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SECRETS OF THE NAVY SEALS

The Weapons, Tactics and Training
of the World's Most
Elite Warriors

+
THE
BIN LADEN
RAID
STEP BY STEP

The HK416 is used by U.S. special-operations forces, including the Navy SEALs team that killed Osama bin Laden.



THICK BLACK SMOKE RISES FROM A COMPOUND IN ABBOTTABAD, PAKISTAN. STUNNED NEIGHBORS MILL AROUND THE 10-FOOT-HIGH WALLS AS THE PAKISTANI MILITARY CORDONS OFF THE AREA. THE STILL-BURNING WRECKAGE OF A U.S. AIRCRAFT LITTERS THE COMPOUND YARD. INSIDE THE BUILDING, FOUR CORPSES, SHOT DEAD, LIE IN CONGEALING BLOOD. ¶ IT'S MAY 2, AND THE WORLD IS LEARNING THAT OSAMA BIN LADEN IS DEAD, KILLED BY A U.S. SPECIAL-OPERATIONS UNIT DURING A NIGHTTIME AIR ASSAULT. THE RAIDERS SUFFERED NO CASU-

BEYOND BIN LADEN: THE NAVY SEALS' NEXT MISSIONS

ALTIES BUT CRASHED A HELICOPTER, WHICH THEY BLEW UP TO PRESERVE ITS SECRETS. **BULLETS, BODIES AND WELL-ORCHESTRATED CARNAGE: THE NAVY SEALS WERE HERE.** ¶ SEALS (THE ACRONYM STANDS FOR “SEA, AIR AND LAND”) WERE LEGENDARY WARRIORS LONG BEFORE THE BIN LADEN RAID. FORMED BY PRESIDENT JOHN F. KENNEDY IN 1962, THE SEALS OPERATE IN EVERY ENVIRONMENT IMAGINABLE TO REACH INACCESSIBLE PLACES, COLLECT BATTLEFIELD INTELLIGENCE, ATTACK HIGH-VALUE TARGETS AND TRAIN FOREIGN

troops. Pentagon officials have relied heavily on these units during the decades-long global campaign against terrorist organizations. When Special Operations Command (SOCOM) recruits personnel for the secretive Naval Special Warfare Development Group, aka Team 6, the unit that killed bin Laden, it looks only at SEALs. After President Barack Obama met the team that raided bin Laden's compound, he called them “the finest small fighting force in the history of the world.”

At the start of their careers, before a life of training and experience, SEALs are able to swim 500 yards in 8 minutes and crunch 100 sit-ups in 2 minutes; most are expert assault-rifle marksmen. These days they spend more training hours on “special reconnaissance,” operating silently close to the enemy, than on traditional underwater demolition

skills. This work demands specialized gear, including clandestine vehicles, surveillance robots and human-target tracking technology.

As the SEALs celebrate the mission in Pakistan, they are also looking to the future. Their next-generation gear foretells how the SEALs will conduct upcoming secret missions—by sea, air and land.

1.

SEA

THE LATE-AFTERNOON SUN LINGERS ON THE HORIZON AS A WHITE FORD F-350 PULLS OUT OF A NAVAL TRAINING FACILITY IN PANAMA CITY BEACH, FLA. TWO PLAINCLOTHES SEALS IN THE CAB ARE HAULING A 21-FOOT-LONG TUBE, HIDDEN UNDER TIGHTLY TIED GREEN CANVAS.

The SEALs and their top-secret cargo, the Mk8 Mod1 SEAL Delivery Vehicle (SDV), are headed to a Coast Guard boat ramp across the harbor. The SEALs will tell any curious gawkers that they are a crew from the Discovery Channel, filming underwater. In reality, they are here to meet trainees to teach them how to operate the submersible, which is deployed from a pod mounted on the hull of a full-size submarine. Of the approximately 2600 active-duty SEALs, only about 230 are qualified for SDV missions.

It's hard duty—the SDV is a “wet” sub, meaning the vessel is operated while flooded, with pilots and passengers wearing scuba gear. There are no windows, no windshield. Navigation is performed with sonar or, on the surface, GPS. “Picture a 55-gallon trash can. Fill it full of ice water. Put an Xbox in there. Climb in and put the lid on, then stay for 12 hours,” says veteran SEAL Daniel Jacob, leading chief petty officer at the Naval Special Warfare Advanced Training Command Detachment in Panama City. “It’s cramped and cold, and until you beat the game, that’s where you’re staying.”

The SEALs know better than anyone that the Mk8 Mod1, an improved model of a 1976 original, is outdated, even with its upgraded electronics and navigation systems. SOCOM has been working on a replacement for 17 years; the proposed 65-foot Advanced SEAL Delivery System (ASDS) would carry at least 10 men in dry, pressurized comfort. SEALs in scuba gear would slide out of the hatch when it was time for their mission.

In 2008, when a lithium-ion-battery fire destroyed the only ASDS prototype, SOCOM decided not to repair the minisub. But a new program is under way,

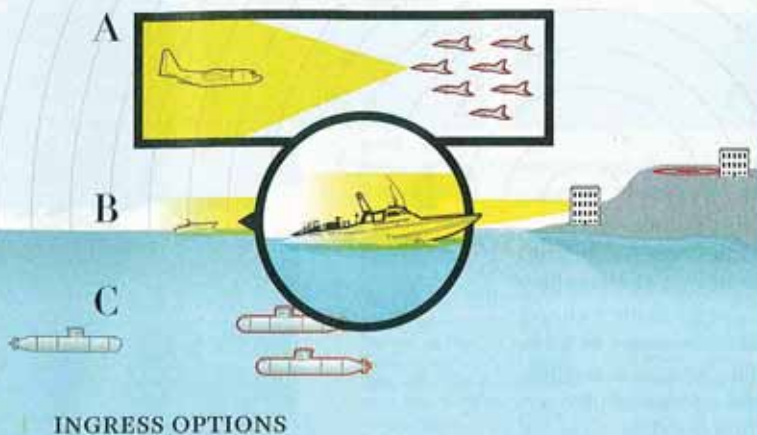
focused on two sizes of dry combat submarines that will do much of what was envisioned for the ASDS. “It won’t be as big as the ASDS, but the speed, range and duration should be close,” says Rear Adm. Edward Winters, commander of Naval Special Warfare Command, which is responsible for equipping the SEALs. The smaller version may be tested in 2014, according to budget documents. These vehicles will be used for traditional SEAL activities such as sabotaging ships and disabling antiship mines. Current wars against low-tech insurgents are not typically fought on the ocean, but African piracy and the growing navies of China and Iran may focus attention on such missions.

SOCOM is also pursuing new surface vessels to deliver SEALs to a mission. In the next few years, the Navy’s Special Warfare crewmen are expected to field Combatant Craft, Medium (CCM). The boat will replace the aged Naval Special Warfare Rigid Hull Inflatable Boat, and a heavier version will replace the Mark V Special Operations Craft. “The secret is being able to meet the payload requirements and still make the necessary speed,” says C.J. Lozano, the director of government products for Willard Marine, one company vying for the contract.

The Navy hasn’t released many details, but the CCM will likely have design elements more common to jet fighters than to boats: a low radar profile, a head-up display with synthetic vision, a light-

CONCEPTUAL OPERATION: BLACK SURF

Mission: Plant surveillance equipment near a weapons depot on a well-guarded shore.
Challenge: Many potential foes have high-tech sensors on land and sea to stop such incursions. "You're talking about an environment today where it's harder to sneak up on anybody's coast," says Rear Adm. Edward Winters, commander of Naval Special Warfare Command.



INGRESS OPTIONS

(A) PARADROP

Powerful radar on shore and modern warplanes make dropping SEALs from a cargo plane too dangerous.

(B) BOAT

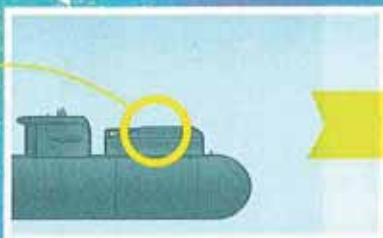
Thermal sensors and surface radar make any approach by surface vessels too risky for a clandestine mission.

(C) SUBMARINE

SEALs on underwater scooters could deploy from subs, but shallow water and enemy sonar keep the big subs too far away from shore.

THE RIDE OF CHOICE

SEAL DELIVERY VEHICLE Deployed from a pod mounted on a full-size submarine, the SDV is quiet enough to avoid sonar. SEALs in scuba gear swim out of this "wet" submersible and head to land.

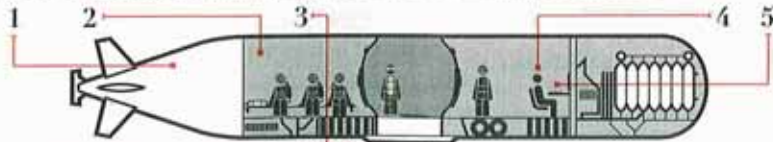


SDV SPECS (EST.)

Length: 21 feet Speed: 6 knots
Range: 70 miles Operators: Two
Passengers: Four

FUTURE TECH

SOCOM is working on three new underwater rides for the SEALs: a new short-range wet vehicle and two dry submarines for use on longer trips. Winters, who is responsible for procuring SEAL equipment, says his command is funding research into medium-size and small versions of the dry minisub; below are some features of a new dry minisub, based on public military documents.



(1) Silver oxide-zinc batteries power an electric motor.

(2) A pressurized interior allows deep dives.

(3) Docks directly to a mother submarine for faster deployment. Today, it takes 12 hours to mount a pod on a mother-ship submarine.

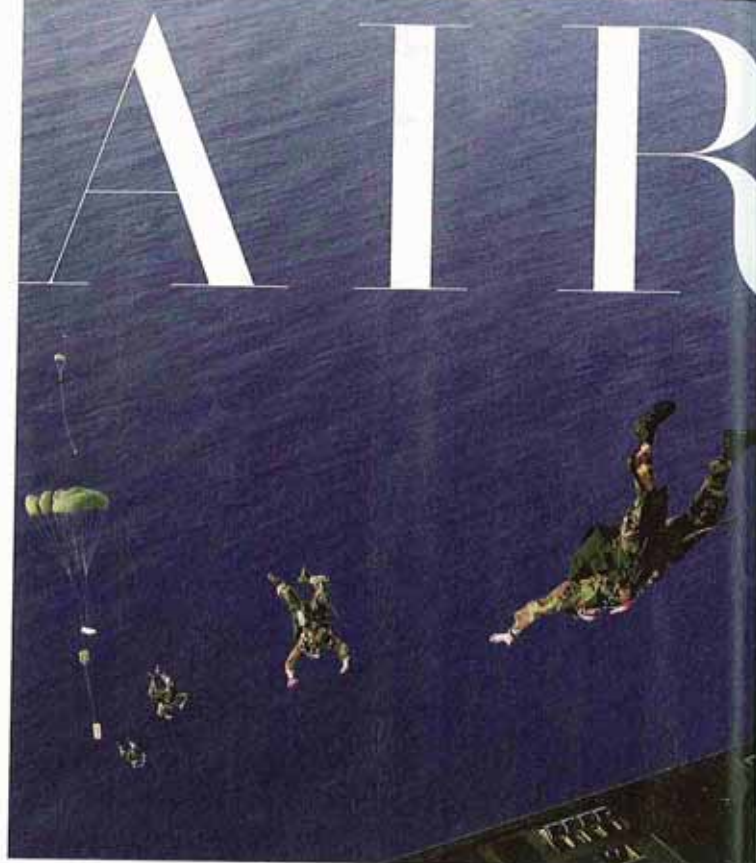
(4) Wireless, through-water communication with divers.

(5) Inertial navigation augments GPS.

weight carbon-fiber frame and intuitive drive-by-wire controls. (During a visit to Naval Amphibious Base, Little Creek, Va., in 2008, a PM editor steered a carbon-fiber testbed prototype using a simple joystick—no experience or training required.) And, as in aviation, naval special-operations planners see great potential in remotely operated vehicles. Mission planners could put robotic vessels above and below the surface into more dangerous situations for hours or even days, reshaping the SEALs' reconnaissance missions.

For now, SEALs have to make do with existing gear. At the Florida boat ramp, the SEALs wait for sundown to unwrap the Mk8, then gingerly back the trailer down a concrete ramp and slide the submersible into the water. Two novice pilots wearing dark wetsuits, masks and scuba tanks climb inside as the black hull hovers at the ramp's edge. The compartments fill with water, the men slide the canopy doors closed, and the vehicle sinks slowly beneath the inky, rippled surface. The goal of the evening is for the students to navigate under a nearby bridge, relying entirely on the sub's sonar. By midnight, they have not succeeded, and are shivering in their wetsuits. It becomes clear that the limitations of SDV missions are largely the limitations of the human bodies immersed inside. "Eventually you're going to get cold in any water colder than your body temperature," says Jacob, who won't reveal the details but says he has embarked on real missions in the SDV. "Your arms start failing, and your legs start failing, but your brain's still working. That's where you're eventually going to be." Or at least that's where SEALs will find themselves until the next-generation submersible is ready for action.

2.



Naval Special Warfare boat crewmen leap from a C-17; the craft and its pallet are already under chutes.

SEALS OPERATE AT NIGHT AND PREFER TO LEAVE NOTHING BEHIND THE NEXT DAY EXCEPT BODIES AND FOOTPRINTS. THE BURNING U.S. HELICOPTER IN THE YARD OF BIN LADEN'S COMPOUND WAS A VIOLATION OF THIS ETHOS.

The wrecked helo was a modified MH-60 Black Hawk, flown by the Army's 160th Special Operations Aviation Regiment. Navy SEALs have no aircraft, and must hitch rides with other military branches to fly to their missions. But on a clandestine operation of high importance, like the bin Laden raid, SEALs fly with the 160th SOAR, the Army's only designated special-operations aviation arm.

The SOAR helicopters used in Abbottabad were specialized, but the technology in them has been in development since the 1960s, when the Pentagon and the CIA hired the Hughes Tool Co. to create a helicopter dubbed The Quiet One. Hughes engineers knew rotor noise could be hushed by decreasing blade-vortex interaction, caused when a rotor slices through the small whirls of air created by the preceding blade. The Quiet One diminished this noise by adding an extra rotor blade so a pilot could slow the rotors, making less noise while remaining aloft.

CONCEPTUAL OPERATION:
PLEASURE CRUISE



B

Mission: Rescue hostages from a liquid-natural-gas tanker hijacked at sea by terrorists. If the hijackers see a team coming, they will torch the ship and kill the hostages. **Challenge:** how to get a six-man SEAL team into action before the vessel reaches a port and probable self-destruction. The solution is to dispatch a team 20 miles from the tanker, at night, by parachuting the team and a Rigid Hull Inflatable Boat (RHIB) from a cargo transport aircraft.

(A) DROP THE BOAT

The 36-foot RHIB is attached to a platform and loaded in the back of a C-17 Globemaster III. At 5000 feet, over the designated area, the airplane's rear ramp opens. A 25-foot-wide extraction parachute yanks the platform from the aircraft, sliding it off the ramp. As soon as the RHIB is free, the boat separates from the platform.

(B) JUMP INTO ACTION

The SEALs and boat crewmen jump after the RHIB is clear, opening their chutes almost immediately. They fall in close formation—the first one out of the plane steers toward the target, and the other jumpers follow.

(C) FLOAT TO FIGHT

Four 100-foot-wide cargo parachutes open above the RHIB. SEALs choose not to attach parachutes to the platform or inflate its airbags, allowing the platform to fall and sink without a trace.

(D) READY TO RIDE

When the RHIB hits the water, its parachutes separate automatically. The SEALs swim to their ride, board and haul in the chutes. The team proceeds to the tanker under cover of darkness. After the mission, helicopters extract the hostages and SEALs.



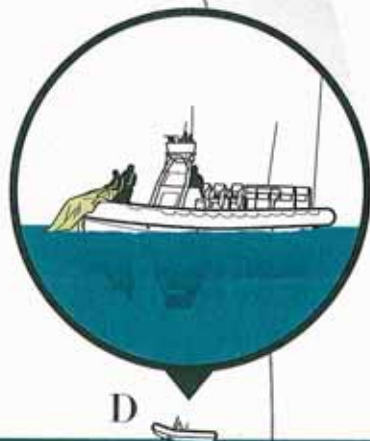
C

The tail boom on the helo that crashed in bin Laden's compound also had at least one extra rotor blade, for this same quieting effect. Aviation researchers are developing more complex ways to deaden the thumps of rotors. For example, Eurocopter makes double-swept blades with piezoelectric flaps that adjust as many as 40 times a second to compensate for blade-vortex interactions. (See Tech Watch, June 2010.)

SOCOM officials always seek ways to operate independently, for example by researching remotely operated helicopters that could carry Hellfire missiles or cargo. This year, however, SOCOM transferred its unmanned helicopters to the Army for more evaluation. If industry can supply a reliable unmanned helicopter, SOCOM will likely buy a small fleet for its operators, including the SEALs.

SEALs pioneered the use of hand-launched UAVs, such as the 4.2-pound Raven, which they outfitted with a target designator to direct airstrikes by F/A-18F warplanes. The state-of-the-art SEAL UAV is the 13-pound Puma AE, which can set down on land or water and has a camera that automatically tracks targets. A gimbal keeps the image steady by compensating for shaking in flight. SEALs no longer have to aim the camera; they just toss the Puma AE and designate a target.

The future of special-operation UAVs lies in small, autonomous aircraft disguised as birds or even insects. These will fly over or inside buildings to gather video. For example, SOCOM is now evaluating a bird-shaped UAV called Maveric. "It's super-quiet and nearly indistinguishable from a turkey vulture," says Jason Grzywina, a co-founder of Prioria Robotics, which builds Maveric. "You can fly it over somebody's head and they would never know it's there." Much like the SEALs themselves.



D



FUTURE TECH

Aerial boat insertions are going higher and faster, says Elek Puskas, chief executive officer of Airborne Systems, designer of the SEALs' boat-launch system. "They jump between 4000 and 5000 feet, but requirements [for future systems] anticipate the need to jump at 10,000 to 12,000 feet," he says. The aerodynamic forces on the boat and pallet will be higher, but the extra altitude will allow cargo planes to fly above threats to deliver the SEALs. GPS-guided parachutes are now commonly used in Afghanistan; their role in special-operations paratroops will enable cargo to travel farther on its own, allowing SEAL insertion and resupply at longer, safer ranges.

3. LAND



Navy SEALs in Desert Patrol Vehicles were the first U.S. troops in Kuwait in 1991.

SINCE SEPT. 11, NAVY SEALS HAVE BECOME ELITE MANHUNTERS. THEY FIND, IDENTIFY AND TRACK INDIVIDUALS—PRIORITY WORK IN COUNTERINSURGENCY CAMPAIGNS IN IRAQ AND AFGHANISTAN, WHERE A SINGLE PERSON'S DEATH CAN BE THE GOAL OF MONTHS OF SURVEILLANCE. WHAT THE PENTAGON ONCE CALLED THE "GLOBAL WAR ON TERROR" IS A PERSONAL BUSINESS.

The SEALs have experienced this kind of fight before, in the Vietnam War. There, SEALs recruited by the CIA advised reconnaissance units that sometimes executed supporters of Viet Cong guerrillas—but the effort was plagued by misidentification. Winning hearts and minds is difficult when detaining innocent bystanders.

These days, targeting is a priority mission, backed by high technology. The SEALs carry sophisticated kits that would be more familiar to a police forensics expert than to a soldier: DNA swabs, digital fingerprint scanners and iris imagers. These instruments can provide a team with a match within minutes, if the subject has previously been fingerprinted.

But SEALs are most often used to find terrorist or insurgent leaders, dubbed high-value individuals, who typically have no prints or other biometrics on file. These targets require DNA for identification, but the Pentagon doesn't have a system for digitizing results of genetic scans performed in the field, as it does for fingerprints.

Instead, paper results are sent by courier to a properly equipped base to make a match. It took the Pentagon 4 hours to identify the bin Laden DNA collected by the SEALs—the fastest genetic identification it has ever performed, according to SOCOM. The ability to use digital DNA results to immediately verify

MAY 2011

BIN LADEN RAID

Vice Adm. William McRaven, commander of the Joint Special Operations Command, planned the bin Laden raid. Fortunately, he wrote the book on such missions. In 1995, the former SEAL team commander published *Spec Ops: Case Studies in Special Operations Warfare*, an analysis of the eight greatest raids in modern military history. In it, he explores the principles that enabled the missions to succeed. So, how does the admiral's raid stack up against his own criteria?



5 SIMPLICITY: A DELICATE BALANCE

"If a plan is complex, it will require extraordinary security, and an overabundance of security hinders effective preparation," McRaven writes. The use of stealthy helicopters complicated the mission. There was likely no way for McRaven to fully vet the modded helicopters and keep them a secret. It's not known how much time the pilots had to adapt to the new ride, but we know McRaven identified the risk and mitigated it by assigning enough helicopters to the mission. When one crashed, the hunt for bin Laden still proceeded.

4

SURPRISE: STAYING AHEAD WHEN THEY KNOW YOU'RE COMING

Of all the principles of a spec-ops mission, McRaven says this one is the most exaggerated. "Many tacticians consider the principle of surprise to be the most important factor," he writes. "What good would it do to surprise the enemy, only to be ill-equipped to fight?" Even when an enemy is surprised, special-operations raids are conducted against fortified positions and forces that are expecting trouble: "[It's] like two boxers in a ring; each is prepared to parry the other fighter's punches, but even with preparation, punches are landed." During the bin Laden takedown, Pakistani radar operators also had to be caught unaware. The method: helicopters modified to fly undetected.

1 PURPOSE: KNOW WHY YOU'RE GOING

McRaven says that each member of a special-operations team must understand the mission and believe in its success. "The mission statement should be crafted to ensure that in the heat of battle, no matter what else happens, the individual soldier understands the primary objective," he writes. The bin Laden mission could not have been clearer: Take him, dead or alive. When their helicopter crashed inside the compound, the SEALs in it simply disembarked and swept the building to find their prey and finish the job.

2

REPETITION: THERE IS NO SUCH THING AS TOO MUCH PRACTICE

SEALs trained in a mockup of the compound; McRaven maintains that such training should be mandatory if time allows, even though the SEALs are well-honed masters of clearing rooms by force. Team 6 members on the bin Laden raid did not need a refresher course on small-unit tactics, but they studied every room, entryway and blind spot of the compound, and got used to working with their teammates. "The plan that sounded simple on paper must be put to the test," McRaven says of his case studies. "Invariably, when a certain aspect of an operation was not rehearsed, it failed during the actual mission."



Vice Adm. William McRaven, the last man on earth a terrorist wants planning a raid against his hideout.

3 SPEED: DELAY FAVORS THE DEFENSE

"Most special operations involve direct and, in most cases, immediate contact with the enemy," McRaven says. Seven of his eight case studies took less than half an hour to complete—and the majority of the violence occurred within the first 5 minutes. The bin Laden raid took about 40 minutes, fitting this profile. The compound's defenders were overmatched, but the real risk was the potential reaction of the Pakistanis. The mission was also crafted to deny them time to respond.

CONCEPTUAL OPERATION:
BAND LEADER

Mission: Kill or capture an insurgent leader in a remote village.
Challenge: Intelligence indicates the presence of shoulder-fired anti-aircraft missiles in the compound, making a helicopter insertion too dangerous. The nocturnal mission depends on a quiet ingress and smooth exit to where U.S. aircraft are waiting, miles away.



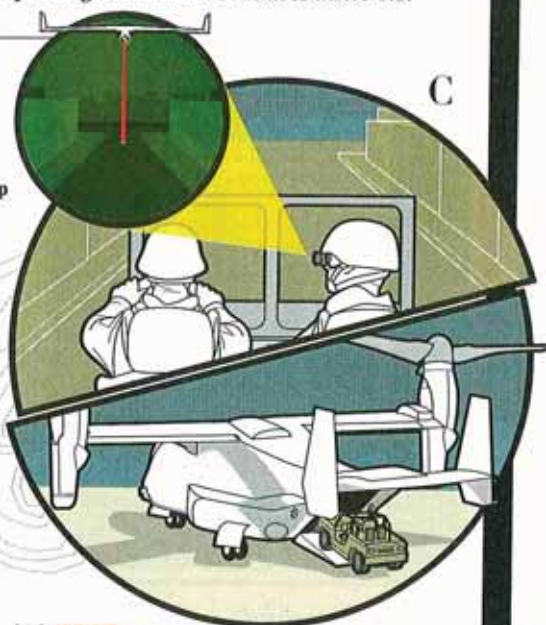
(A) DRIVE IN

A Mark V Special Operations Craft launches a ScanEagle UAV to scout the target. CV-22 Ospreys set down five SEALs and three all-terrain vehicles. The SEALs drive to the target, using night-vision goggles (NVG) to keep the trip clandestine.



(B) THROW BOTS

The SEALs dismount; two guard the ATVs while the others creep to the target building. One SEAL throws a robot, a soda-can-size cylinder with wheels and an infrared camera, through a window. It finds the enemy; the SEALs enter and, met with resistance, kill the target.



(C) EXIT

No well-planned operation starts and ends from the same place. The SEALs will rendezvous with the Ospreys at a new spot, but enemy troops are waking and landmarks are few. The ScanEagle guides the SEALs by designating waypoints along the route with a targeting laser visible only with NVG. The ATVs are designed to fit inside the Ospreys—the SEALs drive on board and fly to base.

**FUTURE
TECH**

GOOD DIRECTIONS

ScanEagle is a combat-tested surveillance UAV equipped with day or night cameras. The Pentagon plans to rig UAVs with targeting beams visible to troops using NVG, as shown in the scenario above.

ROBOTIC SQUADMATE

The Navy is working on a new throw-bot with magnetized wheels that can climb metal walls and hulls. Manufacturer ReconRobotics is also building a mobile "marsupial" system to launch the robot.

identity could be crucial to a SEAL team that needs to exfiltrate as quickly as possible once it confirms the identity of its target—dead or alive.

High-value individuals often switch cars or use body doubles to throw off surveillance from agents on the ground and UAVs flying overhead. To counter this cat-and-mouse game, the SEALs employ taggants, tiny devices that emit electromagnetic signals. But how to persistently follow these signals? The answer might be nanosatellites. Earlier this year, SOCOM officials revealed last year's launch of four satellites, each of which could fit in the palm of a hand, that can be used to track targets from orbit. They will not say whether the satellites are being used operationally. "We sent them up to demonstrate the exchange of tagging, tracking and locating data," says Doug Richardson, a SOCOM official responsible for the program. "They worked."

SEALs prize new equipment, but know it goes only so far. Vice Adm. William

McRaven, the commander who planned the bin Laden raid, states in his 1995 book on special operations that "the men must be inspired with a sense of personal dedication that knows no limitations . . . In an age of high technology we often overlook the need for personal involvement, but we do so at our own risk."

McRaven knows that the SEALs' most potent weapons, what makes them elite, are their brains and dedication. The rest are just tools. **PM**