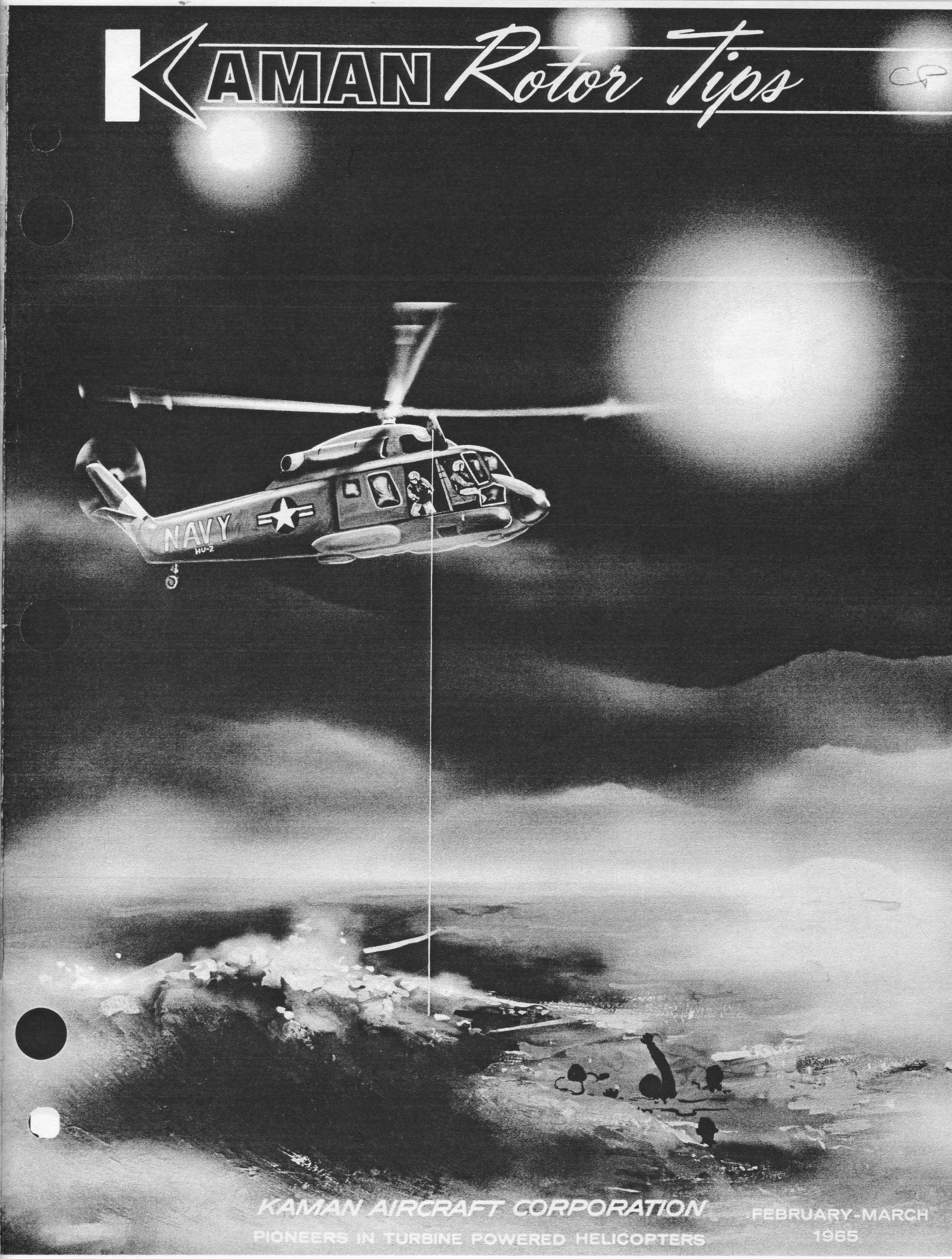
KAMAN Rotor Tips



KAMAN AIRCRAFT CORPORATION

PIONEERS IN TURBINE POWERED HELICOPTERS

FEBRUARY-MARCH
1965

KAMAN Rotor Tips

Volume IV Number 1 February-March, 1965

In This Issue

THE COVER

While flares hang in the darkened sky, a UH-2 crew from NAS Lakehurst rescues ship-collision survivors from the wildly tossing sea. Cover by Donald D. Tisdale, Service Publications.

ADDRESS ALL INQUIRIES TO:
Kaman Rotor Tips
Customer Service Dept.
Kaman Aircraft Corp.
Old Windsor Road
Bloomfield, Conn. 06002

when DISASTER STRIKES

Off the fog-shrouded New Jersey coast two ships collided in the darkness... in the Pacific Northwest thousands were marooned or made homeless by raging floods... in the Southwest and far across the world in troubled Vietnam, torrential rains and flooding brought misery and death. The following accounts are concerned with the activities of the Navy and Air Force men who utilized Kaman helicopters to fly humanitarian missions during these disasters. It is conservatively estimated they rescued 300 civilians.

The first UH-2 SEASPRITE took off from NAS Lakehurst, N.J., at 4:15 a.m. Thanksgiving Day in response to a call for assistance from the Coast Guard — the Norwegian tanker Stolt Dagali and Israeli luxury liner Shalom had collided in dense fog 38 miles off the New Jersey coast. Soon afterward three other UH-2's from Helicopter Utility Squadron Two followed to aid in the rescue. Later, four more SEASPRITES from Helicopter Utility Squadron Four at Lakehurst were dispatched to the scene.

Eight rescues were made and one body recovered by the SEASPRITE crews. The early part of the SAR operation was hampered by heavy fog, darkness and 12 to 14-foot waves. An added hazard was the wildly pitching bow of the tanker which made pickups extremely difficult. During the darkness and half-light at dawn, flares were dropped periodically from a Coast Guard Albatross circling overhead. Capt Ira McMullan, commanding officer of the Coast Guard base at Floyd Bennett Field, Brooklyn, was in the plane and coordinating the rescue activity. "I spent most of the time directing the helicopters to keep them from colliding," he said. Later, as visibility became better, the danger of a mid-air collision lessened. At one time eight UH-2's and two Coast Guard helicopters were on the scene.

Lt George W. Gilpin, pilot of the first SEASPRITE to arrive, described the rescue operation as very difficult. "The fog was so thick we had to drop down from 1,000 feet to 80 and it took 90 minutes before we even saw the men bobbing up and down in their rubber boat," he said. The 'copter dropped to 10 feet and hoisted four survivors aboard. The rescuees were flown to the NAS Lakehurst hospital, the UH-2 was refueled and then returned to search for more survivors. With Lieutenant Gilpin were Lt(jg) Phillip R. Lehrfeld, Charles R. Beasley, AMH1, and John B. Pelto, AE3.

Four other survivors were plucked from the bow of the stricken tanker by HU-2 SEASPRITES. Two were rescued by a crew consisting of Lt(jg) George E. Benoit, Lt(jg) Lief A. Elstad, Christopher R. Valentine, ATN3; and Clyde S. Harting, ADJ3. Lieutenant Benoit said visibility was "very poor" when they arrived on the scene and that the flares being dropped from the Albatross were not too effective. After the second rescuee, a stewardess from the tanker, was picked up, the chopper's hoist hook caught on the tossing bow and the rescue cable snapped. The other two survivors were taken aboard a SEASPRITE manned by LCdr A.E. Fulmer, Lt(jg) Scott Gordon and George E. Dyess, ADR3.

Lt James B. Chester, piloting another UH-2, said the first streaks of light were appearing at 6 a.m. when the crew saw a man in the water. "When we lowered the rescue line he wouldn't take it," Lieutenant Chester said, "he just floated in the water, his life jacket keeping him upright." Lieutenant Chester hovered 20 feet above the figure, while Richard Hall, ADJAN, donned a life jacket and plunged into the icy water. He attached a cable to the figure which was hauled into the helicopter, but the man was dead. Hall then inflated a life raft he carried on his back and waited for the copter to return. Ens R.K. Melcher and M.E. Bazor, AM2, formed the rest of the UH-2 crew. After the SAR operation HU-2 crews were quick to praise the efficiency with which James N. Weldon, ADJ3, and his line crew operated during the emergency. Summing up the mission, Lieutenant Gilpin said, "After twenty-five years of training in this man's Navy, a day like this makes it all worth while."

Wide-spread sweeps of the debris-strewn ocean were also flown by the four UH-2's from HU-4 but no other survivors were sighted. HU-4 pilots participating in the intensive search were: Cdr A. A. Tonkovic, commanding officer, Cdr W. C. Sharpe, LCdr P. H. Kirchner, Lt R.N. Thompson, Lt(jg) J.E. Joplin, Lt K. E. Edmondson, Lt(jg) M. E. Houck, Lt C.H. Moser, Lt(jg) J.W. Gann, LCdr W. P. Wickwire, and Lt M.P. Johnson, Crewmen from HU-4 who participated were: E.R. Nichols, ADJ3; D.A. Nobles, AE3; R.S. Schroder, ADR3; B.R. Monroe, ADR2; R.J. Segal, PR2; M.A. Schueller, ATR3; C. W. Snyder, ADJ2; M. G. Beeching, AN; R. W. Schleich, ADR3; R. E. Parker, ADR3; R. G. Hanna, AMS1; and R. Schultz, ADJ3.

Air Rescue Service detachments were right in the midst of the gigantic 'round-the-clock helicopter rescue work that took place when disasterous floods swept through portions of the Pacific Northwest. Two HH-43B's from Det 9, Portland International Airport, Ore., began the three-day operation and were later joined by another HUSKIE from Det 5, McChord AFB, Wash. Both detachments are attached to the Western Air Rescue Center (MATS).

In accomplishing their mercy missions, during which more than 175 persons were rescued, the HH-43B crews fought their way through heavy rain, darkness, fog and high winds. Often forced to fly at low altitudes, they operated over heavily forested, mountainous terrain or flooded areas jammed with wreckage and debris of all descriptions.

Det 9 personnel who manned the HH-43B's during the rescue operation were: Maj Howard J. Cochran, detachment commander, Capt Hoyt B. Hurt, Capt Troy L. Allen, pilots; 1stLt Duane W. Martin, copilot; SSgt Fred C. Williams, SSgt Colbert Ezell, SSgt Charles R. McGatha,

crew chiefs; SSgt Leon Ertons, SSgt Robert E. Alvey, medical technicians. MSgt Kent W. Brannon of the base information office flew on one mission to photograph the rescue work and A2c George Zeller, base photographer, flew on another mission. A photograph taken by the airman during this sortie received world-wide newspaper distribution. Deputies from the Clackamas County Sheriff's Office and other police officials also flew aboard the HH-43B's as guides or actively engaged in the rescue work, often at the risk of their own lives. Crew of the HUSKIE from Det 5 were Capt Paul R. Schildgen, pilot; Lt Jason K. Bridge, copilot; SSgt Karl A. Aldridge, medical technician; and A3c George O. Lepsey, crew chief.

Working from a central point near Oregon City, Det 9's two HH-43B's flew a total of 92 sorties and performed everything from roof-top rescues to surveillance flights. More than 150 stranded citizens of Clackamas County were rescued. Added to this total were the rescues made by the HUSKIE crew from Det 5. One of these involved the evacuation of six adults, three children and three dogs from an isolated river bank hemmed in by mountains. The pickup was made at dusk in fog and pouring rain. The only place Captain Schildgen could find to land had large trees at the approach and exit side of the field and power lines on the front edge. To further complicate the situation, the landing area wasn't level enough to permit lowering the collective lever to the bottom as the blades might contact the slope. Sergeant Aldridge and Airman Lepsey remained behind while the civilians were flown to safety. Afterward another hazardous landing was made to pick them up.

During the three-day rescue operation the HH-43B crews from Det 9 also encountered one hazardous situation after another. Here are only a few: In a series of sorties to an area surrounded by high pines, Major Cochran hovered the HUSKIE in 45-knot winds and rain above the swollen Molalla River while 18 persons were hoisted to safety by Sergeants McGatha and Alvey. Three more persons were evacuated later when the helicopter was able to land near their home. In another mission, with Lieutenant Martin as copilot, Major Cochran flew through weather so bad the crew opened the

doors and thrust their heads out into the fog and driving rain in order to see where they were going. Two young boys were plucked from a mountain side. Afterward, in a series of sorties with another HUSKIE flown by Captain Hurt, landings were made in a field strewn with tree stumps and about a dozen people were picked up. Next the Major landed on a steeply sloping field and held the helicopter in position for 20 minutes while Lieutenant Martin and a forest ranger gathered evacuees together. Finally, in a series of similar sorties along with the HH-43B from Det 5, more than 50 persons were evacuated to safety. The last few sorties were accomplished during heavy rain after dark. The night was spent at Zig Zag. The next day Major Cochran took the HH-43B down a narrow canyon to rescue two elderly couples. Poor visibility and high winds forced the HUSKIE pilot to fly lower and lower. Power lines criss-crossed in every direction and formed a dangerous web around the only available landing site. The Major was able to maneuver the helicopter in for a landing with the power lines 10 to 15 feet from the rotor blades.

Other helicopter crews were also engaged in similar hazardous flights. Captain Allen, with Lieutenant Martin as copilot and Sergeants Ezell and Ertons as crewmen, hovered the 'copter in high winds with a flagpole 15 feet in front of the rotor blades, two chimneys 10 feet to the left and trees 20 feet to the rear. Five persons standing hip deep in rushing water were rescued. Later, after a rather desperate search, Captain Allen landed on a high school lawn — only three to five minutes fuel remained.

Captain Hurt, with Major Cochran as copilot and Sergeant Williams as crewman, first rescued an 83-year-old woman whose husband had been killed by a log slide, took her to the hospital and then returned through increasing wind and rain to land in the field strewn with tree trunks. During earlier sorties in another HUSKIE, Major Cochran had landed in the same field. Between 12 and 15 persons were picked up by the choppers. With darkness approaching and visibility rapidly decreasing, Captain Hurt then flew up a narrow canyon to a spot where more evacuees waited. The flight was made over tall pine trees that thrust their tops into the low-hanging clouds. After locating several stranded civilians, the captain decided not to make the hazardous trip back and landed in a gravel pit dotted with large piles of gravel. The HUSKIE crew spent the night in a cabin, loaded seven people aboard the next day and then made the trip back through the canyon to safety. Later, directed to another evacuation area swept by high winds, Captain Hurt hovered the helicopter within one foot of a steep slope when he found a landing was impossible. After a thorough search of the area, the civilian guide and Sergeant Williams reported only a lone suitcase remained behind to be "evacuated." Along with this incident the captain notes that other "evacuees" included "approximately 12 dogs, three cats and a red canary."

The HH-43B crews had high praise for the other military units and local and county officials who aided in the rescue work. A great deal of credit was also given to MSgt George W. Stubbs, maintenance NCO at Det 9 and A3c James O. Maull for their "tremendous behind-the-scene support" during the operation. In the three-day period, nearly 1,900 gallons of jet fuel were furnished to the HUSKIES by tanker trucks from the 337th Fighter Group Fuel Section.

Earlier, in Southwest Texas, another ARS detachment swung into action when a near record 15 inches of rain fell, saturating the dry soil and sending rivers over their banks on a rampage of destruction. Participating in a five-day, around-the-clock operation in the Del Rio/Eagle Pass/area, Det 11, CARC(MATS), from Laughlin AFB, Texas, evacuated 33 persons during 16 search and rescue missions. Manning the two HH-43B's were: Capt Leonard L. Hills, detachment commander, and 1stLt Lew E. Phillips, pilots; Capt David B. Hightower and 1stLt Arthur F. Machado, copilots; MSgt Calvin L. Eby, SSgt Clare L. R. Parmer and SSgt Benjamin Selph, crew chiefs; SSgt Edward Hill, A1c Curtis F. Baker and A2c Richard C. Sholtanis, airborne firefighters.

Often plucking marooned persons from the path of the rain-swept, rising flood waters, the HH-43B crews were credited with making a major contribution to the lack of drownings despite the widespread area inundated. They rescued persons from isolated ranches and airlifted motorists, campers, fishermen and trappers to safety. In addition, the helicopter crews from Det 11 were asked to airlift food supplied by the Mexicians — 850 pounds of flour and 850 pounds of milk — to the Mexican town of Allende. Permission to cross the border was obtained by the American consul after the mayor at Piedras Negras asked for assistance in delivering the supplies.

Adding a touch of humor in the midst of the rescue operation was the ground "evacuation" of 30 goats trapped between a fence and rising flood waters. After receiving permission from a rancher, Sergeants Parmer and Hill cut the fence and herded the animals to safety. Both were quick to credit the 'copter in the air with assisting in the rescue roundup.

ALWAYS READY—Det 11 personnel who flew or maintained Laughlin's HH-43B's during flood. Others who participated were on duty elsewhere when photo was taken. Left to right, front row, are Capt L. L. Hills, commander; Capt D. B. Hightower, 1stLt L. E. Phillips, and 1stLt A. F. Machado. Rear row, SMSgt W. G. Ellis, MSgt C. L. Eby, A2c R. Duran, A2c F. Reyes, Jr., A2c B. C. Metzgar, and A3c E. S. Salzwedel. (USAF photos)

When floods came to Vietnam in November, hard-working HH-43B crews from ARS Detachment 5, PARC (MATS), commanded by Maj Ronald L. Ingraham, flew 63 sorties and rescued 80 persons. They also delivered 8,500 pounds of food and medicine to those who chose to stay with their pitifully few possessions. This mission account was written by 1stLt John M. Chapman.

DANANG AB, VIETNAM(OI) —"At 1447, sighted a woman on roof top with two small children. The children were picked up... The woman chose to stay on the house." This entry, taken from the log book of Detachment 5, Pacific Air Rescue Center here, was made at the height of rescue activities during the floods which swept over the northern provinces of South Vietnam. The mission described was flown by Capt James V. Berryhill, Capt Jim F. Hartley, SSgt Homer L. Ramsey, and A2c William J. Flower, all members of Air Rescue Det 5 formed here last month.

In rescue operations, a man should be prepared to meet almost any kind of situation, and after one month in Vietnam, the men of Det 5 are off to a good start. Four continuous days and nights of rain sent the nearby Danang River sprawling out over the lowlands south of this base turning the normally green rice fields into a mammoth muddy brown inland lake. This most unwelcome example of Mother Nature at her worst, set the stage for many tragic scenes which could be only partially compensated for by the all-out efforts of the Det 5 men. They flew their Air Force HH-43 HUSKIE helicopters in and out of the flooded area again and again to deliver food and rescue homeless victims. The disaster couldn't have been avoided. But, were it not for the rescue efforts of the U. S. Air Force, Vietnamese Air Force, the Army, and the Marines, the tragedy would have been much worse.

An estimated 10,000 people did die due to drowning or exposure. Again, the figure would have been higher without the intervention of another HH-43 crew, Captains Bruce M. Purvine and Floyd R. Lockhart, A2c Randolph Smith and A1c Richard H. Syverson.

In nine sorties, this professional crew pulled 43 people from their precarious perches. One of these

43 people was a man who wanted to stay with his dead cow, not out of any particular love for the animal, but because it was meat which still needed to be butchered. Capt Thomas C. Seebo and his crew consisting of 1stLt Donald M. Welsh, SSgt Larry K. Henderson, crew chief, and A2c John A. Moore, paramedic, dropped down into marshy rice paddies just east of the base to pick up another group of people stranded on a bridge. "We couldn't tell what was solid ground and what wasn't," said Sergeant Henderson. "When we did touch down, the water was over the wheels."

Their troubles were just beginning. "All 30 people wanted in at one time." I put my arm across the door to stop them, and they almost broke it. We got 10 inside and Captain Seebo took off leaving me there with the other refugees."

While Captain Seebo deposited the first group safely on high ground, Sergeant Henderson made the best of his predicament and found a refugee who could speak broken English. Through him, he explained to the rest that they would have to leave most of their baggage behind. "Several of them wanted to take their bicycles," related the Sergeant.

The hard working chopper crews not only rescued a total of 80 people; they also delivered over 5,000 pounds of food to people who chose to stay with their homes.

Another entry in the log book reads," People will be spending the night on roof tops. Most don't want to leave their homes, but all indicate they need food."

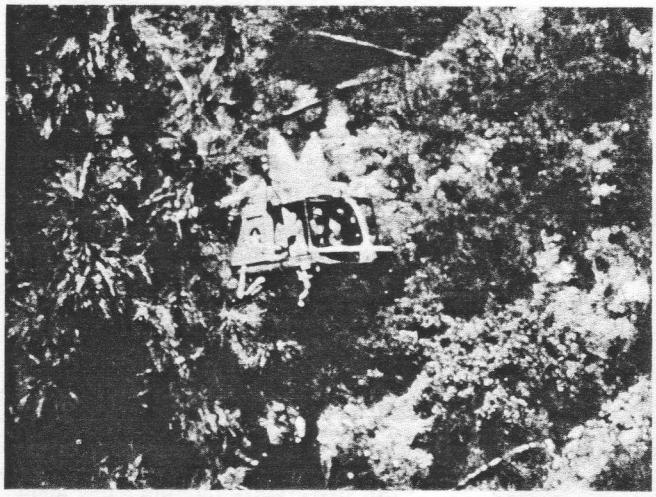
"They would wave the (rescue) basket away, but would motion like they were hungry," explained Airman Flower.

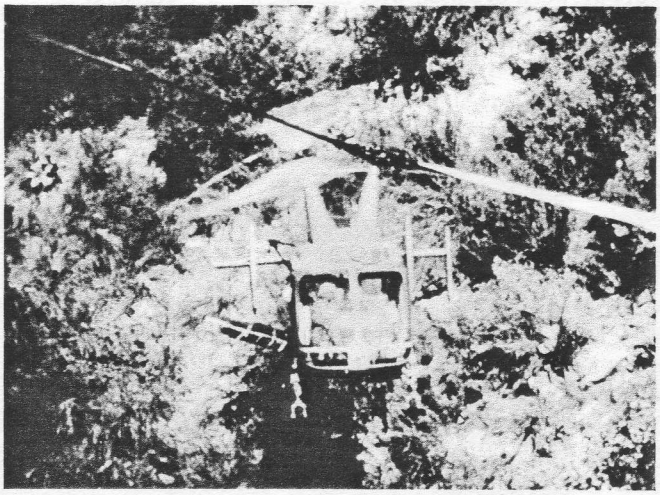
The food delivery missions were coordinated by Chaplains John F. Shea and Wayne L. Stork. Food collected in downtown Danang and food donated by the 23d Air Base Group was delivered to the HH-43 unit personally by the chaplains, and then, still accompanied by the chaplains, it would be delivered to an isolated orphanage or parish church. At one such church, Vien Bien, the food had to be lowered through the roof of an adjacent parish house. Airman Flower was first lowered to the roof of the house. The food was then lowered in the basket, and he passed it to hungry flood victims who were sitting on the rafters just beneath the roof. The water was sloshing mid-way up the walls on the inside of the house.

The efforts of these highly trained rescue men could easily be described as noble in humanitarian terms without the slightest possibility of exaggeration. However, a small amount of pride in their voice as they talk about their efforts during the flood is the only indication one gets that the officers and enlisted men of Det 5 consider their actions more than what was expected of them.

Others who participated in these mercy flights are: Capt Clyde W. Lemke and 1stLt Joseph P. Phelan, pilots; TSgt William H. Michael, TSgt John G. Regan, Jr., SSgt Philip Arketa, SSgt Dewey A. Kilpatrick, MSgt Lenote C. Vigage, and A1c Jon H. Young. K

Televised Rescue





This dramatic photograph of a rescue by an HH-43B crew from ARS Det 15, WARC (MATS), Luke AFB, Ariz., is part of a film taken by Ralph Painter, TV news cameraman. To remove the critically injured survivor of a civilian helicopter crash, Capt Charles R. Kay, RCC, and Capt Andrew J. M. Archer, copilot, took the HUSKIE into a deep and narrow canyon at an elevation of 6,000 feet. The HH-43B hovered with the tail fins touching the overhanging trees and the rotor blades clearing the steep sides by inches while the rescuee was hoisted aboard. Air evacuation had been recommended by A1c William R. Dunbar, crew chief, and A1c Joseph A. Vultaggio, medical technician. Dropped off earlier on a mountain trail they climbed down almost vertical rock walls to reach the isolated spot. Captain Archer hoisted Airman Dunbar aboard and then the litter was raised, inch by inch, between the overhanging trees on one side of the canyon and the rocks on the other.

Timely Tips

Engine Mount Adjustment (HH-43B)

When adjusting the forward engine mounts for engine-to-transmission alignment, adjust the right forward mount first. Then, adjust as necessary and connect the left "fail-safe" mount. Do not torque the left mount to the point where the rubber shock absorber is compressed since the purpose of this mount is to absorb the engine torque force. The complete procedure is adequately described in T.O. 1H-43H(B)-2.

H. Zubkoff, Service Engineer

Blade Folding Retainers (UH-2)

If both K604011-1 and K604011-201 folding retainers are utilized when folding the main rotor blades, use the -1 retainer on the lower (forward) blades and the longer -201 retainer on the upper (aft) blades. If the shorter -1 retainer is used on the upper blades the folding pin may contact the top of the lower blade and damage the deicer boot. The K604011-101, K604011-201 and K604011-301 are all the same length. The K604011-1 is two and one-half inches shorter. It is suggested that the -1 retainer be marked in a conspicuous manner so it will be easily recognizable during blade folding operations. Proper alignment of the rotor head is also always very important when folding the main rotor blades.

P. F. Whitten, Field Service Representative

Proper Relay Clearance (UH-2)

To allow for maximum clearance between the starter relay bus bar, P/N K683086-27, and the No. 1 generator relay, ensure that the short tab (1.37 inches) of the bus bar is attached to the starter relay A-1 stud and that the longer tab (1.62 inches) is pointing down, towards the roof. Future revisions to the HMI will reflect this information.

J. J. McMahon, Service Engineer

Blower Drive Shaft (HH-43B)

When installing a blower drive shaft assembly, part number K777517-9, be certain that the end of the flex cable with the swaged collar is next to the transmission — not the blower.

F. E. Starses, Service Engineer

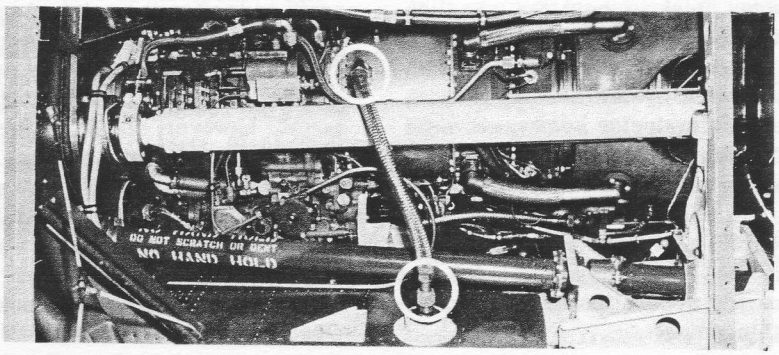
Transmission Installation (HH-43B)

To save time and facilitate shim installation when installing a new transmission, the shim stacks may be scotch taped to the transmission mounting flange. The proper procedure is to hoist the transmission into position and measure the gap, thus determining the amount of shims necessary at each bolt hole. Lift the transmission a few inches and tape the selected number of shims in place. Then lower the transmission back into position.

F. E. Starses, Service Engineer

Prevent Hose Failure (UH-2)

Improper installation of the cabin heat take-off metalflex hose, P/N 13037, or using the hose as a hand hold when climbing up to the work platform can cause hose failure. This will allow leakage of hot air at approximately 550°F into the engine nacelle where it may damage the engine drive shaft support bearing. When installing the hose, be sure that the fittings are not twisted as this will cause the hose to be preloaded at the fitting areas. Use two wrenches, one on the fitting flat to keep it from being twisted while tightening the connector nut with the other wrench. DO NOT use the hose assembly as a hand hold. Cumulative stresses thus imposed can also cause hose failure. These simple precautions may save a costly drive shaft bearing change. To check for hot air leakage, open the left-hand main engine work platform. With the engine operating at ground idle, carefully pass one hand over the area surrounding the hose. Hot air leakage, if present, will be heard and felt. Use caution — remember, this air is HOT!



H. Zubkoff, Service Engineer

Q's AND A's

If you have a question regarding Kaman Aircraft maintenance, send it along to Rotor Tips. The Service Department's engineers will be glad to answer it.

Q. (Applies UH-2) WHAT ARE THE "KAC'S" OF RESCUE HOIST CABLE INSTALLATION?

A. Keep in mind that when a hoist cable is replaced because it was either deliberately or inadvertently cut, the reel must be retimed in accordance with 01-260HCA-2-7. After this is accomplished, follow the usual procedure taken when a cable is replaced for normal wear. The extra step is necessary because, when a cable is cut, its weight is released and the steady pull on the hoist suddenly ceases. This allows the free end of the cable to whip up through the nut and guillotine assembly and throws the timing off in the reel. Adjustment of down-limit switches, if not accomplished properly, can cause unnecessary cable replacement. After checking the installation of the down-limit switch, operate hoist electrically by reeling in a few turns of cable. Then unreel cable until down-limit switch is actuated, cutting off power and stopping the drum. There then should be approximately three turns of cable remaining on the drum. Care should be exercised when using the hoist up-down emergency lever for operation of the hoist. In this phase of operation the up-down limit switches are inoperative. "Care" must be taken to avoid unreeling too far as the cable will then start to rewind backwards. As a reminder, so this can be prevented from happening, the last 15 feet of the cable has been coated with "Red Dykem."

W. J. Rudershausen, Service Engineer

Q. (Applies HH-43B/F) WHY DO DIAGONAL RIPPLES APPEAR OUTBOARD OF THE FLAP ON THE SKIN OF SOME ROTOR BLADES?

A. When the plywood skin is fitted to the blade, the forward edge of the thicker inboard section mates against a recessed "rabbet" in the spar. The outer thinner skin panel is bonded to the surface of the spar with no restraining rabbet joint to hold the panel in position during the application of the bonding pressure. The tip end occasionally creeps a few thousandths of an inch when pressure is applied by the bonding fixture, and results in the diagonal skin ripples sometimes seen in the outboard area. Neither the skin depressions between ribs nor the diagonal ripples are of any structural consequence so long as the bond between skin and ribs is intact. Data compiled while overhauling a number of blades exhibiting skin ripples of this type indicates that KAC has never experienced a separation of the bond between ribs and skin in this area.

N. E. Warner, Service Engineer

Q. (Applies UH-2) WHEN VIEWED FROM THE DRIVE END, IN WHAT DIRECTION SHOULD THE AUXILIARY FUEL TANK AIR COMPRESSOR MOTOR, P/N RG21560, ROTATE?

A. The motor should rotate in a clockwise direction when viewed from the drive end (looking directly at the splined shaft). To ensure clockwise rotation, wire the motor in accordance with the wiring diagram in NW03-10KAM-1, Volume 18. The motor wires are color coded in the following manner: Phase 1, black; phase 2, red; phase 3, green; and N, white. This information will be carried in future revisions of NW03-10KAM-1.

J. J. McMahon, Service Engineer

Q. (Applies HH-43B/F, UH-43C, OH-43D) WHAT ARE SOME OF THE PREVENTATIVE MAINTENANCE STEPS WHICH SHOULD BE TAKEN WITH REGARD TO ROTOR BLADES?

A. (1) Prevent future problems by using padding and a properly prepared area on which to set blades BEFORE removing blades from the helicopter or boxes. (2) To prevent possible injury to personnel, or blade damage, use two men (minimum) on the grip end and one man (minimum) about three feet inboard from the tip when carrying blades by hand. Cooperation is required between the men, and it helps if they are all nearly the same height. (3) Flaps and blades are subject to wear at the trailing edges and corners. To prevent fraying, use paint to touch up any bare fabric (unless fabric is split). Allowable flap and blade repairs are described in the structural repair manual. (4) Always keep in mind that vehicles, hangar doors, and similar objects are enemies of blade tips. Never move a helicopter without the assistance of guide personnel. (5) Helicopters stored over a two-week period should have the blades removed to prevent the development of excessive droop. Store the blades in their shipping containers whenever possible or on padded supports. Make sure the leading edge is down. (6) As an automobile will rust out faster when constantly left dirty, so will a rotor blade deteriorate at a faster rate if uncared for. Aerodynamically, a clean rotor blade also performs better than one with a dirty surface. Periodic cleaning with a cloth dampened with water will aid maintenance personnel in accomplishing a more comprehensive visual inspection. It will also remove grit and possibly caustic dust which might eat into the blade finish. Grease, if smeared on the blade finish, should be wiped off as some greases will slowly penetrate and soften the paint. Again, as with an automobile, one of the best ways to preserve the finish and increase resistance to weather is by periodically applying a coat of wax. Don't use a combination cleaner and wax compound, however, for this type could cause the finish to erode or deteriorate. Kaman Aircraft Corporation uses a liquid wax called "Wing Wax" which may be ordered in one-gallon cans under Air Force stock number 7930-132-5583. Suitable paste wax (MIL-W-18723) may be ordered in one-gallon cans under Air Force number 7930-267-5588 and Navy stock number R7930-267-5588-G600.

N. E. Warner, Service Engineer

Q. (Applies UH-2) WHAT IS THE LATEST INFORMATION REGARDING THE REPAIR OF FUEL CELLS?

A. The U.S. Rubber Co. recently increased the scope of authorized repairs to fuel cells. The following information (and instructions in the repair brochures — Bulletin No. 30 — which accompany each repair kit) will apply. U.S. Rubber Co. cells incorporate compression-type fittings. This is a 2-part removal metal fitting which is not an integral part of the cell. The fitting area is critical since proper sealing is dependent upon the correct thickness of material between the metal rings. Repairs in the fitting area are, therefore, not recommended. If repairs in the fitting area must be made in emergencies, the cell should be replaced as soon as possible. Repairs on contoured surfaces or cell radii may be accomplished. The same instructions for the repair of flat surfaces will apply, except that a double patch will be required at corners. The outer patch will overlap the first patch at least one (1) inch in all directions. Damaged areas larger than two (2) inches should not be repaired in the field. Such cells should be removed and forwarded to the applicable O&R facility. Complete repair limitations, precautions to be observed, and repair facility requirements are outlined in the following publications: NAVAER 03-10-513; NAVAER 03-10-633; USAF T.O. 6J-14-1-1; USAF T.O. 6J-14-1-3. A revision containing the above information, together with the detailed repair instruction, has been submitted to NAVWEPS 01-260HCA-2-3.

H. Zubkoff, Service Engineer

Q. (Applies HH-43B/F) IS THE K774873-1 COUPLING AND SHEAR PIN ASSEMBLY PART OF THE TRANSMISSION ASSEMBLY? THE COUPLING AND SHEAR PIN ASSEMBLY DRIVES THE BLOWER FLEX SHAFT.

A. No, it is not. Each time a transmission is removed for return to overhaul, the installed coupling and shear pin assembly must be removed and retained for use with the replacement transmission.

F. E. Starses, Service Engineer

Q. (Applies UH-2) WHAT SIMPLE PRECAUTION CAN SAVE TIME AND TROUBLE WHEN TURNING IN COMPONENTS FOR OVERHAUL?

A. Aircraft assembly components often carry an identification or data plate bonded to the exterior surface. Occasionally, due to handling, weather, oils, greases, etc., the bonding becomes weakened and the plate is lost. This can, of course, result in additional paperwork and inconvenience for all concerned when the component is returned for overhaul. The rotor retentions are particularly susceptible to data plate loss because, in addition to the conditions mentioned above, the plates are subjected to centrifugal force. Loss of several plates has been reported recently. It is suggested that painting the serial number beside the data plate on the folding pin lug will be most helpful in the event the plate is lost.

N. E. Warner, Service Engineer

Q. (Applies UH-2) EVEN IF PLI-WASHER SETS HAVE THE SAME NUMBER, THEY SHOULD NEVER BE INTERMIXED. WHY IS IT IMPORTANT NEVER TO VIOLATE THIS RULE?

A. Pli-washer sets are factory matched to ensure proper bolt preload at installation. Intermixing these pieces will destroy the matched relationship. To avoid this possibility, keep the sets in their individual packages. Under no circumstances should pli-washers be reused.

W. J. Wagemaker, Service Engineer

Q. (Applies HH-43B/F) IS IT PERMISSIBLE TO USE AN "AN" WASHER INSTEAD OF WASHER P/N K772508-11 AT THE RIGHT REAR ENGINE MOUNT?

A. No, this is not permissible. The right rear engine mount is a close tolerance, rigid assembly which secures the aft end of the engine to the airframe. It is designed to hold one point of the engine immovable while the other three mounts permit engine expansion and/or movement commensurate with engine growth and torque during operation. The mount fittings and associated hardware are manufactured to specific dimensions, tensile strength, and hardness. "AN" standard hardware of similar dimensions and characteristics do not exist. Any substitution of standard hardware for that specified in the IPB, T. O. 1H-43(H)B-4, will allow sufficient movement to cause vibration. This will ultimately result in failure of the mount bearing and can also cause vibration-induced failure of various engine units. The bolt assy, P/N K772521-1, the bushings, P/N K772509-11 and K772520-11, and the special washer, P/N K772508-11, are especially critical.

H. Zubkoff, Service Engineer

Q. (Applies UH-2) IN THE ARTICLE "UH-2 FUEL SYSTEM FUNCTIONAL CHECK" APPEARING ON PAGE 5 IN THE OCTOBER/NOVEMBER, 1964, ISSUE OF ROTOR TIPS, THE FOLLOWING STATEMENT APPEARS: "THE BATTERY SHOULD BE FULLY CHARGED OR 28 VOLT DC AUXILIARY POWER SHOULD ALSO BE CONNECTED TO THE EXTERNAL AC POWER RECEPTACLE." IS THIS INFORMATION CORRECT? IT APPEARS AT THE BOTTOM OF THE FIRST PARAGRAPH.

A. This statement is not correct! The information as supplied by Mr. Zubkoff read: "The battery should be fully charged or 28 volt DC auxiliary power available. Four hundred cycle, AC auxiliary power should also be connected to the external AC power receptacle." A single line was inadvertently omitted before publication and changed the meaning. If the magazine is on file for reference purposes, the erroneous information should be corrected on the margin or other conspicuous place.

(Editor's note: Please notify Rotor Tips immediately if an error such as this appears in the future so that a correction can be made as quickly as possible.)

KAMAN SERVICE ENGINEERING SECTION—*E. J. Polaski, Supervisor, Service Engineering, G. M. Legault, G. S. Garte, Asst. Supervisors; N. E. Warner, A. Savard, W. J. Rudershausen, W. A. Saxby, C. W. Spencer, Group Leaders.*

UH-2 FUEL SYSTEM

by Herman Zubkoff
Service Engineer
Field Service Department

PART II

Part I, "Description of the Aircraft Internal and External Fuel System," appeared in the previous issue. Subsequent issues will include articles on pressure fueling, suction defueling, and the fuel quantity system; the power plant fuel system; and the fuel control system.

The Fuel Transfer System will be presented in the following sequence: (1) General (2) Auxiliary tank transfer to the forward tank (3) Aft tank transfer to the forward tank (4) Fuel feed-forward tank to the engine.

(1) General: Auxiliary tank fuel and aft tank fuel is transferred to the forward tank as the fuel in the forward tank is consumed. Fuel from all tanks is fed to the engine through the forward tank. Internal plumbing and components in the transfer system are also used in single point pressure fueling and suction defueling. The function and operation of these units, as applied to pressure fueling and suction defueling, will be dealt with in Part III.

(2) Auxiliary tank transfer to the forward tank: (See figure 1) Fuel is transferred from the auxiliary tanks first. When the auxiliary tanks are empty, or when auxiliary tank transfer is interrupted, transfer from the aft tank commences automatically. The system maintains the proper center of gravity (CG) and ensures maximum internal fuel load in the event that it is necessary to drop the auxiliary tanks during flight.

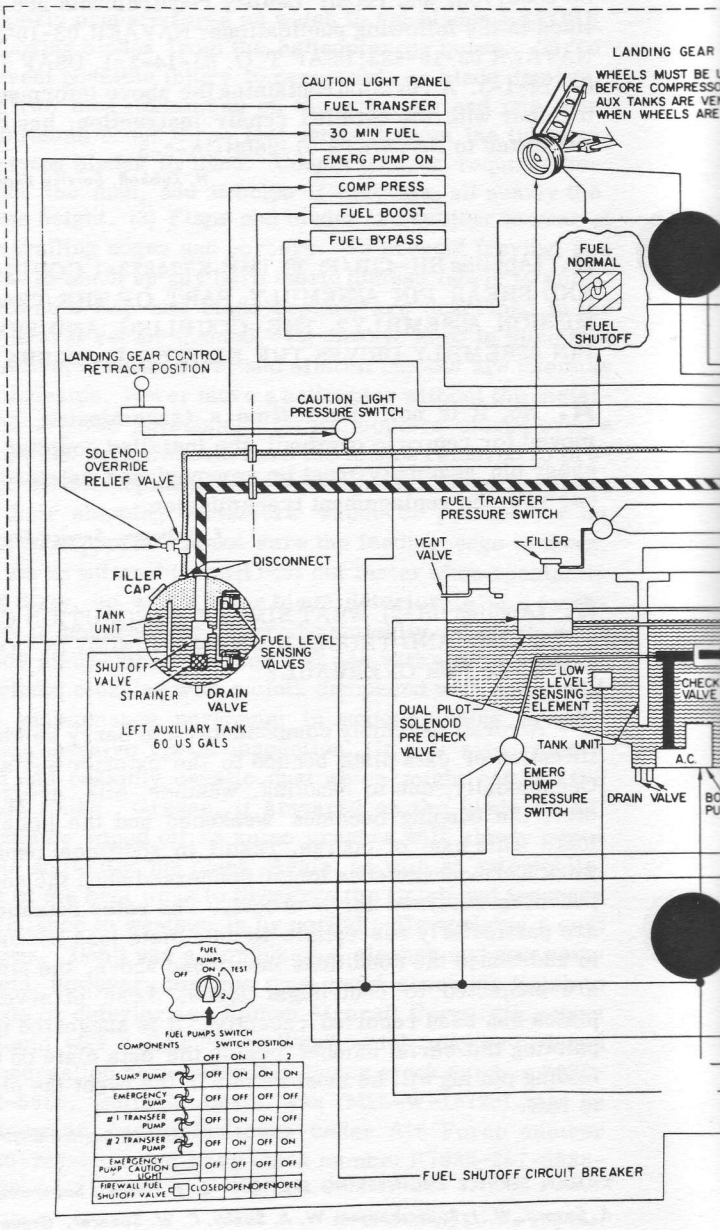
Auxiliary tank fuel transfer is accomplished by means of air pressure supplied by a small motor-driven, oil-free air compressor. The air compressor and associated units are installed in the aft fuselage compartment behind the aft fuel cell. Air pressure of 14-16 psi in the auxiliary tanks forces the fuel from the auxiliary tanks through the transfer line and into the forward tank. The associated units in the compressor system include: the air pressure lines, a dehydrator (referred to as the desiccator), a check valve in the air pressure line, an air compressor pressure switch, a low air pressure switch, and a caution light. As a safety feature, a fuel transfer pressure switch is installed in the forward tank to protect the forward tank from over-pressurization.

The dehydrator removes moisture from the compressed air to protect the system from water contamination from this source. It is visible for daily inspection through the fuel filter access panel on the left side of the fuselage. The desiccant, in crystal form, is replaceable and contained in a clear plastic tube to which a color scale decal is attached. Comparison of the color scale to the color of the desiccant crystals indicates the amount of moisture absorption. The scale also indicates when the desiccant crystals should be replaced.

The check valve, which is installed in the air pressure line between the desiccator and the auxiliary tanks, prevents air in the pressurized auxiliary tanks from leaking back through the compressor. The air compressor pressure switch controls the compressor motor to maintain 14 to 16 psi air pressure. At 16 psi it shuts the compressor motor off. At 14 psi it turns it back on.

A caution light pressure switch is installed in the air line to warn the pilot when the air pressure is too low to properly transfer the fuel. This pressure switch activates the warning light when air pressure drops to 5 psi. The warning light is deactivated when pressure rises to 7 psi. This is the minimum required to transfer fuel at the normal rate of approximately 1.72 gallons per minute.

A fuel transfer pressure switch is installed in the forward tank gravity filler neck as a safety feature. Its sole purpose is to protect the forward tank from over-pressurization. This pressure switch is electrically connected to the compressor motor and to the aft tank boost pumps. In the event that the fuel level and pressure in the forward tank reaches an unsafe level during fuel transfer, the pressure switch shuts off the compressor and the aft tank boost pumps at the same time. As fuel is consumed, and the fuel level and pressure within the



tank drops, the compressor and boost pumps will again be energized.

A solenoid override relief valve is installed in the air pressure line at each auxiliary tank. This valve is electrically opened to permit venting during refueling and suction defueling. It is also actuated to the open position by the main landing gear micro-switch when the gear is down and the aircraft is on the ground. The function of the solenoid override relief valve will be further explained in Part III. During fuel transfer the relief valve is closed, since the tanks must be pressurized. The valve assembly includes an additional spring-loaded relief valve adjusted to open at 25-30 psi. If auxiliary tank air pressure should build up to this point, the relief valve will open and allow the excess pressure to escape. When the pressure drops to approximately 16 psi, the spring-loaded relief valve will close again, pressure will build up, and fuel transfer will continue.

Fuel from the auxiliary tanks flows through the strainer and the shutoff valve in the bottom of the auxiliary tanks, through the two-way check valves, through the swing check valves, through the transfer line and into the forward tank through the fuel-defuel shutoff valve in the forward tank. During this transfer process, fuel pressure from the auxiliary tanks exerts a pressure against the suction check valves in the aft tank, keeping them closed to prevent transfer of fuel from the aft tank. When the auxiliary tanks are empty, or the auxiliary tank transfer pressure drops below normal, the aft tank boost pump pressure opens the suction check valves and aft tank fuel transfer begins.

The shutoff valve in the auxiliary tank, which opens during pressure fueling, is closed by the high-level sensing valve when the tank is full. This action shuts off the flow of fuel into the tanks. When the tanks are pressurized, the valve opens, allowing fuel transfer. When the tanks are empty, the low-level sensing valve closes the shutoff valve to prevent air from entering into the fuel system.

The two-way check valves open in the transfer direction at 0.25 psi. They open in the opposite direction at 17 psi to permit pressure fueling. Since this reverse flow opening pressure is greater than transfer pressure, which is 14 to 16 psi, they serve as check valves to prevent recirculation of fuel between the auxiliary tanks.

The solenoid-operated swing check valves are free flow in the transfer direction. They function in the transfer system to prevent circulation of fuel from the aft tank to the auxiliary tanks during fuel transfer. They are also used in the pressure fueling and suction defueling sys-

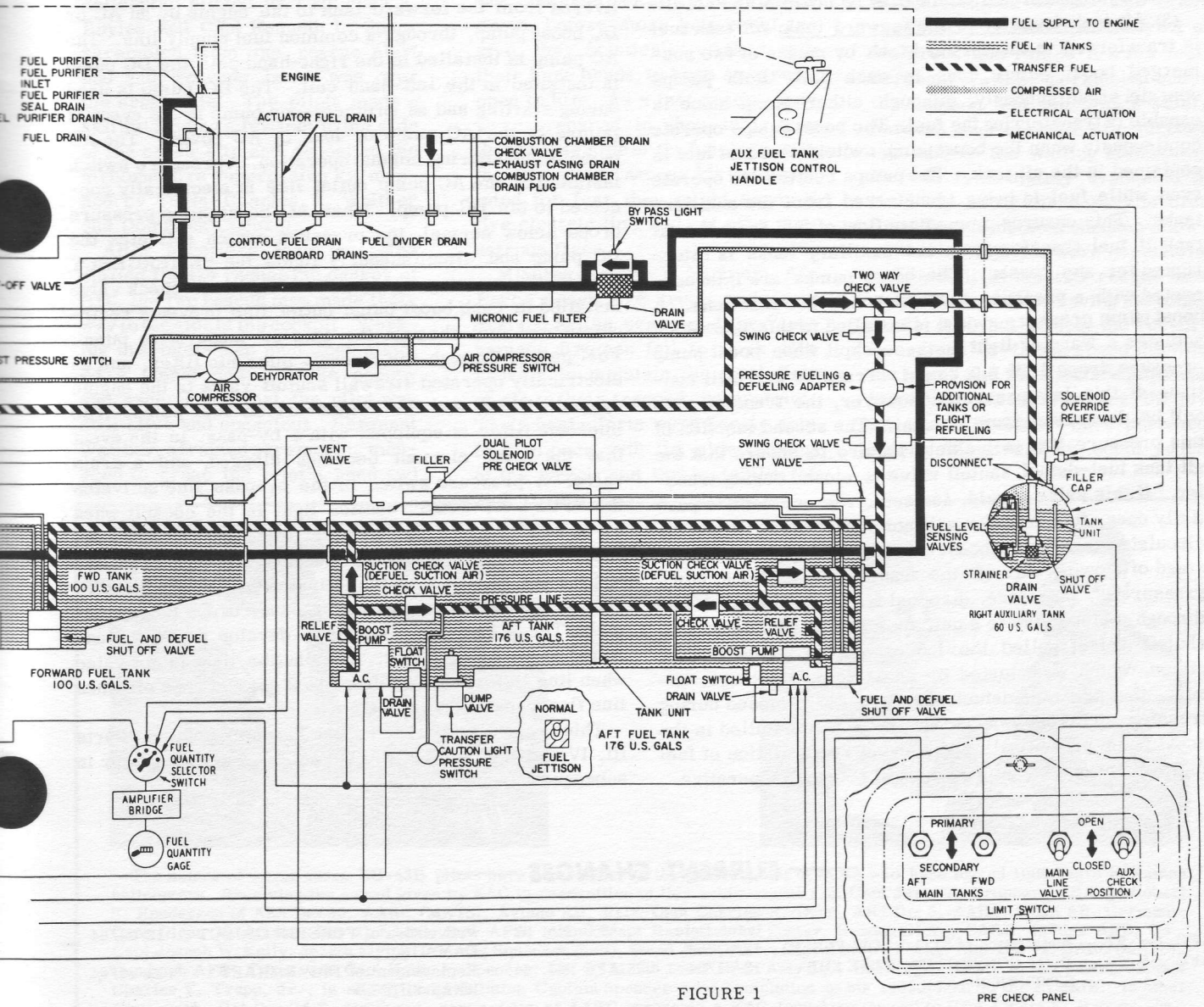


FIGURE 1

tems to be covered in Part III.

Fuel, transferred from the auxiliary tanks and the aft tanks, flows into the forward tank through the forward tank fuel-defuel shutoff valve. This valve is connected to, and is controlled by, the dual pilot solenoid precheck valve. The dual pilot solenoid precheck valve contains identical units which operate independently of one another. The lower unit is the primary valve, the upper unit is the secondary valve. They have identical functions, that of controlling the opening and closing of the fuel-defuel shutoff valve. Safety is the purpose for this dual feature. The precheck valve is installed at the top of the tank. Each unit is float operated. When fuel in the forward tank reaches the valve level, a float rises creating a pressure in the pilot line which connects to the fuel-defuel shutoff valve. This pressure closes the fuel-defuel shutoff valve and prevents further flow of fuel into the forward tank. When the fuel level in the forward tank drops below the level of the precheck valve float, the pilot line opens, the pressure is relieved and the fuel-defuel shutoff valve opens, allowing fuel to flow into the tank. Both the primary and secondary precheck valves can also be actuated to the closed position by electrical solenoids controlled by switches located on the precheck panel. This, however, is a function of the pressure fueling system and will, therefore, be covered in Part III.

(3) Aft tank transfer to the forward tank: Aft tank fuel is transferred to the forward tank by means of two submerged boost pumps, one in each cell. Both pumps operate simultaneously, although either pump alone is capable of transferring the fuel. The boost pumps operate continuously when the boost pump switch is on and fuel is contained in the aft tank. The pumps continue to operate even while fuel is being transferred from the auxiliary tanks. This ensures immediate flow of fuel from the aft tank if fuel transfer from the auxiliary tanks is interrupted for any reason. The boost pumps are interconnected with a pressure line which has two functions. A boost pump pressure switch is installed in this line which actuates a warning light in the cockpit when boost pump pressure drops 1.25 ± 0.25 psi. Transfer will still continue at this low pressure; however, the transfer rate will be decreased from normal. The second function of this pressure line is a safety feature to ensure that the aft tank fuel-defuel shutoff valve is closed during transfer. If this valve should, for some reason, remain partially open, fuel transfer will not occur; fuel will merely circulate through the boost pump and the open valve instead of flowing through the transfer line. Boost pump pressure is, therefore, directed from this pressure line through a bleed line to a unit installed on the fuel-defuel shutoff valve, called the lockout piston. This lockout piston, which is actuated by boost pump pressure, ensures that the fuel-defuel shutoff valve is closed during transfer. Two one-way check valves are installed in the boost pump pressure line to prevent recirculation of fuel in the event one boost pump should become inoperative.

FUEL *Contamination*

FUNDAMENTALS

DO YOU KNOW THAT — Reciprocating engines and carburetors can cope with considerably larger amounts of water and foreign matter than turbine engines and fuel control units. The small clearances make the fuel controls on turbine engines very susceptible to malfunction due to foreign matter.

The boost pumps normally develop approximately 10 psi. During transfer of fuel from the auxiliary tanks, since the auxiliary fuel transfer pressure is greater (14 to 16 psi), the suction check valves remain closed and aft tank fuel circulates through the boost pumps and the orifices in the boost pump output lines. When the auxiliary fuel transfer is completed, pressure against the suction check valve drops. The aft tank boost pump pressure then opens the suction check valves and aft tank fuel transfer begins. The fuel from the aft tank flows through the same transfer line into the forward tank, through the forward tank fuel-defuel shutoff valve. Low level float switches in each aft tank sump shuts off the boost pumps when the tank is empty.

(4) Fuel feed-forward tank to the engine: Fuel is delivered from the forward tank to the engine by an AC or DC boost pump, through a common fuel supply line. The AC pump is installed in the right-hand cell, the DC pump is installed in the left-hand cell. The DC pump is used during starting and as an emergency pump in the event of failure of the AC pump or loss of AC power. The AC pump is used during normal operation. A pressure switch installed in the AC pump outlet line is electrically connected to the DC pump. When AC boost pump pressure drops below normal, the pressure switch activates the DC pump and simultaneously lights the "EMERGENCY PUMP ON" warning light in the cockpit. A check valve installed in each boost pump outlet line prevents recirculation of fuel through the idle or inoperative pump. Fuel passes through the aircraft micronic filter, and an electrically operated firewall shutoff valve to the engine dynamic filter, and the engine-driven fuel pump. The micronic filter is equipped with a by-pass, in the event that the filter element becomes clogged, and a drain valve. A pressure switch in the by-pass line activates the "FUEL BY-PASS" caution light in the cockpit when by-pass occurs. A fuel supply pressure switch is installed in the fuel supply line between the micronic filter and the engine. This switch activates the "FUEL BOOST" caution light when boost pump pressure drops below normal. The boost pumps normally develop between 7 and 10 psi at the pump outlet. The caution light is activated when line flow pressure drops to 2 psi and goes off when line flow pressure reaches 4 psi.

This completes Part II - Fuel Transfer System. Parts III, IV and V of the UH-2A/B Fuel System will appear in subsequent issues.

CURRENT CHANGES

		Issue Date
AFC No. 57	- Installation of SLO-BLOW FUSES	12/31/64
AFC No. 60	- D. C. CONVERTER, FUSE SUBSTITUTION	12/31/64
AFC No. 62	- Prevention of FOREIGN OBJECT DAMAGE	12/31/64
AFC No. 64	- Replacement of DRIVE SHAFT HEAT SHIELD	12/31/64

A. J. Leonaitis, Service Publications

VIETNAM RESCUE

HQ 2D AIR DIV TAN SON NHUT AF SAIGON VIETNAM (OI) — In probably the most dramatic on-base air crash rescue of the year, personnel of Det 4, PARC, teamed with other American and Vietnam Air Force personnel at nearby Bien Hoa Air Base to save the pilot of a crashed A-1H fighter-bomber from literally drowning in mud.

The Vietnamese student pilot was taking off from Bien Hoa on a training mission when his aircraft was caught by a strong crosswind and veered off the runway, crossed a stretch of soft turf and overturned in a shallow muddy ditch. The impact was so great that the canopy and much of the cockpit were completely buried in the ooze. In addition, the plane's fuel tanks were ruptured, spreading high octane gasoline over the surrounding area. Immediately, an HH-43B rescue helicopter piloted by Capt John A. Boyles and Capt Kenneth L. Spaur scrambled from the rescue alert pad and, seconds later, was over the crash site. The pilots made a skillful landing a few feet to the side of the crash site and deposited the airborne fire suppression kit manned by TSgts Charles T. Walther and Dominick Cocuzzi.

After spreading foam over the spilled field to reduce the danger of fire, the two rescue men made their way to the side of the cockpit. Working in armpit-deep mud, they clawed a tunnel down to the canopy and ascertained that the pilot was still alive and conscious. Sergeant Walther, a trained paramedic, managed to grasp the pilot's hand and take his pulse which seemed strong and relatively normal. Meanwhile, both men noticed that the crashed "Skyraider" was slowly sinking deeper into the mud. Realizing that the helpless pilot might readily drown before more help could arrive, they frantically worked with their bare hands to keep an airway open to him. As a last resort, they were prepared to chop their way through the side of the fuselage with the emergency access kit but hesitated for fear they might sever a live electric line and set off a disastrous fire.

SWAMP ANGELS–Discussing dramatic rescue are, left to right, TSgt Charles T. Walther, TSgt Dominick Cocuzzi, Capt John A. Boyles and Capt Kenneth L. Spaur. (USAF photo)

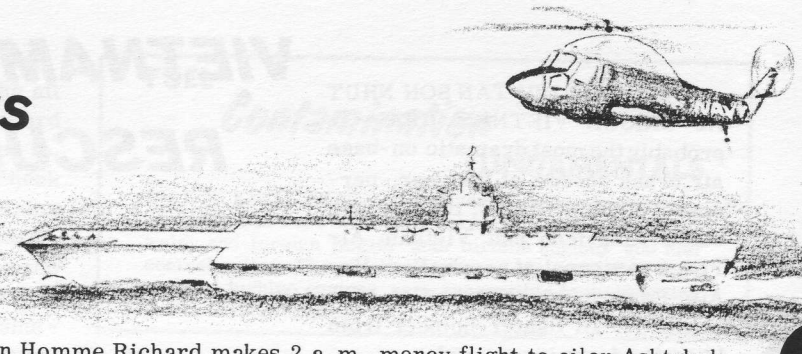
Minutes later, a Vietnam Air Force crash fire truck and crew arrived at the scene and the Vietnamese firemen fell to work with shovels to maintain the vital flow of air to their trapped compatriot. Their best efforts were barely able to keep pace with the slow sinking of the wreck and the instability of the semi-fluid mud. The situation was saved by the arrival of a heavy American truck crane manned by a Vietnamese crew which succeeded in finding a way over the soft ground without bogging down. The crane crew hitched a cable to the front of the wreck and raised it a few feet. Sergeant Walther scrambled under the cockpit, cut the pilot's safety harness and carried him through the mud to the waiting helicopter. He was immediately evacuated to the U. S. Army Dispensary at Bien Hoa where a medical checkup showed that his injuries were superficial.

The skill of the two rescue men was instrumental in saving the young pilot's life, but without the recently arrived HH-43B to speed them to the scene and its special equipment to reduce the danger of fire, the pilot would probably have perished before effective help could reach him. K

1000-Hour Pilot Awards

The names of seven more HH-43B pilots have been added to the growing list of those who have logged 1000 hours in Kaman helicopters. Receiving the award given by KAC in recognition of this achievement are: Capt Jerry A. Crupper, and Capt Robert S. Henderson of ARS Det 10, AARC (MATS), Aviano AB, Italy; Capt Charles R. Dunn, ARS Det 5, AARC, Hahn AB, Germany; Capt Glenn M. Marks, Det 2, EARC, Dow AFB, Maine; Capt Raymond L. Foster, Headquarters, EARC, Robins AFB, Ga.; Capt Joseph W. Kelly, 3638th Flying Training Squadron (heli), Stead AFB, Nev.; Capt Henry Q. Long, ARS Det 12, CARC (MATS), Randolph AFB, Texas; and Capt Keith A. Spencer, Det 1, 1129th USAF Spec Acty Sq., Las Vegas, Nev. In left photo, Captain Charles E. Trapp, Jr., is shown congratulating Captain Spencer upon completion of his 1000th hour in the HUSKIE. In other photograph, Col Donald E. Matthews, commander of AARC, presents a KAC 1000-hour award to Capt Albert E. Hooper, Jr., HH-43B flight commander in the 58th Air Rescue Squadron at Wheelus AB, Libya. (USAF photos)

SEASPRITE ACTIVITIES



...UH-2 crew from HU-1's Det Echo aboard USS Bon Homme Richard makes 2 a.m. mercy flight to oiler Ashtabula to aid seriously injured crewman. Because of fire hazard from oiler's fumes, helo lowers Dr. J.M. Volk onto guided missile destroyer Berkley steaming alongside of Ashtabula. Due to weather conditions and darkness, UH-2 makes approach to Berkley under complete instrument guidance and hovers in 24 mph winds over ship's stern during lowering operation. Doctor highlined from Berkley to Ashtubula afterward and treats injured man. Pilot of UH-2 is Lt(jg) F.J.Hall and LCdr L.F.Bowman is copilot. Crew members are C.J.Britt, AN; and W.E.Zimba, AMS3.

...UH-2 crew attached to Det 42, HU-2, flies through intermittent rain showers to rescue seaman who fell from flight deck of USS F.D. Roosevelt. Helo pilot is Lt(jg) Paul W. Kayle, Lt(jg) Harry E. Higginbotham, copilot; Bruce M. Laurendeau, AMH2, and Richard F. Parry, ATN, crewmen.

...SEASPRITE crew from NAS Key West, Fla., flies 120 miles to USS Wilkenson to aid seaman seriously injured when hatch is closed on hands. Lt Robert Bruce is pilot and LaWayne J. Finkhaus, AD1, crewman aboard UH-2. Stretcher hoisted aboard helo and seaman taken back to naval hospital at Key West....SEASPRITE from HU-1's Det Bravo takes off from deck of USS Ticonderoga after seaman falls overboard. Survivor rescued in eight minutes. Lt(jg) F.G. Riehl, UH-2 pilot; Lt(jg) C.R. Trail, copilot; J.A. Shanks, ADJAN, and J.E. Geier, ADR3, crewmen.

...SEASPRITE from HU-1's Detachment Mike aboard USS Ranger brings water and supplies to landing party during 4-day training exercise held in the Zambales Training Area at the U. S. Naval Station, Subic Bay, P.I. (Official USN photo)....SEASPRITE flown by LCdr Frank Herndon and Lt Dale Myers at NS Adak, Alaska, conducts hazardous search for fishing boat captain pitched out of small boat during high seas. Search made over small inlet despite extreme turbulence created by combination of high winds and cliffs. Helo also called on for photographic work and to investigate old volcanic crater for signs of possible reactivation.

...SEASPRITE from HU-2's Det 59 on night plane guard at 2125 when flares sighted eight miles from USS Forrestal. Both survivors of plane crash picked up by helo and returned to ship at 2150. Lt W.E. Aylward pilot of UH-2 and Lt(jg) L.L. Scott is copilot. J.B. Gilbert, AMS3, is hoist operator and M.J. Napalo, AMH3, on standby.

...Marine pilot whose plane skidded off deck of USS Hancock after landing, back on deck five minutes later thanks to efforts of UH-2 crew from HU-1's Det Lima. Speedy rescue made despite high sea state and hoist cable becoming snagged on seat of downed aircraft. Survivor untangles cable and hoisted to safety. Lt(jg) J.M. Fagundes, pilot of rescue helo; Lt(jg) R.J. Nohr, copilot; Ralph A. Casavant, ADRAN, and George E. Morgan, PR3, crewmen.

...SEASPRITE crew from HU-2's Det 62 on plane guard when fighter flames out prior to touchdown and pilot ejects at end of deck on USS Independence. Pickup made with rescue seat minutes later. LCdr C.S. Sapp is UH-2 pilot and Ens P.R. Lehrfeld, copilot. P.C. Jones, ADR2, and E.C.Hauser, ADR2, crewmen.

FIRST TO LOG 1000 IN UH-2—Lt(jg) Larry W. Beguin, center, of HU-1, NAAS Ream Field, Calif., is presented desk set award by Don Alexander, Kaman Aircraft senior service representative. Cdr Dale W. Fisher, left, commanding officer of HU-1, was also on hand to offer his congratulations. The award is made by KAC to those logging 1000 hours in helicopters produced by the company. Lieutenant Beguin is reported to be the first SEASPRITE pilot to pass this mark. The lieutenant participated in the UH-2 Fleet Indocrination Program at NAS Patuxent River, Md., and delivered to HU-1 the first UH-2 assigned to the Pacific Fleet. While in the squadron Lieutenant Beguin served as plane commander, test pilot and standardization instructor in the SEASPRITE. In his three and a half years as a Navy pilot, he has amassed over 1800 accident-free hours in eight types of aircraft. This impressive total includes 210 night hours in the UH-2 (equivalent to 8 days and 18 hours) and two rescues at sea. (Official USN photo)

CNO VISITS NAS JAX—Adm David L. McDonald, Chief of Naval Operations, alights from UH-2 piloted by Lt Leon Venters while on inspection tour of the naval complex at NAS Jacksonville, Fla. Admiral McDonald arrived in the SEASPRITE with RAdm Robert Goldthwaite, Commander Fleet Air Jacksonville. Standing by to assist is Donald Welch, ADR1. In middle photo, Admiral McDonald is greeted at NAS Cecil Field by the commanding officer, Capt S. D. Wright. In third photo, Capt Charles H. Turner, commanding officer of NS Mayport greets the Chief of Naval Operations. William Wilkinson, ADC/AP, is at the controls of the SEASPRITE. (Official USN photos)

Cherry Point Rescues

A Navy pilot, a skin diver, the civilian survivor of a small plane crash, a heart attack victim, an ill coastguardsman and two injured marines—all were rescued or aided by UH-2 crews from the SAR group at MCAS Cherry Point, N. C.

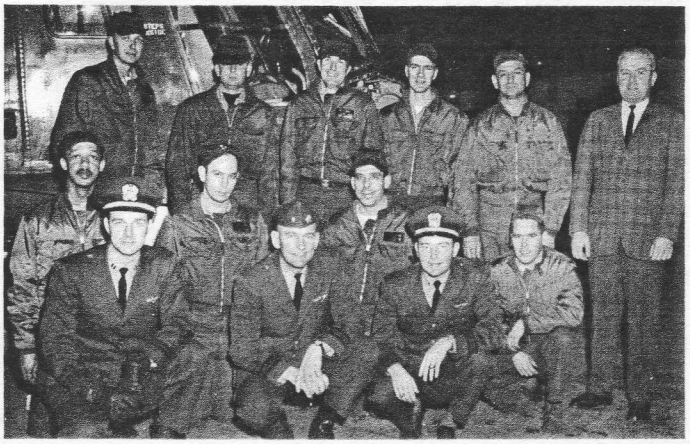
The SEASPRITE was just being launched when the crew received a "Mayday" call from the Navy pilot who was ejecting from his A-4E 16 miles from the station. As he landed in a swamp, the helo was overhead ready to make the pickup. Capt John L. Pipa, USMC, was UH-2 pilot, and SSgt Fredie S. Hamel and GySgt Roy D. Logan, crewmen.

The UH-2 responded to a call for assistance from a small boat after a civilian aboard was injured while skin diving. Aboard the SEASPRITE were Capt Gerald E. Harbison, USMC, pilot; GySgt William G. Toerne and SSgt George N. Burns, crewmen; and Lt R. Van Scoy, MC, flight surgeon. In another incident, the badly injured pilot of a civilian plane was taken to the hospital by a UH-2 crew. The plane crashed at night in a heavily wooded area. Captain Pipa landed the SEASPRITE in a small clearing to make the pickup. Crewmen were Cpl David Moser and LCpl Lynn K. Radcliffe. Lieutenant McDaniels, MC, was flight surgeon. Prompt delivery of the injured pilot to the hospital and the medical aid given at the crash site were credited with saving his life.

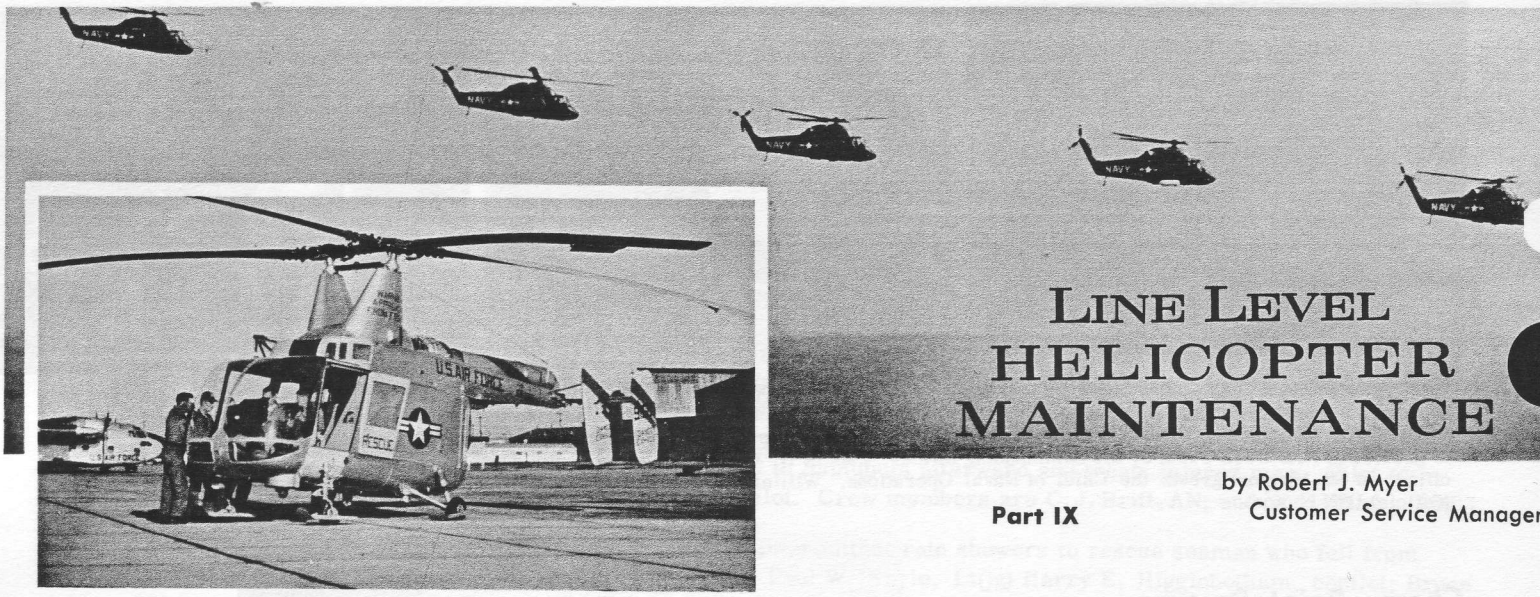
A civilian at a Coast Guard Station was taken to the hospital in a UH-2 from the Marine Air Station after suffering a possible heart attack. Captain Harbison was pilot and Corporal Moser and LCpl Robert T. Bradley were crewmen. A UH-2 crew also flew 90 nautical miles to sea to evacuate an ill seaman aboard a Coast Guard lightship. The pickup was made with a hoist and sling. Captain Pipa was pilot and Sergeant Hamel and Corporal Bradley, crewmen.

In an early morning flight, two marines, who were burned when a shower unit blew up at MCAF, Bogue, N. C., were taken to the hospital at Cherry Point in a SAR UH-2. Captain Harbison was pilot and crewmen were Sergeant Hamel and Corporal Bradley.

MARINES HONORED–Scrolls of Honor are presented to three members of the SAR unit at MCAS Cherry Point, N.C., by BrigGen Norman J. Anderson, station commanding general. Left to right are LCpl L. K. Radcliffe, crew member; Capt J. L. Pipa, pilot; General Anderson; and SSgt F.S. Hamel, copilot. The UH-2 crew received the award for the hazardous night evacuation of an injured seaman from a freighter about 30 miles off the North Carolina coast. (USMC photo)



FIRST AT ADAK—Shown are Navy personnel who formed the first UH-2 crew at the U. S. Naval Station, Adak, Alaska. Both the station and NAS Barber's Point, Hawaii, are represented, for the UH-2's first assigned to Barber's Point were later transferred to Adak to provide SAR capability for the area. Front row, left to right, are Lt William H. Sumrall, LCdr Jim A. Meyer, LCdr Frank C. Herndon. Second row, John Major, AMH1; Charles McIntire, AMS2; Frank Cavyell, ADJ2; and Jack Blevins, ADR2. Third row, Edmund Martin, AE1; Jimmie Petty, AMSAN; James Daughtry, AE2; James Peasley, ATR3; Edgar Houlahan, ADR1; and Francis Heffernan, Kaman service representative. Barber's Point personnel have since returned to sunny Hawaii and Lt Dale Myers and Lt Herchal McDaris, who also aided in setting up the operation, returned to NAS Whidbey Island, Wash. Heffernan had high praise for the cooperative manner in which "all hands" pitched in to get the SAR unit in operation. (Official USN photo)



LINE LEVEL HELICOPTER MAINTENANCE

Part IX

by Robert J. Myer
Customer Service Manager

In the last issue of Rotor Tips the topic of cleanliness of aircraft and work area was dealt with under the heading of General Maintenance. Torque and safetying requirements, which fall in the same category, are now considered.

Torque and Safetying Requirements

This may seem like an odd association of aircraft maintenance concerns until you consider their basic relationship. Since the first mechanical device was built, one of the biggest headaches has been to keep the parts together. Obviously the degree of concern was (and still is) directly related to the forces involved and the criticalness of the function. Through the years, many attaching methods have been developed covering the extremes from baling wire to welding. Recognizing that most moving parts are subject to wear and replacement, welding became relegated primarily to structural non-moving part applications, and pins and bolts came to the fore as the more versatile attaching devices. The next problem was to provide a means of keeping the pins and bolts from loosening and falling out. The resolution of this problem spans the gamut from the use of wire or a cotter pin in the end hole of a fastening pin to a combination threaded and riveted nut and bolt. Although both extremes have numerous applications, experience to date on a majority of significant mechanical devices dictates the need for a compromise attachment more reliable than the simple wired pin and more easily disassembled than the threaded-riveted combination. Here we reveal the primary subjects of our discussion, the ever-present standard nut and bolt. But again, we are plagued with the problem of working and loosening as the mechanical devices are required to perform under increasingly higher speeds and loads. Numerous safetying devices and methods have been developed in the attempt to resolve this last concern. Those principally used in the aircraft industry are castle nuts and cotter pins or safety wire; nonmetallic friction inserts in nuts or in recesses in bolts; tempered, distorted nuts employing metal-to-metal friction; tablock washers; and drilled head safety-wired bolts in plain threaded holes. A cement is also available to supplement, or under certain conditions, to be used in lieu of these safetying devices.

Under nominal load or stress conditions the standard bolt with one of the accepted safety devices performed satisfactorily. But as higher loads per weight and greater operating efficiencies were required, as is the case with aircraft in general and helicopters in particular, components again began to "work" at their attaching points and, in many cases, bolts were found to still be loosening. At this point engineers started to give more consideration to attaching bolt torque. They determined that by tightening a bolt to its allowable tensile limit, normally in excess of the operating forces acting on that part of the joint, the joint and bolt did not "work," the structural capacity of the joint was improved, and the bolt had less of a tendency to loosen. The bolt in effect becomes a heavy spring, prestressed (by torque) to the point that it does not "feel" the lesser operating loads to which it is subjected. This principle has been developed to the degree that many applications require the use of much stronger bolt materials and torques far in excess of their standard counterparts. Also, inasmuch as the tensile loads in a bolt (or any component) is more directly related to its "stretch" than to the torque applied, very critical applications require tightening to a closely defined length or length differential. This is established by: before and after micrometer measurements; use of PLI (preload indicating) washers; protruding indicator pins; etc.

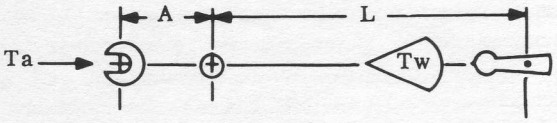
The preceding may sound like more theory than practical maintenance application, but it is hoped that it provides the reader with a little better appreciation of the importance and practical aspects of safetying and torque. As indicated earlier, proper application of safetying and torque requirements is of particular concern in helicopters due to the large quantity of primary, continuously operating components. In addition to adherence to the directions specified in the related sections of affected handbooks, the following general recommendations are offered:

1. Regarding torquing requirements -
   (a) Use proper equipment. Don't attempt to estimate torque manually. On smaller diameter bolts you are more apt to overtorque than undertorque which can result in overstressing of the bolt and premature failure.
   (b) Insure that torque is being applied against adequate threads and not against a bottomed out grip length. The latter condition will provide incorrect retention and can also result in overstressing of the bolt and premature failure.

(c) For precise torque, allow for locking device friction.

(d) Treat torque wrenches as precision instruments; store them in suitable containers; and have them checked and recalibrated periodically. On smaller diameter bolts or low torque requirements a small actual error can be a large percentage error.

(e) Fully understand the leverage principles and/or abide by the related instructions when using a torque wrench with an offset or crow-foot adapter.



Tw = Desired torque wrench gage value
Ta = Desired torque to be applied to nut or bolt
L = Effective torque wrench length
A = Adapter length

$$Tw = \frac{Ta \times L}{L + A}$$

Example: Ta = 250 lb.-in.
L = 12 in.
A = 2 in.

$$Tw = \frac{250 \times 12}{12 + 2} = \frac{3000}{14} = 214 + \text{lb.-in.}$$

2. Regarding safetying and locking devices -

(a) Use specified wire or cotter pins and secure in an approved manner. When safety wiring a group of bolts, only attach a maximum of three together. In helicopter control systems, insure that safety wire or cotter pins do not create interferences.

(b) Elastic stop nuts and the other non-metallic friction locking devices require more consideration than they are normally given. The subject is well covered in a November 1961 NAVWEPS Approach article entitled "Nuts and Bolts." The key points presented were:

(1) Avoid any action that could reduce holding pressure of the insert such as tapping, using a sawed off bolt (or one having a safety wire hole), or subjecting them to excessive heat (121°C. or 250°F.). Friction is obviously also reduced when bolt or nut threads are exposed to lubricants prior to use.

(2) Discard as directed or when friction is obviously lacking. As indicated in the above-referenced article, "the cost of an aircraft and a pilot far exceeds the cost of a new nut."

(3) Insure that at least one full thread protrudes through the insert.

(4) Use this type of locking device on part joints that are not subject to relative motion. Avoid using them on joints in control systems or similar working connections.

(c) Tab locking washers and similar devices also warrant much attention.

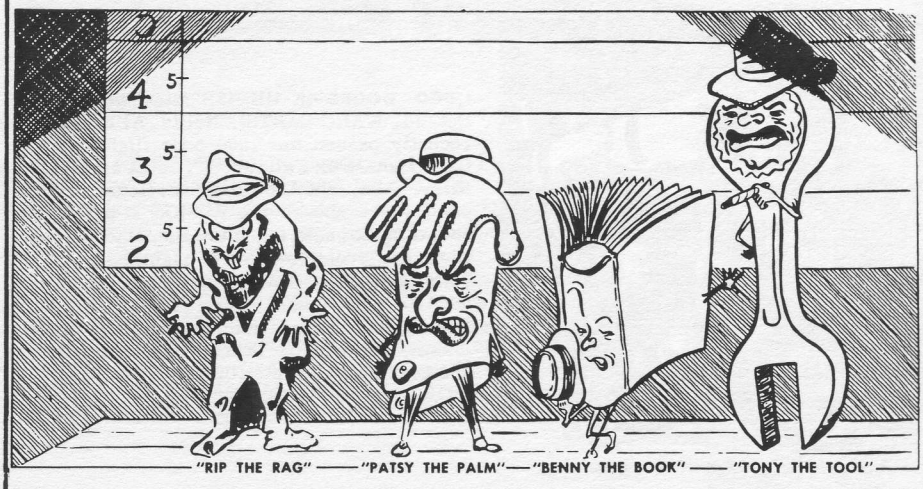
(1) They should be discarded after use to avoid possible re-use of earlier bent tab and/or use of washer with inconspicuously damaged key locking tang from previously applied torque.

(2) Key locking tang should be checked for condition and sufficient engagement at time of installation.

(3) Surface of tab lock washer adjacent to nut or bolt head should be lightly lubricated to reduce friction and possibility of shearing off or damaging locking tang.

In concluding this section your attention is again directed to the need for constant diligence and alertness on the part of aircraft maintenance personnel. The fastener industry has provided us with many fine devices with which we can satisfy attachment, retention and security requirements of practically any combination of conditions. However, these devices are only as good as the person who installs them. Unfortunately the lack of, or improper application of, a safety or torque requirement can, and often does, cause major equipment damage and loss of life.

FOD FACTS



A few years ago a warning appeared in Rotor Tips against these "culprits" which had been found "hiding" in the air-scoops of reciprocating engines. What ever happened to them?

This "gangster element" is still around, only now they have another alias —"FOD." If ingested into a turbine engine they can cause foreign object damage and possibly an in-flight failure. NEVER RELAX YOUR VIGILANCE, for these and other insidious characters like "Clip the Cotter Pin," "Nobby the Nut," "Fastener the Fink," and "Willie the Wire," may be lurking in your work area waiting for the chance to do their dirty work. Beware! Beware! Beware!

Huskie Happenings

...Fighter pilot pulled from smoke-filled cockpit of crashed and burning plane at Aviano AB, Italy, as 20mm ammunition begins exploding. As local HH-43B from ARS Det 10, AARC (MATS), hovers overhead, air rescue firemen leap from HUSKIE to aid ground personnel in freeing trapped pilot struggling to open canopy. Rotor downwash, used to supply cooling air for rescuers, also credited with keeping nose of plane cool and other ammunition aboard from exploding. Fighter pilot, seriously injured in crash but not touched by flames, treated at Aviano and short while later taken in HH-43B to Vicenza Army Hospital 50 miles away. Manning HUSKIE during both flights are Capt Jerry A. Crupper, pilot; Capt Robert S. Henderson, copilot; SSgt Kenneth M. Andrews, and A1c Charles W. Nagy, Jr., firemen; A1c Turllis E. Hollyfield, medic. Capt Gerald Fogel (MC), flight surgeon made the trip to the hospital with the survivor.

...Crew of HUSKIE from ARS Det 12, WARC (MATS), George AFB, Calif., flies into narrow mountainside cleft at 6500 feet altitude to evacuate fatally injured climber. Evacuation by air deemed necessary to preclude additional risk to ground rescue party in making descent. Two sorties made after pilot of another type helicopter indicates he is unable to make pickup because of altitude and close proximity to sheer mountainside. Stokes litter lowered from HUSKIE and accident victim hoisted aboard. Bladetip clearance during hover is 15 feet on one side and five feet on other. Capt Jay M. Strayer was RCC; Captain Jack D. Peak, CP; A1c Alexander Montgomery, HM; and MSgt Leonard W. Jones, MT....HH-43B attached to Det 12 passes 1000-hour flight mark on Dec 4, 1964....HH-43B crew from 54th ARSq flies through driving snowstorm to scene of C-133 crash near Goose Air Base, Labrador. Investigation reveals that there were no survivors. Capt Fernand M. Espiau is RCC on hazardous flight, Capt Thomas F. Madden, copilot, and A2c Richard A. Pink, medical technician.

...Crew of HUSKIE from Det 7, AARC (MATS), Torrejon AB, Spain, on night training mission when Spanish F-86 crashes and burns. 1stLt K. E. Ernest, HUSKIE pilot, flies to area and injured pilot who bailed out is picked up and in Torrejon hospital 10 minutes after HH-43B crew saw his plane crash. Flaming wreckage extinguished later with FSK at request of Spanish authorities unable to reach inaccessible site. With Lieutenant Ernest are 1stLt V. M. Liebernecht, copilot; A1c A. R. Battaini, crew chief; A1c P. R. Martin and A2c E. T. Doughty, Jr., rescue specialists; A1c J. D. Burnett, medical technician....HH-43B from ARS Det 5, WARC (MATS), McChord AFB, Wash., makes night overwater flight through 45-knot winds and heavy rain to rescue four duck hunters from tide-swept island in Puget Sound. Capt Warren K. David, pilot, makes hazardous landing between three large tree stumps in marsh as he is guided by 1stLt Jason K. Bridge, copilot, TSgt Eddie Hagerman, crew chief, and A1c William J. Emery, medical technician. Survivors and equipment loaded aboard and flown back to McChord.

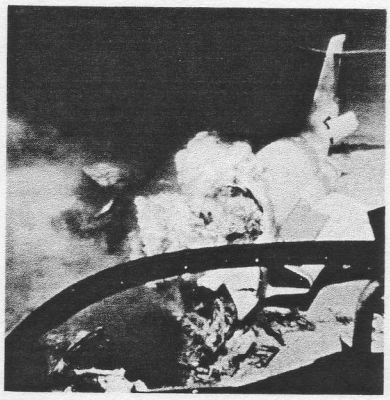
...HH-43B crews from ARS Det 11, CARC (MATS), Laughlin AFB, Texas, make two 145-mile trips to hospital to evacuate military personnel injured in accidents. Airman with severe head injuries suffered in fall from moving vehicle evacuated by HH-43B crew consisting of Capt Leonard L. Hills, detachment commander, RCC; 1stLt Arthur F. Machado, copilot; and SSgt Herman Halyard, Jr., medic. Capt Robert R. Smith, MC, was flight surgeon. Officer with part of foot severed in power mower accident evacuated during second flight in HH-43B manned by Captain Hills, RCC; Capt David B. Hightower, copilot; TSgt Edward G. Smith, medic; and Captain Smith. (Until recently, all medical evacuations made by ambulance. However, high-speed trips on highways prove to be dangerous so base and hospital officials decide helicopter evacuation is not only faster but much safer.)

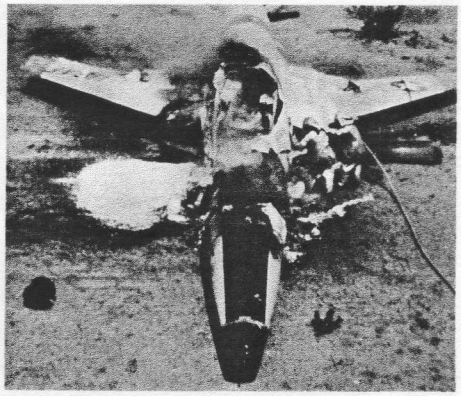
1,000 HOURS-An HH-43B attached to ARS Det 14, WARC (MATS), Nellis AFB, Nev., recently passed the 1000-hour flight mark. Capt Thomas E. Fallows, IP, 1stLt James T. Riley, pilot, and A2c Ronald R. House, crew chief, were aboard the HUSKIE at the time. Shown in the photo taken to commemorate the flight are, front row, left to right, SSgt J. V. Sells, MSgt J. H. Duehr, A2c R. L. Maticic, and Airman House. Rear row, Capt R. H. Busch, detachment commander; Capt I. S. Momii, 1stLt R. C. Tubbs, Lieutenant Riley and Captain Fallows. (USAF photo)

SERVICE TO MANKIND—Capt Herbert G. Gates, commander of ARS Det 13, EARC (MATS), at Brookley AFB, Ala., was recently presented the coveted Sertoma "Service to Mankind" award by the Mobile and Port City Sertoma Clubs. The captain was cited for rescue work "beyond the call of duty" in both military and civilian disaster situations. Club rules state the award must be presented to an individual but, in his acceptance speech, Captain Gates gave full credit for the rescue achievements of the detachment to the helicopter pilots and crewmen. "Without them, I am nothing." he said. (USAF photo)

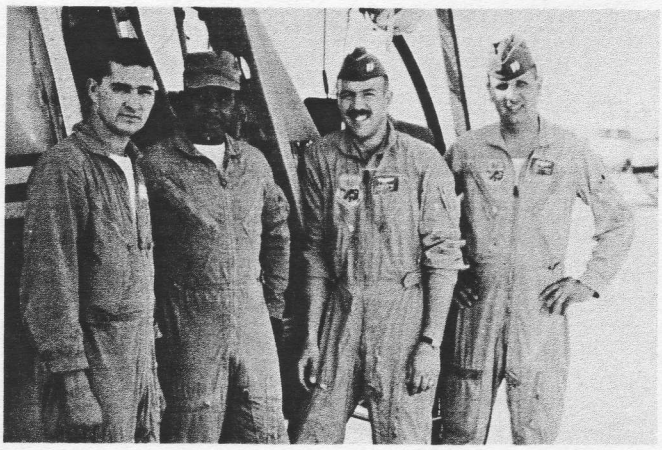
TFX AND "FRIEND"—As FSK-carrying HH-43B flies protectively overhead, the F-111 fighter-bomber lands after short maiden flight in Ft. Worth, Texas. The plane, capable of 1650 mph, was held to 230 mph, a little under the anticipated test speed, because of a malfunction in the wing flaps but the performance was lauded by observers. (United Press International photo)

CHOPPER LOGGERS—Three pilots assigned to ARS Det 10, AARC, (MATS), have amassed more than 1,000 hours each in the HH-43B. The rescue unit is located at Aviano Air Base, Italy. The three pilots are Capt Robert S. Henderson, left, Capt Jerry A. Crupper, standing, and Capt Harry A. Jones. (USAF photo)

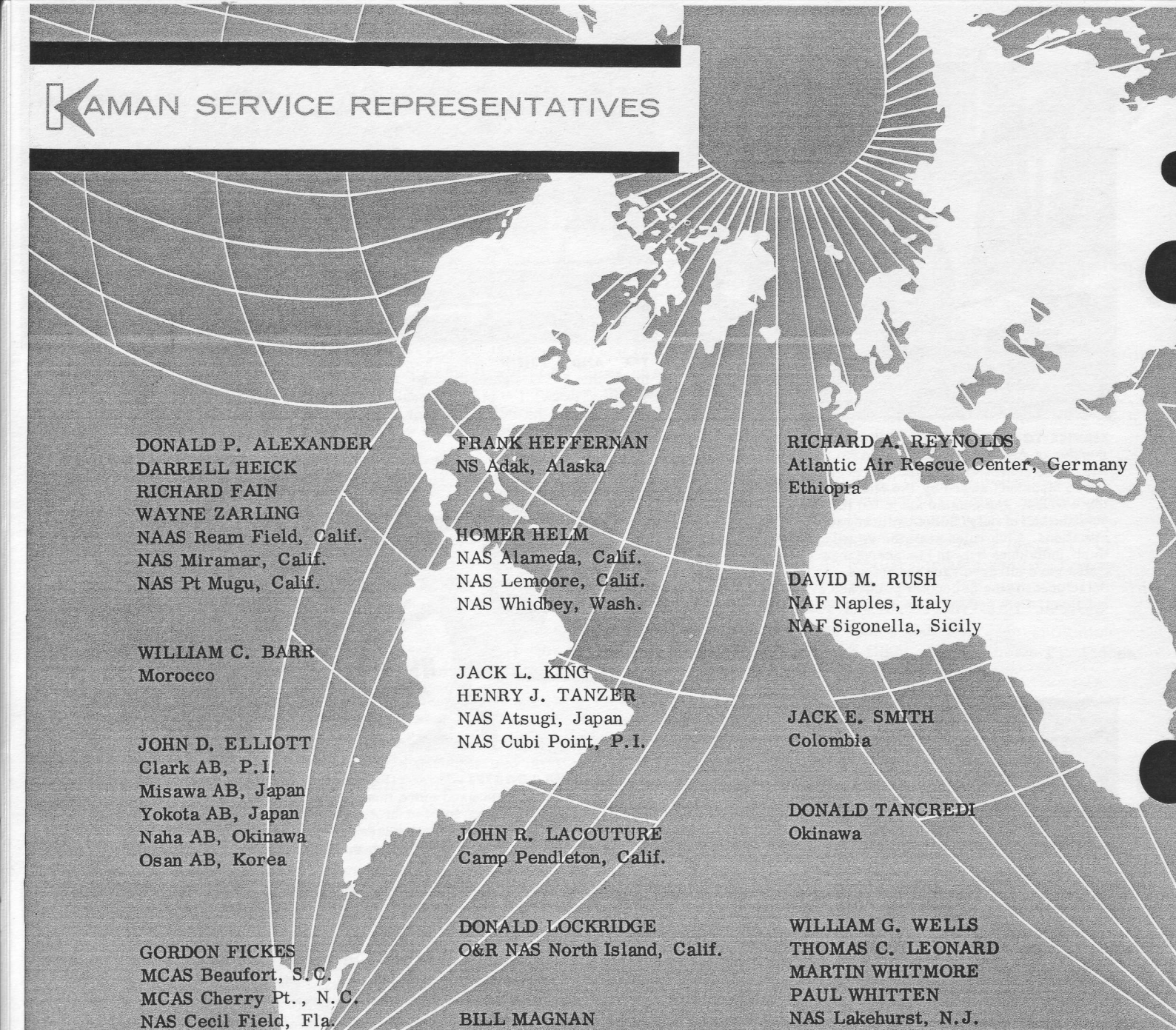




SCROLL OF HONOR—Four members of ARS Det 15, WARC, Luke AFB, Ariz., recently received Scrolls for the rescue of a pilot whose RF-101 crashed and burned in the desert. Left to right are: A1c Edward Martinez and SSgt Walter R. Basnight, firemen; Capt Dale L. Potter, HH-43B copilot; and Capt Harold D. Salem, RCC. The spectacular photographs above were taken during the mission. The approach to the burning aircraft is shown in the top left photo in the series. The others, left to right, show: hovering in on the fire after the FSK and firemen were dropped off; fire coming under control; final stage—fire out. Capt Edward Conley, MC, a doctor, was the fifth member of the HUSKIE crew and also received a Scroll. (USAF photos)



KAMAN SERVICE REPRESENTATIVES



DONALD P. ALEXANDER
DARRELL HEICK
RICHARD FAIN
WAYNE ZARLING
NAAS Ream Field, Calif.
NAS Miramar, Calif.
NAS Pt Mugu, Calif.

WILLIAM C. BARR
Morocco

JOHN D. ELLIOTT
Clark AB, P.I.
Misawa AB, Japan
Yokota AB, Japan
Naha AB, Okinawa
Osan AB, Korea

GORDON FICKES
MCAS Beaufort, S.C.
MCAS Cherry Pt., N.C.
NAS Cecil Field, Fla.
NAS Jacksonville, Fla.
NAS Sanford, Fla.
NAS Key West, Fla.

HORACE F. FIELD
Pakistan

CLINTON G. HARGROVE
Iran

FRANK HEFFERNAN
NS Adak, Alaska

HOMER HELM
NAS Alameda, Calif.
NAS Lemoore, Calif.
NAS Whidbey, Wash.

JACK L. KING
HENRY J. TANZER
NAS Atsugi, Japan
NAS Cubi Point, P.I.

JOHN R. LACOUTURE
Camp Pendleton, Calif.

DONALD LOCKRIDGE
O&R NAS North Island, Calif.

BILL MAGNAN
NS Mayport, Fla.
O&R NAS Jacksonville, Fla.

WILLIAM MORRIS
NAS Norfolk, Va.
NAS Oceana, Va.
NAS Patuxent River, Md.
NAS Quonset Pt., R.I.
NAS Argentia, Newfoundland

RICHARD A. REYNOLDS
Atlantic Air Rescue Center, Germany
Ethiopia

DAVID M. RUSH
NAF Naples, Italy
NAF Sigonella, Sicily

JACK E. SMITH
Colombia

DONALD TANCREDI
Okinawa

WILLIAM G. WELLS
THOMAS C. LEONARD
MARTIN WHITMORE
PAUL WHITTEN
NAS Lakehurst, N.J.

LOGISTIC REPRESENTATIVES

WILLIAM C. SOFIELD
NAAS Ream Field, Calif.

JOHN W. HENDRICKSON
NAS Lakehurst, N.J.

CUSTOMER OPERATIONS SECTION

G. D. EVELAND, Supervisor, Field Service Representatives.