

János Nagy<sup>1</sup>

## THE HISTORY OF COMBAT SEARCH AND RESCUE<sup>23</sup>

*„Preserving the life and well-being of our Service members and civilians who are placed in harm’s way while defending our Nation’s interests is, and must remain one of our highest priorities.”*

*(William J. Perry)*

*Combat search and rescue preserves critical combat resources while denying the enemy from a potential intelligence source. It is a key element in sustaining the morale, cohesion, and, ultimately, the operational performance of friendly forces. It became a part of military operational capabilities with the advent of largescale air operations during World War II. Combat search and rescue has evolved over time, taking full advantage of the new technology. As time progresses, combat search and rescue will become increasingly more difficult and will require more and more specialized aircrew skills. The article shortly describes the history of this evolution from the initial steps until Operation Desert Storm.*

### **A HARCÍ KUTATÁS-MENTÉS TÖRTÉNETE**

*A harci kutatás-mentéssel kritikus harci képességek és emberi erőforrások óvhatók meg, miközben megakadályozza az ellenséget abban, hogy értékes felderítési adatokat szerezzen. Kiemelkedő jelentősége van a morál, az egység és végső soron a harci képességek fenntartásában. Viszonylag új keletű képesség, amely a II. világháború alatt a nagykiterjedésű légi műveletekkel együtt jelent meg. Az azóta eltelt idő alatt a harci kutatás-mentés a technikai fejlesztések eredményeit kihasználva egyre összetettebb, bonyolultabb lett, végrehajtásához egyre több speciális ismeretre van szükség. A cikk röviden ismerteti ezt a fejlődési folyamatot a kezdeti lépésektől a Sivatagi Vihar műveletig.*

## CSAR HISTORY BEFORE WORLD WAR II

The first air rescue was implemented by Hugh Robinson in 1911, when he landed on Lake Michigan to pull a crashed pilot out of the water. [1]

During World War I there were several attempts to use airplanes as ambulances. The French Air Service evacuated sick soldiers from Serbia in 1915. Two years later, as the United States proceeded with a mobilization for war, thousands of new pilots were trained at temporary fields all over America. Many inexperienced pilots suffered accidents and injuries. Since most training fields were isolated, overland transportation by ambulance took hours. Early in 1918 Captain William C. Ocker, a training officer at a remote field in Louisiana, converted a standard IN-4 “Jenny” to accommodate a patient in a semirecumbent litter in the rear cockpit, thus initiating the world’s first military aerial ambulance service. [2]

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1 Colonel, Hungarian Defence Forces, 86. Szolnok Helicopter Base. nagyjahung@gmail.com

2 Publisher’s readers: Lt. colonel Zoltán Krajnc (PhD), Associate Professor, National University of Public Service Military Science and Army Officer Training Faculty, krajnc.zoltan@uni-nke.hu

3 Publisher’s readers: Ferenc Varga , (PhD), Associate Professor, National University of Public Service Military Science and Army Officer Training Faculty, varga.ferenc@uni-nke.hu



Fig. 1. Hugh A. Robinson Curtiss with his seaplane [1]

At that time, no nation had a special search and rescue unit, but individual actions were often made. During World War I, on 21 August 1918, while flying a Navy seaplane near Pula, the American Charles Hammann landed on the Adriatic Sea to rescue Ensign George H. Ludlow, whose aircraft had been shot down by Austro-Hungarian forces. Though Hammann's plane was not designed for two persons, and despite the risk of enemy attack, he successfully completed the rescue and returned to the base at Porto Corsini, Italy. [3]

Britain, France, and Germany made advances in the use of the airplane for humanitarian purposes during the interwar period. In April 1923 an epidemic of dysentery afflicted British soldiers on garrison duty at isolated posts in Kurdistan. The Royal Air Force units stationed in Iraq had a few Vickers-Vernon troop carrier aircraft which were quickly dispatched to a forward landing field in the Adghir Dagh Mountains. Two hundred stricken troops were then quickly evacuated to hospitals in Baghdad. [4]

## CSAR HISTORY DURING WORLD WAR II

At the beginning of World War II with the appearance of long-range aircraft, it became obvious that some kind of system was necessary to increase the chances of survival for pilots whose aircraft went down during flights over water. If an aircraft got into trouble over mainland the pilot could land safely with his parachute, but if he had to jump out over water just a quick boat or seaplane rescue could save him from hypothermia and drowning.

The development of air sea rescue was motivated by the fact that the flight crews' combat morale rapidly increased when they become aware of their good chances to escape after an emergency or forced landing. Aside from simple life-saving, rescue meant that rescued personnel could return to the flight line, saving the cost and time of training his replacements.

### **Seenotdiens, the German air-sea rescue service**

The German Seenotdiens (Air-Sea Rescue service) was established in 1935 and served until 1945. It was the world's first air rescue organization. The rescue service was established as a non-governmental institution operated by soldiers, and only later became officially part of the Luftwaffe.

Its successful operation served as an example of the British and American military leaders who established their own rescue organizations according to the Seenotdiens model. As

World War II progressed the Germans lost their control over more and more territories, so the rescue unit belonging to the area was disbanded. The last unit was dismissed in March 1945 in the Baltic Sea region.

### *Establishing of the Seenotdients*

In the spring of 1935, Lieutenant Colonel Konrad Goltz, a Luftwaffe supply officer was given the task of organizing the Seenotdienst, an air-sea rescue organization and developing a system for recovering downed airplanes and their crews. He held administrative command over the Ships and Boats Group which was organized at Kiel within the Luftwaffe. Goltz was to operate the Seenotdienst as a civilian organization manned by both military and civilian personnel, with civil registrations applied to the aircraft.

Goltz issued regulations that provided six rescue zones, two in the North Sea and four in the Baltic. Each zone was assigned a rescue boat for retrieval purposes, and each zone commander was given the authority to request the use of Kriegsmarine (Navy) aircraft for search purposes. Support from naval units could be obtained through German Naval Headquarters. [5]

### *Development of tactics and equipment*

Until 1939 it occurred only a few times that the aircrews got into trouble over water. In these cases, the currently available boat or seaplane was used for the rescue. After the Luftwaffe had been carried out flights over water surface on a daily basis, the need arose for a specially designed water rescue aircraft, so the Luftwaffe decided to acquire factory modified airplanes for the air sea rescue task.

The Heinkel 59, a large, twin-engine biplane fitted with floats, was selected as the first Luftwaffe aircraft dedicated for air-sea rescue duties. The Rescue Service acquired 14 of these planes and sent them for modification. Accordingly, first aid equipment, electrically heated sleeping bags, and artificial respiration machines were installed. The rescue experts ordered the planes refitted with a floor hatch, a collapsible ladder long enough to reach through the hatch to the surface of the water, a hoist, and lockers to hold life belts, signaling devices, as well as other survival equipments. [6]

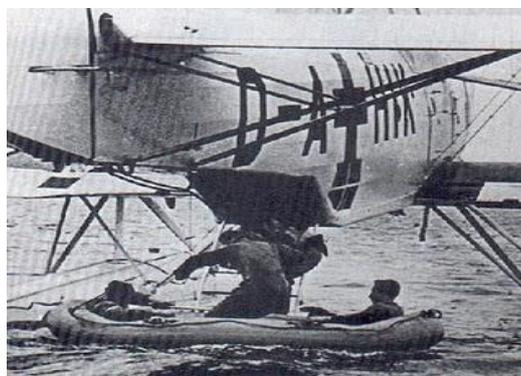


Fig. 2. Modified He 59 aircraft [7]

Based on previous experiences an inflatable rubber dinghy was introduced on the board of German aircraft, which kept away the pilot from the cold water and hypothermia, thereby

increased the time available for a successful rescue. Using the dinghy the German pilots were recommended to make emergency water landing instead of bailing out and parachuting down. The Messerschmitt Bf 109 and Bf 110 aircraft was floating on the surface for at least 60 seconds after water landing, which was sufficient time for the pilot to get out of the wreckage and prepare the rubber raft. In order to make the emergency landing site highly visible, a bright green fluorescent paint was developed and placed on board of all German aircraft.

## THE LEGAL STATUS OF RESCUE AIRCRAFT

German and British rescue aircraft were painted white and marked with the large Red Cross of the International Red Cross. Both sides considered their Air Sea Rescue vehicles immune from enemy attack and rescued all downed pilots, regardless of their side in the conflict. But since a rescued pilot would return to duty, both sides frequently shot down rescue aircraft, leading to protests from each side in turn.



Fig. 3. White painted He 59 marked with the Red Cross [8]

The picture above was published in the German press on 17 June 1940. The article says: "The British shot down the aircraft mark with Red Cross." The photograph is good enough to see the distinctive sign, demonstrating that the shot down of the aircraft could not be accidental. [9]

After the incident, the British Air Ministry issued a decree that all enemy air or water rescue vehicle must be destroyed. Winston Churchill later wrote, "We refused to recognise that kind of rescue of the distressed aircrews, because we were afraid that the enemy aircraft would bomb civilians instead of rescuing pilots." [10]

Germans protested, arguing that the rescue aircraft were under the Geneva Convention, and according to the regulations the belligerent parties must respect each other's mobile sanitary assets. According to British, the rescue aircraft were not covered by the Convention, and the attacks against He 59 were intensified.

In response to the incident Seenotdienst armed their aircraft, their white paint was changed to camouflage, and the Red Cross symbol was removed. After the incident the rescue flights were carried out with fighter escort. The search and rescue flights did not have protected nature any more and the age combat search and rescue began.



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## British and American response

During the first two years of the war, British had no air rescue units. The British air force only had a few rescue boats and they had no specially modified rescue aircraft. During these years, a British aircraft forced landing on water was generally lethal for the pilots. The fate of the distressed aircrew was basically in the hands of their mother unit, and they could give very little help with determining the location of the emergency situation.

In the early months of the Battle of Britain the British Air Force lost almost one-quarter of its pilots. The loss of well-trained aircrews seriously threatened the air defense capabilities during the fights against Luftwaffe. If the losses would not have been reduced, England had lost the war before the United States would interfere.

In January 1941, the British Air Ministry created the Directorate of Air-Sea Rescue to coordinate operations among the Royal Air Force, Royal Navy, and Coastal Command. In the first six months of 1941, out of 1,200 pilots who ditched, 444 were rescued. The organization's operation procedure was based on Seenotdienst successful methods. [11]

British rescue units started cooperation with the United States Air Force to coordinate air sea rescue efforts in 1942 September. The joint British-American effort brought the rescue of 2000 American aircrew members along the British coast. [12]

From very beginning it was clear that the military cooperation among different services played a crucial role in successful operations. The cooperation was often good among combat units, and sometimes even among headquarters, but the extensive cooperation was hindered by the fact that the services could not agree on the question of responsibility during rescue missions.

## COMBAT SEARCH AND RESCUE DURING THE VIETNAM WAR

After World War II the United States recognized the need for a constant rescue organization. In 1946 the Air Rescue Service was established as the subordinate of the Air Transport Command. Before entering the Korean War the service was responsible for peace-time rescue tasks, using a number of different aircraft and helicopter types which were redundant at different services. In five short years of peace the Air Rescue Service was facing the same constraints as the Air Force as a whole, including equipment and staff cuts and the centralization of the existing forces. [13]

In June 1950, the North Korean People's Army crossed the 38° parallel and intruded to South Korea. Two days later the United States gave military help to South Korean people. Parallel with the air force employment the use of search and rescue forces begun. During the war their number increased from 1,100 to 7,600. The Air Rescue Service went through the baptism of fire in Korea, while saved 996 lives and earned indisputable merits and respect. [14]

The Korean War dramatically demonstrated the utility of overland rescue. Such rescues depended largely on the improved capability of the helicopter. Although helicopters had been utilized in China at the end of World War II, they arrived too late to really impact on rescue efforts. However, in Korea the U.S. Air Force Rescue Service recovered about ten percent of



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the aircrews that went down inside North Korea. This was a significant improvement over the absence of overland rescue in World War II. The Navy also played a role in combat search and rescue in Korea. During the conflict, aircraft carriers first received their own organic helicopters providing an overland rescue capability. [15]

After the war, many rescue units were disbanded due to budget cuts. The effective force was reduced from 7600 to 1600 soldiers, while the service had steadily expanded responsibilities. Beside their basic tasks, the Air Rescue Service supervised the search and rescue coordination centers, the airport emergency forces and was responsible for the search of space capsules after returning from the cosmos. [16]

## **VIETNAM THE BIRTH OF ORGANISED COMBAT SEARCH AND RESCUE**

In the beginning of the war there was no organization, command and control system, or assets in Southeast Asia that could provide a professional rescue force for a downed airman. In the event when a U.S. pilot was forced down, his or her chance of rescue was limited. Survival relied heavily on friendly forces seeing the aircraft going down, and being nearby either on the ground or in the air. Because of the unfriendly terrain, the ubiquitous enemy forces, it was impossible to simply walk out of the jungle. The more time the downed pilot spent on the ground, the less likely it was to survive. In Vietnam the only one hope to escape for a downed pilot in hostile territory was the air rescue [17]

The extension of the Air Force operations and the growing number of involved pilots led to the constantly increasing demand for the organized combat search and rescue. In December 1961 the U.S. Air Force established the Rescue Coordination Centre at Tan Son Nhut Air Base near Saigon. According to the current military doctrine each service was responsible for its own search and rescue operations, and provided the necessary support to other services upon request. If an airplane got in trouble the Rescue Coordination Center was responsible for alerting and tasking the available forces and for the coordination of rescue operations.

The Rescue Coordination Centre had no directly subordinated rescue units for immediate deployment. Before rescue operations they had to request the necessary assets from American or South Vietnamese forces, who were usually not trained for search and rescue tasks. Before the mission the Rescue Coordination Centre had to coordinate with external organizations, which significantly increased the time required for the rescue, thereby reducing the chances of successful implementation.

From 1962 to 1964, numerous reports and studies stressed the importance of trained search and rescue forces, summarizing the previously incurred and expected losses, analyzing the requirements of increasing Air Force deployment and suggestions how to effectively and quickly replace the existing deficiencies. [18]

Due to the analysis, and the dispute surrounding the cause CINCPAC<sup>4</sup> approved the introduction of Search and Rescue forces in May 1964, and from that point on, there was a rapid expansion of search and rescue capability in Southeast Asia. [19]

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4 Commander in Chief, Pacific Command

### *Initial steps*

The United States Air Force, Air Rescue Service was tasked with the rescue in Vietnam. At that time the service did not have the necessary resources, equipment, tactics, techniques and procedures for the successful operations. Their primary helicopter was the HH-43 Huskie. The fundamental task of this helicopter was firefighting and rescuing ejected pilots in the vicinity of the airport. The pilots and the staff were not prepared for wartime missions in tropical conditions thus the service was unsuitable for combat search and rescue tasks.

The rescue units in South-East Asia were equipped with the HH-43F helicopter, the modified version of from the HH-43 Huskie. According to the theater tactical requirements, the HH-43F engine was 400 horsepower more powerful as the basic version. The helicopter had increased size self-sealing fuel tanks resulting bigger combat radius. 12 mm thick armor plate around the cockpit and the engine provided better survivability, and new radios were built in to expand communication options. [20]



Fig. 4. HH-43 Huskie helicopter (<http://www.h43-huskie.info>)

The HH-43F had several indispensable advantages compared to the base model, but the tactical requirements of combat search and rescue were still not met. The biggest problem was that the Huskie had no weapons on board, so the crew could have used only small arms, thereby reducing the ability of self-defense. Despite the increased volume of fuel tanks the range was still not enough to operate in North Vietnam from South Vietnamese bases. [21]

### *Sikorsky Jolly Green Giant*

By the end of 1964 the North Vietnamese anti-aircraft artillery evolved considerably and it became clear that the HH-43F is no longer able to effectively operate in the changing circumstances. Due to the steady increase in the number of missions and the increased level of risk, the Air Rescue Service requested 15 pieces of HH-3 helicopters as the replacement of the Huskies. The HH-3 nicknamed "Jolly Green" was the modified version of CH-3 transport helicopter, specially adapted for search and rescue missions. The changes included the powerful engines, the helicopter armor, increased volume fuel tanks, unbreakable glazing and a high performance winch unit. The helicopter flight speed was 30 percent greater than its predecessors.



Fig. 5. HH-3 „Jolly Green” (<http://www.militaryfactory.com>)

Due to the modifications the helicopter's range more than doubled, compared to its predecessor. [22]

The increased amount of fuel allowed the Jolly Green to hold in the air during attacks, instead of standing by at the airport. Providing the readiness from the air, and the HH-3 helicopter's greater speed significantly reduced the time to reach the distressed crew, thereby increased the chances of survival.

#### *Sikorsky CH/HH53 „Super Jolly”*

The rescue coordination center experts continuously analyzed the previous missions and collected the lessons learnt. It was found that 47% of the unsuccessful rescue missions happened due to the helicopters slow flying speed. When the helicopter reached the downed crew within 15 minutes the chances of successful rescue were very good, and if it took longer than 30 minutes the probability of success was dramatically decreased. [23]

In 1962, the Navy signed a contract with Sikorsky Company to develop a heavy transport helicopter. The Sikorsky CH-53A, built as the result of the contract had adequate performance, speed and range to fulfill the tactical requirements of the Southeast Asia theatre. The first two CH-53A helicopters were delivered in 1966, and in June 1967 the special search and rescue version, the HH-53 was developed. By August of that same year the training of the aircrews was finished, and the first two helicopters arrived in Vietnam.



Fig. 6. HH-53 „Super Jolly” (<http://www.thunderstreaks.com>)

As any new equipment, the HH-53 also had initial difficulties. Despite the fact that the helicopter was capable of air refueling, they could not patrol continuously because the co-pilots did not receive air refueling training.

The pilots called the helicopter "Buff", the abbreviation of "Big Ugly Fat Fellow". Since the "Fellow" was often replaced with obscene words, the commanders intervened and the name was changed to "Super Jolly Green Giant". [24]

### *Combat search and rescue escort*

During search and rescue operations, it was quickly proved that helicopters were very vulnerable to enemy anti-aircraft weapons and small arms. The low-speed flight and the hovering during extract made them easy targets, so they needed some kind of escort aircraft, which provided coverage in combat situations.

The rescue escort (RESCORT) aircraft is a tactical aircraft, capable of operating close to the altitude, speed, and endurance regimes of recovery helicopters and responsible for providing protection for the helicopters from surface threats, suppressing surface threats en route to and returning from the objective area, locating and authenticating isolated personnel.

In August 1964 the U.S. T-28 pilots were allowed to occasionally assist in rescue operations. Despite the fact that there were no developed combat search and rescue procedures the aircraft proved extremely useful during escorting the helicopters. [25]

Fundamental problem was that the primary tasks of T-28 aircraft were close air support and air interdiction, thus they were only occasionally able to fulfill the helicopter escort request, while with the growing number of combat operations there was an increasing demand for the organized and efficient rescue escort.

Meanwhile, the A-1 Skyraider arrived to the theatre as replacement of the T-28. The aircraft proved to be more effective in close air support, air interdiction role than its predecessor, and in addition it was perfect for rescue escort. [26]



Fig. 7. HH-53 „Super Jolly” escorted by A-1 Skyraiders (<http://www.militaryphotos.net>)

Due to the continuously increasing number of combat search and rescue operations, from August 1965 the 602<sup>nd</sup> “Air Commando” Skyraider squadron kept 8 aircraft on alert exclusively for rescue escort missions. [27]

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### *Combat search and rescue task force*

The helicopters and the Skyraiders were elements of the newly developed concept, the search and rescue task force. The third element of the concept was the effective command and control. Combat search and rescue operations were usually implemented far from the rescue coordination center, so the task force had an airborne command and control post, which was flying around the site, following the events of the mission and controlling the execution.

The first airborne command and control posts in Vietnam were two modified EN-16 amphibious aircraft, loaded with communication equipment to make it suitable for the task. The aircraft had limited electronic search capabilities and its self-defense and survivability capabilities were not good enough for safe operation over Vietnam.



Fig. 8. HU-16 amphibious aircraft (<http://flickrhivemind.net>)

Due to the shortcomings a new command and control aircraft, the HC-130 was developed on the base of the C-130 transport aircraft. First flown in 1964, the HC-130N/P served many roles and missions. The new aircraft had improved navigation, threat detection and countermeasures system, and was initially modified to provide a command and control platform for search and rescue missions. [28]

### *Pararescue Jumpers*

During the Vietnam War, all the pararescue jumpers were volunteers, and became the most honorable members of the search and rescue task force by the end of the war. They were the first from the friendly forces to meet the survivors hiding in enemy territory, those who were lowered by winch to the distressed crew and helped him get up on board of the hovering helicopter. If the immediate transport of the distressed person was not possible, the pararescue jumper stayed with him until help arrived. [29]

### *The importance of aerial refueling*

During heavy airstrikes the rescue helicopters were orbiting near to the target area in order to be able to start the rescue mission as soon as possible. Due to the limited amount of fuel on board, the helicopters had to return to refuel after 2 hours orbiting. Air to air refueling gave new flexibility to the rescue forces by extending the range of the helicopters and allowing them to orbit as long as they were required.



Fig. 9. HH-53 „Super Jolly” air to air refueling (<http://heritageflightgeardisplays.wordpress.com>)

Previously if a chopper received a rescue call that required hovering at high altitude it was often necessary to dump fuel, because the helicopter was too heavy to hover during the rescue. Without air to air refueling it was not always possible, because after the fuel dump, the remaining fuel was not enough to fly back to the base. [30]

## COMBAT SEARCH AND RESCUE IN THE GULF WAR

At around 2 a.m. local time on Aug. 2, 1990, more than 100 000 Iraqi troops crossed the border into Kuwait. Within just a few hours the first Iraqi troops reached downtown Kuwait City. The United States and United Nations immediately condemned the invasion, and called for Saddam Hussein to withdraw his troops from Kuwait. The UN also imposed economic sanctions. On Nov. 29, the UN Security Council passed a resolution stating that its member states could use “all necessary means” to drive out Iraq from Kuwait if Iraq remained after Jan. 15, 1991. Even as the date approached, Saddam remained adamant against withdrawal.

The commander of the coalition forces from 34 countries was General Norman Schwarzkopf. He had to achieve the coalition’s objectives, while the Allied military and Iraqi civilian casualties had to be kept as low as possible. This criterion was very important in order to get the support of the American civil society, since the Vietnam War showed that the general public would not tolerate the death of their soldiers. The essential prerequisite for minimization of losses was an adequate combat search and rescue capability. [31]

Combat search and rescue (CSAR) encompasses reporting, locating, identifying, recovering, and returning isolated personnel to the control of friendly forces in the face of actual or potential resistance. [32] The Vietnam War showed that even the U.S. armed forces did not have a complex military organization which had the necessary assets and equipment for all the implied



tasks, thus no single organization could be responsible for combat search and rescue. CSAR requires the synchronization of forces and elements that may never have operated in a hostile environment. The Joint Rescue Coordination Center (JRCC) was responsible for controlling and coordinating the theatre combat search and rescue, but at the same time JRCC did not have the necessary assets for the mission. According to the theatre operational plan all component commanders had to use his organic resources for initial efforts to recover his own personnel. Since JRCC did not have operational control of any of the component assets, the controllers could not order them to launch, they had to ask for available forces. [33]

### **Survival radios**

Even though it may seem relatively unimportant, the survival radios are fundamentally determined the outcomes of Desert Storm combat search and rescue operations. The importance of these devices was paramount, despite the fact that the military leaders of the conflict realized this too late.

Since the Korean War, the US military had recognized the value of equipping airmen with survival radios. These small, handheld devices allowed the downed aircrew to make voice contact with rescue forces to facilitate rescue. They also had a “beacon” mode that sent a signal that could be followed by rescue forces, providing another way to find survivors.

These radios were key elements for the recovery of hundreds of crewmembers from the jungles of Vietnam. In the later years of the war, all crewmembers carried two URC-64 radios. These were reliable four-channel radios. Most flyers carried extra batteries. To home in (follow the signal) on the signal quickly and accurately, the Air Force had developed an Electronic Location Finder (ELF). This device could pick up the survival radio signal and give the helicopter crew accurate guidance to the survivor. [34]

After the war the URC-64s were replaced with the PRC-90. The new radio had similar capabilities and it could guide helicopters using the ELF. The radios broadcast on well-known international frequencies, and over time, the tactics and techniques of rescue became common knowledge. Any potential adversary could easily figure out how to exploit them - either broadcast false signals or home in on the signals themselves.

By the time of Desert Storm, a new radio had been designed for the aircrews, the PRC-112. This radio had the ability to transmit on three common international frequencies and two programmable frequencies. It also had a new feature built into it, a discrete capability to precisely guide an aircraft to it if the aircraft had been equipped with a homing device called the Downed Airman Location System or DALs. This was a vast improvement over the ELF. The Navy HH-60s had this homing capability, as did the Special Operation MH-53s, but none of the Air Force helicopters had it. According to the new developments, the Navy and the Special Operations Command began to replace the PRC-90 radios with PRC-112s. The Air Force did not, although the need for this was clearly recognized. The radio cost about \$3,000, and the Air force Command decided not to spend the money. They sent their crews into combat with radios easily exploitable by the enemy. [35]

Understanding the importance of quickly locating downed airmen, the Air Force programmed



the ability to listen for and locate any emergency calls into several of its intelligence assets. One of the assets for locating survivors was the Search and Rescue Satellites (SARSAT) system. This constellation of satellites in polar orbit could quickly pick up any emergency signals, but its “error probable” was about 20 km. [36]

The rescue forces needed a more accurate position for a recovery, especially in a high-threat area. In this theatre a fighter-type aircraft would be needed to perform this function, but neither the Air Force nor the Navy modified any fixed-wing aircraft with the DALs. [37]

The Navy pilots received their new PRC-112 survival radios one day prior to combat. The life support specialists quickly read the instructions and learned how to properly key them for the crewmembers. But there were not enough for all. They had to be rotated among the pilots as they flew. Briefings were hastily arranged to teach the crews how to use the radios. Preoccupied with last-minute details of the first strikes, several aircrews found it difficult to concentrate on the new radio. Several were also concerned that the radios did not fit well into the survival vests. [38]

When the shipment arrived, there were several corroded batteries and the Navy did not receive many spare batteries. Some of the crewmembers reported that the radios had a tendency to slip out of the modified pouches on their survival vests. Some pilots noted that the radio was too easy to turn on. That and the constant testing and re-keying with personal codes were wearing out the batteries, so several pilots asked for extra batteries, but none were available. [39]

### **Desert Storm combat search and rescue assessment**

Desert Storm was a short but violent conflict. In just 43 days, coalition forces destroyed Iraq’s air force, a major portion of its army, and a large portion of the national infrastructure. In spite of the total number of sorties flown, there were relatively few combat search and rescue missions. Out of the 64 pilots, who were shot down in combat situations 3 were rescued during seven rescue attempts, while 19 became prisoners of war. [40]

The Special Operations Command was primarily responsible for the combat search and rescue operations. In spite of the well prepared rescue forces and the modern equipment on board of the helicopters, it was unable to execute the task independently, since the Special Operations Command had no appropriate means to locate and authenticate the downed aircrews. Despite the fact that this problem had been known during the planning phase, it was not solved until the end of the conflict. Reasons for this could include the poor level of cooperation between headquarters and the fact that the unscheduled Scud attacks distracted the assets from all other task.

During the conflict it was clearly demonstrated that in a high threat environment the PRC-90 survival radio was totally inappropriate for combat search and rescue tasks. Since it provided only unsecure communication, the Iraqis exploited the radio’s deficiencies and virtually their air defense assets were driven by the survival radio’s signal. In these circumstances, the vulnerable, low-speed, low survivability helicopters were not suitable for determining the position and for the authentication of the downed aircrews and without this information it was impossible to launch the rescue mission. The high altitude fighters would have been optimal for location and authentication, but these aircraft were not available, since they were retained for different tasks.



The wider employment of the PRC-112 radios would have improved the situation, however it would only partly solve the problem, because only part of the rescue helicopters had the ability to determine the source of the emergency signals.

The Desert Storm combat search and rescue operations appear to be a mixed bag. As a result of using modern technology, such as precision weapons, or GPS the losses were relatively small comparing to the number of sorties flown during the air campaign.

At the same time, mainly for political reasons, unexpected change of the sorties was common. Due to the sudden change there was not enough time for planning and preparing for the new task. The flow of information was also a problem. Sometimes, despite the best efforts of the rescue coordination center, the pilots flying the sorties did not know that their downed fellow pilot was waiting for contact in the same area. One of the contributing factors was that the short time available for preparation did not allow sharing information about implied tasks, such as searching for downed aircrews.

There were cooperation deficiencies among various commands, such as the rescue coordination center and the headquarters controlling combat operations. They had different opinion about the priority and importance of each-others tasks, they had only negligent knowledge about each-others needs and responsibilities, and this led to information distortion or complete failure of the information flow.

## SUMMARY

From the early years of World War II German and the British forces maintained specially trained forces for the rescue of downed aircrews. Along the wars, beside the continuous modernization of the aircraft, new tactics and procedures have been developed according to the changing circumstances and environment. The continuous searching of new ways, the human ingenuity and creativity were crucial to establish an effective command and control system, the doctrinal background and the training system of combat search and rescue.

The combat search and rescue experts of the previous wars ensured that none of their fellow-soldiers were left alone condemned to suffering or death. Their professional skills, self-sacrificing work, lessons learnt during rescue missions, served as an excellent base for today's modern and efficient combat search and rescue organizations.

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