

Getting it Done

In many ways, and apart from the actual duties that are being assigned to them, all the individual special forces around the world can be considered as equipment testers. This because they are usually formed of small groups of individuals entrusted with extreme missions and who end up knowing and trusting one another to much higher levels than in any other force.

Tracing back the history of today's special forces – or commandos as they were once upon a time known – leads one into the foggy nights of the middle ages when small groups of specially trained men surreptitiously climbed up fort walls to secure ropes for the morning attack. There was no night combat then. Some may even argue that the Romans already had special elite forces. Closer to us though, it was revealed that Germany had formed specially formed 'storm troops' to attack the British positions in France during World War One. However, whichever way we look at them, the key to the success of special groups, apart from training, is their ability to be extremely flexible and relatively autonomous with a high potential for initiative. Their flexibility is largely owed to their small sizes.

Commandos, though, are more generally considered to have seen the light of day during World War Two in the British armed forces, when Winston Churchill formed the Special Operations Executives, often referred to as SOE. Their duty was typically focused on infiltration and sabotage. Then shortly after, in 1942, came the Special Operations section of the US Office of Strategic Services; France eventually formed its own groups to fight alongside the British SAS commandoes in Africa and in the Middle East.

Today the need for special forces is even more acute, as they are of paramount importance for the discrete penetration and destabilisation of an enemy before any large-scale operation can be carried out by regular forces. They also proved invaluable in counter-operations involving piracy and highjacking.

This supplement is intended to provide an update on the equipment special forces use in air, land and sea operations in four separate sections. It thus complements the previous supplements on the subject already published by Armada International.

Eric H. Biass
Editor-in-Chief



The NH 90 (here the first German TTH) has strong potential for special operations



Black Kite Discretion

The employment of aerospace assets in Special Operations has come to be primarily associated with specially-equipped fixed- and rotary-wing aircraft that insert small numbers of personnel into hostile territory, and resupply and extract them using highly trained crews and night-time low-level flying. However, development efforts are now concentrated on hand- or bungee-launched lightweight reconnaissance drones and the precise delivery of personnel and stores by guided parafoils.

Roy Braybrook

As in many aspects of modern warfare, special air operations had their origins in Hitler's Germany. One of the surprises sprung on the Allies in the 1940 Blitzkrieg (lightning war) was the DFS 230A assault glider, which carried eight troops and was towed to the target area by a Junkers Ju 52/3m. It was first employed on 10 May in a dawn attack on the Belgian fort at Eben-Emael; ten of these gliders landing 78 heavily-armed Fallschirmtruppen (paratroopers) on the roof of the fort, which was disabled by large hand-placed shaped charges (another innovation).

The need for a shorter landing subsequently led to three forward-firing rockets being mounted in the nose, reducing ground roll to around 15 metres. Eight examples of this rocket-braked DFS 230C-1 were successfully employed on 12 September 1943 in Operation Eiche (Oak), to release Mussolini from imprisonment in a hotel on Gran Sasso in the Apennines (a location otherwise accessible only by cable car). In a joint operation by a Fallschirm-Battalion and troops of the Waffen-SS, led by Otto Skorzeny, Italy's Duce was subsequently extracted to Pratica di Mare (Rome) in a Fieseler

Fi 156 Storch (Stork) Short Take-off and Landing (stol) utility aircraft.

The lessons learned in those early operations remain valid today, including the need for precision air delivery and the usefulness of stol aircraft. The continued use of such aircraft was brought out when an Iraqi Air Force Aerocomp CompAir 7SL crashed in a sandstorm 130 km from Baghdad in May 2005. Four of the five casualties were US Air Force personnel from Hurlburt Field, Florida, the headquarters of Air Force Special Operations Command (Afsoc).

The CompAir 7SL is a seven-seat stol aircraft with a 490 kW, Czech-built, Walter M601E turboprop, replacing the 200 kW piston engine of the baseline CompAir 7. Seven of these aircraft were purchased by the United Arab Emirates as a gift for Iraq. The 1.7-tonne, composite-built CompAir 7SL might be regarded as America's answer to Switzerland's legendary 2.6-tonne, ten-seat Pilatus PC-6, which is powered by a 410 kW Pratt & Whitney Canada PT6A-27 and first flew in 1959.

Special Delivery

In past conflicts the accurate delivery of men and supplies by parachute demanded release from below 2000 ft, a procedure now ruled out by shoulder-launched

Sams. The problem of achieving precision airdrops has been particularly acute in Afghanistan, where mountainous terrain severely restricts the DZ (drop zone) area.

However, it is now possible to paradrop accurately from high level, by combining steerable parafoils with satellite navigation and/or radio command guidance. In some cases a conventional unguided round parachute is used for the terminal phase, to provide a soft landing.

The Flight Refuelling Cads (Controlled Aerial Delivery System) is already in service with several armed

«...it is now possible to paradrop accurately from high level, by combining steerable parafoils with satellite navigation and/or radio command guidance.»

forces. Cads employs an Irvin-GQ ram-air parafoil which is guided by coded radio commands that are provided either manually by a following parachutist or ground personnel, or automatically by a beacon on the ground. The system is intended for releases above 25,000 ft, providing an offset of up to 25 km. It is designed for payloads of 150 to 500 kg. An accuracy of 20 metres has been demonstrated in manually guided tests, degrading to 100 metres with automatic homing. The Cads is claimed to have a life of at least 50 drops.

Another serious contender is Canada's Mmist (Mist Mobility Integrated



Ever since the days of the Fieseler Storch and Westland Lysander, *stol* utility aircraft, instanced here by a United Arab Emirates-operated Pilatus PC-6, have played a key role in special operations. (Pilatus).

Systems Technology) series of GPS/radio-guided parachute delivery systems, providing a CEP (Circular Error Probable) of less than 100 metres. The baseline Sherpa has three parafoil options, sized for 230, 460 and 550-kg payloads. It was first employed operationally in Iraq by a US Marine Corps Reserve KC-130T squadron (VMGR-452) in August 2004, dropping supplies in a combat support situation.

The 635-kg Powered Sherpa has an 80 kW piston engine and is designed for release at up to 18,000 ft with a 270 kg payload. A batch of 36, designated CQ-10A SnowGoose, is being evaluated by America's Special Operations Command (US Socom) as a means to dispense Psy-Ops (Psychiatric Operations) leaflets over Iraq and Afghanistan. Mmist also produces a similarly guided one-man ManPack.

A third example in this rapidly growing field is America's Atair Aerospace Onyx series, which is designed for payloads ranging from 34 to 1000 kg and release altitudes up to 35,000 ft. The Onyx employs a highly loaded, GPS/INS-guided elliptic ram-air parafoil for a high-speed descent (minimising exposure to winds), and an unguided round parachute for a soft landing. The Onyx was developed under contract with the US Army Natick Soldier Center (NSC) and with support of the Festo Corporation. It performed the first flight demonstration of its formatting and collision-avoidance algorithms in December 2004, when five systems were released in a single drop. The US Army is interested in ultimately dropping up to 60 units at the same time.

Atair Aerospace, which claims to produce the world's most efficient parachute wings, is also developing composite materials that are 300 per cent stronger and almost 70 per cent lighter than conventional ZP nylon. These new materials will also hold their shape better, producing significantly less drag. The company has referred to a lift:drag ratio of 4.5:1, implying a 48 km range from 35,000 ft in still air conditions.

Atair is also working with Rockwell Collins and Kaiser Electro-Optics on a

helmet-mounted high-altitude release, high/low opening (Haho/Halo) navigation aid, combining GPS/INS inputs with a monocular display. This Haho/Halo device will provide a member of the Special Forces with day/night all-weather imagery of the target area and the in-flight locations of the rest of the team. The NSC is reportedly studying three such MFF (military free-fall) navigation systems.

The US Army earlier specified a Pegasys (Precision and Extended Glide Airdrop System) family of possible requirements, relating to different payload categories. More recently, its Pegasys-XL, for payloads of 90 to 1000 kg, and Pegasys-L for loads of 1.0 to 4.5 tonnes, have been integrated with the US Air Force Pads-MP (Mission Planning) system, which plugs into the navigation

computer of an Air Mobility Command (AMC) Lockheed Martin C-130 or Boeing C-17. This combination provides the basis for the Jpads (Joint Precision Airdrop System) ACTD (advanced concept technology demonstration) programme. This was launched in FY2004, under the auspices of US Joint Forces Command, and is expected to be extended later to include heavier payloads.

One low-cost Jpads contender is the Agas (Affordable Guided Airdrop System), being developed jointly by America's Vertigo and Capewell Components. The Agas employs existing equipment in the form of the G12 steerable round parachute and the A-22 cargo bag. Prior to releasing the payload, a windsonde is dropped from the parent aircraft to provide wind vector data as a function of altitude.

At the Precision Airdrop Technology Conference And Demonstration at Yuma Proving Ground in Arizona in October 2005, over 15 systems were to be tested, leading to a joint military utility assessment around two months later.

Jpads may also benefit from European developments. For example, Eads Defence Electronics is producing the Parafinder/Paralander system (military designation SLG-Sys) for German's airborne troops; it is being developed in co-operation with the Bundeswehr WTD-61 test centre. The Parafinder is for individual paratroops and includes a helmet-mounted display. The Paralander caters for loads up to six tonnes, release heights up to 33,000 ft and offsets to 50 km. Prescott Products of Texas has an agreement with Eads to manufacture a Precision Parachute Delivery System (PPDStm) under licence, featuring a



The growing demand for precision delivery from altitude has led to various GPS-guided parafoil systems, one of the leaders in this arena is the Atair Aerospace Onyx series. (Atair).



Eads is producing the Parafinder guidance and display system for Germany's paratroops, and the corresponding Paralander system which was designed for carrying loads up to six tonnes. (Eads).

patented 'dynamic flare' to soften impact.

Dutch Space of Leiden has useful experience in parachute-based recovery systems, having provided those for the 17-tonne Ariane One first stage and for the 35-tonne boosters for Ariane Five. The company has also participated with parachute descent simulations in studies for the Crew Rescue Vehicle for the International Space Station and for guided parafoil systems to suit re-entry vehicles weighing up to 3.2 tonnes.

In co-operation with the Netherlands' National Aerospace Laboratory, Dutch Space is now developing its Spades (Small Parafoil Autonomous Delivery System).

Designed initially for a payload of 200 kg, release at up to 30,000 ft and offsets of up to 40 km, Spades employs a Zodiac/Aerazur ARZ G9 ram air parachute (as used by the Netherlands' Korps Commandotroepen) and GPS guidance; giving an accuracy of 100 metres. Impact loads are reduced by a shock-absorbing base. Development is supported by the Royal Netherlands Army (RNLA), and drop tests are being carried out from an RNLA C-130H. Feasibility studies cover variants of the Spades with payloads up to five tonnes.

Other developments relevant to Jpads include the Para-Flight Para-Point, and

the Strong Enterprises Screamer, designed for loads of 270 kg and 2.7 tonnes respectively. Like the Onyx, the Screamer employs a steerable ram-air parafoil followed by a conventional round parachute to provide for a soft touchdown.

The Stara Technologies Generic Delivery System, being developed with US Navy support, is intended for small canister-launched payloads, such as ground-based chemical/biological agent detectors that could be delivered by drones. A special feature is the use of Cuben Fiber composite parachute fabric, originally developed for racing yachts. This material is reportedly 350 per cent stronger and 75 per cent lighter than the traditional ripstop nylon.

The US Navy is funding studies of more conventional gliding logistics drones (looking more like submunition-dispensers) that could be dropped from aircraft or possibly catapulted from ships, delivering to Marines urgently needed items such as ammunition, batteries and medical supplies. A ten-man section would typically require 450 kg to be delivered every three days, corresponding to a payload volume of 0.5 cubic metres. The range required is at least 90 km, although 370 km is desirable. The Advanced Logistics Delivery System is currently seen as a 680-kg glide vehicle

with folding or inflatable wings, extracted by parachute from a C-130. A lift/drag ratio of 20:1 would provide a range of 180 km from 30,000 ft.

In 2004 US Naval Air Systems Command completed tests of the 76-kg Aerovironment Hawkeye or ULAV (Unmanned Logistics Air Vehicle), a tandem-wing project with fold-out aerofoils. The Hawkeye has been under development since 2001 for Socom. The X-Glider was a larger version that was studied for the US Navy but funding was terminated in 2003.

Flying Binoculars

Once on the ground, special forces generally have an urgent requirement for close-range airborne reconnaissance, since their insertion often precedes the establishment of detailed routine surveillance of the operations area. Over the last two decades a series of man-portable sensor-equipped drones has emerged to fulfil such needs.



Dutch Space and the Netherlands' National Aerospace Laboratory (NLR) are developing the GPS-guided Spades (Small Parafoil Autonomous Delivery System), which is shown here during tests. (Dutch Space)



The Eurocopter EC725 'Resco' is a new version of what was originally named the Cougar Mk2+, used by the French Air Force in the combat search and rescue roles. (Eurocopter)

The mother of all backpack drones is the 3.8-kg electrically powered Aerovironment FQM-151A Pointer, which first flew in 1986 with a black-and-white camera providing live imagery at the ground station. It was employed by the US Army and Marine Corps in the 1991 Gulf War. A complete system with two drones can be carried in two 22 kg backpacks. The Pointer has gone through a series of upgrades, including the addition of GPS navigation and a thermal imager in 1995. It has been employed successfully in both Afghanistan and Iraq. In a recent nose count, the Army had 555 air vehicles, Socom had 94, and the US Air Force 32.



Integrated display helmets like the TopOwl from Thales allow helicopter crews to see the outside world via a flir camera, the Top Owl also displays flight parameters. (Thales)

The Aerovironment RQ-11A Raven is an even lighter (1.9 kg) derivative, taking advantage of reductions in battery and electric motors weights. It first flew in 2001 and entered service two years later. The US Army is buying 185 systems, the US Air Force 41 and Socom 70; giving a total of around 850 air vehicles. Well over 200 of these drones have so far been delivered to Socom, in addition to which the US Air Force has more than 80. The drone itself costs around \$ 35,000 and a complete system \$ 250,000. The Raven employs the same ground station as the Pointer and is recovered by the same deep-stall procedure.

In 2003 Aerovironment was selected to produce the 2.6-kg, twin-motor Dragon-Eye, which had been designed by the US Naval Research Laboratory for the US Marine Corps. It first flew in 2000 and deliveries began in 2004. The Dragon Eye carries two cameras and is bungee-launched with an endurance of 53 minutes. The service plans to acquire 467 systems with a total of 1400 air vehicles over a five-year period – some 135 drones had been delivered by early 2005. A possible US Navy version is referred to as the Sea-All. The improved Dragon Eye Block One will enter service in 2006, with a longer endurance, a day/night camera with zoom lens and an upgraded datalink.

To complete Aerovironment's current electric mini-drone range (of which the company has produced over 2000 examples), the Puma is a 4.6-kg proposed replacement for the Pointer, and the Swift is being produced for an unspecified export customer, using a Raven ground control system. The Evolution is a BAI export version. The US Army's Small UAV (Suav) programme is aimed at replacing the Raven.

The other principal electrically powered mini-drone in American service is the 3.2 kg Desert Hawk, which was developed by the US Air Force Electronic System Center to meet a Centcom Force Protection Airborne Surveillance System (Fpass) requirement. The Desert Hawk is licence-built by Lockheed Martin under the name Sentry Owl. The US Air Force ordered 20 systems, each with six air vehicles. Deliveries began in 2002. The system became operational in Iraq in mid-2004, and by early 2005 some 126 of these drones had been delivered. It is used primarily for air base protection, in conjunction with ground-based sensors.

The follow-on Fpass-2 is already being developed by BAI Aerosystems, which has sold over 1000 mini-drones and in January 2005 was taken over by L-3 Communications. The BAI proposal for Fpass-2 appears to be based on the Evolution-XT, a derivative of the Dragon Eye. It will provide an endurance of 90 minutes, compared to 60 for Fpass-1. Some 20 examples of the baseline 2.95-kg Evolution have been supplied to Socom for trials in Afghanistan. The BAI Snake Eye is another derivative of the Dragon Eye, developed for use by the US Navy Seals. It has a new flight control system and thermal imager.

Another mini-drone employed by Socom in Afghanistan and Iraq is the BAI Aerosystems XPV-1 Tern, a much heavier (60 kg) air vehicle with a nine-kW two-stroke engine. The Tern is designed for rough field operation and has a high-mounted engine and provisions for under-slung loads. It is launched by means of a trailer-mounted pneumatic catapult and has an endurance of over five hours. The Tern has also been demonstrated from a US Navy LPD (USS *Denver*). Some 65 Terns have been delivered.

Socom has received 30 examples of the XPV-2 Mako drone, which is in the same 60-kg class as the Tern, powered by a 7.1 kW

engine and produced by Navmar Applied Sciences and BAI Aerosystems.

The remarkable success of electrically powered American mini drones has inspired a series of Israeli developments. The main winner appears to be the 5.5-kg Elbit Skylark, which was selected by the IDF (Israeli Defense Force) in February 2004, deliveries beginning 13 months later. Unusually in this category, it has a fully stabilised EO payload with a 10:1 optical zoom, and a fan-inflated airbag to cushion the landing impact from a deep stall. The Skylark evidently impressed the evaluators with its ability to land consistently within five metres of the operator.

Israeli companies are working on several flying-wing mini drones, such as 4.1 kg IAI/Malat Bird Eye 400 (which lands inverted), the Skylark-A and the 6.5 kg Aeronautics Defense Systems Orbiter. In the absence of an IDF order, attention appears to be concentrated on the international paramilitary market. In the micro category, IAI has developed the



The twin-motor, bungee-launched Dragon Eye was developed by the US Naval Research Laboratory and is produced for the US Marine Corps by Aerovironment. (US Marine Corps)

0.5-kg Mosquito, which is a drone that is small enough to be flown through the window of a building.

Although not selected by the IDF, one of the more interesting Israeli projects is the Rafael Skylite, which is designed specifically for urban warfare. Boosted from its canister by means of a small propellant charge, the 6.5-kg Skylite can be launched from a roof or window, or even from the middle of a crowd.

Germany's EMT has developed the three-kg, electrically powered Aladin, which was deployed by the German Army in pre-series form to Kosovo in 2000. A batch of twelve improved systems with 28 air vehicles was ordered for the service in



The Elbit Skylark, designed to follow a recent trend in easily delivered drones, is a backpack-carried system for over-the-hill observation. (Elbit)



There apparently is a marked (or renewed?) interest for lighter and more flexible helicopter armament as war against terrorism intensifies. Indeed, stopping a 4 x 4 Toyota with a Hellfire might be spectacular on television, but the Minigun revamped by Dillon Aero as the M134D for example, is definitely up to the job. (Dillon Aero)

August 2002, and the Aladin is now in use in Afghanistan. It has also been employed as a testbed for an Eads miniature Sar (Synthetic Aperture Radar).

Appreciating the fresh challenges posed by urban warfare, several nations are turning their attention to man-portable vtol drones that can hover and stare. However, vtol demands proportionally far more thrust, ruling out electric motors in favour of internal combustion engines.

In this class, the lead will probably be provided by the US Army, which plans to procure a Class One vtol drone weighing less than 6.8 kg. In January 2005 Honeywell (with AAI as airframe subcontractor) began tests with a 5.7-kg ducted fan micro air vehicle, powered by a three-kW model aircraft engine. This is to be replaced by a heavy fuel engine in 2006, and the US Army is expected to buy up to 50 of this improved model for evaluation. The Raven is serving as an interim Class One.

In a much larger vtol category, the Boeing/Frontier Maverick is a 620-kg

unmanned version of the RobinsonR22 helicopter, with a 108 kW engine. Five are being purchased under a joint Darpa/Army/Navy programme.

The DRS Unmanned Technologies Neptune is a 36.3-kg drone with an 11.2-kW engine, designed for launch



The Lockheed Martin HC-130P/N is the US Air Force's only fixed-wing Combat Search and Rescue aircraft. Its secondary tanker role is shown here, refuelling two HH-60Gs. (US Air Force)



This Sikorsky HH-60G Pave Hawk of the US Air Force Reserve 301st Rescue Squadron was pictured at a forward deployment location in southern Iraq. (US Air Force)

from a ship and recovery into the sea. It first flew in 2002 and 27 are being purchased by the US Navy.

Full-Scale

The role of manned aircraft in special operations was examined in some detail in the Armada International Complete Guide of issue 6/2004. The principal player in the fixed-wing category is the Lockheed Martin C-130 Hercules series. The Afsoc gunship inventory will soon consist of four AC-130Hs and 17 AC-130Us, but it is accepted that the Hercules' use is restricted to a low-threat environment, and that from around 2015 a more survivable 'AC-X' is desirable. In August 2005 it was announced that Northrop Grumman has been contracted to develop a Viper Strike missile installation for the AC-130.

In more conventional transport-related roles, Afsoc has moved 14 MC-130E Combat Talon Is to the reserves, while 22 MC-130H Combat Talon IIs (to be supplemented by ten more) are flown by three active squadrons. These aircraft are primarily tasked with the insertion, resupply and extraction of special forces, but they are also used as tankers for Afsoc helicopters. Up to 54 Combat Talon IIIs will be procured as tankers for helicopters of the US Army's expanded 160th Special Operations Air Regiment.

Afsoc has 24 MC-130P Combat Shadow tankers (and four with the National Guard) to support special operations helicopters. The HC-130P/N is a tanker for combat search and rescue (Csar) helicopters. There are 13 with active squadrons and 23 with National Guard and Air Force Reserve units. Some electronic warfare EC-130E/Hs will be replaced by EC-130Js, five of which are already on order. The EC-130E seen on our cover is one of seven such aircraft operated by the 42nd Airborne Command & Control Squadron from Davis-Monthan AFB.

Soll (Special Operations - Low Level) refers to specially equipped transports that are flown by equally specially trained crews, to penetrate hostile airspace at night and use unlit or infrared-marked airstrips. This role is currently performed by Soll-II Boeing C-17s. Soon after 9/11, C-17s of the 437th Airlift Wing



One of the contenders for the US Air Force Csar-X programme (formerly Personnel Recovery Vehicle) is a variant of the Lockheed Martin VH-71A. (Lockheed Martin)

Pave Hawk and MH-53J Pave Low III/IV. However, the HH-60G is due to be replaced by the Csar-X (formerly the Personnel Recovery Vehicle) from around 2011, with 141 aircraft required. The known contenders are the Eurocopter/AgustaWestland NH90 (as used by Greek Army Special Forces), the Sikorsky H-92 Superhawk, the Lockheed Martin VH-71A (formerly US101) variant of the AgustaWestland International EH101; the PRV-22 version of the Osprey could have been a contender but according to Bell-Boeing the requirements lean more on traditional helicopter performance than on range and speed.

The US Army's USASOC MH-60K/Ls are expected to be brought to MH-60M standard, now with 1950-kW General Electric CT7-8B5 engines, while its MH-47D/Es will be upgraded to MH-47Gs. Europe's leaders in this category are the Eurocopter EC725 Resco, used by the French Air Force, and the Merlin HC3 version of the EH101, used by Britain's Royal Air Force.

inserted US Navy Seabees into a dirt strip in Afghanistan; in 40 sorties delivering over 400 personnel and 1300 tonnes of equipment for the construction of Camp Rhino. Likewise, at the start of Operation

Iraqi Freedom, seven C-17s flew over 200 sorties to insert 2400 personnel and 4200 tonnes of cargo.

Sikorsky currently dominates the Csar helicopter field, with the Afsoc HH-60G

The Transition Force



Abnegation and determination could be the motto of special force team members

The United States was assisted in Afghanistan by the special operations forces of other nations, including Australia, Canada, Denmark, Germany, New Zealand, Norway and the United Kingdom. Nato's new members in Eastern Europe are using their special forces to drive the transition of their armed forces; these units are often included among national contingents sent to Afghanistan and Iraq.

Ian Kemp

The period since the end of the Cold War and particularly since «nine-eleven» has seen a huge investment in many of these countries, both to expand the numbers of special forces and to enhance their capabilities. The selection and training of true special forces is a long process, as is the development of the full range of enabling capabilities such as strategic transport, communications and logistics to enable these units to be rapidly deployed, effectively employed and sustained for protracted periods. In addition, the US Department of Defense uses spe-

cial operation forces exchanges as the first block of foreign military training programmes, as these units are best able to assimilate US training assistance.

Special forces are often the first to evaluate and field new equipment. Some of this equipment is later introduced into service with conventional forces, particularly airborne, marine and light infantry units that are often called upon to support special forces on operations or to undertake similar missions.

Lethality

In one of the most significant small arms developments in recent years FN Herstal

was selected by the US Special Operations Command (US Socom) in November 2004 to supply the new 5.56 mm/7.62 mm Special Operations Forces Combat Assault Rifle (Scar). The requirement was influenced by the experience of special forces in Afghanistan who often found the need for a more powerful cartridge than the Nato standard 5.56 × 45 mm SS109 (US M855) round and also wanted a weapon that could use 'pickup' 7.62 mm Russian standard ammunition found in operational situations.

The Scar project illustrates the ability of Socom to circumvent the protracted procurement procedures of the regular services. A request for proposals was announced in January 2004 and only eleven months later FN Herstal's candidate was selected from the numerous worldwide competitors. Field trials began in midyear and a full production decision is scheduled to be made in December 2005. The Scar is scheduled to be produced at the Columbia subsidiary of FN Herstal.



The US Special Operations Command's new FN Herstal SOF Combat Assault Rifle: the 7.62 mm Scar-Heavy (top) with the sniper barrel installed and the 5.56 mm Scar-Light with the assault barrel fitted. (FN Herstal)

The Scar contract is expected to cover 84,000 of the 5.56 mm Scar-L (Light) and 15,000 Scar-H (Heavy) weapons that will be capable of firing both Russian 7.62 × 39 mm and Nato 7.62 × 51 mm ammunition. The Scar's modular design provides 90 per cent 'ergonomic compatibility' and 70 per cent parts commonality between the two rifles. Both can be fitted with carbine, close quarter combat or sharpshooter barrels, allowing the soldier to choose the appropriate calibre and barrel length for a specific mission. The Scar can be fitted with the same aiming accessories as the 5.56 mm M4 carbine and the 12-gauge Lightweight Shotgun System under-barrel attachment.

The third distinct element of the project is the future 40 mm Enhanced Grenade Launcher Module (EGLM) that can be fitted to both rifles. Despite the considerable US Army investment under the Objective Individual Combat Weapon (OICW) project to develop first 20 mm and later 25 mm grenades, the consensus within many armies and certainly within the US special operations community is that '40 mm is here to stay'.

The Scar could be a strong contender to replace the 5.56 mm M16 rifle/M4 carbine family throughout the US Army following the service's decision to abandon its commitment to the H&K 5.56 mm modular XM8 carbine family and relaunch the OICW programme. The army said the decision was justified by the need to

replace its 5.56 mm M249 Squad Automatic Weapons (the service designation for the FN Herstal Minimi LMG), many of which are more than 20 years old and have been used heavily. The new solicitation to industry issued in March 2005 calls for a non-developmental OICW Increment I family of small arms, consisting of a carbine, a special compact weapon, designated marksman weapon and an LMG that is capable of firing standard US M855 and M856



Developed for the Special Operations Command the Barrett M468 fires Remington's new 6.8 × 43 mm Special Purpose Cartridge. (Barrett)

ammunition. In a further twist the army suspended the solicitation in July so that it could consult the other services about their small arms requirements. The protracted OICW project demonstrates why Socom is exasperated by the standard procurement procedures.

Until the Scar and the OICW, in whatever form, is fielded Socom and the Army

are continuing to purchase M4 carbines and accessories. In August, for example, Knight's Armament was awarded a \$ 33 million delivery order as part of an \$ 81 million firm-fixed-price contract for the M4 Modular Weapon System.

The dissatisfaction of the command with the performance of the standard M855 round has provided an opportunity for several niche companies to offer alternatives. At Socom's request Black Hills Ammunition, a North Dakota company that produces high quality 5.56 mm ammunition for US military shooting teams, developed the Mk 262 cartridge. Its 77-grain bullet provides better performance than the M885's 62-grain bullet.

Another example is the M468 weapon developed by Barrett Firearms, well known for its family of 12.7 mm sniper rifles, and the associated 6.8 × 43 mm Special Purpose Cartridge developed by Remington. The work was done at the request of the Special Operations Command. The 115-grain 6.8 mm bullet delivers at least 50 per cent more energy than the M885. A new upper receiver assembly, comprising barrel, bolt, chamber and gas operating tube, is fitted onto the M4's lower receiver to produce the M468. Barrett can produce either new weapons or modification kits. An M468 magazine holds 28 6.8 mm rounds compared to the 30 rounds in a standard 5.56 mm magazine.

In 2005 US special forces units began using the 5.56 mm HK416, an M4 carbine

that has been extensively rebuilt by Heckler & Koch (H&K) under contract to Socom. H&K has comprehensively modernised the M4 based on recent experience developing the 5.56 mm G36 rifle, the 5.56 mm XM8 rifle and the modernisation of the British 5.56 mm SA80 assault weapon. Customers can purchase a new upper receiver, buffer and drive spring to refurbish existing weapons or buy a completely new HK416.

Special forces have provided the first export customers for Israel Military Industries' 5.56 mm Tavor Tar-21 bullpup assault rifle (IMI's small arms division has since been privatised and is now known as Israel Weapons Industries, or IWI). Earlier this year the Indian Army began receiving the first of 3074 rifles ordered in late 2002 for its special forces. The manufacturer had already delivered about 400 to India's Special Frontier Force. India is considering the local pro-



The Heckler & Koch 5.56mm HK416 carbine, an improved version of the M4, is in service with US special forces. (Heckler & Koch)



Knight's Armament was selected by the US Army in September 2005 to provide the 7.62 mm XM110 Semi-Automatic Sniper System to replace the M24 Sniper Weapon System that is used by army snipers and US Socom units. (Knight's Armament)

duction of the Tavor to equip additional special forces and airborne units. Such a development would leave IWI well placed for an Indian Army project to initially acquire up to 60,000 5.56 mm carbines. Last year the Republic of Georgia ordered an undisclosed quantity of weapons for its special forces and plans to equip other units with the rifle. The Israel Defence Force has bought 15,000 weapons to date.



Day or night, a laser aiming device, like Crimson Trace's integrated laser grips, can make all the difference to being on target. (Crimson Trace)

Knight's Armament could receive one of the largest sniper rifle contracts in years following its recent selection to provide the US Army's 7.62 mm XM110 Semi-Automatic Sniper System to replace the M24 Sniper Weapon System that is used by Army snipers and Special Ops units. Its design is a variant of the KAC Mk 11 Mod 0/SR-25 sniper rifle designated the SR-XM110. The requirement stipulated that the selected rifle

design be capable of delivering precision fire primarily on anti-personnel targets out to a range of 1000 metres.

The failure of Nato armament officials to choose between the two competing personal defence weapon calibres intended to replace 9 mm pistols and sub-machine guns has not deterred special forces from buying the weapon suited for their needs. Since FN Herstal unveiled its 5.7 x 28 mm P90 in 1991 it has sold more than 12,000 examples to more than 20 customers, primarily military and police special operations units. To provide a companion weapon that is both cheaper and less menacing than the automatic P90 the Belgian company also developed the 5.7 mm FiveseveN pistol.

German special forces deployed in Afghanistan are now equipped with the H&K MP7 'close-range weapon'. This uses the 4.6 x 30 mm round designed by the Royal Ordnance division of BAE Systems. In 2003 H&K introduced a 4.6 mm pistol, recently designated the P46 by the German armed forces. Selection of the MP7 by Britain to equip the Ministry of Defence police is likely to give a further boost to sales efforts. More than 20 countries have chosen the MP7 for service use or for evaluation purposes.

The need for accurate firepower has always been paramount for special forces. Day and night sights, laser pointers, rangefinders and other target acquisi-

tion systems initially fielded with special forces are now coming into widespread service. The US Department of Defense is awarding contracts almost every month. In July 2005 Lightforce USA was awarded a \$ 10.8 million contract to deliver 7700 family of rifle day scopes to Socom by 2010. In August Insight Technology was awarded a \$ 32 million delivery order for up to 92,877 Special Operations Peculiar Modification (Sopmod) Visible Bright Light III (VBL III) night sights for the M4 carbine. Insight Technology has a \$ 783.5 million contract for the Multi-Functioning Aiming Laser System. In September Northrop Grumman Systems received a \$ 1.845 billion contract and ITT Industries a \$ 1.391 billion contract to supply Omnibus VII enhanced third generation image intensifier ground night vision devices and spare



A Heckler & Koch 40 mm XM320 Grenade Launcher Module attached to a 5.56 mm M4 carbine. The US Army has selected the XM320 to replace its ageing M203 launchers. (US Army)

image intensifier tubes. Night vision goggles and night sights, once almost restricted to special forces, are now considered essential for many soldiers on operations (night sights and laser pointers will be the subject of a dedicated article in the next issue of Armada International).

Fire Support

FN Herstal's 5.56 mm Minimi has become the light machine-gun of choice for many armies and special forces units around the globe. Several recent customers, including the British Army, have opted for the ParaMinimi that is lighter and shorter than the standard model. At the request of Socom FN Herstal has developed an even lighter model which



FN Herstal's 5.56 mm Mk 46 Mod 0 and 7.62 mm Mk 48 Mod 0 light machine-guns were developed to meet the needs of US special operations forces. (FN Herstal)



Saab Bofors Dynamics is developing new ammunition for the Carl Gustaf 84 mm recoilless rifles in service with the US Army's 75th Ranger Regiment. (US Army)

has been type-classified as the Mk 46 Mod 0 LMG. In August 2005 FN Manufacturing received a \$ 9.8 million follow-on contract to provide up to 1100 Mk 46 Mod 0 LMGs and support equipment to add to the 600 weapons already in service. The Mk 46 weighs 27 per cent less than the M249, the US Army version of the Minimi, and yet still retains 80 per cent parts commonality. The weight reduction is achieved by using a lightweight barrel and removing the magazine well, carrying handle and vehicle mounting lugs.

FN Herstal is also producing the 7.62 mm Mk 48 Mod 0 LMG as a big brother to the Mk46. This was developed in response to a Socom requirement issued in March 2001 for a new 7.62 mm LMG to replace the command's worn out M60s. The 'little brother/big brother' combination provides the user with the advantages of ergonomic and parts commonality. The Mk 48 weighs 34 per cent less than the US Army's standard FN Herstal M240B 7.62 mm general-purpose machine-gun and has 70 per cent parts commonality with the M240, M249 and Mk 46. Socom achieved the 'first unit equipped with the Mk 48' milestone in August 2003 and plans to buy about 600 weapons through fiscal year 2007.

US Ordnance produces the M60E4 LMG, (type classified by the US Department of Defense as the Mk 43 Mod 1), which is a significantly improved member of the M60 family. The company recently received a \$ 5.5 million US Foreign Military Sales contract to supply weapons to Colombia's Marine Corps.

From Russia

Russian Forces have learnt the hard way that there was no panacea in terms of vehicles, particularly in unconventional battles and urban warfare. Uralvagonzavod has therefore developed the BMPT which provides the protection afforded by the T-72 chassis armed with two 2A42 twin-barrel 30- mm guns and two launchers with four Shturm-SM missiles equipped with Heat or thermobaric warheads. A key feature of the vehicle is its multiple-channel system that allows the operators to fire simultaneously and independently of one another on up to three targets using direct or indirect trajectories. The guns are fed by two 850-round magazines while the coaxial PKTM machine-gun uses a 2000-round belt. As can be

seen on this photograph, all crewmembers are under armour, meaning that all the stabilised weapons are remotely controlled. The commander's station is equipped with an optical 200-degree field-of-view sight and a TV day/night all-round panoramic sight. The sight is located on the top of the armament's superstructure and has an elevation angle of -15° to 45° . The commander can control the main armament (including the missiles) via his panoramic sight or through the gunner's thermal imaging sight. Forward-facing AG-17D 30 mm grenade launchers located in armoured sponsons on the left and on the right of the forward area of the hull round up the vehicle's armament. The grenade launchers are also stabilized in the vertical plane offering elevations of 30 degrees.

Another threat that has plagued the Russian forces is the sniper. To first identify those and counter them, Transcript exploits the fact that snipers always use powerful optical sights. The company claims it has developed a system, the Luch-1, seen below in operation close to a gunner, that has the ability to make any lens system glow like a cat's eye (see the black and white image recorded from the Luch-1) at ranges of between 15 and 2500 metres, day or night, in fog, rain and snow. Suffice to pan a given area and any lens combination will instantly be revealed. The Luch system comes in a variety of configurations and thus also lends itself to surveillance missions or to monitor people trying to take photographs of a restricted area.



seen on this photograph, all crewmembers are under armour, meaning that all the stabilised weapons are remotely controlled. The commander's station is equipped with an optical





Singapore Technologies Kinetics plans to unveil its 120 mm smoothbore Super Rapid Advanced Mortar System mounted on its 4 × 4 Spider light strike vehicle at Asian Aerospace in February 2006. (Singapore Technologies Kinetics)

The new 40 mm MLG-140 hand-held grenade launcher, manufactured by Milkor USA, is already in service with US special forces and the US Marine Corps. As for the MGL Mk 1 developed by Milkor of South Africa, this weapon was quite successful with more than 14,000 examples having been built since 1983, and proved its worth with the Colombian forces who used it extensively against rebel groups. The MLG-140 can fire six 40 mm grenades accurately at ranges up to 400 metres. The weapon is being marketed along with a new range of 40 mm grenades developed by Martin Electronics. These include the Hellhound (for High Order Unbelievable Nasty Destructive series) low velocity multipurpose grenade which delivers 55 per cent more shrapnel than the standard M433 round, the Draco (Direct Range Air Consuming Ordnance) enhanced blast explosive multi-purpose grenade, the Solar Flare white star parachute illumination round and the Huntir (High-altitude Unit Navigated Tactical Imaging Round). The Huntir round ejects a Cmos infrared-capable camera at average height of 700 ft. Suspended from a parachute the camera provides up to five minutes of real time video that can be monitored from a hand-held display unit. The Huntir round is being evaluated by the Swedish Army and British Royal Marines.

The US Special Operations Command is the launch customer for the Striker CG-40 40 mm automatic grenade launcher developed by General Dynamics, Bofors Carl Gustaf and Computing Devices Canada.

The integration of weapon, sight and fire control system combined with air-burst munitions, developed by Nammo, makes the CG-40 significantly more accurate than the Mk 19 that it replaces. The system incorporates a computerised

fire control system enabling the Striker to accurately engage point targets at 1500 metres and area targets at 2000 under all weather conditions, day or night. The use of air-burst technology ensures that each round detonates over the intended target. The complete system weighs about 43.5 kg, which is 40 per cent less than the Mk 19. General Dynamics began delivering production weapons, type classified as the Mk 47 Mod 0, in December 2003.

The Saab Bofors Dynamics Carl Gustaf 84 mm recoilless rifle, developed in the 1940s, has found a new lease on life with US special forces as the M3

Multi-Role Anti-Armor Anti-Personnel Weapon System. The US Army's 75th Ranger Regiment has used the M3 since 1990 and the Naval Special Warfare Command since 1997. The third-generation M3 weighs 10 kg and is 1065 mm long. The US Socom is seeking to reduce the M3's weight by 'three to five pounds'. A complete family of ammunition is in US service, including high-explosive anti-tank, high explosive dual purpose, high explosive, area deterrent munition, smoke and illumination rounds. A project was launched last year to acquire a new multi-target warhead to penetrate 7.5-cm-thick reinforced concrete or 30-cm triple-brick walls. Since 2003 Saab Bofors has been under contract to develop an anti-structure munition «capable of entering urban structures constructed using 8-inch (20.3-cm) reinforced concrete or 12-inch (30.5-cm)-thick triple brick walls».

The Saab Bofors 84 mm AT4 (under the designation M136) replaced the 66 mm M72 as the US Army's light anti-armour weapon in the 1980s. However, US special forces who like the M72's light weight and ease of use have acquired new M72 variants, developed by Talley Defense Systems and its Norwegian partner Nammo. The latest, the M72A7 design, is optimised to provide a high level of fragmentation after penetrating light armour and urban walls and barricades. The US special forces have also bought the AT4 Confined Space High Penetration version which is designed for urban operations.

To provide indirect support to special forces and airborne units Denel Ordnance of South Africa is promoting its 81 mm M8 or 60 mm mounted in the 4 × 4 Bat Mk II air-droppable light utility vehicle. Singapore Technologies Kinetics has developed a version of its 4 × 4 Spider



To provide indirect support to special forces and airborne units Denel Ordnance of South Africa is promoting its 4 × 4 Bat Mk II air-droppable light utility vehicle as a platform for the company's 60 mm and 81 mm mortars. (Denel)



Syracuse Research's Lightweight Counter Mortar Radar (LCMR) is deployed with US forces in Afghanistan and Iraq. The US Army wants about 300 radars with an extended range radar. (Syracuse Research)

light strike vehicle that carries the company's 120 mm smoothbore Super Rapid Advanced Mortar System (Srams). This was successfully test fired earlier this year on the High Mobility Multipurpose Wheeled Vehicle and tests on the Spider are planned to take place before year-end. The combination will be publicly shown for the first time at Asian Aerospace in February 2006.

Situational Awareness

The Lightweight Counter Mortar Radar was developed by Syracuse Research to meet the needs of the US Army's 75th Ranger Regiment and is now deployed in Afghanistan and Iraq. The radar has since been fielded with the US Army and Marine Corps and the 32 deployed systems have logged up more than 100,000 operational hours. The radar is designed to be carried in two 27-kg loads so that it can be inserted in static line airborne operations. A unique element is its ability to detect and track mortar rounds through a full 360 degrees; the in-service AN-TPQ 37(V)3 Firefinder radar has only a 90-degree field of view. The US Army is seeking about 300 objective radars to equip its new brigade-sized units of action. For this application the army plans to extend the range of the radar from the present 6.5 km out to a nominal ten km.

01dB-Metravib of France was chosen by US Socom through the Foreign Comparative Test programme to provide a family of sniper detection systems to trace and locate 5.56 mm, 7.62 mm and 12.7 mm gunfire from up to 1200 metres away. Under present plans the command will buy 154 Pilarw Acoustic Vehicle Mounted Gunfire Detection Systems and 21 Pivot (Pilar Versatile Observation Turret) units. 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 of the hostile bullet. The Pivot is a daylight observation that, when linked to the Pilarw, will

automatically turn to the direction of the threat when a bullet is fired.

Small unmanned air vehicles are an ideal intelligence gathering tool for special forces. Units operating in Afghanistan and Iraq are equipped with the hand-launched AeroVironment FQM-151 Pointer, which was first introduced into service with the US Marine Corps in 1988. Continuously upgraded the system has been acquired by the US Air Force for use in Iraq. The California-based manufacturer has supplied more than 60 systems, consisting of two aircraft and a ground station. Two 22-kg backpacks are used to transport two 3.8-kg drones, the ground

control station and accessories. Mounting either a day or night camera the Pointer can be flown for up to 90 minutes. Socom has also ordered a batch of 179 RQ-11A Raven systems from AeroVironment with three micro-UAVs in each system. Weighing 1.9 kg the Raven is a smaller version of the Pointer with similar capabilities. It has an endurance of 80 minutes and an operational radius of about ten km.

The US Special Operations Command plans to replace the Raven with 348 Rucksack Portable systems, each with three air vehicles, from fiscal year 2006. Officials have indicated that they wish to see each twelve-strong US Army Special Forces A Team equipped with a system.

The Malat Division of Israel Aircraft Industries produces a range of tactical drones including the Hunter, Searcher and Pioneer. It promotes the new Bird-Eye mini for a range of applications including special forces use. The 1.3-kg Bird-Eye 100 has an endurance of 60 minutes while the 4.1-kg Bird-Eye 400 has an endurance of more than 80 minutes and a range of over 15 km. The prototype of IAI-Malat's 250-gr Mosquito 1 micro first flew on 1 January 2003 and the company is developing a more advanced version intended to have an endurance of about an hour whilst carrying a video camera.

Mobility

US special forces in Afghanistan and Iraq are using the Sportsman MV7 4 x 4 all-terrain vehicle (ATV) following the award of a \$ 10.3 million contract to Polaris in April 2004 to provide about

Things to Come

The US Department of Defense's Foreign Comparative Testing programme provides a good indication of what new technologies may enter service. Socom is sponsoring five of the 18 programmes launched with Fiscal Years 2005 funding, while the Army and Navy are each sponsoring four, and the US Marine Corps is sponsoring five including one jointly with Socom.

The projects led by Special Operations Command include:

- ▶ Two 40 mm grenades developed by Nico Pyrotechnik of Germany using chemiluminescent night marking technology. The first is a tactical marking cartridge to provide accurate infrared target marking by day and night. The second is a day/night training cartridge that allows soldiers to train at night wearing night vision goggles
- ▶ A 70 mm Multi-Purpose Penetration (MPP) Warhead developed by Nammo for use by helicopters of the 160th Special Operations Aviation Regiment (Airborne) to defeat hardened targets such as bunkers and buildings
- ▶ The Multi-Target Warhead developed by Sweden's Saab Bofors Dynamics for its 84 mm Carl Gustaf recoilless rifle. The warhead was developed to be used in both the anti-armour and anti-personnel role. The tandem warhead is optimised for use in urban/built-up areas
- ▶ The Tethered Balloon Intelligence, Surveillance and Reconnaissance Platform developed by Tyra Invest of Norway and Britain's Allsopp Helikite and Noesis/Lindstrand
- ▶ The Close Quarter Battle Pistol project will evaluate pistols from Beretta (Italy), Glock (Austria), Heckler & Koch (Germany), SIG (Switzerland/Germany) and Steyr-Mannlicher (Austria). The aim is to replace the SIG226 battle pistol that has been in service with special forces for 15 years
- ▶ Product improvements to the 40 mm High Explosive Dual Purpose grenade will be examined in a joint project led by the US Marine Corps. This project will integrate an improved propulsion system, cleaner burning propellant, a self-destruct fusing mechanism and improved insensitive munitions energetic technology. Nammo Raufoss and Nico Rheinmetall are participating although certain sources say that SNC Technologies of Canada could also be involved.



The Pinzgauer 6 × 6 Weapons Platform is the basis of the special operations variant that Automotive Technik supplied to the New Zealand Army. (ATL)

to 88 EFSS 120 mm mortars while the acquisition of 650 ITVs will be split with the US Marine Corps receiving one third – the bulk will be issued to special operations units. The ITV is designed to be carried internally by CH-47 and CH-53 helicopters and the MV-22 tiltrotor aircraft that is entering service with the marines and the US Air Force Special Operations Command. The first ITVs are scheduled to be fielded in 2007.

In June 2005 a 50-strong New Zealand Special Air Service detachment began a six-month deployment with the US-led coalition in Afghanistan to conduct long-range reconnaissance and direct action missions. The unit's capabilities have been improved with the recent introduction of Pinzgauer 6 × 6 special operations vehicles built by Automotive Technik. The British company, owned since April 2005 by Stewart & Stevenson, is producing 13 special operations variants as part of the New Zealand Army's Light Operational Vehicle project to acquire 321 Pinzgauers. The Pinzgauer is already in

700 vehicles. Based on the chassis and engine of the company's commercial Sportsman 700 Twin ATV the MV7 has been modified to meet Socom's needs. Modifications include a reinforced steel exoskeleton and floorboards, enlarged front and rear stowage racks, an auxiliary fuel tank and electronically activated front and rear winches. Goodyear Extended Mobility Technology Mud Runner run-flat tires enable the MV7 to continue for 85 km after a puncture. Three vehicles can be carried internally by a CH-47 helicopter. The contract also covers an unspecified number of Sportsman 6 × 6 ATVs that are capable of carrying 363.6 kg of cargo in a rear dump box.

The command is also planning to field a new light strike vehicle in a joint programme with the US Marine Corps. In November 2004 the Corps selected General Dynamics Ordnance and Tactical Systems to develop the Expeditionary Fire Support System (EFSS) and its associated Internally Transportable Vehicle (ITV). The marines are seeking to buy up



Result of a recent license agreement with Panhard and Auverland who developed the A4, Rheinmetall's iteration is this Gaval, which is intended to meet a Bundeswehr requirement for dangerous deployment. (Rheinmetall)



Jankel Armouring has completed the first production version of the Al-Thalab (Fox) long-range patrol vehicle based on a tropicalised Toyota 4 × 4 chassis. (Jankel)

service with British special forces and the company is offering the latest model, dubbed the X-treme Mobility series, to the Australian Army for its Land 121 Overlander utility vehicle project and Project Redfin to enhance the capabilities of the special forces. The later includes the replacement of the Special Air Service Regiment's Land Rover 6 × 6 Perentie Long Range Patrol Vehicles that have seen much hard service since being introduced in 1987.

A vehicle derived from the Perentie is among the Land Rover Defender ATVs that Jaguar Land Rover is promoting to the Polish armed forces under the local name Huzar. Poland's Grom special operations unit bought four Defender 110 vehicles in 2003 and ordered a further six in October 2004. The Huzar vehicles are being proposed for special forces and mil-



Germany's Rheinmetall Landsysteme has developed the Serval Light Infantry Vehicle (Special Operations) for that country's special forces. The weapon station can be folded to carry the vehicle inside a CH-53 helicopter. (Rheinmetall)

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 was first deployed in Afghanistan. The weapon station can be folded to lower the vehicle's profile for air transport.

Although special forces units can generally be regarded as 'light' there are nevertheless operational situations when they require a higher level of protected mobility than is offered by most patrol vehicles. Earlier this year the US Army loaned 16 General Dynamics Land Systems 8 x 8 Stryker armed 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. Similarly, the Australian special forces task group that has been operating in Afghanistan since September 2005 is equipped with a small number of ADI Bushmaster Infantry Mobility Vehicles for security patrols while the 6 x 6 Land Rover Surveillance Reconnaissance Vehicles are used for classic patrol missions.

Parachutes are effective means of covertly inserting special forces and keeping units resupplied. In September the US Naval Surface Warfare Center issued two contracts for parachutes. ParaFlite, a division of Airborne Systems, along with British parachute maker Irvin Aerospace, received a \$ 10.5 million firm fixed-price contract for its parachutist oxygen system, special applications parachutes and associated support equipment for high altitude/low opening operations. Complete Parachute Solutions in Deland, Florida received a \$ 20.6 million contract for purchase of parachute systems and training for the US Marine Corps.

itary police use in international operations. The Huzar A model, based on the 6 x 6 Defender 130, is being evaluated by the armed forces. The company also plans to offer the Huzar B, which is based on the Defender 110 and the Huzar C, based on the Defender 90. All of these models could very well be fitted with armoured protection.

The first production version of the Al-Thalab (Fox) long-range patrol vehicle was unveiled by Jankel Armouring at the DSEi exhibition in September 2005. The company is building 15 vehicles for an undisclosed African customer before production shifts to the Jordanian facilities of Jankel's joint venture partner, King Abdullah II Design and Development Bureau. The first 20 vehicles from the Jordanian production line have reportedly been ordered by that country's armed forces. The Al-Thalab is based on a tropicalised Toyota 4 x 4 chassis to ensure the availability of 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 1300 kg. A 7.62 mm machine-gun can be mounted for the commander's use and a heavy machine-gun or automatic grenade launcher can be fitted on the rear-mounted ring platform.

In mid-2005 the French Army selected the Mercedes-Benz G 270 4 x 4 light utility vehicle to meet a special forces need for a vehicle that could be carried internally by a variety of rotary wing and fixed wing aircraft without special preparation. The vehicles will operate with a three-strong crew and be armed with a pintle-

mounted machine gun or automatic grenade launcher.

Germany's special forces are equipped with the Serval, developed by Rheinmetall using an extended wheel-base G-class chassis. The vehicle has a crew of four and is fitted with an RLS 609 K weapon station able to accommodate weapons such as the 12.7 mm heavy machine-gun or the 40 mm automatic grenade launcher. General-purpose



Polaris is providing about 700 Sportsman MV7 4 x 4 all-terrain vehicles to the US Special Operations Command. (Socom)

By Sea & Stealth



The Northrop Grumman ASDS on the USS Charlotte

Maritime special forces tend to arrive in hostile territory by sea and by stealth, but where once they would be delivered by rubber dinghies from a submarine now they are using Special Delivery Vehicles (SDV) and even midget submarines.

E. R. Hooton

Maritime special forces have a variety of roles that include covert reconnaissance and surveillance, hydrographical reconnaissance, mine-field surveillance and covert ship/harbour attack. These require quiet vehicles with low acoustic or magnetic signatures to reduce the chances of detection and, for these reasons, many are made of non-ferrous metals with battery-powered electric propulsion.

At the bottom end of the market are vehicles designed for one or two operators who are usually immersed in the water. Anteon has produced the Sea Shadow, which is actually a 107-kg diver propulsion vehicle for one or two people and powered by lead-acid batteries; despite this simplicity the vehicle is surprisingly sophisticated. The hull is of moulded high-density polyethylene plastic to provide a low magnetic signature while folding bow planes and rotating motors allow the vehicle to be deployed through a 76-cm escape hatch.

The Sea Shadow features electronic speed control with a manual back-up mode and an option of electronic drift compensation. A liquid crystal display provides speed, depth, battery duration and voltage details while there are visual warning signals on low battery power as well as unsafe rates of both ascent and descent. However, the vehicle has a range of only five nautical miles (9.25 km) at 2 to 3 knots and at a maximum of depth of 30 metres but it has still been acquired by a number of special forces including those of the United States.

A more sophisticated one-man vehicle is the Serbian Brodosplit R-1, which weighs 150 kg and resembles a torpedo, with the operator straddling the alumini-

um alloy hull behind the first of two buoyancy tanks. The vehicle has silver-zinc batteries operating a one-kW motor that provides a range of eight nautical miles (15 kilometres) at 2.5 knots (maximum speed three knots) at a maximum depth of 60 metres. The 52-cm vehicle can actually be housed in a submarine torpedo tube and the operator can deliver 40 kg of limpet mines of either the 7 or 15 kg size. Both Serbia and Croatia are known to have these underwater vehicles and the foreign customer list is believed to include Sweden.

Two-man units are more common and one of the most basic is the Cosmos Charriot CE2F/X100-T which is a development of the Italian so-called piloted maiali (pigs) used by the famous 10. Mas whose most famous exploit was to damage two British battleships in Alexandria har-

bour. The light (2.10-tonne) vehicle resembles a torpedo but with two open compartments amidships for the crew, it also has ballast tanks that can be blown or flooded to ascend or descend and a small rudder to turn.

It reaches the operating area either attached to or towed by another vessel and can operate down to 100 metres. The electric motors give it a submerged range of 50 nautical miles (95 km) at four knots, the maximum speed being five knots. The payload can be a 230-kg charge or 150 kg of limpet mines. These vehicles are known to have been acquired by Argentina, India and Pakistan. The latest version includes a digital control module, displaying navigation and platform details, as well as a fully integrated autopilot.

The Croatian Brodosplit R-2 follows a similar concept but the two-man crew ride astride the 1.41-tonne spindle-shaped vehicle. The 3.3 kW DC electric motor is powered by either lead/acid or silver-zinc batteries. Navigation equipment comprises an aircraft-type gyro compass, a magnetic compass, depth gauge with a 0 to 100-metre scale, echosounder, sonar, two searchlights and so on. All navigation equipment is housed in a waterproof container.

With the lead-acid batteries it can travel 23 nautical miles at 3.7 knots and with the silver-zinc batteries 46 nautical miles at the same speed, the maximum speed being 4.4 knots. The R-2 can operate down to 60 metres with a maximum limpet mine load of 250 kg.

An interesting modern two-man vehicle is the Columbia Research Corporation Piranha, which uses a powerful brushless DC motor and silver-zinc batteries. The 1.63-tonne glass-fibre vehicle has a range of 27.5 nautical miles at five knots but is capable of burst speeds of seven knots and can operate down to 70 metres, although it will usually be kept at 45 metres. A high-resolution multi-beam sonar is fitted for obstacle avoidance. Although the vessel is 'wet', forcing



A (former) Yugoslavian development, the R-2 is now built by Brodosplit in Croatia and is available with two power sources. (Brodosplit)



This Seal special delivery vehicle is seen in these two photos as it is swimming out of a dry deck shelter on the USS Philadelphia submarine. (US Navy)

the crew to wear scuba gear, even though they are fully enclosed.

There is a growing demand for larger SDVs to deliver teams of special forces or other groups with a large amount of equipment who can then conduct wider or more effective operations. These vessels are often mini submarines but differ from submarines in that they lack a pressure hull and the crew compartment is generally flooded, forcing the personnel to wear underwater breathing apparatuses.

One of the first, developed by the US Naval Surface Warfare Center, was the Mark VIII. The original Mod 0 version was something like the Pompidou Centre or Lloyd's building consisting of a pipe-work frame which also served as part of the ballast system. In 1995 the Mod 1 version replaced this structure; it featured flat aluminium framing which is lighter, stronger and easier to maintain. Mod 1 included larger internal space by the repackaging of internal components such as air flasks. Also the movable-weight ballast system was replaced by trim tanks.

The Mod 1 has also received a substantial improvement in its electronics, with the navigation and sonar systems now housed in watertight containers. The vehicles received a precise Doppler sonar and integrated GPS receiver, secure communications as well as new digital displays.

The vehicle, used by American and British special forces, still carries six personnel (including the pilot) but now has rechargeable silver-zinc batteries and a

quieter new motor with increased power doubling speed to nine knots and the range to 36 nautical miles (66 km), although the Mk VIII can travel at a depth of only six metres.

The short range of these vehicles means they must be delivered by submarine. Since 1982 the US Navy's traditional submarine manufacturers, General Dynamics' Electric Boat and Northrop Grumman Newport News, have built air transportable Dry Deck Shelters (DDS) to house these vehicles and their support personnel on the backs of nuclear submarines with the installation usually behind the sail. The shelters transport and launch an SDV or are used by combat swimmers.

The 30 tonne DDS is subdivided into three watertight compartments each capable of independent pressurisation to at least 40 metres – allowing its use even when the submarine is submerged. The forward compartment is a hyperbaric chamber to treat injured divers. The middle compartment is a transfer chamber

«There is a growing demand for larger SDVs to deliver teams of special forces or other groups with a large amount of equipment...»



The Class 5 underwater vehicle was exhibited by Emirates Marine Technologies at the 2003 Idex show. An optional fit includes a built-in breathing system providing operators an autonomy of 6 hours. (Emirates Marine Technology)



The Emirates Marine Technologies Class 5 SDV is readily equipped with full navigation system, automatic pilot assistance and communication set. (Emirates Marine Technology)

water use and a diesel for surface operations, making it almost a midget submarine. The crew compartment will, however, be 'wet', although the crew will be able to conserve their underwater breathing apparatuses by using built-in breathing sets. The 'cab' will have a computer-controlled system – including an automatic pilot to reduce operator workload. It will also feature a telescopic mast with a television camera and possibly a thermal imager. The vehicle will have a range of 100 nautical miles (185 km) at four knots down to 50 metres, but on the surface the diesel will give it a maximum speed of around 20 knots.

Details of the planned Class 8 design are limited but it will apparently be eleven metres long, propelled by two eight-kW motors and powered by a lithium-ion battery. This will give a range of 50 nautical miles (93 km) at five knots, with a maximum speed of six knots. It will carry a six-man team, have a crew of two and, like the Class 6, will have built-in breathing sets.

One unusual vehicle for delivering special forces is the KSA SSK 96 Subskimmer, which is a 1.52-tonne rigid inflatable boat that can carry a two-man crew and two divers, the vehicle being capable both of surface operations and underwater. It is powered by a 90 hp Yamaha three-cylinder outboard motor in a water-tight engine compartment.

For underwater operations, a section of the hull is partially or wholly deflated by an electric pump and a centrally placed buoyancy tank can then be filled in an operation which takes between 14 and 90 seconds. Flexible electric propulsion units near the bow are powered by lead-acid batteries and the vehicle can be left on the sea bed for periods of up to several days. The Subskimmer can also be operated awash with a snorkel supplying the engine with air.

providing access to the other compartments and the submarine while the aft compartment is a floodable hangar for a single SDV or other vehicles as well as the special forces' equipment and houses up to 20 personnel. About half-a-dozen American and British submarines are equipped to operate the DDS and the Indian Navy has expressed interest in acquiring them following the United States-India rapprochement of recent years.

The Mk VIII has been augmented by the Columbia Research Corporation Dolphin or SDV-X in both US and British service. This is essentially a larger version of the Piranha carrying up to eight personnel but with brushless DC motor and silver-zinc batteries. These will provide a range of 56.5 nautical miles (104.5 km) at 5 knots as deep as 91 metres, but burst speeds of nine knots are possible.

The sophistication of these 2.75-tonne vehicles is illustrated by the electronics fit. This includes colour liquid crystal displays and colour digital charts, while the computer-based navigation system includes GPS and Doppler velocity log. There is also a multi-beam obstacle-avoidance sonar to distinguish targets while the integrated communications suite includes an underwater telephone and a VHF radio.

Traditionally SDVs have been produced by the United States, Italy and Serbia, but a new player is the United Arab Emirates. Emirates Marine Technologies (EMT) has developed four SDVs since the mid 1990s, both for domestic use and for neighbouring countries. The Classes 4, 5, 6 and 8 are built of glass reinforced plastic and carbon composite materials, with the first two being two-man units powered by an eight-kW motor with

external battery packs, the three-tonne Class 4 uses silver-zinc while the eight-tonne Class 5 uses nickel-cadmium. Their sensor/control suites include a sonar, echo sounder, GPS, electronic compass and electronic mapping facility and an onboard computer. They have a range of 60 nautical miles (110 km) at six (maximum speed 7) knots and can operate down to 50 metres. the Class 4 carries a 200 kg payload while the Class 5 can handle 450 kg.

The manufacturers are now developing two more ambitious designs, the Class 6 and Class 8, to carry four and eight (two crew) personnel. The former will have two eight kW electric motors for under-



An interesting device is the hybrid Subskimmer, basically a Zodiac-type boat that is deflated when the diving point is reached. Propulsion is then switched from piston-engine to electric. (Armada archive)



After Rafael had developed the unmanned Protector with Aeronautics, the latter firm presented its own iteration, the six-tonne SeaStar at the 2005 Paris Air Show. It can be armed with a variety of stabilised weapons, perform electronic intelligence and electronic countermeasure missions and reach 45 knots. (Armada/EHB)

The vehicle has a cruising speed of 20 knots (maximum speed of more than 25) while the surface range is 70 nautical miles, although this can be increased with extra tanks. The Subskimmer usually operates a crew of two with up to 300 kg of stores and it is in service with a number of countries including Thailand.

For longer-range operations the SDV is usually replaced by the midget submarine. Larger versions of the SDV, such as the EMT Class 6 and the Columbia Dolphin may blur the distinction between the two, but the midget submarine not only tends to have longer sea legs but the personnel are in a dry environment. However, 'dry' is a relative term, and these small vessels tend to be effected by condensation due to several people living in close proximity within a confined space. A floodable chamber allows personnel to enter and to leave the submarine.

Italy's Cosmos has been foremost in developing commercial designs that have been used not only for special operations but also to provide in miniature the capability that was expected from a conventional diesel-electric submarine. The MG 120/ER, for example, is described as a Shallow Water Attack Submarine (Swats) that was originally designed for special operations but has since had its roles expanded through the addition of improved sensors and the capability to conduct anti-ship operations.

With a submerged displacement of 130 tonnes it is capable of 1600 nautical miles (2960 km) at seven knots on the surface and 60 nautical miles (111 km) at 4.5 knots submerged. It is also available with an air independent propulsion system based on a closed circuit diesel fuelled by liquid oxygen, which provides an underwater range of 400 nautical miles (740 km).

The vessel has a crew of six and can carry a team of up to 15 and two Cosmos CE2F/X100 with 20 limpet mines. But the two 53-cm torpedo tubes mean it can also carry two heavyweight torpedoes and two spare. It is used by several navies in Eastern and Western Asia as well as Latin America.

The manufacturer has improved the concept with a new design as the X 201, a 200-tonne vessel with a surface range of 2500 nautical miles (4600 km) at 15 knots and can operate down to 200 metres. The X201 can carry six torpedoes or two SDVs as well as up to twelve special forces personnel. Cosmos, based in Leghorn, went bankrupt in March 2004 following the involvement of its owners in the Iraqi Oil for Food scandal.

A derivative of another Cosmos design has been built by the Pakistan Navy as the MG 110, with a submerged displacement of 110 tonnes. The performance and weapon load are similar to the

MG 120 but it can carry eight special forces personnel.

The former Yugoslavia produced the Una class midget submarines. A Yugoslav-based design has certainly been used by North Korea (and exported to Vietnam as well as Iran) to land special forces operatives as one of these so-called Yugo boats became stranded in South Korean waters in 1998. They have a submerged displacement of 90 to 110 tonnes and a surface range of 550 nautical miles (1020 km) at ten knots and a submerged range of 50 nautical miles (92.5 km) at four knots. It is operated by a crew of four and carries about half-a-dozen special forces, and the weapon load can include two lightweight (40 cm) torpedoes.

By contrast the 60-tonne (submerged) displacement Northrop Grumman Electronics Sensors and Systems Division, Oceanic Systems Advanced Seal Delivery System (ASDS) is designed to deliver up to 16 special forces personnel. Powered by silver-zinc batteries and using retractable thrusters the vessels are capable of about 125 nautical miles (230 km) at eight knots and it can operate down to 60 metres.

The ASDS control system includes multifunction displays, an inertial navigation system identical to that of the F/A-18 Hornet, forward- and side-scan sonars as well as dual-redundancy control computers. Improvements include the introduction of lithium-ion batteries and new assemblies for the bow and stern.

Clockwork Special

Special operation fighters can make use of a myriad systems to fulfil their missions – from the largest to the smallest and to the most anonymous. Macroswiss, a fairly new company specialising in surveillance and covert operations equipment, has recently developed an underwater version of its Giraffe recently and quite successfully tested by the US Marine Corps (4th Marines) over a period of six months. The Giraffe consists of a telescopic aluminium pole that can expand to a length of 5.5 metres and at the tip of which is affixed a miniature camera that conveys real time images to a chest-carried display. This enables one to very discretely watch «what's going on» over walls, behind even second-floor windows, or even search down sewer manholes for suspect items. Macroswiss has recently developed an



underwater version that can be used down to depths of 70 metres, including its display.

The anonymous, in such circumstances, are connectors. For instance in the case of this Delftjet underwater propulsion system, disaster could strike if for any reason the connector between the battery pack and the motor could fail. A connector is an item that is often brutalised and tampered with during endless plug-in/unplug manipulations,

but must yet give flawless service at all times – and in this case also remain waterproof. This is the gauntlet raised by another Swiss company, Fischer Connectors, that produces connectors for medical pacemakers as well as for the military. See the «What's Up» section in the main issue of this magazine.

Beyond the Thunder



Thales Communications PR4G F@stnet radio

Before, during and (especially) after the operation, the sound of a friendly voice or a superior barking a command can be supremely reassuring to those operating with one bean, one bullet and on the edge of nowhere. Combat communications connecting the special soldiers/sailors/airmen to their command or extraction party are the backbone of any mission.

Johnny Keggler

Despite the plethora of national and international communication upgrade and modernisation programmes – where Britain’s Bowman and the US military’s JTRS are the headliners – dedicated communication sets for special force operations have been, until recently, largely nonexistent. The order of the day was to grab what comm sets were available for a specific task, an action that often led to a veritable truckload of radio sets, which in turn translated to forward operating teams having to ‘cache’ gear to avoid ‘humping’ 50 kg or more during the entire operation.

A Brick in the Hand

Special ops comm kit, whether in hand-held, manpack or vehicular version, is on the shelf and in the mits of the black shirts on the ground, at/under the sea and in the air. But a new problem is beginning to show its ugly head; as with any sector of technology, choosing a radio today is akin to shopping for an MP3 player or a mobile telephone, there are almost too many on the shelf and in development for one to make a quick selection.

Within the JTRS programme and on the ground tactical communications side for the house will be the Cluster 5 Spiral II single and dual-channel hand-held radios. These will include an embedded GPS and offer a large selection of waveforms. The single-channel variant will weigh not more than 0.91 kg, with the

dual-channel being less than 1.36 kg. Deliveries of the Engineering Development Model should begin in early 2007 and will include a set of eleven new Small Form Fit radios that will be embedded into the ‘clothing’ of the US Land Warrior and (expectedly) also those worn by spec ops teams’.

Thales Communications, involved in the Cluster 5 radio development, was

chosen by the US Special Operations Command (Socom) in May 2004 to deliver 19,000 of the company’s new Jem (JTRS Enhanced MBITR) radios along with 9000 existing MBITR designs with 12,000 upgrade kits.

Socom subsequently revised this decision following guarantees by Harris that its 30 to 512 MHz JTRS Inter/Intra Team Radio (Jitr) hand-held set could meet the requirement. For ground operations the Jitr supports Singgars, Havequick II, VHF/UHF Am and FM, Mil-STD-188-181B and the High performance Waveform that provides 56 kbps data transfers.

The Thales Jem offers all the MBITR functionality along with JTRS SCA 2.2 compliance, software programmable



Harris has positioned itself as a leader in the HF market with over 10,000 radios produced for the Bowman programme, as well as having numerous Nato PFP customers. The US National Security Agency recently certified the company’s AN/PRC-152 multi-band hand-held for use within the JTRS software communications architecture for transmitting secure voice and data traffic up through top secret. (Harris)

A Selection of Radios Available for Special Operations Communications



Rohde & Schwarz

M3TR

Freq. range: 25 to 512 MHz
 Data rate: 72 Kbps
 Weight: 5.6 kg with battery
 Dimensions: 74 x 199 x 309 mm
 Power output: up to 50 Watts

Notes: Blos, Los (Line-of-Sight). Civil waveforms include ATC HF datalink VHF ATC



Thales Communications

AN/PRC-148 Jem

Freq. range: 30 to 512 MHz
 Data rate: 64 Kbps
 Weight: 868 grams with battery
 Dimensions: 67 x 215 x 39 mm
 Power output: 0.1, 0.5, 3 and 5 Watts

Notes: Shares same mechanical envelope as the M3TR on which it is based



Tadiran Communications

PNR 500

Freq. range: 400 to 450 MHz
 Data rates: 9.6 Kbps typical
 Weight: <370 grams with battery
 Dimensions: 110 x 65 x 40 mm
 Power output: 250 mWatts minimum

Notes: Acquired for trials by US Special Operations Forces



Thales Communications

PR4G F@asnet

Freq. range: 30 to 88 MHz
 Data rate: 64 Kbps
 Weight: 3 Kg
 Dimensions: 259 x 181 x 79 mm
 Power output: 10 Watts

Notes: In service with the French and other armies



GDC4 Systems

JTRS Cluster 5 Spiral 2

Freq. range: 2 to 870 MHz
 Data rate: 2 Mbps (wideband waveform)
 Weight: <1.3 kg 2-chnl, <0.9 kg 1-chnl
 Dimensions: <258 cm³ 1-chnl, <451 cm³ 2-chnl (max requirement)
 Power output: 5 Watts

Notes: Under dev., enter service in 2009.



ITT Communications

Spearhead

Freq. range: 30 to 88 MHz
 Data rate: 2320 channels
 Weight: 550 grams with battery
 Dimensions: 45 x 67 x 168 mm
 Power output: 4W, 2W, 100 mWatts

Notes: Optimised for digital and network-centric communications. Bone conduction headset and microphone available.



Harris Communications

RF-300M-HH

Freq. range: 30 to 512 MHz
 Data rate: 64 Kbps typical
 Weight: 300 grams with battery
 Dimensions: 28 x 73 x 128 mm
 Power output: 100 mWatts

Notes: Launched at AUSA in October 2004. JTRS SCA compliant.



Titan Systems

TTR-2101M

Freq. range: 1.5 MHz to 108 MHz
 Data rate: 16 Kbps
 Weight: 3.63 Kg w/o battery
 Dimensions: 267 x 206 x 81 mm w/o battery
 Power output: 20 Watts

Notes: Multi-band multi-mode manpack launched in autumn 2004



The Telefunken Racoms HRM short-wave radio system is seen here in the manpack version with hand-held terminal and handset. The HRM radio system, which also comes as vehicle-based and fixed versions, is in wide use by the German Bundeswehr and a collection of other armed forces on three continents. (Telefunken Racoms)

information security and a JTRS wave-form library compatible to include porting of the Project 25 waveform.

Tadiran Communications has developed a small hand-held squad radio that is also targeted to the special forces communities, the PNR 500, which was acquired by US Special Operations teams. The tiny radio weighs a slight 370 grams with battery, yet offers 250 mWatts that push a 400 to 450 MHz frequency range transferring a typical 9.6 kbps of voice and/or data.

Just keep running

Regardless of the comm system used by any forward operating team, one of the major concerns is keeping the equipment powered without having to carry one's weight in batteries and then leaving a Hansel and Gretel trail of spent power cells behind.

Technology hasn't yet caught up with the power demands of the world of com-

munications, but it is making some serious in-roads.

Voller Energy has developed a hydrogen fuel cell, the V900 Personal Portable Battery Charger, that weighs one kg yet provides 350 Watt hours to the user's equipment. The fuel cell produces equal amounts of power and heat, a physics equation the company is working on harnessing.

Global Solar Energy of Tucson, Arizona continues to innovate and develop solutions for harnessing the sun – the company's P3 flexible solar 'mat' has metamorphosed from a size that a large child could sleep on to one that fits in a map pocket. The P3 can recharge a laptop, a selection of batteries or, very quickly, cell phones and PDAs.

Is It Enough?

The question remains of when the communications gear will be fully integrated into the fabrics or, apprehensively imag-

ined, under the skin of the forward operating commandos.

Raytheon, among other trend-setting innovators, has developed its EPLRS Microlight that somewhat falls into the wearable comm system genre. But until the size, weight and power requirements are of no consequence the special operations team members will continue to be faced with deciding on a hand-held and manpack to meet their needs (with software-driven architectures already the standard).

The well-established tactical comm system manufacturers – such as Datron World Communications with its ubiquitous Spectre V manpack family that has been in the forefront of special operations communications support – will continue to dominate the market and bend the laws of creativity in producing new products for the special operators, and the warfighter in general.

The world of these new communication technologies are topics for future issues of Armada International and will be covered extensively in 2006. ☐



Tadiran Communications has designed a versatile headset for the PNR 500 hand-held radio. Here being modeled by one of the company's media representatives, the unit is available with either a wired or wireless configuration. It features optional wireless PTT unit. (Armada/JK)


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