.





Flares are dispensed from a Lockheed Martin AC-130H Spectre of the 16th Special Operations Squadron, based at Hurlburt Field, Florida and forming part of the 1st Special Operations Wing. (US Air Force)

of the US Air Force 46th Test Wing. Using high-resolution imagery the system tracks and 'lases' moving ground targets, paving the way for experiments that will begin around 2010 with a megawatt-class chemical oxygen iodine laser (Coil) weapon. This Boeing Advanced Tactical Laser will provide a lethal range of around 35 km.

The production laser weapon is expected to be an electrically powered solid-state device that will be operational before 2020. With more than 30 years of experience, Northrop Grumman claims to be the industry leader in solid-state high-energy lasers. In August 2007 the company received a US Army contract for the High Energy Laser-Technology Demonstrator (HEL-TD), a ground vehicle-mounted system to defend against incoming rockets, artillery and mortars.

Aside from giving terminal effects at the speed of light (eliminating target movement and crosswind aiming problems), a laser weapon has a precisely selectable aim point and beam duration, making possible a graduated strike. Thus, an aircraft attacking a vehicle could burst one of its tyres, or the fuel tank could be exploded.

Other projected directed energy weapons include an Aesa (active electronically-scanned array) radar, producing beams of energy to damage target electronics.

Herc Variants

Aside from using the AC-130 in close air support, convoy escort, air base defence and armed reconnaissance, Afsoc employs several other Hercules variants. The primary role of the HC-130P/N is to act as a tanker for combat search and res-

cue helicopters. The MC-130E/H Combat Talon I/II is mainly concerned with the insertion, resupply and extraction of special forces. The MC-130P Combat Shadow is a tanker for special operations helicopters, as is the new MC-130W Combat Spear, which will also serve the US Air Force's Bell Boeing CV-22 Osprey.

The MC-130W is a converted C-130H with additional avionics, including the Northrop Grumman APN-241 radar and Raytheon AAQ-17 infrared missile detection system. To refuel helicopters, the MC-130W has two Flight Refuelling Mk 32B-902E underwing pods. It also has a strengthened tail to permit high-speed low-level airdrops, and a Universal Aerial Refueling Receptacle Slipway Installation to allow it to take fuel in flight from a boom system. Deliveries of the MC-130W to the 1st SOW at Hurlburt Field, Florida began in June 2006.

The EC-130H Compass Calls of the US Air Force 41st and 43rd Electronic Combat Squadrons, operating from Bagram Air Base in Afghanistan and Ali al Salem in Kuwait, have been employed to transmit anti-IED (improvised explosive device) RF jamming along ground convoy routes. Similar duties are performed by US Navy and Marine Corps Northrop Grumman EA-6Bs.

The US Air Force's 14 EC-130Hs in southwest Asia are supplemented on occasion by deployments of EC-130Js Commando Solos, of which six are operated by the 193rd SOW, an Air National Guard unit based in Middletown, Pennsylvania.

Anti-IED efforts also involve other specially equipped aircraft. Signals intelligence (sigint) duties are performed by



The AC-130U gun installation consists of a 25 mm General Dynamics GAU-12/U just ahead of the black sensor turret, a 40 mm Bofors further aft and a 105 mm howitzer at the rear. (Afsoc)

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LEADING.



Boeing is currently modifying the first four AC-130U 'Spooky' aircraft, replacing the 25 mm Gatling and 40 mm Bofors guns with two 30 mm ATK Mk 44 Bushmaster II chain guns. (Boeing)

Advanced Hawkeye and either Rolls-Royce AE2100 engines (as used on the C-130J) or even more powerful Pratt & Whitney Canada PW150As (from the Bombardier Q400) turning eight-blade Hamilton Sundstrand NP2000 propellers (as on the E-2D).

The Airbus A400M is being promoted by EADS North America, but this programme is reportedly felt by Afsoc to be running too late. Deliveries of the 192 A400Ms under contract for nine nations are due to begin in October 2009, but existing customers are evidently not willing to cede their slots on the line.

Boeing is also supporting the Alenia Aeronautica C-27J Spartan, which in June 2007 (promoted by a team led by L-3 Communications but including Boeing) was chosen as the US Army/US Air Force Joint Cargo Aircraft. The initial buy is 55 aircraft of a planned 78, but the eventual total could exceed 200. The twelve C-27Js on order for the Italian Air Force are expected to support the country's special forces.

the US Air Force Boeing RC-135V/W Rivet Joint, the US Navy Lockheed Martin EP-3E and the US Army RC-12 Guardrail (Beechcraft King Air B200), all 33 of which are now being upgraded by prime contractor Northrop Grumman to RC-12N-1 standard.

Synthetic aperture radars (Sar) with moving target indication (MTI) facilities are carried by the US Air Force Northrop Grumman E-8C Joint Stars and Air National Guard RC-26B (Fairchild Metro), and by the US Army C-12R Horned Owl and Shorts 360 Constant Hawk.

Herc Plans

For the short term, Afsoc plans for its Hercules fleet include retention of its 25 AC-130s, plus 20 MC-130H Talon IIs and 17 MC-130Ws, all of which are candidates for the Boeing-led Avionics Modernisation Program (AMP) upgrade. However, in February 2007 the US Air Force briefed industry on its programme to replace 78 HC-130P/Ns and 37 MC-130E/Ps. It is planned to start funding in FY08 and to

buy replacements for two HC-130P/N and four MC-130E/P in FY09. Deliveries are to begin in FY11 to provide initial operational capability (IOC) in FY14.



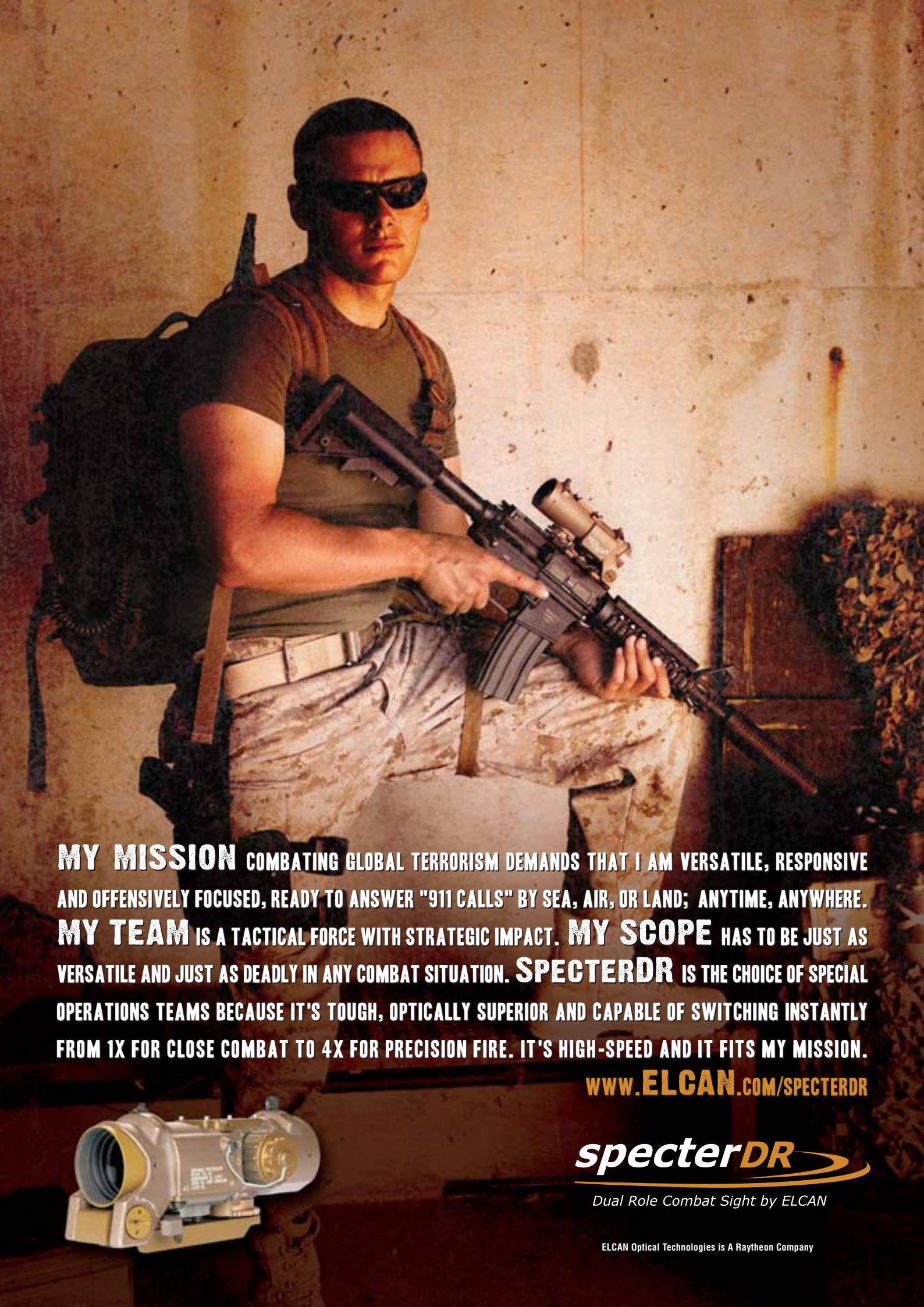
«Low visibility aircraft» such as the Pilatus PC-12, shown here in civil form, may be used to deliver special forces covertly to small airstrips. The PC-12 is designated U-28A by Afsoc. (Armada/RB)

As an alternative to new-build Lockheed Martin C-130Js, Boeing is proposing refurbished Hercules aircraft, presumably C-130Hs. Northrop Grumman has teamed with Snow Aviation to propose a modified C-130 with a new wing design by Snow, the cockpit from the E-2D

The Israeli Air Force, which operates old ex-US Air Force C-130Es in low-level missions from improvised airstrips, is considering the purchase of up to six C-130Js with a special avionics package that includes the Rafael Litening targeting system, to facilitate low-level flying at



Coin operations may involve turboprop aircraft, such as Embraer Super Tucanos. Brazilian Air Force A-29Bs are shown armed with rocket pods and wing-mounted machine guns. (Embraer)



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US Aircraft is currently developing the A67 specifically for counter-insurgency warfare operations. Because it is not derived from a trainer aircraft, its anticipated performances – particularly in terms of endurance – will be substantially higher than those of trainer-based derivatives. (US Aircraft)

night. Boeing is proposing to Israel an upgraded and rewired Hercules with a new centre section wing box, extending its safe fatigue life by 20 years.

Some aircraft in a follow-on batch of up to six C-130Js planned by Australia may be modified to suit the needs of special forces, including in-flight refuelling of helicopters. Australia is also expected to buy Alenia C-27Js to replace its old DHC-4 Caribou light stol transports (used in special operations as far back as the Vietnam War), although the government has recently insisted on competitive tendering.

Irregular Warfare

It has been suggested by the Rand Corporation that Afsoc should form an «irregular warfare» wing to combat terrorists and insurgents. The wing would operate light strike assets such as the Beechcraft AT-6B trainer derivative, transports such as the C-130J and C-27J and the lighter EADS-Casa C-212.

It may be noted that Field Aviation of Toronto has recently developed a 127 × 152-cm cargo door for the Bombardier Dash 8, with an airflow deflector to facilitate paradrops. The aircraft can accommodate 30 paratroops.

Afsoc may also need several types of 'low visibility aircraft' that are not overtly military, to deliver personnel clandestinely to short airstrips. One example is the Pilatus PC-12/45, six of which are already flown as U-28As by the 319th Special Operations Squadron, based at Hurlburt AFB in Florida. Fitted with weather radar and special communications and navigation equipment all six are believed to be operating in Iraq and Afghanistan.

Other fixed-wing aircraft of use to special forces include the Seabird Aviation Seeker two-seat light observation aircraft.

Present conflicts have concentrated attention on desert and mountain warfare, but there are many areas where Coin operations may involve coastlines, islands and rivers, favouring the use of amphibious vehicles.

In this context it may be noted that the Beriev Design Bureau and Sukhoi's Knaapo plant have been collaborating on a military version of the six-seat Be-103 amphibian armed with a machine gun. This is to be marketed in China (which has ordered 25 civil Be-103s), Indonesia and Malaysia. A further development includes a surface search radar by PNO Leninet, using two side-looking antennas.



The US Navy plans to evaluate the special operations potential of the Universal Hovercraft UH-19WRX Hoverwing, which is basically a hovercraft with stub wings attached. (Universal Hovercraft)

Under its Sly Fox rapid prototyping programme the US Navy has announced the intention to buy a Universal Hovercraft UH-19XRW Hoverwing, basically a hovercraft with short wings to allow it to fly in ground effect. Powered by a 100 kW

engine, the Hoverwing can carry a 385 kg payload for a range of 225 km, over waves of up to 1.2 metres.

Precision Airdrop

Traditionally, delivering loads accurately by parachute has required release from below 1000 ft. The threat now posed by man-portable air defence systems (manpads) at altitudes below 15,000 ft has encouraged the development of guided parachute/parafoil systems that allow personnel and urgently-needed supplies to be delivered accurately from relatively high release levels.

A further consideration is that inserting and supplying special forces by landing at remote airstrips has become increasingly hazardous as the use of IEDs has spread. Since mid-2006, Britain's RAF has lost two Hercules aircraft to anti-tank mines (and a third due to a heavy landing) on secondary airstrips in southwest Asia. The RAF has therefore developed a requirement for a new airdrop system for the C-130J and A400M to airdrop loads of up to 11.3 tonnes, rather than the current C-130J single-load maximum of one tonne. This British requirement reportedly specifies release from up to 8000 ft.

One system already employed by US Air Force Air Mobility Command in Afghanistan is the Agas (Affordable Guided Airdrop System) developed by America's Vertigo and Capewell Components. A windsone is first released to provide atmospheric data, then the payload is dropped in an A-22 cargo bag attached to a G-12 steerable round parachute, which takes it to preset GPS coordinates.

Beginning in July 2006, early examples of the Joint Precision Airdrop System (Jpads) have been used operationally by US Air Force C-17s and C-130s, Marine Corps C-130s and miscellaneous SOF aircraft. These developmental systems combine the Airborne Systems Firefly parafoil, an airborne guidance unit on the load, and the Pads (Precision Airdrop System) mission planner. This Jpads-Mp is a 38.5 kg briefcase-size portable data receiving and processing system, developed by Planning Systems, a subsidiary of Qinetiq. Pads was designed to provide accurate delivery and a useful standoff range from releases up to 25,000 ft.



The Qinetiq subsidiary Planning Systems is responsible for the Precision Airdrop System (Pads) mission planner that forms an essential part of the Jpads currently being tested. (Qinetiq)

TACTICAL ADVANTAGE

AT THE FORWARD EDGE

On the modern battlefield, a diverse array of military capabilities can be focused on the mission, with a number of different units working together at the forward edge. To be most effective, however, they must be tightly controlled and coordinated — and this means accurate, timely communications extending from higher command levels right down to the individual warfighter. The advantage belongs to the warfighter who carries the most capable tactical radio available today: the battle-proven Thales AN/PRC-148 JEM handheld.

Ready for the Net-Centric Future

JEM, which stands for JTRS (Joint Tactical Radio System) Enhanced MBITR (Multiband Inter/Intra Team Radio), is not only the first fielded production radio developed under the U.S. Department of Defense's JTRS program of record, but also the first fully functional radio designed for net-centric warfare.

In keeping with JTRS program goals, JEM can be enhanced with legacy waveforms and software — protecting existing hardware investments — as well as with newly developed and future capabilities, such as increased data throughput, networking, and improved satellite communications. Whatever the future holds in tactical radio communications, JEM will be ready to take it on.

Software-Defined Multiband Interoperability

Gone are the days when a unit leader had to rely on trained radio operators lugging cumbersome manpacks and entering frequencies from notebooks. With 10 sets of 16 programmed channels in the 30-512 MHz range — downloaded from a computer or keyed from the front panel — the JEM gives the warfighter push-button access to all units in the area, and beyond. From an infantry unit on VHF SINGARS, to an aircraft on UHF Havequick,

to operations over a UHF long-range satellite link, a unit leader can see all available links by name right on the JEM display screen and communicate with them seamlessly with the push of a button.

Changing as Fast as the Combat Situation

The JEM is a highly adaptable radio, not just in software configuration but also in mode and range of operation. The small, lightweight 5 Watt radio can be worn anywhere on the body — hip, chest or back. By using the new handheld Remote Control Unit, which features an embedded GPS capability, the warfighter can send and receive situational awareness data.

The JEM's range of communication can be quickly extended from 6 kilometers to over 30 kilometers, simply by inserting it into the Thales 50 Watt Vehicle Adapter Amplifier. Also available in a 20 Watt version, the VAA recharges the radio's batteries. The JEM can be dismounted in less than two seconds with a single push-button action, with no cables to disconnect, and operated as a fully functional 5 Watt manpack.

The JEM's versatility is further extended by its ability to serve as a secure means of sending data. With the addition of the 56 kbps high-throughput waveform, it adds a new

dimension to point-to-point communications. It can also enhance the battlespace capabilities of weapon systems that rely on dependable high-speed data communications, such as Patriot, Abrams, and Paladin Howitzer.

Confidence for Leaders at the Forward Edge

With its broad capabilities, flexibility and reliability, the AN/PRC-148 JEM tactical radio gives battlefield leaders confidence that they will be able to establish and maintain communications with all units at the forward edge of the battle, however the situation may change. This high level of confidence improves their ability to fight — and win.

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The US Air Force/Army Joint Precision Airdrop System (Jpads) is seen here under test in Afghanistan from Boeing C-17s of the 816th Expeditionary Airlift Squadron of the 379th Air Expeditionary Wing. (US Air Force)

Over 60 such Jpads have been supplied to US Air Force Air Mobility Command. A further 100 have been funded, and 200 more requested. The currently used 'Screamer' system is restricted to a maximum release height of 15,000 ft and has a 900 kg payload limit. In August 2007 the Pentagon issued an RFP (request for proposals) for a 4500 kg system. This would use an Enhanced Container Delivery System (ECDS) 4630 parachute and a standard 88 x 108-inch or Type 5 pallet. There are also US Department of Defense plans for a 13,600 kg Jpads that can be released from up to 25,000 ft.

Another guided parafoil system being tested by the US Army under the Jpads programme is the Atair Aerospace Onyx, for which the company received a \$ 3.2 million contract in September 2006. Onyx is designed for release up to 35,000 ft and offsets of more than 50 km. Atair is a



In September 2007 Rockwell Collins unveiled its Paranav GPS-based helmet-mounted navigation system with integral display. Over 100 jump tests have been carried out from up to 28,000 ft. (Rockwell Collins)

leader in the field of active collision avoidance systems for multiple 'swarming' payloads.

Atair's Darpa-funded Leapp (Long Endurance Autonomous Powered Paraglider) is designed for loitering surveillance missions of up to 55 hours using an elliptical parafoil of over 34 metres span. Disposable load (payload plus fuel) is 1090 kg. Micro-Leapp is a small backpackable derivative for special ISR operations, with a payload of 23 kg and an endurance of eight hours.

Other leaders in this field include Canada's Mmist (Mist Mobility Integrated Systems Technology), which produces GPS/radio-guided parachute delivery systems. The basic unpowered Sherpa has three parafoil options, sized for 230, 460 and 550 kg payloads. The Sherpa was first employed operationally in Iraq in 2004 by a US Marine Corps Reserve unit (VMGR-452) flying KC-130Ts. Mmist also produces a guided Manpack for parachutists.

The 635 kg Mmist Powered Sherpa is designed to deliver a 270 kg payload from up to 18,000 ft. As the CQ-10A Snow Goose, it has been used operationally by Socom as a means to dispense leaflets. Full-rate production of the CQ-10A was authorised in 2004, with planning for up to 200 systems over a five-year period. Some 41 have so far been ordered. It has also been tested by Socom as a platform for television and radio broadcasting. The present version is dropped from a transport aircraft or released from a moving ground vehicle, but Mmist is studying a self-launching variant. The company is also projecting a scaled-up Snow Goose to deliver heavier payloads.

Mmist is discussing with the US Army the use of the CQ-10A as a battlefield medical delivery system. In a similar context, the civil organisation Aviation Sans Frontières plans to test unmanned logistic air vehicles in supporting humanitarian relief operations in war zones. The tri-

als in 2008 will use an optionally manned Flying Robots FR101 parafoil aircraft, which is capable of carrying a 250 kg payload. The FR101 has a 60 kW Rotax engine and an approximate flyaway price of € 300,000.

European developments in the guided paradrop field include the EADS Defence Electronics SLG-Sys or Parafinder/Paralander. The Parafinder is for airborne troops and the Paralander for loads up to six tonnes, with release heights up to 33,000 ft and an offset of up to 50 km.

Dutch Space, in collaboration with the Netherlands' National Aerospace Laboratory, has developed its GPS-guided Spades (Small Parafoil Autonomous Delivery System), employing a Zodiac/Aerazur ARZ G9 ram air parachute and a shock-absorbing base for the payload. Spades was designed initially for a 200 kg load, release up to 30,000 ft and an offset of up to 40 km, but heavier payloads are planned.

Other significant developments in the paradrop field include the T-11 Advanced Tactical Parachute System (ATPS) manu-



James Bond, eat your heart out! Swiss pilot Yves Rossy demonstrates the ultimate in long-range infiltration devices for paratroops: a jet-powered strap-on wing. (Babylon-freefly.com)

factured by Para-flite which has been part of Airborne Systems since April 2007. The US Army's 82nd Airborne Division will begin using the T-11 static line deployed, non-steerable parachute in 2008 as a replacement for the 50-year-old T-10. Using new materials and a larger canopy, the T-11 will reduce descent rates at impact from 6.4 to 4.9 m/sec, with a consequent expected 40% reduction in injuries.

At the opposite end of the airdrop spectrum, Swiss pilot Yves Rossy has pioneered the development of a jet-powered folding wing that is strapped to his back for flights from a launch aircraft such as the Pilatus PC-6. Flight trials began in 2004 with a wing of three metres span and two Jetcat Germany P200 turbojets, each producing 22 kg of thrust. A later version of the carbon-fibre wing (by ACT Composites of Geneva) has four of these engines and weighs 45 kg with ten kg of fuel, giving an endurance of up to six min-



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The roles of US Air Force CV-22B Ospreys of the 8th SOS include the delivery and recovery of Seal (Sea Air Land) teams from US Naval Special Warfare Command missions. (US Air Force)

utes at up to 300 km/hr. Rosy lands by means of a conventional parachute.

Due to an egression problem with the launch aircraft in April 2007 Rosy was forced to drop the 'Fusionman' wing, which is currently being repaired. The point worth making is that in a military service it should be possible to eliminate the wing fold by launching from the load-ramp of a tactical transport.

Tilt-rotor

The Bell Boeing V-22 Osprey tilt-rotor transport is the epitome of special operations aircraft, combining vtol capability with the cruise speed of a fixed-wing turboprop. Despite two fatal accidents in 2000 that led to an 18-month grounding, low-rate production continued and deliveries restarted in 2003. Production ramped up to 14 US Marine Corps MV-22Bs and two US Air Force CV-22Bs in FY07.

Some 21 MV-22Bs and five CV-22Bs have been requested for FY08, and planned production will peak at 30 MV-22Bs and six CV-22Bs in FY09, and then drop to a combined annual total of 35. The Pentagon plans to buy a total of 360 MV-22Bs for the US Marine Corps, 48 MV-22Bs for the US Navy and 50 CV-22Bs for the US Air Force (assigned to Socom).

Following operational evaluation of the MV-22B by the Marines' VMX-22 trials unit, aircraft were delivered to VMMT-204 for pilot training. From late 2005 MV-22Bs were delivered for VMM-263, which was formally activated in March 2006 as the first of seven operational squadrons to be based at MCAS New River, North Carolina by FY12.

The first overseas deployment of the MV-22B began in September 2007, when VMM-263 shipped out aboard the 40,000-tonne amphibious assault ship USS Wasp

(LHD-1) to begin a six-month tour of duty in Iraq. It is to be replaced in 2008 by VMM-162 and later VMM-266. At the end of 2009 VMMT-204 will switch to MCAS Miramar, California, where eleven operational squadrons will be based, followed by others on Hawaii and Okinawa.

The training of CV-22B personnel is currently performed by VMMT-204 at New River and by the US Air Force's own 71st Special Operations Squadron (SOS) at Kirtland AFB, New Mexico. In December 2006 the first production CV-22B was handed over to the US Air Force's 8th SOS at Hurlburt Field, Flori-

da. Initial operational capability is expected to be achieved in the second quarter of 2009. The CV-22B differs from the MV-22B in some items of equipment, introducing the Raytheon APQ-186 terrain-following/avoidance radar and the ITT ALQ-211 Sirfc (suite of integrated RF countermeasures). Some form of Dircm (directed infrared countermeasures) will be added later.

Helicopters

The main news regarding special operations helicopters has concerned the US Air Force programme for a new combat search-and-rescue (Csar-X) aircraft to replace its 101 Sikorsky HH-60G Pave Hawks. In November 2006 the Boeing HH-47 Chinook was selected, and an initial development contract was awarded, to include three test aircraft. These were to be followed by 141 production Block 0s, later to be brought to a Block 10 standard (represented by a fourth test aircraft). The two blocks were to be managed as separate programmes, with IOC scheduled for FY12 for the Block 0 and FY18 for the Block 10. Full operational capability was planned for FY24. The US Government Accountability Office (GAO) has estimated that Csar-X development will cost \$ 1.3 billion and production just over \$ 7.0 billion.

However, Lockheed Martin, promoting a variant of the AgustaWestland EH-101, and Sikorsky, promoting its HH-92 Superhawk, protested against the US Air Force selection, primarily objecting to life-cycle cost estimates. In January 2007 their protests were backed by the GAO, and the US Air Force has accordingly issued an amended RFP.

At the upper end of the (Western) helicopter scale, the 21-tonne Sikorsky MH-



The training of Afsoc personnel to operate the CV-22B is partly performed by the US Marine Corps and partly by the US Air Force's own 71st Special Operations Squadron at Kirtland AFB, New Mexico, as shown here. (US Air Force)



The US Air Force has over 100 Sikorsky HH-60G Pave Hawk Csar helicopters. This example from the 38th RQS (Rescue Squadron), based at Moody AFB, Georgia, is shown training US Army Special Forces. (US Air Force)

same company's Tiger, four of which will be used in the close support and transport helicopter escort roles.

It may be noted that the duties of the Irish Air Corps' AgustaWestland AW139s includes the support of special operations units. Their equipment includes a rescue hoist, abseiling and fast rope systems and a dual machine gun installation.

France's assignment of a dedicated attack helicopter (Eurocopter Tiger) to a special forces unit follows Russia's use of the Kamov Ka-50 to support Spetsnaz troops in Chechnya. In August 2007 the Itar-Tass news agency reported that the Russian Air Force plans to buy 'dozens' of Ka-50/52s for use by special forces.

At the Maks 2007 air show near Moscow, the Ulan-Ude Aviation Plant unveiled the Mil Mi-171Sh, a Csar development of the widely used Mi-8/17/171 series. The Mi-171Sh has two winches of 270 and 300 kg capacity, flir equipment, a public address system, infrared suppression, UV-16-06 chaff dispensers, armour plating and self-sealing fuel tanks. In a smaller category, Russia continues to export the Rostvertol-built Mil Mi-24/35 assault helicopter series. Recent deliveries include ten Mi-35Ms for Venezuela.

53J Pave Low III is being retired from Afsoc service, to be replaced by the CV-22. The last MH-53J is to be withdrawn in October 2008, although the better equipped MH-53M will continue in service at Hurlburt Field, Florida, RAF Mildenhall in Britain and Kadena AB, Okinawa.

The top of the US Army range is represented by the Boeing MH-47G, of which 61 are planned for the 160th Special Operations Aviation Regiment (Soar). An assembly line in Europe is under consideration, to fulfil the potential needs of Italy and Britain. The 160th Soar also operates a fleet of around 60 Sikorsky MH-60K/Ls, which are expected to be modified to MH-60M standard, with wide-chord composite blades, new avionics, glass cockpits and 1900 kW General Electric CT7-8B5 engines.

Based on operational experience in southwest Asia, the American services have become increasingly concerned about 'brown-out' problems produced by rotor downwash creating clouds of sand. Several companies have proposed situational-awareness solutions based on a variety of sensors and helmet-mounted displays. Lockheed Martin's Pathfinder is already in service on the Boeing AH-64D and may well migrate to cargo and utility helicopters. Boeing is marketing its own Enhanced/Synthetic Vision System (E/SVS), which may be developed to include a laser radar and stored Digital Terrain Elevation Data. As reported in Armada 3/07, Sikorsky, Honeywell and Sierra Nevada have teamed to develop a brownout-solution system, initially for the UH-60. They are working under an 18-month Darpa contract that forms part of the latter's Sandblaster programme.

Europe's principal dedicated Csar helicopter is the Eurocopter EC725, of

which 14 have now been delivered to satisfy French needs: six for the French Air Force and eight for the French Army. The former's EC725s are with the Escadron d'Hélicoptères 01/067, and the latter's are operated by EOS3 Squadron of the Détachement Alat des Opérations Spéciales (Daos). Named 'Caracal' (after an African lynx) by the French services, the EC725 has been employed in the rescue of French citizens from Lebanon (then under Israeli attack) and to support military operations in Afghanistan.

Daos also operates the older Eurocopter AS532 Puma in EOS4, and is to form a small squadron (EOS6) with the

Drones

The current status of military drones was discussed in the supplement to Armada 3/2007. The following is a summary of recent developments that are particularly relevant to special operations.

At the upper end of the propeller-driven drone spectrum, in June 2007 it was announced by the US Air Force that 21 General Atomics MQ-1 Predator-As had been transferred from ACC (Air Combat Command) to Afsoc. These aircraft form the 3rd SOS 'Dragons' squadron, which is based at Nellis AFB, Nevada, but forms part of the 1st SOW, headquartered at



The Eurocopter EC725 is a dedicated Csar version of the Cougar family. It is used by the French Army Special Forces and French Air Force under the name 'Caracal'. (Eurocopter)



Illustrated here by a Hellfire-armed General Atomics MQ-1 of the US Air Force's Iraq-based 15th Expeditionary Reconnaissance Squadron, the Predator-A is to be operated by Afsoc's 3rd SOS 'Dragons'. (US Air Force)

Hurlburt Field, Florida. Seven further MQ-1s were added shortly afterwards, providing for six combat air patrols.

Predators are known to have been used in a variety of special operations, such as the Hellfire strike on a ground vehicle in southern Yemen in November 2002. This was performed by an MQ-1 from the US Navy forward operating site at Djibouti's Camp Le Monier.

Socom is negotiating a contract with AeroVironment (AV) for a three-year demonstration programme to assess the utility of a hale drone in urban operations using the liquid hydrogen-fuelled Global Observer, flying for more than five days at over 55,000 ft. In September 2007 a lighter Hale demonstrator, the Qinetiq Zephyr, performed a 54-hour flight, using solar arrays and rechargeable lithium-sulphur batteries.

Goodrich is producing short-wave infrared (Swir) cameras, which produce high-resolution images by day or night, for tests on the 27 kg Finder (Flight Inserted Detector Expendable for Reconnaissance) drone, originally developed by the US Naval Research Laboratory for atmospheric sampling duties, to detect chemical agents. Under a US Air Force UAV Battlelab demonstration programme, these small recoverable drones are to be launched from an AC-130 gunship to provide off-board sensing and targeting for MQ-1s.

The lightweight end of the operational drone spectrum is represented by hand-launched, electrically-powered aircraft. The big winner in this class appears to be AeroVironment's 1.9 kg RQ-11B Raven-B, which has been adopted as the Small UAS for the US Marine Corps, Army and Socom. If the older RQ-11A is included, by mid-2007 there were around 2500 Ravens in service. Socom plans to buy 350 Raven systems by 2013. There is talk of a version with a warhead capable of destroying a thin-skinned vehicle.

In US Marine Corps service the Raven-B is replacing the 27 kg AV RQ-14A Dragon Eye, the Snake Eye version

of which is used by US Navy Seals. The AeroVironment RQ-11B Raven B has recently been ordered by the Danish Army. Three of the twelve systems are to be allocated to the Army Special Forces or Jaegerskorpset

In August 2007 Lockheed Martin's 'Skunkworks' unveiled the hand-launched, electrically powered, 6.0 kg Stalker, which was designed to meet special operations requirements in Afghanistan and Iraq.

In a heavier category, the 59 kg L-3 BAI Aerosystems XPV-1 Tern, featuring large wheels and an engine mounted on top of a high-set wing, was developed to meet Socom requirements for rough field operations. It has been flown in Afghanistan by a US Navy unit (VC-6) in force protection missions and to dispense an unspecified ground sensor weighing over 9.0 kg.

Navmar Applied Sciences originated two drone projects used in special operations. The 64 kg Navmar Mako, which is launched from a speeding Humvee and lands on a runway, was developed as a low-cost drone to meet a Socom requirement for use in Iraq. Socom also has around nine 150 kg Navmar Tiger Shark LR3 drones in Iraq, supported by Neany (North Eastern Aeronautical).

The US Army is considering the use of the Neany Arrow, a drone version of the 450 kg Titan Aircraft Tornado 912 kit plane, as a platform for the 107 kg Flight Landata 'Buckeye' large-format camera system. The award-winning Buckeye combines 22 (later 39) megapixel imagery, laser-radar and GPS inputs to produce three-dimensional digital images with a resolution of one centimetre and a positional accuracy of one metre. It was first used over Iraq in November 2004 from a manned aircraft. The Buckeye is employed to detect small changes in the ground surface where IEDs have been laid, and to produce maps of urban areas for troop briefings prior to counter-terrorist operations.

Development of the Arrow drone was originally funded by US Naval Air Systems Command on behalf of Socom. If this Arrow/Buckeye programme goes ahead the service will be operated by Neany, with a start set for March 2008.

Socom has already ordered the Boeing A160T Hummingbird drone helicopter, a turbine-engined development of the piston-engined A160. The A160T first flew in June 2007 and will be tested with a variety of sensors. Trials will also include its use in psychological operations (psyops), with broadcasting equipment and leaflet drops. Emergency resupply and personnel recovery will be tested using a canoe-shaped ventral pod with a 360 kg payload.

Socom is also developing drone rotorcraft procedures and tactics, using modified Robinson R22s. The California-based Tactical Aerospace Group (Tag) is a leader in the conversion of helicopters to optionally piloted form.

Some operations would benefit from a drone that can land on water. The first such example was probably the 36.3 kg DRS Unmanned Technologies Neptune, which was the subject of a production contract in March 2002. In a lighter class, the 5.5 kg AV Aqua Puma was included in the Socom FY06 budget, and 18 systems were in US service by mid-2007.

In mid-2006 the 135 kg Oregon Iron Works Sea Scout, developed under US Navy contract, performed its first autonomous water landings, using a laser-radar to measure wave profiles. The



The Elbit Skylark was selected by the Israel Defense Force in 2004 as its interim close-range drone. It has also been purchased by Australia and Canada for use in Afghanistan. (Elbit Systems)

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autoland avionics were supplied by Geneva Aerospace. A modified Sea Scout with an increased wingspan is being developed for demonstration at NAS Patuxent River, Maryland.

At the bottom end of the spectrum, the only supplier of micro air vehicles (Mav) to Socom is Aerovironment. In December 2006 the company's Wasp III was selected by the US Air Force as the basis for its Batmav (Battlefield Air Targeting Mav) programme. The company subsequently received an order for an initial 30 systems (out of a planned 314), the first of which was delivered in July 2007. The Wasp III has a wingspan of 74 cm and an endurance of 45 minutes with a lithium-ion battery that forms the wing structure. It has a gross weight of 454 gm with side- and forward-looking EO colour cameras plus an unspecified EO/IR payload. Earlier Wasps are in limited service in Iraq with the US Army and US Marine Corps. Development of a vtol Wasp is being jointly funded by Darpa and AV.



The Warrior (Aero Marine) Gull 24 is a technology demonstrator for the 70 kg Gull 36 amphibious drone, which is to be used in trials of formation operations off the Welsh coastline. (Warrior/Aero Marine)

In an even more 'special' context, AV is developing the hand-launched Switchblade lethal drone with an explosive war-

head and an autonomous terminal guidance phase, to 'neutralise' snipers and mortar and machine gun positions.

Fast on Water



A US Marine Corps trademark is the Landing Craft Air Cushioned hovercraft

British naval operations during the opening stages of Operation Iraqi Freedom refocused the spotlight on maritime special forces operations as troops from the British Special Boat Service (SBS) assisted the capture of the Al Faw peninsula to open a route of entry for humanitarian supplies into Iraq's second city of Basra, and also to establish a beachhead for Coalition forces.

Thomas Withington

Small, highly trained maritime and riverine Special Operations Forces are a potent weapon in the Global War on Terror. They can be applied to a host of situations from boarding vessels suspected of carrying everything from Kalashnikovs to weapons of mass destruction to manoeuvring from the sea to seize vital coastal targets during amphibious operations. As far as homeland security is concerned, water-borne special operations forces play an important role in helping to

safeguard against illegal immigration by inspecting vessels. They continue to play a major role in the fight against narcotics trafficking and in the ongoing battle against maritime piracy. The tools of the trade for special operations forces waterborne mobility revolves around fast craft such as Rigid Inflatable Boats/Rigid Hull Inflatable Boats (Rib/Rhib), hovercraft, midget submarines and swimmer delivery vehicles along with specialised diving equipment such as re-breather apparatus. Across the world, a number of navies and special operations units have dedicated craft and technologies at their disposal.

Africa and Asia

With a long coastline spanning two oceans, the South African Navy has a large area to patrol along with key port facilities at Cape Town, Durban, East London, Port Elizabeth, Richards Bay and Saldanha Bay. To this end, the Navy uses two Delta-80 LCU fast boats which are deployed with the Drakensburg logistics vessels and are used by the Navy's Combat Divers.

In China, the People's Liberation Army Navy (PLAN) makes significant use of fast patrol craft for naval special forces operations by the 1st Marine Corps. These craft have often been captured from drug smugglers. The PLAN also has a number of stealthy high-speed insertion craft that have been in service since 1996 and are used to intercept narcotics traffickers. They operate around China's coastal waters and beyond and there



A favourite of the South African Navy's combat diver special forces is the Delta-80 design of RBL. These boats have proven popular with both military and civilian operators due to their speed. This one is in service with the Port of London Authority in the United Kingdom. (Port of London Authority)

have even been sightings of these boats around the Philippines.

Another country using large numbers of fast special forces craft is the Democratic People's Republic of Korea (DPRK) Navy which uses a curious semi-submersible craft design which may be deployed with the 137th Naval Squadron; the force thought to be tasked with marine insertion. A large quantity of these craft have been constructed and they are thought to be particularly difficult to detect on radar due to their low profile. On the surface, these craft are reckoned to be capable of speeds in the region of 45 knots (83 km/h) while they can travel at four knots (7.4 km/h) when submerged.

Singapore has a major merchant marine fleet of 1063 ships in excess of 1000 Gross Register Tonnes and the city itself is a major port. The country has several maritime special forces units including the Coastal Command, Alpha and

Bravo Naval Diving Units, the Singapore Commando Battalion, the amphibious brigade of the 21st Division of the Army and the Police Coastguard. They make use of four assault craft built by Singapore's SBEC, Rhib harbour patrol boats, Boston Whaler-constructed high-speed interceptor craft (used by the Naval Diving Unit) and also camouflaged high-speed interceptor craft.

The notable hovercraft operator in Asia is the Republic of Korea (RPK) Navy which uses an unknown number of air cushioned vehicles and may be planning to equip the country with around 20 such craft for use by the Naval Special Operations Unit; thought to be the primary user of such vessels. The RPK Navy also deploys the Solgae class which bears an uncanny resemblance to the Landing Craft Air Cushioned vehicles used by the United States Marine Corps and which may be capable of speeds of up to 65 knots (120 km/h). The Plan also uses



Indonesian Kesatuan Gurita commandos on exercise with the US Navy around Surabaya. The country's marine special operations forces are essential given the security challenges that Indonesia faces both from Islamist political violence and maritime piracy. (US Navy)

Jingsah II hovercraft which may have since been upgraded to an improved design with a bow door.

To the north of the RPK, in addition to the plethora of semi-submersible craft that the DPRK uses, the navy has also made significant use of around 21 Sang-O class midget submarines for infiltration missions into the south. Construction of the Sang-O vessels was completed in 1997 and the boats are thought to be able to fire 533 mm (20 in) 53-65KE anti-ship weapons. One vessel was captured by South Korea on 18th September 1996. As well as anti-surface attack, the submarines can be used for periscope-depth swimmer debarkation. Other vessels used by the DPRK navy include Una class midget submarines of Yugoslav ori-



The Republic of Singapore has several SOF units which contribute to maritime security including Coastal Command, two Naval Diving Units, the Singapore Commando Battalion, the Army's 21st Division amphibious brigade and the Police Coastguard. Here they practice ship boarding. (US Navy)

gin that can navigate submerged for up to 50 nautical miles (93 km). The Una boats can embark up to six special operations forces personnel and carry two 400 mm (15.7 in) torpedo tubes. Exports of three of these vessels may have been completed, with a single unit equipping the Iranian Navy for use by that country's Combat Divers, with another two vessels supplied to the Vietnamese Navy also for use by Combat Divers.

The Navy of Pakistan uses midget submarines, notably a homegrown variant of the Italian MG-110 design for use by the Naval Special Services Group. Three of the vessels were built under licence from Cosmos and have been upgraded to carry a pair of CF2FR60 Swimmer Delivery Vehicles (SDV), along with CE39 periscopes. The craft has a range of 2000



Although no longer in service with the US Marines, the Seafox remains in use with Egypt's naval SOF. The craft is powered by a pair of 6V-92TA diesel engines which develop 520 horsepower. (US Navy)

nautical miles (3704 km) and a 20-day endurance.

Europe

A modernisation initiative for the Finnish Navy during the 1990s resulted in the force procuring the Jurmo class fast boat which is designed for coastal operations and amphibious warfare, and is used by the Leivaston Erikoistoimintayksikko Naval Special Operations Unit, Nyland Brigade and 1 Ramnikkojaakarkomppania Marine Commando Battalion. This same design of craft is also in operation with the Hellenic and German navies equipping the Monada Yporixionb Kastrafan and Kampfschwimmerkompanie naval special forces units respectively. The Royal Malaysian Navy will also acquire the vessels.

In addition to the Jurmo boats, the Greek Navy makes use of Rigid Hull Inflatable Boats built by Fabio Buzzi of Italy. Meanwhile, the highly successful Swedish Combatboat 90H design is used by that country's Amphibious Corps along with small Gruppbat raiding craft; a variant of which is deployed with the Finnish special forces. The United Kingdom's SBS and Royal Marines are equipped with VT Halmatic's Arctic 28 Rib with a 50-knot (92 km/h) top speed and 200-nautical mile (370 km) range. These boats can also be airdropped by C-130K/H/H-30 aircraft. In addition, the force also uses the Arctic 22, Pacific 22 and Pacific 28 designs. Other fast boat designs used by the British include the Fic-145 and VSV high-speed interceptor craft and these air-portable designs can reach 55 knots (101 km/h). Along with

the boats, British special operations forces use Divex Shadow re-breather equipment which can provide around six hours of air.

European special operations forces hovercraft operators include Finland, which deploys the Aker Finnyards T-2000 medium lift vehicle; a single unit of which was delivered in 2000. It is expected that the Finnish Navy will eventually receive a total of four air-cushioned craft. These will operate alongside the navy's Singsby SAH-2200 light hovercraft. The other Nordic hovercraft operator is Sweden, which uses the ABS M-10 medium-lift air-cushioned vehicle with a 50-knot top speed and 600-



The Combatboat 90 has enjoyed widespread success as a special operations craft and fast patrol boat. This example is in service with the Royal Norwegian Navy's Marinejaegerlag special forces commandos. (Department of Defense)

nautical mile (1111 km) range. Meanwhile, Sweden announced at the 2007 DSEi exhibition in London that it would buy three Griffon 8100TD vehicles.

To their east, by far the biggest special operations forces hovercraft operator in Europe is Russia. Around 25 Aist class vehicles are in Russian naval service. The Aist displaces around 170 tonnes empty. Since their entry into service in the 1970s these hovercraft have been upgraded with new anti-corrosion engine filters. Their capacity is notably larger than hovercraft designs used elsewhere in the world, which tend to focus on moving troops or light vehicles. For example, the Aist can carry up to four PT-76 amphibious tanks. They are also equipped with a pair of 30-mm (1.18 in) anti-aircraft/surface warfare guns. The Zubr class hovercraft are bigger than the Aist design and can carry up to ten Armoured Personnel Carriers or 360 troop at speeds of up to 60 knots (112 km). The Zbur design has also

Select Asian/African Special Forces Craft

Country	Service	Craft
Sri Lanka	Independent Special Forces Group	ABS M-10 medium lift hovercraft
Thailand	Royal Thai Navy Seal Team, Royal Thai Navy Marine Corps	Griffon 1000TD light hovercraft SSK-96 Subskimmer Rib
Egypt	Egyptian Combat Divers	Seafox- class SDV
India	Marine Commando Force	Griffon 8000TD medium hovercraft Chariot CE2F/X100T SDV
Indonesia	Kesatuan Gurita Combat Swimmers	Cakra (209) SSK submarine
Libya	Combat Divers	R-1 SDV, R-2 Mala SDV
Malaysia	Pasukan Khas Laut Combat Divers/special operations forces	high-speed patrol/interceptor craft, fast patrol boats
Republic of Korea	Seal Unit, Naval Special Operations Unit and Republic of Korea Marine Corps	MG-120ER shallow water attack submarine
Sudan	Sudanese Navy	Ashoora class inshore raiding craft



Avon Inflatables builds a whole series of boats that have proven popular with special forces and paramilitary organisations across the globe. The design seen here is the Searider. (Avon Inflatables)

been sold to the Ukraine and Greek navies. Other hovercraft in Russian service include the Lebed class heavy-lift air-cushioned vehicles and also the Czilim light hovercraft which entered service in 2001 and operate with the Russian Border Guards special operations forces contingent. The other hovercraft are in service with the Spetsialnaya Naznacheniya naval special operations forces and the Morskaya Pekhota Russian Naval Infantry force. The British Royal Navy uses the Griffon-2000TDX(M) light hovercraft for Royal Marine operations, having purchased two of the vessels.

The former Yugoslavia and Italy dominate special operations forces submersible production in Europe. Brodosplit of Croatia have built a number of midget submarines, including the two-person R-2 design with a 3.3 kW electric motor which has a range of 23 nautical miles (42 km) and a 4.4-knot (8.1 km/h) maximum speed. The company's R-1

design is a single-person swimmer delivery vehicle with a three-knot (5.5 km/h) top speed and a six-nautical mile (eleven km) range. Both designs are used by Russian special forces in addition to Croatia's Combat Divers and Serbia's

do Raggruppamento naval special operations forces unit with the vessel configured for shallow water anti-ship combat as well as special forces operations. The armament carried by the vessel can include up to 20 limpet mines, twelve

Select European Special Forces Craft

Country	Service	Craft
Germany	Kampfschwimmerkompanie	Orca SDV
Norway	Marinejaegerlag Naval Special Operations Forces.	Combatboat 90H
Sweden	Kurstjaegerskolans Combat Diver Unit	Spiggen-II midget submarine
UK	Special Boat Service	Mk VIII Mod 1 SDV

82nd Combat Divers Unit, both of which also use the Una class midget submarine as do Sweden's Kurstjaegerskolans combat divers.

Italy's MG-120/ER attack submarine is deployed with that country's Comman-

ground magnetic/acoustic mines and up to four wire-guided torpedoes. The range of the vessel is thought to be in excess of 1600 nautical miles (2960 km) when surfaced and the boat can embark up to 15 combat divers. Like Thailand, the UK



Along with Avon Inflatables, Zodiac produces a number of Rib designs for special forces use. Here, one of their craft is in service with Peru's Fuerza de Operaciones Especiales naval commando force. (US Navy)



British boat builder VT Halmatic builds a number of watercraft for special operations, one of which is the Arctic 28. This boat is in service with the Royal Marines as well as the naval special operation forces of the United Arab Emirates. (VT Halmatic)

also uses the SSK-96 Subskimmer constructed by KSA (Underwater). This is a Rhib that can be converted to a submerged swimmer delivery vehicle in around 90 seconds. Surfaced, the Subskimmer has approximately a 70-nautical mile (129 km) range and a 25-knot (46 km) top speed.

Latin America

Argentina equips its Buzo Tacticos combat divers, Infanteria de Marine naval infantry brigade and Pagina Anti-Terrorismo special operations forces units with Guardian-class Ribs; each of which is equipped with twin 150 hp outboard motors developing a top speed of 35 knots (64 km/h). Each boat can carry up to eight troops. Colombia, meanwhile, operates larger Eduardono class assault craft for its Cuerpo de Infanteria de Marina (Colombian Marine Corps). The same service also uses the Tenerife class riverine patrol craft built by Boston Whaler of the United States. Operating at 35 knots, these craft have a 330-nautical mile (611-km) range, are air-transportable and used extensively for Colombian anti-narcotics operations. Equally important for riverine operations are the Swiftsure class river patrol craft that can carry up to eight troops and are used by



Underway in the Persian Gulf, Australian commandos from the Offshore Assault Team perform an inspection of a Dhow during operations to prevent and interdict weapons smuggling in this region. (US Navy)

the Ecuadorian Infanteria de Marine Marine units.

Middle East

The Royal Jordanian Special Forces operate the Hashim class patrol boats which can carry up to 30 troops at a top speed of

28 knots (51 km/h). Meanwhile, for patrols in the Persian Gulf, the Kuwaiti Maritime Special Forces Group uses the French-built Manta design of high-speed boats built by Simoneau. These craft are able to travel at 35 knots for around 243 nautical miles (451 km). One of the largest users of special forces craft in the Middle East is Iran. The country has the Pasdaran Islamic Revolutionary Guards Corps, which has numerous vessels at its disposal including Wellington BH.7 medium-lift hovercraft, which are thought to be maintained in service by Iranian Aircraft Manufacturing Industries, al Sabehat SDVs which can carry three combat divers, Una class midget submarines, Ashoorra assault boats, jet-ski based assault craft, Mig-G-0800 fast boats and Type 4 fast patrol vessels. Other hovercraft users in the Middle East include Saudi Arabia's maritime special operations forces which operate Slingsby

Select Latin American Special Forces Craft

Country	Service	Craft
Argentina	Buzo Tacticos Combat Diver Unit	Chariot CE2F/K100T SDV
Bolivia	Battali3n de Marina	Pirana Mk. II riverine patrol boat
Colombia	Almirante Grau Marine Unit Grupo de Comandos Anfibious combat divers	MG-120/ER Swat Midget submarine of unknown type
Uruguay	Cuerpo de Fusileros Navales Marine Battalion	Nuevos Ayres riverine patrol boat



The Mk V special operations craft is one of the most recent additions to the US Navy Seal's equipment list. The boats can travel in excess of 50 knots (93 km/h) and are powered by two Kamewa K50S waterjets. (US Navy)

Sah-2200 air cushioned vehicles while the Shayetet Shlosh Estrai Israeli maritime special operations forces make use of the South African-built Stingray Interceptor patrol boat, which has a range of 260 nautical miles (481 km) at 35 knots. Other major users of rapid special forces craft in the Middle East include the United Arab Emirates, which operates Arctic 28 and Al-Shaali Ribs along with domestically-produced Class 4 and Class 5 SDVs; sophisticated craft which carry sonar, navigation equipment and GPS to a range of 60 nautical miles (111 km); both are used by the UAE Navy Special Operations Group.

Central and North America

Nicaragua has opted to purchase a number of Colombian-built fast craft for maritime and riverine operations. These Eduardono class vessels are used by the Prefectura de Unidades de Fuerzas Especiales special operations forces unit. To the north, Mexico operates a fleet of Interceptor class fast patrol vessels that can travel at 50 knots, along with a number of Piranha class boats. These vessels are reinforced with Isla class fast boats, built by VT Halter Marine in the United States,

and are also used by US Navy Seals for the infiltration and exfiltration of special operations forces units with a 456-nautical mile (844 km) range at 35 knots.

Unsurprisingly, the largest user of special operations forces craft in the Western

Hemisphere is the United States which has a large array of craft that can be used both in the homeland security role and also for overseas operations. Along with the Mk 5 boats which are known in Mexico as the Isla class, US Special Operations Command uses the Boston Whaler-designed light patrol boat. These air transportable vessels feature a single 7.62 mm and triple 12.7 mm machine guns. USMI constructs larger Ribs for the Seals that can carry up to eight troops and are fitted with Mk 19 Mod 5 grenade launchers along with one 12.7 mm and 7.62 mm machine gun.

In terms of SDVs, the United States received the Mk 8 Mod 1 aluminium-framed vessel which superseded the Mk 8 Mod 0 version designed by the US Naval Surface Warfare Centre. This latest craft will not only equip American special forces but also their British counterparts and can travel at nine knots (16 km/h) for 36 nautical miles (66 km). In order to deliver these vehicles, Northrop Grumman and General Dynamics have



Seal teams operate from the USS Toledo in Ribs during an exercise. Seals will soon be operating from converted US Navy Ohio class missile boats under the 'Tactical Trident' initiative, which aims to convert a number of the SSBNs to support special operations. (US Navy)



Northrop Grumman has teamed with Aluminium Chambered Boats of Bellingham, Washington, to produce the Joint Multimission Expeditionary Craft, which marries a fast craft design to sophisticated command and control and navigation systems. (Northrop Grumman)

designed Dry Deck Shelters which can be installed on a nuclear submarine to deliver the SDV into coastal waters. The advanced SDV-X system, created by Colombia Research, will augment the Mk 8 Mod 1 design and can convey eight troops 56.5 nautical miles (104.5 km) at five knots (9.26 km/h). The largest SDV system in service with the US Navy is the Advanced Seal Delivery System which can carry up to 16 troops for a distance of 125 nautical miles (230 km). These vessels will be carried to their area of operations by a nuclear submarine; notably six of the Los Angeles class SSNs which will be suitably modified, along with all of the boats in the Virginia class. To increase their mobility, the ASDS are also air-portable in both C-5A and C-17A Globemaster-III air freighters. The first ASDS was delivered in 2003 and can be deployed from either the USS Charlotte or Greenville, the first two Los Angeles class SSNs configured to carry the ASDS.



The Panhard 4 × 4 VPS has recently entered service with the French 13^e Régiment de Dragons Parachutistes

Special operation units no longer are the privilege of Western nations, and there is a growing need for equipment to be operated by such entities around the world. Some of these nations are now adopting regionally developed systems as exemplified by the United Arab Emirates' acquisition of the Agrab mortar vehicle in March 2007.

Ian Kemp

Obviously American special forces units continue to dominate the discipline in terms of number of men, equipment and budget size. However, the palpable growth of special forces units around the world stems from the totally different nature of warfare since the demise of the Soviet Union's regime. Today everything has to be accounted for, and from small arms to mobile howitzers every item appears to be honed for a specific mission.

Small Arms

In December 2007 the US Special Operations Command is scheduled to complete the Initial Operational Test & Evaluation (IOT&E) of the FN Herstal 5.56 mm/7.62 mm Special Operations Forces Combat Assault Rifle (Scar) and the 40 mm Enhanced Grenade Launcher Module (EGLM). A positive outcome will result in the weapons being designated 'Operationally Effective' and 'Operationally Suitable' for fielding. The Scar is one of the most important small arms projects in the world today.

Socom released a request for proposals in January 2004 and only eleven months later selected FN Herstal's candidate from numerous worldwide competitors. The requirement was influenced by a number of factors, including dissatisfaction with the performance of the 5.56 mm M4 car-

bine in the War on Terror and the need for a weapon that fires a more powerful cartridge than the Nato standard 5.56 × 45 mm SS109 (US M855) round.

Development was expedited by bringing Socom project managers, budget officials and special forces operators together at FN Herstal's facilities in Liège, Belgium. Operators were able to suggest changes to the weapon's design to FN engineers, who often presented a solution the next day, thus telescoping a process that normally takes months if not years. This procedure also ensured the design truly meets the needs of frontline SOF operators. Scar production is anticipated at FN's facility in Columbia.

The Scar's modular design provides 90% 'ergonomic compatibility' and 60% parts commonality between the two different calibre weapons, which have now been type-classified as the Mk 16 Mod 0 Scar-L and the Mk 17 Mod 0 Scar-H. The Mk 16 can be fitted with a 254 mm close quarter combat (CQC) barrel, a 355.60 mm standard barrel and a 457.2 mm long barrel for accurate fire at longer ranges while the Mk 17 has 330.20 mm, 406.40 and 508 mm barrels. The CQC barrel is intended for use at combat ranges up to 200 metres, while the standard barrel is designed for combat at 300 to 500 metres and the SV barrel is optimised to engage targets between 500 and 800 metres.

The user is able to change barrels in less than five minutes with the aid of a special wrench, thus allowing the soldier to choose the appropriate barrel length

for a specific mission. Both weapons are fitted with MIL-STD-1913 'Picatinny' rails at the 12, 3, 6 and 9 o'clock positions that are compatible with 'nearly' all of the components of the M4 carbine Special Operations Modification (Sopmod) kit and the new twelve-gauge XM26 Modular Accessory Shotgun System produced by C-More Systems. A requirement for a weapon that can use 'pickup' 7.62 × 39 mm Russian standard ammunition found in operational situations may be met through further development of the Mk 17. The third distinct element of the project is the EGLM, now type classified as the Mk 13 Mod 0, which can be fitted to both calibre weapons and also used as a stand-alone weapon. The EGLM is derived from the grenade launcher FNH developed for its modular F2000 5.56 mm assault rifle.

In October 2007 FN Herstal (FNH) completed deliveries of 886 Mk 16s, 772 Mk 17s and 196 Mk 13s ordered under a low-rate initial production contract for the IOT&E phase. Socom has requested funding to buy 3502 Mk 16s, 2798 Mk 17s and 1804 Mk 13s worth more than \$ 25 million in fiscal year 2008 (FY08) and 1569 Mk 16s, 500 Mk 17s and 500 Mk 13s worth more than \$ six million the following year. Officials have previously indicated the project could total 84,000 5.56 mm and 15,000 7.62 mm weapons. FNH should be well placed with the Scar should the US Army decide to revive its protracted efforts to field a replacement for the 5.56 mm M16 rifle/M4 carbine family.

Until the widespread fielding of the Scar the primary small arm of US special forces units will remain the Colt Defense 5.56 mm M4A1 carbine and the associated Special Operations Modification (Sopmod) kit from Knights Armament, which contains Picatinny rails, forward grips, various day and night sights, lights,

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FN Herstal's 7.62 mm Mk 17 Mod 0 Scar-H assault rifle in the final stages of evaluation by the US Special Operations Command. (FN Herstal)

laser pointers and other accessories. Under the Mini Day Night Sight portion of Sopmod Block II Socom plans to buy in FY08 2309 EO Tech Close Quarter Battle Combat Optical Sights (1268 in FY09), 2309 Trijicon Enhanced Combat Optical Sights (1268), 1307 Litton Electro-Optical Systems Image Intensified Clip On Night Vision Devices (387), 480 Insight Technology Thermal Clip On

and then awarded HK a NOK 100 million contract for 8200 weapons while Aimpoint received a NOK 50 million contract to provide sights.

In parallel with the order for the HK416 Norway has ordered HK 6500 MP7A1s to replace its 9 mm MP5 sub-machine guns from 2008. This first important military export order could be a significant boost as more than 20 countries have bought small numbers of MP7s for evaluation purposes. German troops, including special forces units, deployed in Afghanistan have now been equipped with the MP7A1 for a few years. The weapon uses the 4.6 × 30 mm round designed by the Royal Ordnance division of BAE Systems, which provides better penetration at longer ranges than the 9 mm round. In 2003 HK introduced a 4.6 mm pistol, recently designated the P46 by the German armed forces.

Israel Weapon Industries (IWI) (formerly the Small Arms Division of Israel Military Industries) has resumed deliveries of its 5.56 mm Tar-21 (Tavor Assault Rifle – 21st Century) to the Indian Army following the resolution of minor technical problems. In 2004 the Indian Army ordered 3074 rifles to equip special forces units and 300 to 400 weapons were delivered the following year and issued to the Special Frontier Force. At the request of India modifications were made to the butt of the bullpup rifle and sight, which resulted in India approving completion of the order. IWI is assisting India's state-owned Ordnance Factory Board to build the

Micro Tavor (Mtar-21) for use by special forces and India's airborne units. The Micro Tavor can be converted from a 5.56 mm assault rifle to a 9 mm submachine gun. By the end of 2007 IWI is scheduled to complete delivery of an initial batch of 15,000 Tavors to the Israel Defense Force. The Republic of Georgia has also received an undisclosed quantity for its special forces with additional orders expected and the weapon is also reportedly used by Colombian special forces units.

Precision Fire

In 2007 US Army and Socom snipers began receiving the Knight's Armament M110 Semi-Automatic Sniper Systems (Sass) to replace the bolt-action Remington 7.62 mm M24 Sniper Weapon System. The army contract covers the supply of 4492 M110s. To expedite procurement the Sass selection was limited to non-developmental items; Knight's winning design is a variant of the KAC Mk 11 Mod 0 Sniper Rifle System in service with US Navy Seal teams. In December 2006 Knight's received a follow-on contract



FN Herstal's 5.56 mm Mk 16 Mod 0 Scar-L assault rifle can be fitted with a close quarter combat (bottom), a standard (centre) or a sharpshooter variant barrel (top). (FN Herstal)

Night Vision Devices (159), 2950 Insight Technology Advanced Tactical Precision Illuminating Aiming Lasers (1150) and 2250 Third Generation Visible Bright Lights (1240) from a still-to-be-decided contractor.

Since 2005 US SOF units have been using an unspecified number of 5.56 mm HK416 carbines, which is an M4 carbine that has been extensively rebuilt by Heckler & Koch under contract to Socom. Capitalising on experience over the past decade developing the 5.56 mm G36 assault rifle for the German Army, the 5.56 mm XM8 rifle for the US Army and the modernisation of the UK's 5.56 mm SA80 assault rifle, HK has comprehensively modernised the M4. Customers can purchase a new upper receiver, buffer and drive spring to refurbish existing weapons or buy a completely new-build HK416. In April 2007 the Norwegian Army selected the HK416 to replace its 7.62 mm G3 assault rifles even though it was not one of the shortlisted contenders,



FN Herstal's 7.62 mm Mk 17 Mod 0 Scar-H can be fitted with a close quarter combat (bottom), a standard (centre) or a sharpshooter variant barrel (top). (FN Herstal)

potentially worth \$ 9.9 million to supply Mk 11 rifles through December 2011. The Sass requirement stipulated that the selected rifle design had to be capable of delivering precision fire against personnel and soft-skinned materiel targets out to a

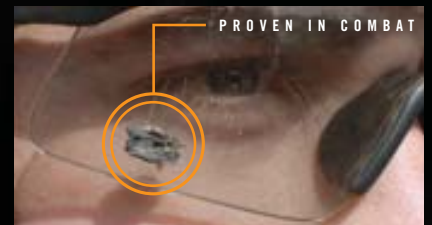


A US Marine Corps scout sniper team leader practises with the Barrett Firearms .50 calibre M82A3 Special Application Scoped Rifle. The weapon is widely employed in the EOD and anti-materiel roles. (US Marine Corps)

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A US Army sniper practises with the new Knight's Armament 7.62 mm M110 Semi-Automatic Sniper System. The M110 will eventually replace the Remington bolt-action 7.62 mm M24 Sniper Weapon System (foreground) that is used by US Army and Special Operation snipers. (US Army)

range of 1000 metres. Like the Mk 11, the M110 is optimised to fire M118LR long-range ammunition but can also fire standard 7.62 x 51 mm ammunition, including the M993 armour-piercing round. To improve survivability the weapon is fitted with a flash/sound suppressor. The rifle is supplied as a complete system with shipping container, 10, 15 and 20-round magazines and the new Leupold XM151 Spalding telescope. Operational testing was conducted at Fort Drum, New York in 2006 with 15 rifles and the weapon entered operational service in Afghanistan early in 2007.

The M110 will be used in conjunction with the Barrett Firearms M107 .50 calibre Semi-Automatic Long-Range Sniper Rifle, which was designed to engage materiel targets beyond 1000 metres. The M107 is derived from the M82A1 which is widely employed by many armies in the EOD clearance and anti-materiel roles. During FY07 the US Marine Corps is scheduled to complete fielding of the Barrett M107 .50 calibre Special Application Scoped Rifle to replace the earlier Barrett .50 calibre M82A3.

Although the Marine Corps Special Operations Command (Marsoc) is the newest component of Socom, the service is quick to point out that every Marine Expeditionary Unit is designated 'special operations capable'.

In December 2006 Optical Systems Technology (Osti) received a \$6.9 million initial delivery order from the Marine Corps Systems Command for 841 Magnum Universal Night Sight (Muns). The five-year indefinite-delivery/indefinite-quantity contract could eventually cover 4700 units at a cost of \$40 million. Marsoc selected it to meet the Scout Sniper Mid-Range Night Sight requirement. According to Osti a soldier using Muns in starlight conditions can detect a vehicle at about 3150 metres and a human at 1350. The sight weighs 1.45 kg and is powered by 2 AA batteries, which provide over 60 hours of use in optimum conditions. The Muns clips onto day sights without requiring tools and does not affect the zeroing of the day sight. Delivery of the initial order is scheduled for

completion by December 2007. According to the manufacturer the Muns is already in service with British and Canadian special forces.

The Canadian Army, which is dramatically expanding its SOF capabilities with the formation of the Canadian Special Operations Regiment, is now being equipped with the .338 Lapua Timberwolf Tactical sniper rifle developed by

1913 rail is mounted on the receiver. The butt is adjustable for length and has an adjustable cheek piece. The rifle is fitted with a Harris bipod that can be adjusted for height and cant. A six-baffle muzzle brake is fitted but this can be removed by the user and replaced with a titanium sound suppressor designed by PGW. The weapon is being marketed internationally by Colt Canada and has attracted interest both in the USA and among European armies.

Fire Support

FN Herstal has developed a lighter model of its 5.56 mm Minimi light machine gun (LMG), designated the M249 Squad Automatic Weapon in US service, at the request of Socom. The new weapon, type-classified as the Mk 46 Mod 0 LMG, weighs 27% less than the M249 and yet still retains 80% parts commonality. The weight reduction is achieved by using a lightweight barrel and removing the magazine well, carrying handle and vehicle mounting lugs. Socom has requested funds to buy 172 weapons in FY08 and 156 the following year to supplement 989 LMGs already purchased. The Minimi is the most widely used 5.56 mm LMG with

Transparent Ball Count

Colt Defense has recently introduced the 5.56 mm Colt Translucent Magazine, which is intended to eliminate the problems caused by damaged aluminium and other metal magazines not properly feeding rounds into the weapon. The polymer body of the 30-round magazine exceeds the strength of existing magazine at a much-reduced weight. According to Colt officials, the weight of a fully loaded magazine is less than the empty weight of the reduced metal magazines produced by some competitors. Steel feed lips with a corrosion resistant coating are permanently moulded into the body. Users can easily monitor their ammunition expenditure with 20 and 30 round indicators. The magazine is being evaluated by the special forces and other users in several Nato countries.

PGW Defence Technologies. After experience in Former Yugoslavia the army decided it needed a rifle that is lighter than a .50 calibre anti-materiel rifle, yet fired a more powerful round than a 7.62 mm. The Timberwolf Tactical, an extensively modified version of a civilian rifle, is being fielded to replace both the 7.62 mm C-3A1 and the McMillan .50 calibre rifle in some roles. The weapon features a McMillan A5 synthetic stock with titanium reinforcement, an integral laser spot marker mount and a titanium MIL-STD-

most recent customers opting for the ParaMinimi model that is lighter and shorter than the standard version.

FN Herstal is also producing the 7.62 mm Mk 48 Mod 0 LMG as a big brother to the Mk 46 and formally launched the weapon on the export market at Eurosatory 2006 under the name 7.62 mm Minimi. The Mk 48 was developed in response to a Socom requirement issued in March 2001 for a 7.62 mm LMG to replace the command's worn out M60s. The 'little brother/big brother' combina-



The US Marine Corps Special Operations Command has ordered the Optical Systems Technology PVS-27 Magnum Universal Night Sight (Muns) for its Scout Sniper Mid-Range Night Sight requirement. (Osti)

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Iraqi special operations forces, advised by US Army Special Forces, patrol a Baghdad street during an operation to detain suspected insurgent leaders. (US Navy)

using an eye-safe laser rangefinder, calculates a fire solution and then programmes the round in the chamber before it is fired. The sight includes a Gen III image intensifier. Nammo's Mk 285 prefragmented, pre-programmable high explosive air burst round incorporates the Mk 438 electronic fuze, which can be programmed for point detonation or to explode above or beside a target such as infantry in trenches, on rooftops, in buildings or behind obstacles. A prefragmented sleeve surrounds the 40-gram high explosive payload and the base of the round contains 1450 steel balls. These are sprayed in a five-metre forward arc from the detonation point. The round also incorporates an electronic self-destruct function. As these lines were being written Nammo was scheduled to complete an \$ eight million firm-fixed-price contract awarded in September 2006 for 39,776 Mk 285 rounds.

Norway's Vinghøg received an \$ 8.4 million firm-fixed-price, indefinite-deliv-

tion provides the advantages of ergonomic and parts commonality. At eight kg the Mk 48 weighs 34% less than the US Army's standard FN Herstal M240B 7.62 mm general-purpose machine gun and has 70% parts commonality with the M240, M249 and Mk 46. Socom plans to buy 100 weapons in FY08 and another 100 the following year to add to the 683 acquired since the Mk 48 was fielded in August 2003. The Department of Defense's latest report on the Foreign Comparative Test programme, presented to Congress in April 2007, noted the success of the «Special Operation Forces' 7.62 mm Lightweight Machine Guns from Belgium that significantly increases the organic firepower of Seal platoons in Iraq».

In July 2007 General Dynamics Armament and Technical Products (GDATP) was awarded a \$ 13.2 million production option to provide Mk 47 Mod 0 40 mm automatic grenade launcher (AGL) to Socom under the terms of a June 2006 five-year indefinite delivery/indefinite quantity contract. The latest production order brings the total contract value thus far to \$ 46.3 million.

GDATP developed the CG-40 Striker as a lightweight replacement for its widely deployed Mk 19 Mod 3 40 mm AGL. GDATP is responsible for overall systems integration and production of the gun while Raytheon produces the fire

control system (FCS) and Nammo Norway manufactures the ammunition. Socom selected the Striker, subsequently type classified as the Mk 47 Mod 0, to



Afghan National Army commando soldiers assault a building during their final training exercise in Kabul on 18 July 2007 culminating 90 days of training provided by US Army Special Forces and Afghan special forces instructors. Such training is a primary mission of US Army Special Forces. (US Navy)

meet its demanding requirement for an Advanced Lightweight Grenade Launcher, and bought 374 weapons over the three-year period from June 2004. The complete Mk 47 Mod 0, including a box of 32 rounds, weighs less than 45.36 kg when manpacked, a 40% weight reduction compared to the Mk 19 Mod 3. The FCS measures ranges out to 2000 metres with an accuracy of one metre

ery/indefinite-quantity contract in late 2006, funded through the US Department of Defense's Foreign Comparative Test programme, to supply its Softmount for evaluation as an Improved Crew Served Weapons Mount (ICSWM) for the Mk 47 Mod 0. The mount will also be used with other weapons such as the M2HB .50 calibre heavy machine gun and the M240 7.62 mm medium machine gun.

The United Arab Emirates announced at IDEX 2007 that it had placed a DHS 390 million contract for 48 Agrab (Scorpion) 120 mm mobile mortar systems. A source close to the programme said the country's special forces are likely to be the first operational unit equipped with the weapon. The Agrab was developed by the International Golden Group, which includes BAE Systems, Singapore Technologies Kinetics and Denel. The Agrab consists of an ST Kinetics 120 mm Super Rapid Advanced Mortar System (Srams) mounted on the rear of a BAE Systems OMC RG-31 Mk 5 4 x 4 mine-protected vehicle fitted with a new three-person armoured cab. This is the first contract for the Srams, which has been tested on a range of tracked and wheeled platforms.



US Army Special Forces soldiers train with the Saab 84 mm Carl Gustaf M3 Multi-Role Anti-Armor Anti-Personnel Weapon System in Iraq. Socom is funding the development of new 84 mm ammunition including an anti-structure round. (US Navy)



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Since its introduction in 2005 the General Dynamics Armament and Technical Products Mk 47 Mod 0 40 mm Advanced Lightweight Grenade Launcher has proven a popular weapon with American Special Forces in Afghanistan and Iraq. (US Department of Defense)

The Srams is ideally suited for light forces as it can be mounted in platforms as small as the Humvee; in this application the mortar vehicle would carry twelve rounds and a second Humvee would carry the bulk of the ammunition. In the Agrab system the Srams is mounted on the vehicle's rear platform and fires to the rear. Use of the Denel Arachnida computerised fire control system enables the three-person crew, consisting of commander, driver and loader, to bring the mortar into action within a minute of the vehicle stopping. Two carousels each hold 23 rounds and a further twelve rounds are stored in two ready racks. The contract covers the supply of 120 mm ammunition from Denel Munitions and the Improved Conventional Munition bomb from ST Kinetics, which delivers 25 dual-purpose bomblets to a maximum range of 6600 metres.

The US Naval Surface Warfare Center awarded the Laser Systems division of Litton Systems a \$ 98 million firm-fixed-price, indefinite delivery/indefinite quantity contract on 15 August 2007 for the Special Operations Forces Laser Acquisition Marker (Soflam) Special Operations Forces Laser Rangefinder Designator. The contract covers the purchase of up to 940 systems over a five-year period. The system is described as «a lightweight integrated laser designator and rangefinder that provides Special Operations Forces personnel the capability to locate and designate critical enemy targets for destruction using laser guided ordnance». Accessories such as pointers and night sights can be mounted and the system can be used remotely.

Mobility

The primary means of tactical transport for American units is the AM General Hummer, which is modified into one of four Ground Mobility Vehicle (GMV) variants: the GMV-R (Ranger) and GMV-S (SOF) for the US Army Special Operations Command, the GMV-N (Navy) for the Naval Special Warfare Command and the GMV-M (Marine Corps) for the recently formed Marine Corps Special Operations Command. Modifications can include auxiliary fuel bladders, ammo storage racks, rear floor reinforcement, roll bars, rear bench seats, a smoke and grenades system, recovery

strap kits, jacking and skid plates, spare tire carriers, side rails and various types of weapon mounts, not to mention add-on armour to provide 360° protection for the vehicle plus gunner protection. GMVs are normally armed with a turret-mounted M2HB .50 calibre heavy



Instalaza is currently developing a new tandem warhead for its C90 and Alcotan 100 ABK. The type for the latter weapon is currently being qualified with the Spanish Ministry of Defence and consists of a precursor warhead able to create a 50 mm diameter hole in 350 mm of concrete to enable the main warhead to penetrate and disperse some 2500 steel balls with a lethal radius of ten metres. (Instalaza)

machine gun or a 40 mm automatic grenade launcher as well as 7.62 mm machine guns mounted on arms that swing out from the doors. Storage racks are provided for support weapons such as the Javelin anti-tank guided weapon, mortars and .50 calibre rifles. Socom has requested funding in FY08 to modify four GMV-M, 24 GMV-R and 72 GMV-S vehicles and provide add-on armour kits for 43 GMV-S vehicles. The command plans to buy a further 75 GMVs in FY09, 285 in FY10, 293 in FY11, 380 in FY12 and 310 in FY13.

To provide logistics support for long-range patrols, a number of Stewart & Stevenson (now owned by BAE Systems) 2.5-tonne Light Medium Tactical Vehicles have been modified by removing the cabs and fitting protective roll bars. Lockheed Martin has developed a 4 x 4 'Armored Proof of Concept Vehicle' which is expected to be of interest to the American special force command both as a long-range patrol vehicle and a support vehicle. The company is also offering a derivative of this vehicle for the British Army's Medium Protected Patrol Vehicle requirement. The concept demonstrator has a gross vehicle weight of 6.9 tonnes, including a payload of almost two tonnes and is capable of towing a trailer of more than 4.5 tonnes. Options include different levels of armour protection, weapons mount, air conditioning, central tire inflation system, run-flat tires, automatic fire suppression and a C4I suite.

At the other end of the weight spectrum American units utilise hundreds of small all terrain vehicles (ATV) for both tactical and logistical functions. Polaris, of Medina, Minnesota, was awarded a \$ 10.3 million contract in April 2004 to provide about 700 vehicles over a five-year period. More than 230 vehicles have been delivered to date and Socom has requested funding for another 132 in FY08. The majority are the Sportsman MV (Military Version) derived from the commercial Sportsman 700 Twin 4 x 4 ATV. Modifications include a reinforced steel exoskeleton and enhanced suspension, enlarged front and rear stowage racks



With several thousand rounds ordered, the Instalaza C90 appears to be very popular with special forces from Europe, the Middle East, South and southeast Asia. The weapon is available with anti-tank (seen here), anti-armour plus anti-personnel and anti-bunker warheads, the latter with a concrete penetration capability of over 300 mm. (Instalaza)



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A number of Stewart & Stevenson 2.5-tonne Light Medium Tactical Vehicles have been modified to provide logistical support for long-range patrols. (Stewart & Stevenson)

enabling the MV to carry twice the load of a commercial Sportsman, an auxiliary fuel tank, infrared lights and electronically activated front and rear winches each capable of towing 1134 kg. Goodyear Extended Mobility Technology Mud Runner run-flat tires enable the MV7 to continue for 85 km after a puncture. Three Sportsman MVs can be carried inside a Boeing CH-47 Chinook helicopter. The contract also includes the Sportsman 6 x 6 ATV, which is able to carry 363.6 kg of cargo in a rear dump box. In addition to the US Army, the company has received contracts from foreign customers.

The Prowler Rugged Terrain Vehicle was designed specifically by All Terrain Vehicle of Orange, California to provide Socom with a purpose-built vehicle that could be carried internally by helicopters for deployment on reconnaissance, direct action and logistics missions. The four special operations components have conducted operational evaluations since 2002 and according to ATV, the Prowler has been enthusiastically received particularly by drivers who appreciate that the Prowler handles more like a car than an ATV. The vehicle has a payload of more than 454 kg and can tow up to 1066 kg, depending upon terrain. Weapons such as a 7.62 mm machine gun can be mounted on the roof, which incorporates an integral roll bar to protect the driver and front seat passenger. The Prowler is now available with a third seat that faces to the rear. Like most ATVs the Prowler is fitted with a gasoline engine but ATV is developing an engine for the Prowler and subsequent vehicles that will use JP8 aviation fuel.

In early 2006 Socom announced that it was seeking proposals for a new generation of advanced Lightweight Tactical All Terrain Vehicle in 4 x 4 and 6 x 6 configurations and hosted an industry day in May that year. Interested companies were asked to submit a brief on their products and the estimated costs of «an RDT&E effort intended not to exceed 6 months» with an emphasis on seven specific areas:

- ▶ advanced ergonomics which enhance both safety and operational capabilities in tactical and administrative environments
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- ▶ improved safety features such as roll-over protection

- ▶ worldwide deployment capability in all terrains and climates and
- ▶ single and multiple-passenger variants are being sought as part of the proposed family of vehicles.

Although special forces units can generally be regarded as 'light' forces there are nevertheless operational situations when they require a higher level of protected mobility than offered by patrol vehicles derived from light utility vehicles. In 2005 the US Army loaned 16 General Dynamics Land Systems – Canada 8 x 8 Stryker armoured vehicles – 14 infantry carrier vehicles, a command variant and a medical evacuation vehicle – to a battalion of the 75th Ranger Regiment for operations in Afghanistan. Since then Socom has bought the General Dynamics Land Systems – Canada RG-31 Mk 5 to provide protected mobility for operations in Afghanistan and Iraq. Under the joint service Mine Resistant Ambush Protected (Mrap) programme the Department of Defense has authorised the purchase of 333 Mrap vehicles for Socom. As of September 2007 the Department of Defense had ordered 1092 RG-31s from General Dynamics which subcontracts production to BAE



The primary patrol vehicle used by the American land special forces is the AM General Ground Mobility Vehicle that is derived from the High Mobility Multipurpose Wheeled Vehicle. (US Army)

Land Systems OMC of South Africa, the original designer of the vehicle. Demmer of Lansing, Michigan will be opening a production line to support the latest order. The RG-31's all-welded armoured shell defeats small arms fire up to 5.56 x 45 mm with an optional protection level of up to 7.62 x 51 mm armour-piercing, while the V-shaped hull can withstand a double TM57 level mine explosion (14 kg of TNT) under any wheel and a single detonation (seven kg) under the centre of the vehicle.

Australia: the special forces task group that has been operating in Afghanistan since September 2005 is equipped with a small number of Thales Australia Bushmaster Infantry Mobility Vehicles for security patrols while Land Rover 6 x 6 long-range patrol vehicles and Land Rover 110 4 x 4 Surveillance Reconnaissance Vehicles (SRV) are used for classic special forces patrol missions.

Land Rover is positioning itself as a contender to replace these vehicles and, at DSEi 2007, displayed its new 6 x 6 prototype that combines the all-terrain



Lockheed Martin has developed a 4 x 4 Armored Proof of Concept Vehicle which could be suited for special forces long-range patrols. Options include armour protection. (Lockheed Martin)

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Land Rover has developed a 6 x 6 prototype vehicle that combines the all-terrain capability of its 4 x 4 light utility vehicles with greater payload. (Land Rover)

capability of the company's 4 x 4 light utility vehicles with greater payload and volume capacity. In the late 1980s Land Rover developed a 6 x 6 vehicle for the Australian Defence Force's Project Perentie and subsequently 1000 vehicles were assembled in Australia under licence along with almost 3000 Land Rover 110 4 x 4 models. Among the 6 x 6 variants was the long-range patrol vehicle for the Australian Special Air Service Regiment and these were later supplemented through the Bushranger Phase 1 programme by the SRV. The Australian Army plans to replace its wheeled tactical fleet, including its 4 x 4 and 6 x 6 Land Rovers, through project Land 121 Overlander and its special forces vehicles through Project Redfin. In its basic form the new Land Rover 6 x 6 vehicle has a chassis cab and is designed for modular rear bodies to meet mission/customer requirements. With an overall length of 6001 mm the vehicle is 1400 mm longer than the Defender 110 and 190 mm wider with a width of 1980 mm. It has a gross vehicle weight of 7000 kg including up to 4000 kg in payload capacity. Two vehicles can be driven without preparation onto a C-130 Hercules for movement by air. The vehicle, which is in permanent 6 x 6 drive, is powered by a Defender 2.4-litre common rail diesel engine mated to a six-

speed manual gearbox and two-speed transfer box.

New Zealand: In June 2005 the Special Air Service deployed its newly delivered Pinzgauer 6 x 6 special operations vehicles for the first time to conduct long-range reconnaissance and direct action missions in Afghanistan. The British company (bought in April 2005 by Stewart &

was designed under a £ 3.5 million Ministry of Defence contract. A lightweight aluminium honeycomb construction is used to keep the 6 x 6 vehicle's weight to about 800 kg enabling it to carry a 1000 kg payload. The rear platform is designed to accommodate a wide variety of demountable bodies and equipment. Roush is planning Las-200RE and 300RE series derivatives for other operational requirements. Roush and Arctic Cat teamed to develop the Arctic Cat Diesel Reconnaissance Vehicle (also known by the Roush designation Las-50RE). The ATV can carry 45 kg on the front rack, more than 90 kg on the rear rack and a tow a 500 kg trailer or other equipment up to 500 kg. The vehicle entered full-rate production in mid-2006 with deliveries beginning in the third quarter.

South Africa: airborne and special forces are equipped with more than 100 Gecko 8 x 8 Rapid Deployment Logistical Vehicles. South Africa's LMT Products modified the Argo Centaur 8 x 8 ATV, manufactured by Ontario Drive and Gear, to meet South African National Defence Force requirements. Modifications included fitting a militarised top structure,

Australian Training

In July 2007 the Australian Army formally opened a new Special Forces Training Facility (SFTF) at Holsworthy Barracks. The facility was built and equipped for a cost of A\$ 94 million and is described by the Australian Department of Defence as «one of only four of its kind in the world providing leading-edge training to counter-terrorism forces». The SFTF includes indoor and outdoor multi-level electronic and live firing ranges as well as a variety of training environments.

Stevenson, which was subsequently purchased by Armor Holdings which in turn was bought recently by BAE Systems!) built 13 special operations variants as part of the New Zealand Army's Light Operational Vehicle project to acquire 321 Pinzgauers. The Pinzgauer is in service with British special forces and the company is offering the latest model, dubbed the X-treme Mobility series, for Australia's Land 121 and Redfin projects.

Britain: in late June 2007 the Ministry of Defence announced the purchase of 130 Medium Weapons Mounted Installation Kit (Mwmik) patrol vehicles under an Urgent Operational Requirement to bolster fire support for troops in Afghanistan and Iraq. In comparison with the Land Rover 4 x 4 Wmik vehicles now in use, the Mwmik vehicle will provide longer range, greater payload capacity and greater mobility. The open-top vehicle carries a crew of up to four and can be fitted with a range of weapons including the M2HB .50 calibre heavy machine gun, the Heckler and Koch 40 mm automatic grenade launcher and 7.62 mm general-purpose machine guns. The vehicle has a top road speed of 130 km/h. The first vehicles are scheduled to deploy to operational theatres early in 2008.

Roush Technologies in Britain has recently produced two ATVs for the British rapid reaction forces. The Las-100RE lightweight all-terrain platform

weapon mounts, storage space, a 12V/24V electrical system, communication harnesses and a strengthened lower structure to allow air delivery and helicopter lifts. The vehicle can carry a 900 kg payload and tow a 600 kg trailer and achieve a top speed of 47 kph. The Gecko is fully amphibious with a 230 kg payload and this can be improved by fitting flotation bags.

France: The French Army's Brigade des forces spéciales Terre (BFST) has received 41 4 x 4 Véhicule Patrouille Spéciale (VPS) bought from Panhard in mid-



Panhard's Véhicule d'Action dans la Profondeur (Vap), a derivative of the successful Véhicule Blindé Léger (VBL), is designed for long-range reconnaissance and direct action missions. The Vap underwent extensive trials in the United Arab Emirates. (Panhard)



DML is building 130 Medium Weapons Mounted Installation Kit (Mwmik) patrol vehicles based on the Supacat High Mobility Transport design under an Urgent Operational Requirement from the British Ministry of Defence to bolster fire support for troops in Afghanistan. (British Ministry of Defence)

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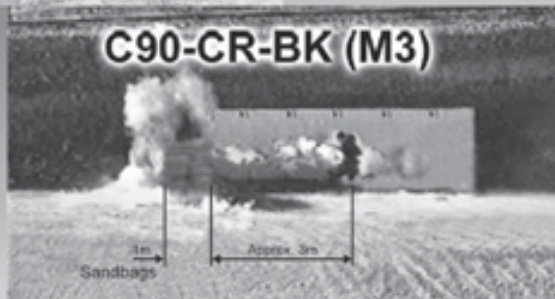
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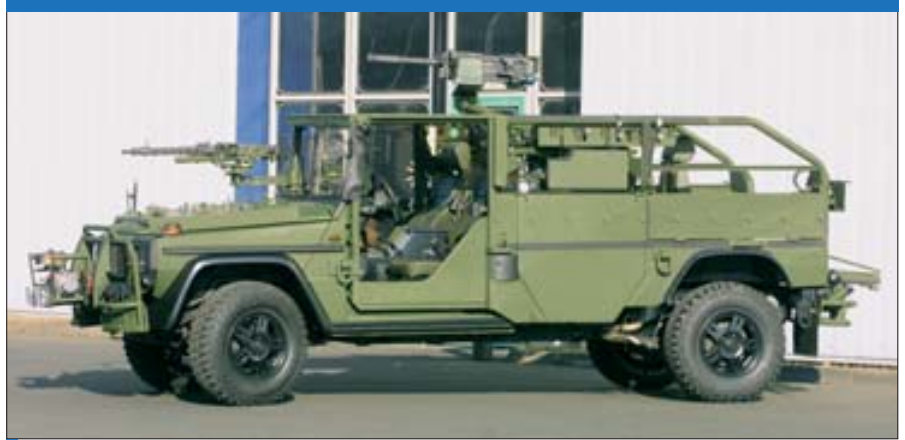
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2005. The VPS is based on a short wheel base Mercedes-Benz G 270 CDI G Wagon that Panhard modified to meet the army's requirement for a vehicle that can be carried internally by a variety of rotary- and fixed-wing aircraft without special preparation. The VPS (seen in the title picture above) has a combat weight of 4000 kg and measures 4.74 metres in length, 2.21 wide and 1.92 metres to the top of the roll cage. One vehicle can be air-lifted inside a medium helicopter, two inside a Transall C-160 and three in a C-130J-30 stretched Hercules. Seating is provided for four personnel. A manually operated ring mount is fitted on the roll cage over the rear compartment and is able to accommodate a .50 cal (12.7 mm) heavy machine gun or 40 mm AGL, while a 7.62 mm machine gun can be installed at the commander's position in the right forward seat. An armoured floor under the hull protects against anti-personnel mines. The vehicle has a maximum speed of 120 km/h on roads and a road range of 800 km with its 96-litre fuel tank. Standard equipment includes storage of 30 litres of water and rations, two 20-litre fuel cans, two spare wheels and a self-recovery winch on



Rheinmetall developed the Serval light infantry vehicle for Germany's special forces using an extended wheelbase Mercedes-Benz G-Class chassis. The vehicle has also been bought by an unspecified European customer. (Rheinmetall)



The Rheinmetall 4 x 4 Tokeh light tactical vehicle was designed specifically to be carried inside the NH 90 helicopter. A second prototype will be ready by the end of 2007. (Rheinmetall)

the front bumper. Although the French brigade would like additional VPS vehicles, budgetary restraints have forced the service to consider converting some of its P4 Luvs, a derivative of the G Wagon produced by Panhard between 1983 and 1992, to the special forces role.

As a private venture Panhard has developed a Véhicule d'Action dans la Profondeur (Vap) deep penetration variant of its successful 4 x 4 Véhicule Blindé Léger (VBL) reconnaissance vehicle, which is used by the armed forces of at least 15 countries. By eliminating the VBL's armoured hull the empty weight of the vehicle has been reduced to 2500 kg and it can carry a payload of 1500 kg including four crew. The Vap has an armoured floor, which according to Panhard provides 'good' mine protection. Powered by a 2.1-litre Steyr turbo diesel engine the VAP has a maximum range of 700 km and can reach a top speed of 120 km/h. Panhard is proposing that the Vap be fitted with a range of weapons, observation and communications equipment,

enabling it to undertake missions such as direct action, reconnaissance and target designation. Panhard estimates the export potential for the Vap at 200 vehicles.

Germany: special forces are equipped with 21 Serval Light Infantry Vehicles (Special Operations) developed by Rheinmetall and based on an extended wheelbase Mercedes-Benz G-Class chassis. The vehicle has a four-man crew and is fitted with an RLS 609 K weapon station able to accommodate weapons such as a 12.7 mm heavy machine gun or a 40 mm AGL. General-purpose machine guns can be fitted at the front passenger's seat and the rear of the vehicle. The Serval is designed to be carried internally by the army's CH-53 heavy-lift helicopters and the weapon station can be folded to lower the vehicle's profile for air transport. A smaller number of Servals were delivered to an unspecified European customer in 2007 and discussions are being held with another potential European customer.

At Eurosatory 2006 Rheinmetall Defence unveiled the Tokeh 4 x 4 light tactical vehicle feasibility demonstrator that has been designed to meet a German Army requirement for a vehicle that can be carried inside the NH Industries NH90 tactical transport helicopter. The Tokeh weighs 1800 kg and is able to carry up to 600 kg in cargo including a two-person crew. It is powered by an Iveco 2.3-litre diesel engine, which gives a maximum speed of 120 km/h and features a

height-adjustable suspension system. The Tokeh can be armed with a 5.56 mm or 7.62 mm machine gun operated by the vehicle commander. Rheinmetall is evaluating the Tokeh's suitability for internal deployment by the Socom's Bell Boeing V-22 Osprey tilt-rotor aircraft. A second demonstrator will be completed before the end of 2007 incorporating design changes as a result of the early trials.

Jordan: Jankel Armouring in Britain and Jordan's King Abdullah II Design and Development Bureau used a tropical specification Toyota 1979 4 x 4 chassis as the basis for the Al-Thalab (Fox) long-range patrol vehicle first unveiled at the September 2005 DSEi exhibition. The use of the Toyota chassis, which has been sold to civil users around the globe, is intended to make it easier to obtain spare parts and ease of repair in remote areas. The vehicle accommodates a driver, commander and two crewmembers in the rear and has a maximum payload of 1700 kg. A 7.62 mm machine gun can be mounted for the commander's use and a heavy machine gun or AGL can be fitted on the rear mounted ring platform. Jordan's special forces have received 20 vehicles and another 15 were delivered to an undisclosed African customer for use on border patrol duties.

Precision Insertion

Current parachutes are a far cry from the types used even 30 years ago. Sports

TacEye on Goggles

The TacEye head-mounted display system was developed by Vuzix's Tactical Display (previously Icuti) with partial funding from Socom and the US Air Force Research Lab Human Effectiveness Directorate. Weighing less than 85 grams the TacEye can be mounted on a helmet or goggle to provide clear video and computer data in either daylight or darkness utilising a high brightness SVGA (800 x 600) Oled micro display. The user can plug in a variety of sensors or computers using an interface box that also incorporates three additional USB 2.0 ports to allow users to stow the computer system and still maintain control using an external keyboard and a wearable mouse. The lighter TacEye LT version, which can be mounted on sunglasses, has recently been developed for a customer.





Scheduled to enter US Army service in 2008 the Airborne Systems T-11 Advanced Tactical Parachute System allows soldiers to make more controlled landings thus significantly reduce injuries during parachute operations. (Airborne Systems)

Parachute Equipment and Logistics Consortium (Spelco) was formed by ESG Elektroniksystem- und Logistik and Dräger. In 2002 after they were selected by the German BWB defence procurement agency to supply the Special High Altitude Parachute System (Shaps) to Bundeswehr Special Ops units. In service since 2003 Shaps consists of about 60 sub-systems, including a ram-air parachute, oxygen supply, communications and navigation components supplied by various manufacturers. Spelco unveiled the Gryphon delta wing system in 2006. In its initial configuration parachutists will be able to jump from a height of about 10,000 metres and glide for 40 km carrying up to 100 kg of equipment. Launching a mission from such a range avoids alerting the enemy to the presence of transport aircraft thus contributing to surprise. Spelco claims that detecting «this almost 100% silent parachute system using air or ground-based radar systems is extremely difficult. Night operations or operations

paragliders and powergliders have since influenced military designs.

America: in April 2007 Airborne Systems Group, which included Irvin Aerospace, Irvin-GQ, Irvin Canada, Para-flite and AML, was reorganized into two divisions: Airborne Systems North America and Airborne Systems Europe. The company is a leading supplier of parachutes to many of the world's armed forces. In April 2006 the company received a \$ 7.9 million contract from the US Army Soldier Systems Center to supply approximately 8800 steerable MC-6 parachutes developed for the Special Operations Forces Tactical Assault Parachute System (Softaps) programme. The MC-6 combines the SF-10 canopy, in service for over ten years, with the T-11 harness and T-11R reserve canopy developed by the company for the US Army's Advanced Tactical Parachute System (ATPS). The MC-6 provides a lower rate of descent, lower opening shock, reduced canopy damage, better turn ratio and a better glide ratio than the MC1-B/C/D parachute that it will replace.

The T-11 ATPS will replace the 52,000 T-10 parachutes now in service. The T-11 has a slower rate of descent than the T-10, which reduces the force on landing by 40% and is expected to significantly reduce casualties. During the US invasion of Panama in 1989, more than 4% of the 2nd Battalion, 75th Ranger Regiment (Airborne) suffered jump-related injuries. More than 3200 test jumps will be made using the T-11 leading to initial deployment with the 75th Ranger Regiment, Rigger School and Airborne School in 2008-09. Airborne Systems has inquiries about the Softaps and ATP, «From many countries that want to reduce injuries and improve operational capabilities».

Germany: trials are continuing of a unique system intended to enable German special operations parachutists to glide silently up to 200 km into enemy territory using a modular delta wing system. The Special

FY07 Socom Foreign Comparative Test Projects

Each year the four American services and Socom nominate candidate projects to the Office of the Secretary of the Defense for funding consideration under the Foreign Comparative Test. The Special Operations Forces Combat Assault Rifle (Scar) programme, won by Belgian FN Herstal, was initially funded through the FCT programme. Other FCT success story for the Command in FY05-06 was the fielding of the Saab Bofors Dynamics AT-4CS Disposable Shoulder-fired 84 mm Weapon. According to the Department of Defense the «project also achieved an estimated \$ 25 million development cost avoidance by leveraging previous US military AT-4 efforts, \$ five million in production savings and \$ two million in operations/life-cycle cost savings». Socom has procured a further 24 systems from ten countries through the FCT programme.

Socom is sponsoring five of the 19 FCT projects launched in FY07:

► the Naval Surface Warfare Center, Crane, Indiana, will evaluate **20 mm anti-material rifles**, developed by RH-Alan of Croatia, and Denel and Truvelo Armoury, both of South Africa, to determine their capabilities to defeat material targets such as lightly armoured vehicles, power stations, communication assets and unexploded ordnance. Phase I of the project will culminate with the selection of a single weapon, which will undergo full technical testing and assessment in Phase II. Operational testing will be conducted in Phase III of the project.

► **various tagging, tracking and locating (TTL) equipment** that represents the latest in worldwide TTL technology. «These ultramodern devices will provide deployed US Special Operations Forces worldwide with an enhanced capability to tag, track and pin-point potentially dangerous adversaries.» Companies in Canada, France, Italy and Britain have been selected to participate in this programme.

► the Swedish Ericsson **Quiclink lightweight Universal Mobile Telecommunications system** Will be evaluated by the Program Executive Officer for Intelligence and Information Systems, with test support from the US Army Communications and Electronics Command at Fort Monmouth, New Jersey. The project will focus on the critical requirements of the Special Operations Forces Tactical Assured Connectivity and Joint Threat Warning Systems programmes, and the US Army's Warfighter Information Network-Tactical (Win-T) programme. The Department of Defense describes the Quiclink as «a downsized third generation cellular system that can provide high data rates to personal communications devices, as well as handle a large number of simultaneous voice calls. The system can operate autonomously, or as a sub-network within current legacy networks, and will incorporate robust header compression technology.»

► the Naval Surface Warfare Center will evaluate a **Mk 47 Mod 0 Crew-Served Weapon Trainer** developed by Simrad Optronics/Vinghøg, which allows troops to 'dry fire' the Mk 47 and automatically receive feedback during mission-specific rehearsals prior to combat operations.

► The Naval Air Warfare Center, Saint Inigoes, Maryland, will evaluate the deployment and operating capabilities of an **FM Broadcast System** developed by Norway's Tyra Invest using a tethered balloon concept. The system can place an FM Broadcast Transmitter at a predetermined altitude for up to five days and transmit psyops messages to personnel on the ground in denied areas. The system is designed to be deployed from fighter aircraft by means of a standard MK-7/20 (PDU-5B) canister.



01dB-Metravib has supplied the Pilarw acoustic vehicle-mounted gunfire detection system for US Army special forces vehicles (seen here mounted above the right-hand windscreen of a Hummer) and for use in static facilities. (01dB-Metravib)

under adverse weather conditions are possible.» Gryphon has a 1.5-metre wingspan and is fitted with ailerons and flaps. In the next development stage Spelco plans to integrate lightweight turbo jet engines, developed for unmanned air vehicles, which could extend the range of the Gryphon to 200 km.

Situational Awareness

In mid-September Aerovironment announced the Danish Army Operational Command had placed a \$ 2.4 million order for the RQ-11B Raven B small unmanned aircraft system to equip the army's special forces (Jagerkorpsset) and for use at the Danish Army's Artillery Training Centre. The order covers twelve systems each of which typically consists of three aircraft, a hand-held ground control station, a remote viewing terminal, systems spares and related services. More

than 6000 RQ-11A and RQ-11B air vehicles have been built, making it the most numerous drone system in the world today. The Raven B is being fielded by the Special Operations Command, the US Army and the US Marine Corps as the Rucksack Portable UAS. In FY07 Socom bought 130 systems and plans to buy a further 73 systems next year. The hand-launched, battery powered Raven B has an endurance of about 80 minutes and can operate over a radius of ten km sending back high-quality video images.

Macrosswiss, the Swiss developer of unmanned systems, recently launched the one kg Micro Spyrobot 4WD remotely-operated reconnaissance vehicle which is intended for use by SOF units on dismounted patrols, where weight is an a premium. The system has already been purchased by Britain and is being evaluated by the United States. Made from nylon, the Micro Spyrobot can be thrown

through a window and, after righting itself, the robot will send colour video from its front and back cameras to a monitor in up to 300 m away in line-of-sight. The Micro Spyrobot can travel up to 15 km/h and the patented 'flapper' wheels enable the vehicle to swim across water obstacles.

French company 01dB-Metravib has supplied 165 Pilarw Acoustic Vehicle Mounted Gunfire Detection Systems and 18 Pivot (Pilar Versatile Observation Turret) to the American Special Operation Command following its selection through the Foreign Comparative Test programme to provide a family of sniper detection systems to detect and locate the source of 5.56 mm, 7.62 mm and 12.7 mm gunfire from up to 1200 metres away. The Pilarw analyses data from the sound of the bullet passing through the air and the muzzle blast to provide the bearing, elevation, range and trajectory to the firing point. When linked to the Pilarw the Pivot daylight observation system will automatically turn to the direction of the threat when a bullet is fired. The system has been mounted on a number of Socom vehicles deployed on operations in Southwest Asia. □



Socom is fielding the Airborne Systems MC-6 Special Operations Forces Tactical Assault Parachute System which provides units with a steerable parachute. (Airborne Systems)

Index to Advertisers

Adventure Lights	33	ITT	9
Airborne Systems	31	L-3 Communication Systems-East	3
AltornaMATS	33	L-3 Ruggedized C & C Solutions	C3
AM General	29	mb-microtec	31
AMTI	13	Raytheon	C4
Ceradyne	29	Revision Eyewear	23
ELCAN	5	Saab Bofors Dynamics	21
Hardigg	27	Tactical & Survival Specialties	31
IAI	25	Tadiran Communications	C2
Instalaza	33	Thales Communications	7

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