NO FEAR

Welcome to the heroic world of USAF Combat Search and Rescue

by Tom Kaminski

Combat Search and Rescue (CSAR) involves the recovery of stricken personnel in need of emergency assistance — often from deep behind enemy lines — and is one of the most challenging missions of modern warfare. It is a low profile, yet politically important mission that is carried out by dedicated rescue or special operations forces (SOF) personnel. It is also a highly dangerous assignment in which the USAF excels.

above: **USAF HH-60Gs and A-10s demonstrate the techniques involved with rescuing downed airmen from behind enemy lines — the art of Combat Search and Rescue.** *(Mark Farmer)*

below: **Coming of age. An HH-21B recovers personnel at the Tactical Air Command Water Survival School (3613th CCTS) at Homestead AFB, Fl, during April 1971.** *(Don Logan)*

The rescue of downed aircrew or isolated personnel — either during wartime or other military scenarios — is the primary mission assigned to the USAF's combat search and rescue (CSAR) forces.

While a single helicopter can normally handle a traditional search and rescue (SAR) mission, CSAR often involves a sizable number of assets pooled under a search and rescue task force (SARTF). This is typically composed of fixed- and rotary-wing aircraft, fighters, tankers and airborne command posts, with the structure of each SARTF dictated by the complexity of the mission.

There is no doubt that today's military planners place huge importance upon the art of CSAR, but, even though its roots delve back into the early 1940s, the doctrine has only recently come to enjoy such a high emphasis. Indeed, the importance of the role has grown with every conflict, as has its life-saving successes.

Early Rescue

The US Army Air Forces (USAAF) established the first Emergency Rescue School at Keesler AFB, Mi, in late 1943. However, it didn't actually deploy credible air rescue assets until 1944. During the interim period the service relied heavily on the Royal Air Force in Europe and the US Navy in the Pacific for such services.

The USAAF actually recorded its first pararescue in Burma during 1943, when LTC Don Fleckinger, and two medical corpsmen, parachuted into uncharted jungle to rescue 21 survivors of a C-46 crash. Aided by natives, the three men cared for the injured until they were carried from the jungle. Air Rescue teams in the Pacific received their first helicopters in May 1945 when Sikorsky R-5 helicopters were assigned to the 8th Emergency Rescue Squadron (ERS) in China. As the war

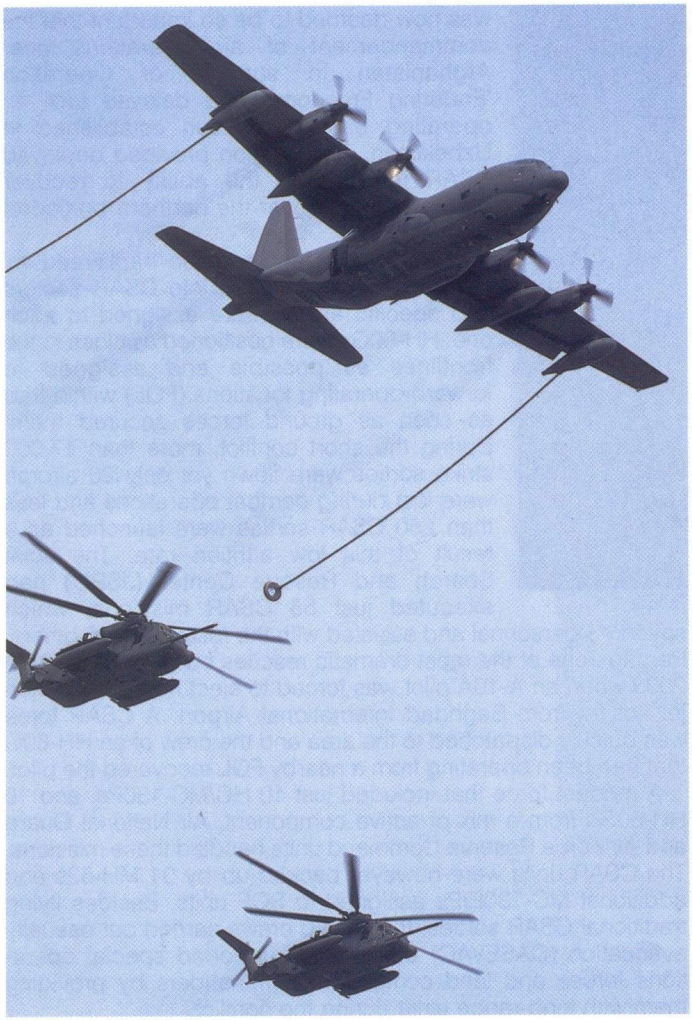
above: **Safe hands. The crews trained for CSAR are true heroes.** *(USAF)*

below: **A pair of MH-53M Pave Low IVs conduct an aerial refueling demo with an MC-130P Combat Shadow. Both assets are part of the RAF Mildenhall-based 352nd SOG, reporting to the AFSOC at Hurlburt Field, Fl.** *(Richard Cooper)*

right: **As mean as it gets. The long-range MH-53 is the largest helicopter in the US inventory and is perfected for CSAR operations.** *(Richard Cooper)*

came to a close, only a handful of these dedicated squadrons had been activated and these forces were primarily trained and equipped to perform rescues at sea with variants of the Boeing B-17, Consolidated OA-10, Douglas C-47, Stinson L-5 and R-5.

The formal history of the today's CSAR units dates to 13 March 1946 when the USAAF activated the Air Rescue Service (ARS), as part of Air Transport Command (ATC). This had been preceded by the Emergency Rescue Branch and the Air Sea Rescue Agency, which were formed in 1943 and 1944 respectively. The ARS was initially composed of two squadrons and 10 detachments.



By 1947, five complete pararescue teams had been deployed, but the ARS was primarily organized for peacetime search and rescue operations. Combat rescue was still largely unknown in 1950 when the US found itself embroiled in another war in Korea. The organization was forced to develop CSAR techniques under fire and pararescue teams and helicopters soon demonstrated their ability to extract downed aircrew and wounded personnel from behind enemy lines.

When the Korean cease-fire was enacted in 1953, the ARS had 45 pararescue teams deployed, but the command soon returned to its peacetime duties. By the late-1950s the service had been restructured around smaller detachments equipped with lightweight helicopters and Grumman SA-16 Albatross amphibians and most units were tasked with local air base rescue. Meanwhile, the ARS began gearing up to take on a new mission in support of America's entry into the 'Space Race' and, in 1964, the command was accordingly renamed the Aerospace Rescue and Recovery Service (ARRS).

A further surge of CSAR operations was just around the corner as Vietnam loomed. The first rescue units arrived in Southeast Asia in mid-1964 and, in the aftermath of the August 1964 Gulf of Tonkin incident, the USAF presence in Southeast Asia increased dramatically and the ARS soon established detachments in the Republic of Vietnam and Thailand. Operations were initially hampered by the inadequacy of the Kaman HH-43B, which had been built to provide local base rescue (LBR) and was then the service's primary helicopter. Then, in 1964 the HH-43B was replaced by the upgraded HH-43F, which was equipped with additional fuel, armor and defensive weapons. Despite these modifications between 1966 and 1969 13 HH-43s were lost in Southeast Asia. More equipment updates followed, with HC-130s beginning to replace HU-16Bs and HC-54s during 1965 (the Hercules eventually served both as a tanker and an airborne command post). Following the

right: **Convair modified 34 C-54Ds for rescue duties under the designation SC-54D. The aircraft, which became HC-54Ds in 1962, featured blister-type observation windows, additional navigation and communication equipment and increased fuel capacity. This HC-54D (42-72564) was visiting Elmendorf AFB, Ak, on 29 March 1964.** *(Norman E. Taylor)*

below: **Seen landing at the PACAF Jungle Survival School at Clark AFB, Philippines, during November 1971, this HH-3E (serial 66-13280) was assigned to the 3614th Combat Crew Training Squadron.** *(Don Logan)*

same modification pattern, the more capable Sikorsky CH-3Cs entered service in November 1965 and they were joined by HH-3Es in June 1967. The HH-3E was equipped with armor plating, long-range fuel tanks and was capable of air-to-air refueling. Affectionately nicknamed the 'Jolly Green Giant' the HH-3E was later supplanted by Sikorsky's larger and more capable HH-53B/C. Known as the 'Super Jolly', the latter aircraft was specifically designed to meet the needs of the CSAR mission and first entered service in September 1967. The war in Southeast Asia changed the face of CSAR forever and over the USAF's 11-year involvement the ARRS logged an impressive 2,780 combat saves.

By the mid-1970s, the remaining HH-3Es had been transferred to newly activated CSAR units within the Air National Guard (ANG) as well as the Air Force Reserve (AFRES) — but the majority of the HH-53B/Cs remained assigned to active duty rescue units.

A reorganization program in 1980 resulted in the transfer of the HH-53B/C fleet to the special operations mission, but in 1983, special operations and rescue units were merged to form the Military Airlift Command's 23rd Air Force. The dedicated CSAR units were assigned to the reactivated Air Rescue Service (ARS) at McClellan AFB, Ca, in August 1989. The special operations forces remained with the 23rd Air Force, which formed the basis for Air Force Special Operations Command (AFSOC) and was established on 22 May 1990.

A valuable asset

During the war in Southeast Asia and in more recent operations, typical missions called for the rescue forces to transit several hundred miles into hostile territory, being refueled en-route by Hercules tankers. Although techniques have been revised and equipment modernized, little has changed since then in the basics of the CSAR mission. Whereas A-1 Skyraiders and A-7 Corsairs were replaced by A-10A Thunderbolts, many of the same HC-130s that saw duty over Southeast Asia still remain in service. The original HH-3E 'Jolly Green Giants' were replaced by HH-60G 'Pave Hawks', but even these faster, more maneuverable and more survivable helicopters are now nearing the end of their service lives.

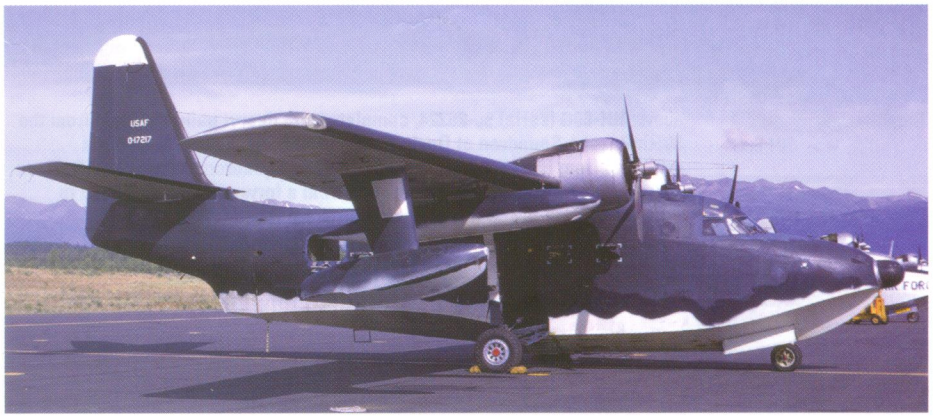
Bringing CSAR's war operations a little more up to date, Operation 'Desert Storm' in 1991 saw 38 coalition aircraft lost, yet only seven CSAR missions launched. These accounted for the recovery of just three aircrew members, but, in fairness to the CSAR forces, most of the aircraft crashed deep inside Iraq. The most dramatic mission saw MH-53Js assigned to the 16th Special Operations Wing (SOW), supported by A-10As, rescue the radar intercept officer (RIO) from a downed F-14A Tomcat deep inside Iraq, just minutes before he would have been captured by Iraqi troops.

Following the Gulf War, CSAR saw another resurgence and, by the mid-1990s, a major service upgrade had commenced that saw the activation of several new squadrons. Over the subsequent decade, deployments in support of Operations 'Northern Watch' and 'Southern Watch' regularly saw active duty and reserve component HH-60G and A-10A units deployed together at Incirlik AB, Turkey, and Ali Al Salem AB, Kuwait.

The ability to recover a downed aircrew was now deemed to be so important that the commencement of air operations over Afghanistan in support of Operation 'Enduring Freedom' were delayed until an operating base had been established in Uzbekistan. The location provided deployed CSAR forces with the ability to recover downed aircrew over the northern portion of Afghanistan.

In preparation for Operation 'Iraqi Freedom' the country was divided into CSAR sectors and specific assets were assigned to each one. HH-60Gs were positioned as close to the frontlines as possible and assigned to forward operating locations (FOL) within Iraq as soon as ground forces secured them. During the short conflict, more than 17,000 strike sorties were flown yet only 20 aircraft were lost during combat operations and less than 250 CSAR sorties were launched as a result of this low attrition rate. The Joint Search and Rescue Center (JSRC) had executed just 55 CSAR missions, which saved 73 personnel and assisted with the rescues of 20 others. Perhaps one of the most dramatic rescues occurred on 8 April 2003 when an A-10A pilot was forced to eject from his stricken jet not far from Baghdad International Airport. A CSAR force was quickly dispatched to the area and the crew of an HH-60G that had been operating from a nearby FOL recovered the pilot.

A modest force that included just 10 HC/MC-130Ps, and 16 HH-60Gs from a mix of active component, Air National Guard and Air Force Reserve Command units handled these missions. The CSAR units were however backed up by 31 MH-53s and additional MC-130E/Ps assigned to SOF units. Besides flying traditional CSAR sorties, the HH-60 crews carried out casualty evacuation (CASEVAC) duties and supported special operations forces and land component commanders by providing them with long-range airlift during the conflict.



top: **This HC-97G (52-2739) of the 303d ARRS at March AFB was seen at Elmendorf AFB, Ak, on 29 June 1968. At least 29 C-97Gs were converted as interim rescue command posts pending delivery of the HC-130.** *(Norman E. Taylor)*

above: **HU-16B (51-7217) assigned to the 304th ARRS at Portland IAP, Or, visiting Elmendorf AFB, Ak, on 16 Jun 1968.** *(Norman E. Taylor)*

CSAR specialized

In parallel with the mission's growth in importance over the years, the USAF has initiated a number of reorganization processes to best incorporate the most efficient unit structure.

A USAF review that began in 1992 avoided aligning the combat rescue forces under AFSOC, instead the units were reassigned from the newly created Air Mobility Command (AMC) to Air Combat Command (ACC) and the Pacific Air Forces (PACAF) — and on 1 February 1993 the Air Rescue Service was deactivated. The 542nd Crew Training Wing, which then trained aircrew for ACC, PACAF and AFSOC, was subsequently transferred from AMC to Air Education Training Command (AETC) on 1 July 1993. The wing was later re-designated as the 58th Special Operations Wing on 1 April 1994.

The prominence of the CSAR mission within the USAF structure was fortified on 2 July 1993 when ACC established the USAF Combat Rescue School (CRQS) at Nellis AFB, Nv. CRQS provided HH-60 pilots with a weapons instructor course and graduate level training in combat rescue techniques and tactics. The school was tasked with advanced training and tactics development, as well as test and evaluation. The establishment of this unit ensured that previous lessons learned would be passed on to the CSAR community rather than forgotten, with the school later became a component of the impressive USAF Weapons School.

The USAF became the Department of Defense (DoD) Executive Agent (basically, the lead service) for CSAR on 26 January 1996. One month later the Joint Combat Rescue Agency (JCRA) was established at Langley AFB, Va. Primarily intended to enhance the joint service's ability to recover isolated personnel during wartime or contingency operations, the overall responsibility was transferred to the Joint Personnel Recovery Agency (JPRA) as part of the US Joint Forces Command (USJFCOM) during 1999. The agency, which is headquartered at Fort Belvoir, Va, provides military commanders with information pertaining to CSAR organization, training, planning, as well as operations and policy.

Nellis was also home to the Joint CSAR Joint Test and Evaluation program (JCSAR JT&E), which was staffed by personnel from the four service branches. The unit conducted assessments of JCSAR operational effectiveness, determined critical problem areas, suggested ways of addressing the problems and evaluated enhancements. The initial evaluations and tests were carried out during Search and Rescue Task Force exercises held at Nellis during exercises held in 1996/97. A year later, JCSAR functions were included in 'Red Flag' and 'Blue Flag' exercises as well as the first Joint Rescue Exercise (JREX). As a result of these efforts several new systems have been developed and the USAF is working to incorporate them into its CSAR platforms.

Airborne angels

So how does the mission work? Taking today's HH-60G or MH-53 crews as examples, a number of conditions (including the local topography, the state of the survivor and how hostile the environment is) will determine whether the crew lands their aircraft or brings the downed airman aboard via a rescue hoist. Recovery of injured personnel may require a pararescueman, or 'PJ', to be placed on the ground to assist with the evacuation. These highly trained enlisted personnel can be called upon to carry out a mission in any environment ranging from remote mountain areas to the waters of the Caribbean and they may arrive on scene aboard a helicopter or via parachute from a C-130. Upon locating the survivors, the PJs can provide survival and evasion assistance, emergency trauma care and security — a good face to see when you're in trouble.

In order to accomplish the mission, PJs are trained in an entire range of specialty areas, such as insertion/extraction, adverse terrain operations, advanced parachute techniques, weapons and tactics, plus survival, evasion, resistance, and escape (SERE), scuba diving and amphibious warfare. They are also nationally registered combat emergency medical technicians specializing in combat trauma and are the only DoD personnel trained and equipped for conventional and

Still dusty from Operation 'Desert Storm', a pair of HH-3E 'Jolly Green Giants' of the 301st RQS sits on the ramp at Patrick AFB, Fl. The type was withdrawn soon after, replaced by the HH-60G Pave Hawk. *(Richard Cooper)*

USAF SAR and CSAR Units (July 2003)

Wing/Sqn		Location	Aircraft	Tail Code
Air Combat Command				
57th Wing		Nellis AFB, Nevada		
57th OG	58th RQS		(PJs)	
	66th RQS		HH-60G	WA
USAF WS	34th WPS		HH-60G	WA
347th RQW		Moody AFB, Georgia		
347th OG	38th RQS		(PJs)	
	41st RQS		HH-60G	MY
	71st RQS		HC-130P, C-130E	MY
355th Wing		Davis Monthan AFB, Arizona		
355th OG	48th RQS		(PJs)	
	55th RQS		HH-60G	DM
	78th RQS		HC-130P	DM
363d AEW		Prince Sultan AB, Al Kharj, Saudi Arabia		
9th AEG	4411th RQS(P)	Ali Al Salem AB, Kuwait		HH-60G
Air National Guard (ANG) Units				
106th RQW		Francis S. Gabreski Airport, Westhampton Beach, New York		
106th OG	102nd RQS		HC-130N/P, HH-60G	LI
129th RQW		Moffett Federal Airport, Sunnyvale, California		
129th OG	129th RQS		HC/MC-130P, HH-60G	CA
Air Force Reserve Command (AFRC) Units				
920th RQW		Patrick AFB, Florida		
920th OG	39th RQS	Patrick AFB, Florida	HC-130N/P, C-130E	FL
	301st RQS	Patrick AFB, Florida	HH-60G	FL
	304th RQS	Portland IAP, Oregon	(PJs)	
	305th RQS	Davis Monthan AFB, Arizona	HH-60G	DR
Pacific Air Forces (PACAF)				
18th Wing		Kadena AB, Japan		
18th OG	33rd RQS	Kadena AB, Japan	HH-60G	ZZ
	Det. 1	Osan AB, Korea	HH-60G	ZZ
Air National Guard (ANG) Units				
176th Wing		Anchorage IAP/Kulis ANGB, Alaska		
176th OG	210th RQS	Anchorage IAP/Kulis ANGB, Alaska	HC-130N, HH-60G	AN
	Det. 1	Eielson AFB, Alaska	HH-60G	AN
US Air Forces Europe				
85th Group	56th RQS	NAS Keflavik, Iceland	HH-60G	IS
Air Education Training Command				
336th TRG	36th RQF	Fairchild AFB, Wash.	UH-1N	
58th SOW		Kirtland AFB, New Mexico		
58th OG	512th RQS		HH-60G, UH-1N	
	550th SOS		MC-130P	
	551st SOS		MH-53J	

continued

above: **HH-60G (serial 90-26224, complete with desert paint scheme) from the 305th Rescue Squadron at Davis Monthan AFB, Az, conducts in-flight refueling from HC-130P from the 39th Rescue Squadron at Patrick AFB, Fl, on 5 May 2003. Both units were operating from a forward deployed base in Southwest Asia in support of Operation 'Iraqi Freedom'.** *(USAF)*

USAF SAR and CSAR Units (July 2003) Continued

Wing/Sqn		Location	Aircraft	Tail Code
Air Force Special Operation Command				
16th SOW		Hurlburt Field, Florida		
16th OG	8th SOS*	Duke Field AS, Florida	MC-130E	
	9th SOS	Eglin AFB, Florida	MC-130P	
	20th SOS	Hurlburt Field, Florida	MH-53M, NCH-53A	
352nd SOG	21st SOS	RAF Mildenhall, UK	MH-53M	
	67th SOS	RAF Mildenhall, UK	MC-130P	
353rd SOG	1st SOS	Kadena AB, Japan	MC-130E	
	17th SOS	Kadena AB, Japan	MC-130P	
Air Force Reserve Command (AFRC) Units				
919th SOW		Duke Field AS, Florida		
919th OG	5th SOS**	Hurlburt Field, Florida	MC-130E	
	711th SOS	Duke Field AS, Florida	MC-130P	
Air Force Space Command				
30th SPW		Vandenberg AFB, California		HV
30th OG	76th HF		UH-1N	
90th SPW		F.E. Warren AFB, Wyoming		FE
90th OG	37th HF		UH-1N	
91st SPW		Minot AFB, North Dakota		MT
91st OG	54th HF		UH-1N	
341st SPW		Malmstrom AFB, Montana		MM
341st OG	40th HF		UH-1N	

*The 8th SOS is an active associate unit that shares aircraft that are "owned" by AFRC's 711th SOS.
**The 5th SOS is an associate squadron that shares aircraft that are "owned" by the 9th SOS.

unconventional recovery operations. The PJ is the heart of CSAR — without a PJ, a helicopter crew could fly hundreds of miles into enemy held territory only to discover their victim is incapacitated and unable to assist with extrication. And it's not just for CSAR pararescuemen are also tasked with rescuing civilians during natural disasters or at sea. They are true heroes.

In Southeast Asia, PJs were regularly found on the ground providing medical assistance for downed aviators and troops. During the conflict, 20 PJs were killed in action and 10 Air Force Crosses were awarded to these brave servicemen.

Since that time the same medal has been earned by individual PJs for heroism in Somalia during 1993 and in Afghanistan in 2002.

Their training is similar to that of special operations forces and a fair portion of it is carried out alongside the SpecOps personnel. After basic training, a prospective PJ spends more than 15 months in USAF, US Army and US Navy schools learning the tools of the trade, as follows:

Pararescue/Combat Control Indoctrination Course • Lackland AFB, Tx (10 weeks)
US Army Special Operations Underwater School • NAS Key West,Fl (four weeks)
US Navy Underwater Egress Training • NAS Pensacola, Fl (one day)
USAF Survival School • Fairchild AFB, Wa (two weeks)
US Army Airborne School • Fort Benning, Ga (three weeks)
US Army Military Freefall Parachutist School • Fort Bragg, NC/Yuma, Az (five weeks)
Special Operations Combat Medic Course • Kirtland AFB, NM (21 weeks)
Pararescue Recovery Specialist Course • Kirtland AFB, NM (20 weeks)

Rescue Units

Once qualified, these specialist crews can expect to join one of Air Combat Command's 17 operational CSAR units. These include 10 active-duty, three Air National Guard (ANG) and four Air Force Reserve Command (AFRC) squadrons. In addition, personnel on temporary duty (TDY) staff a provisional squadron based in Southwest Asia. Dedicated CSAR assets are no longer based in Europe, however, an AFSOC Special Operations

Group (SOG) is based at RAF Mildenhall in the United Kingdom and a single CSAR squadron is stationed in Iceland. CSAR forces assigned to Pacific Air Forces (PACAF) include individual active duty and ANG squadrons and an AFSOC SOG is based within the PACAF area of responsibility.

Back on home territory, the 347th Wing at Moody AFB, Ga, became a dedicated Rescue Wing on 1 May 2001 (following the inactivation of three of its fighter squadrons) and was renamed accordingly. During 1999 the command took possession of the MH-60Gs that had previously been assigned to the deactivated 55th Special Operations Squadron (SOS) at Hurlburt Field, Fl. Those aircraft, along with HH-60Gs that had been assigned to the deactivated 48th RQS at Holloman AFB, NM, were assigned to ACC's two remaining squadrons at Moody and Nellis AFB.

Elsewhere, Fairchild AFB, Wa, is home to AETC's 336th Training Group (TRG) and the USAF Survival School, which is supported by the 36th Rescue Flight (RQF). The flight, which operates Bell UH-1Ns, provides SAR, Medical evacuation (MEDEVAC) and aerial support rather than CSAR. Its personnel also train aircrew in hoist and parachute operations and, during field training, the unit maintains a single UH-1N on 24hr alert at Cusick, Wa. The 36th was activated on 1 May 1993 and assigned to ACC but transferred to AETC control just two months later on 1 July.

The 58th Special Operations Wing (SOW), at Kirtland AFB, NM, provides aircrew training for all CSAR/SAR and SpecOps personnel. Flight Training includes transition, instrument, air refueling, personnel and equipment airdrop, helicopter hoisting, combat tactics and night vision goggle (NVG) use. The three squadrons assigned to this AETC wing operate every aircraft type used for SAR/CSAR in support of the other major commands.

Graduate level training for CSAR personnel is provided by the USAF Weapon School at Nellis AFB, Nv.

Talking of the Nevada 'superbase', Nellis' CRQS was renamed the HH-60 Division of the USAF Weapon School on 15 July 1995, but it still serves as the 'Topgun' of CSAR. The division was recently designated the 34th Weapons Squadron (WPS) as part of a reorganization that involved the entire USAF Weapons School. During the 300hr, 26-flight weapon instructor course, 'Pave Hawk' pilots receive graduate level training in combat rescue and composite force employment.

Coordinating all the above assets and activities is a sole DoD agency — the Air Force Rescue Coordination Center (AFRCC) at Langley AFB, Va. Upon notification of a SAR situation, the AFRCC will analyze the requirement including capabilities, geographic location, terrain, weather and urgency and then notify the selected DoD service, the US Coast Guard, or local government agency. Once the SAR activity is initiated, the AFRCC serves as a communications link, providing coordination for the on-scene commander. Five Joint Search and Rescue Centers (JSRC), (which are located outside CONUS) task theater components to support CSAR operations, and during contingency operations, (or wartime), temporary JSRCs may also be established.

Interestingly, the AFRCC/JSRC can also task US Navy or US Marine Corps assets to perform a rescue. This was the case in the 1996 rescue of USAF Captain Scott O'Grady who was shot down over Bosnia and spent several days evading Serb forces before being rescued by US Marine Corps Special Operations personnel.

Also of note are the helicopter units that support Air Force Space Command (AFSPC). Equipped with the Bell UH-1N these Rescue Flights (RQF) were assigned to the ARS until 1 April 1993, and support the command's Intercontinental Ballistic Missile (ICBM) silos. Primarily tasked with responding to emergencies or security threats to missile facilities, escorting missile convoys, airlifting support personnel, and inspecting missile cable routes. The units also perform MEDEVAC and

above: **After covertly crossing into hostile territory, two USAF H-60Gs arrive on the scene ready to pick up stranded Allied personnel. As the two Pave Hawks approach the desert floor, an A-10 Thunderbolt II is called in overhead to unleash a devastating burst from its GAU-8/A seven-barrel, 30mm Gatling gun into the advancing enemy.** *(Mark Farmer)*

local rescue missions. They are not, however tasked with CSAR and in recognition of their primary mission these units were redesignated as Helicopter Flights (HF), on 1 May 1998.

In May 2003 the USAF announced that the CSAR force would once again be realigned and will now be placed under the operational control of AFSOC. This move was result of a decision that would finally rationalize the two similar missions under a single command. The formal change will occur on 1 October 2003 — it will, however, only apply to those forces assigned to ACC. As a result those active and reserve component units assigned to the Pacific Air Forces (PACAF) and US Air Forces in Europe (USAFE) will remain assigned to their current commands.

CSAR AIRCRAFT – MISSION POSSIBLE

The USAF's main Combat Search and Rescue assets are a mix of variants within three aircraft types. The C-130 Hercules, H-60 Pave Hawk and H-53 Pave Low have all been adapted to the role in different ways.

Aircraft dedicated to today's CSAR mission include the Lockheed Martin HC/MC-130 'Combat Shadow' and Sikorsky HH-60 operated by ACC; however AFSOC's special mission MC-130 'Combat Talon I/Combat Shadow' and Sikorsky MH-53s can also be tasked for rescue missions when required.

ACC's Herks include two different versions of the HC-130N, the HC-130P (Model 382-12B) and a small number of MC-130Ps. Only the California ANG operates the latter variants. Delivered in the mid-1960s, the HC-130P (Model 382-12B) is the most numerous type in service. Whereas a number of these aircraft were delivered as HC-130Hs, they were eventually brought up to the later configuration.

This HC-130H is seen prior to being equipped with the aerial refueing pods and re-designated as an HC-130P. The aircraft was with the ANG's 129th ARRG at Moffett Field, Ca. *(Author's collection)*

Based on the airframe of the C-130E, both versions were equipped with four 4,508shp (3,362kW) Allison T56-A-15 engines, large observation windows, and the overhead delivery system (ODS). They also featured the AN/ARD-17 Cook Aerial Tracking antenna, in a large radome on the upper portion of the forward fuselage. Originally developed for locating satellites as they re-entered the atmosphere, the system proved useful during the Vietnam War in locating the radio beacons of downed aircrew.

The HC-130H and HC-130P were also equipped with the Fulton surface to air recovery system (STARS), identified by a modified nose radome. Used almost exclusively by Special Operations forces, Fulton STARS was retired during 1996.

The primary difference between the two models was the ability of the 'P' model to refuel helicopters in-flight via wing-mounted refueling pods and two internal 1,800gal (6,814ltr) fuel tanks. During the early-90s, however, the HC-130Hs received this equipment and were redesignated as HC-130Ps. At least 12 HC-130Hs were also converted into weather reconnaissance aircraft under the designation WC-130H and these were assigned to the ARRS and ARS but remained with Air Mobility Command when the rescue mission transferred to ACC.

Although the early HC-130N (Model 382-20B), was equipped with the ARD-17 and refueling pods it did not carry the Fulton STARS. The final variant is the late-model HC-130N (Model 382-24F), which was originally referred to as the HC-130H(N). Six examples were purchased between 1988 and 1993 for the Alaska ANG, and two were subsequently transferred to the New York ANG.

AFSOC's MC-130P 'Combat Shadows' are similar to the ACC aircraft but are equipped with improved navigation, communications, threat detection and countermeasures systems, which increase their survivability in higher threat areas. Their range is increased by the ability to refuel from boom-equipped USAF tankers. The primary mission of these aircraft is to fly covert, low-level missions into hostile or politically sensitive territory and provide air refueling for special operations helicopters including both USAF and US Army types. As a result of an AFSOC reorganization, California's 129th RQS exchanged several of its HC-130Ps for MC-130Ps during 2000. AFSOC also operates 14 MC-130E 'Combat Talon I', which are primarily tasked as a special operations penetration transports however, they are also capable of refueling helicopters.

Ongoing modifications for the HC-130N/P fleet are providing the fleet with global positioning (GPS) equipment, AN/ALE-47 chaff/flare and AN/AAR-47 missile plume detection systems, AN/AAQ-22 FLIR, night vision goggle (NVG)-compatible cockpit instrumentation, AN/ARC-222 radios, and AN/APN-241 radar. Ultimately however, planning calls for replacing the HC-130N/Ps with a fleet of 35 C-130Js modified to support the CSAR mission.

Chopper squad

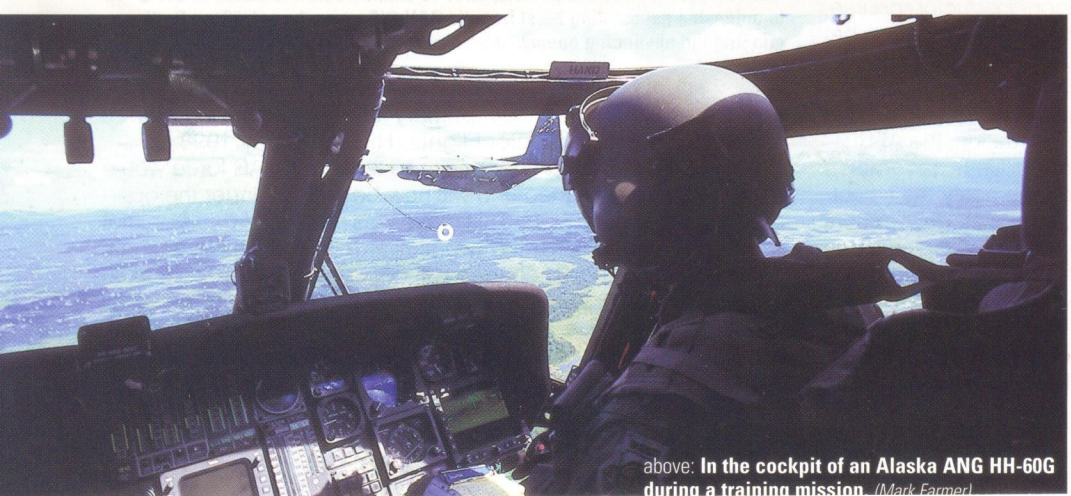
In 1981 the USAF purchased the first of 11 standard UH-60A Blackhawk helicopters through the US Army. Nine aircraft were initially used for training and familiarization and two were assigned to become prototypes for a new CSAR helicopter that Sikorsky Aircraft and IBM Federal Systems were developing for the USAF.

At the time the service had a requirement for nearly 250 examples of the new aircraft, which was designated the HH-60D and named Nighthawk. It was equipped with advanced avionics, including terrain following/terrain avoidance (TF/TA) radar and forward looking infrared (FLIR) systems, long-range fuel tanks, and air-to-ground weapons or external fuel tanks. Budget constraints eventually caused the program to be reduced to just 155 helicopters comprising 69 HH-60Ds and 86 less sophisticated HH-60Es. These fiscal constraints eventually resulted in the deletion of the TF/TA radar and a further reduction to just 99 examples. The sole HH-60D prototype was subsequently redesignated the HH-60A and it flew for the first time in this configuration on 3 July 1985. The basic configuration of the HH-60A became the baseline for to the MH-60G special operations helicopter and the UH-60As were eventually modified to HH-60G configuration.

Early MH/HH-60Gs were powered by a pair of 1,560shp (1,163kW) General Electric T700-GE-700 turboshaft engines, however later examples were equipped with the more powerful 1,940shp (1,447kW) -701C version. These engines were subsequently retrofitted into the earlier aircraft. The MH/HH-60G's external refueling boom and probe allows the 'Pave Hawk' to refuel from USAF MC/HC-130 and USMC or allied KC-130 tankers, thereby extending its range dramatically. The boom measures 7.25ft (2.2m) when retracted and extends to 15.7ft (4.8m) in order to clear the forward arc of the main rotor disk. The HH-60G is also equipped with a Bendix King AN/APN-239 weather radar, AN/AAQ-16 forward looking infrared (FLIR), AN/APR-39A radar warning receiver, M130 chaff/flare dispensers, AN/ALQ-144A infrared jamming system and hover infrared suppression system (HIRSS).

Unlike the MH-60Gs, the HH-60Gs were not originally equipped with FLIR systems although the equipment was eventually installed. Likewise, the HH-60G defensive countermeasures were not as capable as the MH-60G, however much of this equipment has also been retrofitted to the CSAR variant. The cockpit is compatible with night vision goggles, and equipped with a low altitude warning system and satellite communications (SATCOM). A hydraulic rescue winch is installed above the starboard cargo door.

For combat missions, a pair of 7.62mm GAU-2/C mini-guns or M240 machine guns is installed in the windows just aft of the pilots.



above: **In the cockpit of an Alaska ANG HH-60G during a training mission** *(Mark Farmer)*

An ongoing modification, which was hurriedly installed on the aircraft deployed for Operation 'Iraqi Freedom', provides the aircraft with the capability of carrying the GAU-18 .50cal machine gun. The modification, originally developed as part of the 'so-called Block 152' upgrade, relocates the weapon mounting points from an internal location to one that is external to the aircraft and provides an option to lock the weapons in a forward firing position. In addition to being more accurate than the earlier weapons, the GAU-18's 1,500m range is nearly double that of the lighter weapons.

During CSAR missions, the defensive weapons are normally manned by the flight engineer and a gunner (or the PJs). A 300gal (1,136ltr) fuel capacity provides the aircraft with approximately two hours of flight time; however, mission duration is nearly doubled when a 185gal (700ltr) auxiliary fuel tank is installed at the aft end of the cabin. This tank is carried in lieu of those mounted on the external stores suspension system (ESSS) that had been utilized by the MH-60G special operations variant. During 1999 AFSOC's MH-60Gs were transferred to ACC and although they differed visually from the HH-60G they were assigned the same designation.

The HH-60G, which has been in service since the late 1980s, was never considered the ideal platform for CSAR — especially by PJ's who preferred the larger HH-3E. Designed with a service life of 7,000 hours, which the oldest airframes will soon reach, Sikorsky determined that a service life extension program (SLEP) could allow the USAF to retain the fleet through 2030.

Following a lengthy analysis that began in 1999 however, the service decided to replace the 'Pave Hawk' with a new aircraft. While a stretched version of the HH-60G is one of the options under consideration, it appears that the purchase of a new aircraft is more likely. Those under consideration include the AgustaWestland EH-101 (as the Lockheed Martin US-101 — see next issue) and the Sikorsky S-92. An updated HH-60 remains a possibility, however and that aircraft would be equipped with a new powerplant developed under the Army's common engine program (CEP) and the S-92's drive train and rotor system. It would also feature a 20in (.5m) plug in the cabin and a 16in (.41m) plug in the tail boom. The former would increase the cabin volume while the latter would provide the clearance required by the S-92's longer span main rotor. It would also be equipped with a single 440gal (1,666ltr) main fuel cell, 75gal (284ltr) external fuel tanks updated avionics and survival equipment and would be capable of operating at increased gross weights.

A decision regarding the 'Pave Hawk' replacement could be made in 2004. In the interim period, however, a small number of aircraft will undergo a service life extension program (SLEP) and a number of modifications have been developed that will keep the HH-60G viable until a replacement is fielded. These include upgraded communication, navigation, electronic warfare systems and the previously mentioned defensive weapons mods. The aircraft are already being equipped with the HAVE CSAR system that provides crews with updated intelligence information via satellite during CSAR missions. The system was used operationally on at least 18 occasions during Operation 'Iraqi Freedom' and allowed crews to update route planning based on merging threats. Another communication modification may provide crews with the global personnel recovery system (GPRS). This system will allow secure, over-the-horizon communication between downed aircrew, the rescue helicopter and the JSRC using text messages transmitted via satellite. The system was installed on one aircraft that was deployed to Southwest Asia and underwent limited testing during the conflict.

A little larger on the scale is Sikorsky's MH-53J/M 'Pave Low IIIE/IV' — the largest helicopters in the USAF inventory. These awesome machines are equipped with folding rotors and are air transportable.

The first MH-53J was delivered on 17 July 1987 and 32 CH/HH-53Cs and nine HH-53H 'Pave Low III' were eventually modified to 'Pave Low III Enhanced' configuration. 'Pave Low IIIE' is equipped with, INS/GPS, TF/TA radar, FLIR, and a projected map display. It is powered by a pair of 4,380shp (3,266kW) General Electric T64-GE-415 engines and capable of a maximum take-off weight greater than 46,000lbs (20,865kg). The MH-53M 'Pave Low IV' is equipped with a 'glass' cockpit that features the interactive defensive avionics system/multi-mission advanced tactical terminal (IDAS/MATT), with the first of 25 MH-53Ms being delivered on 17 April 1998.

For self-defense, both versions are equipped with three GAU-2/A miniguns or .50cal. (12.7mm) machine guns. Primarily tasked with supporting special operations forces, Pave Low remains the aircraft of choice for long-range CSAR into heavily defended areas. MH-53Ms are operated by exclusively by active duty AFSOC units in Florida and the UK, while the remaining MH-53Js are primarily used for training at Kirtland. Both versions were however deployed in support of Operation 'Iraqi Freedom'. The 'Pave Lows' will eventually be replaced by the CV-22B special operations variant of the Osprey tiltrotor aircraft, which will be covered in a future issue. ❑

above: **An MH-53M from the 21st Special Operations Squadron approaches the refueling basket of a 67th SOS MC-130P over Central Mozambique on 20 March 2000, during Operation 'Atlas Response'.** *(USAF)*

below: **A 66th RQS HH-60G from Nellis AFB flies over desert terrain on the way to a rescue. The unit's primary mission is the recovery of downed pilots and is one of five active component USAF squadrons to operate the type.** *(USAF)*