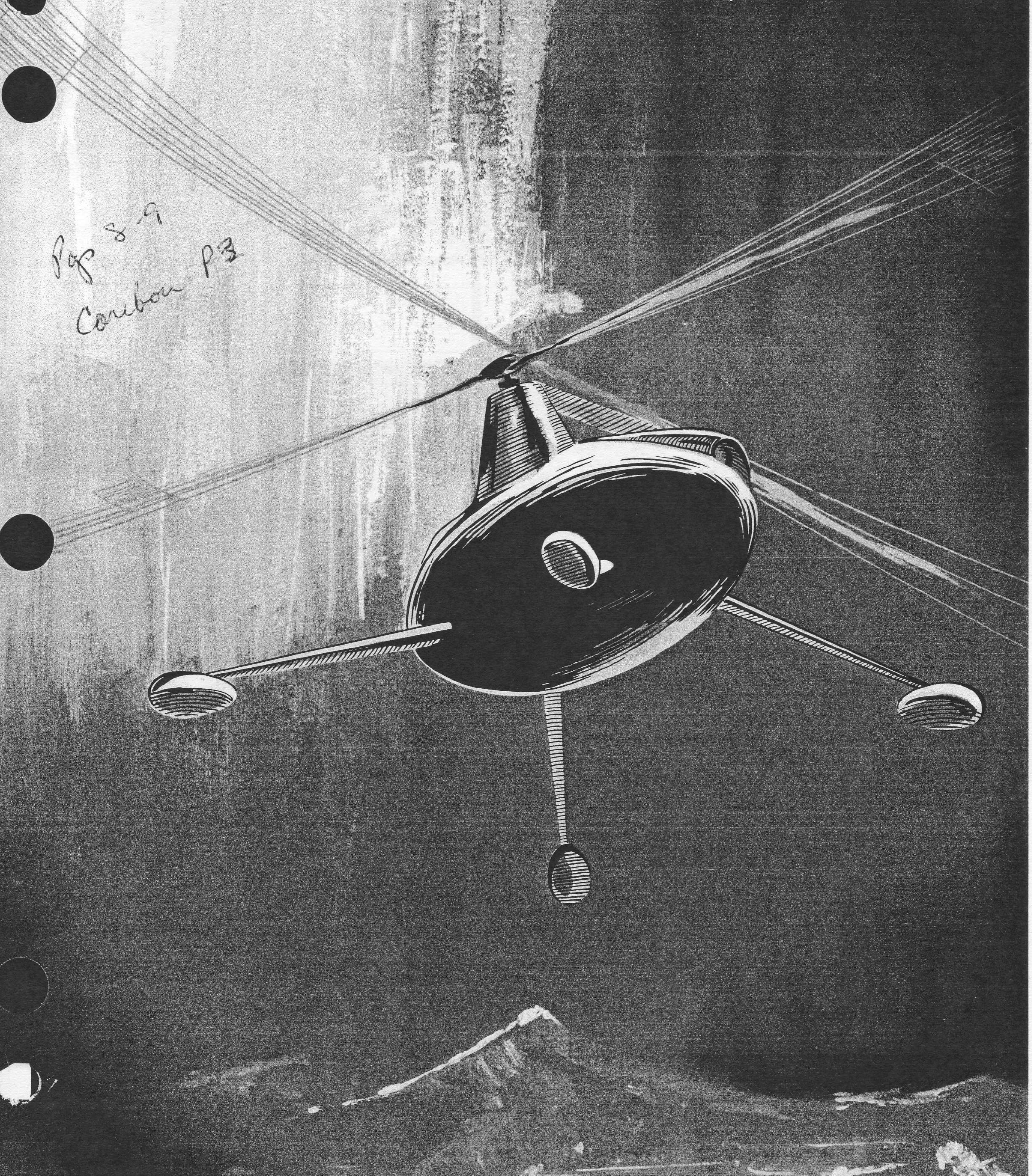
# KAMAN *Rotor Tips*



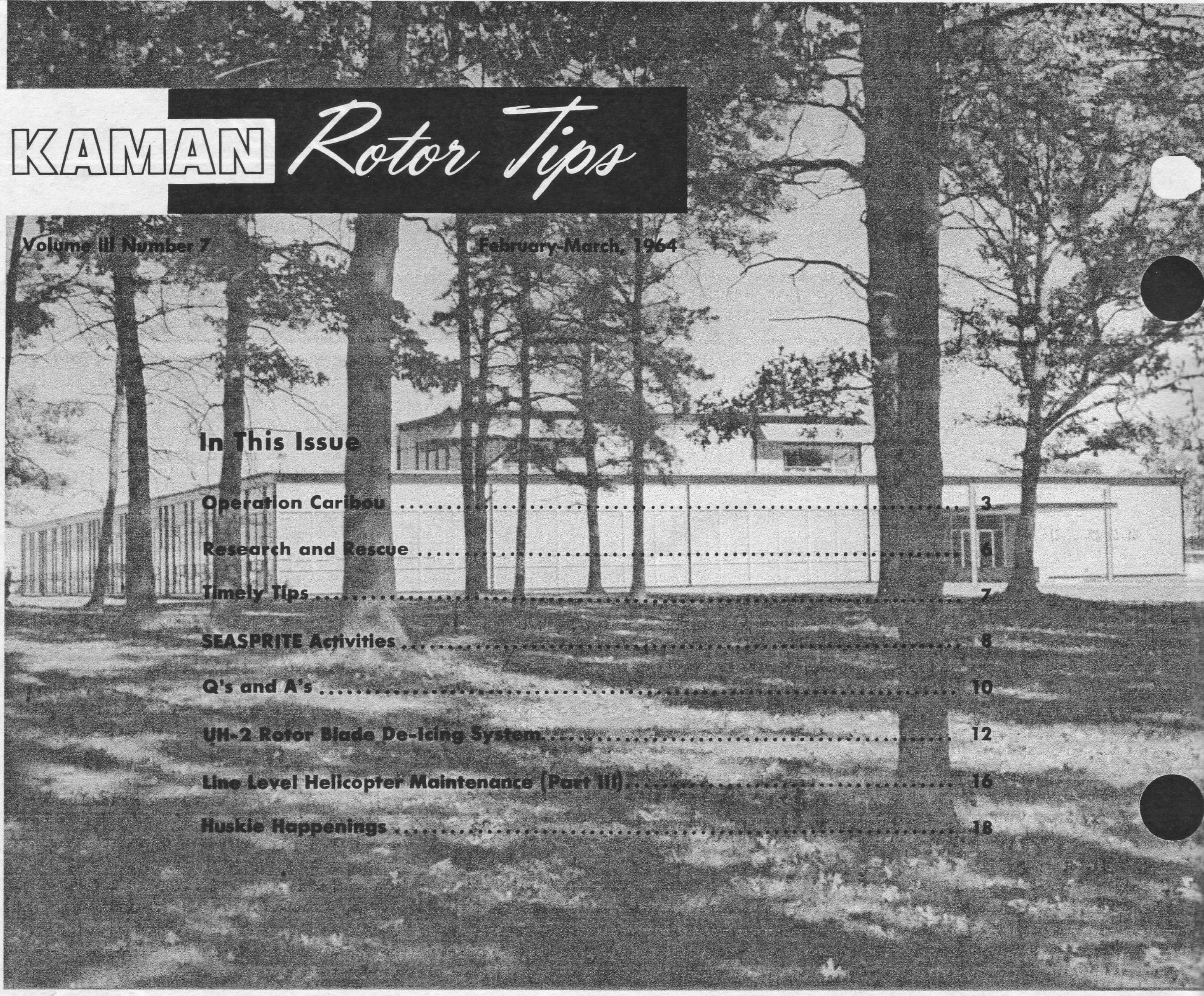

**KAMAN AIRCRAFT CORPORATION**

PIONEERS IN TURBINE POWERED HELICOPTERS

FEBRUARY-MARCH
1964

# KAMAN Rotor Tips

Volume III Number 7 February-March, 1964



## In This Issue





## THE COVER

*Artist's conception of what the unmanned helicopter of the future may look like. See Page 6 for story. Cover by Donald D. Tisdale, Service Publications.*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# OPERATION *Caribou*


By Richard Day, SN
Public Information Office
HU-4 NAS Lakehurst, N.J.

Caribou airlift?? Maine?? What mad manner of assignment is this, pray tell! Perhaps the Navy has decided to enter the animal trading business?

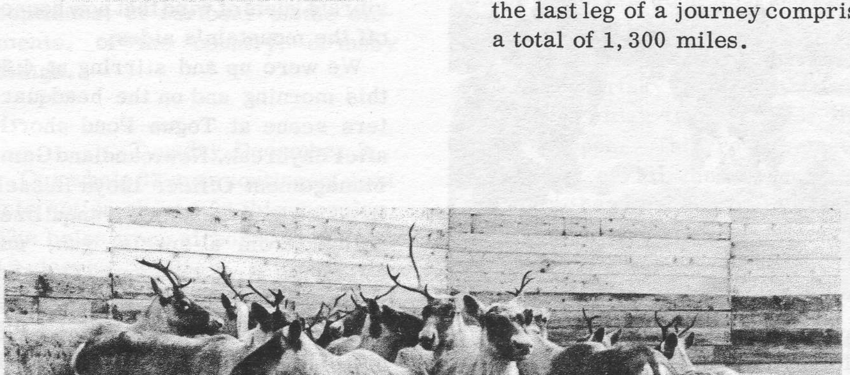
Well, as we all know, the Navy is interested and sometimes involved in goodwill business of various types. It's a part of our job to promote goodwill and public relations and to be concerned with projects which are advantageous to the U. S. whenever possible, and this rather unusual job of running an airline for transient caribou befell the foul-weather fliers of HU-4.

Our part of "Operation Caribou" was airlifting, via our helicopters, 24 of these large animals to a mountaintop in Maine in what was to be the last leg of a journey comprising a total of 1,300 miles.

After being informed of the project and after the initial strangeness of the task wore off, we did a bit of research on this remote member of the moose and deer family and the operation it instigated. We found that before the turn of the century, caribou were quite plentiful throughout the northern reaches of Maine, until suddenly migrating, most probably in a search for more and better food, they became extinct in this country. It was in 1959 that a plan began to take shape to restore the caribou to the Katahdin Mountain range where the herds once roamed. Finally a trade was consummated between the state of Maine and Newfoundland, and this transaction sent about 400 grouse to the northern territory for 24 caribou.

The operation swung into action on Nov. 28th. A herd of the animals was chased into a Newfoundland Lake, lassoed, and brought by trucks to Togue Pond at the base of Mt. Katahdin. Here they awaited the final stage of the trip; this one upward, via U. S. Navy helicopter.

On Sunday, Dec. 1st, the 16-member "Operation Caribou" team departed NAS Lakehurst for Millinocket, Maine, headquarters for the project and the base for our two helicopters, under the personal supervision of Cdr C. C. Coffey, commanding officer of HU-4. The other pilots were Lcdr H. J. Sundberg, Lcdr P. H. Kirchner and Lt F. J. Lakeway.

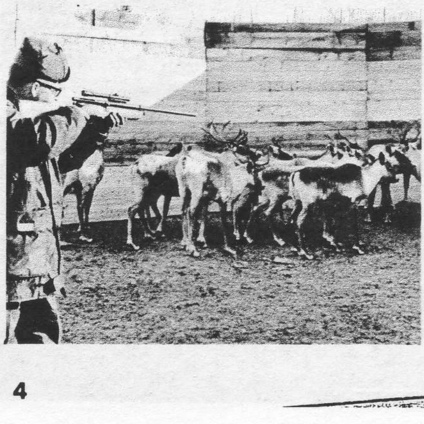


Sunday December 1..

The caribou being absent from our mountains for nearly 70 years, we set out today with firm and optimistic authority for getting this job done—and a job not to be without its difficulties and hardships. For here in the untamed far north country, there is a treacherous terrain, with ruthless, driving blasts of icy wind. Those who came along expecting a stimulating and invigorating New England vacation of skiing and cozy firesides were somewhat disappointed.

Thirty-three men in all are involved in this transplantation. Eighteen does and six stags have been brought from the wild interior of Newfoundland and now await within view of their new home. The snow-capped range of Mt. Katahdin was chosen because of its supply of lichen, a moss which is the caribou's favorite food, and also because of its uninhabitability by man.

This morning we were several hundred miles south, in the relative warmth of New Jersey's flatlands; now we are at the foot of this giant Kilimanjaro-like adversary. Tomorrow our two helos will take the caribou some 3,400 feet up the scarred face of Maine's highest mountain to the cold region of the northwest plateau where they will add life and beauty to the barren wastes of the great 'rock! The durable, magnificently rugged animals are now impounded in a corral, sturdily built to withstand the strongest abuse.



The caribou arrived here in their trucks at 11 o'clock this morning. Their trip began Thanksgiving Day; and now, some 1,300 miles later, here they are and apparently none the worse for wear. Fish and Game Commissioner Ronald T. Spears said that one of the captured beasts escaped as they were being herded into the trucks, but the rest of them discovered that things weren't really all that bad. They were virtually spoon fed during the journey, riding in the darkness of the vans. A game warden and veterinarian were among the members of the entourage making the sojourn. So, tomorrow morning, weather permitting, our flexible and maneuverable mechanized 'birds' of the present will aid the rough and mighty animals of a past generation in pursuing their course away from civilization; and thus contribute to the effort to reestablish a caribou herd.

#### PLATFORMS INSTALLED IN UH-2'S

This afternoon our two jet helos were equipped with specially constructed platforms which will be carried inside cargo nets to help support the animals. They will be

put to sleep, fastened to the platform with line, and hauled away. After their release, they're on their own. Game Division Chief Kenneth Hodgdon, who supervised the four-day trip from Newfoundland, said that Maine game biologists will maintain a constant surveillance of the caribou. They will be especially observant of their migration habits.

Monday, December 2..

Mt. Katahdin, so often the oppressor of man, with its fierce elements has frustrated our project. "Operation Caribou" has been temporarily delayed. Angry 43 mile-an-hour winds and dangerous cloud coverings blanket the drop area at the northwest plateau, causing the postponement of helo lifting the caribou from Togue Pond. At the moment, with one eye cast upon the dark skies above, plans call merely for waiting for the first break in the weather. The drop will be attempted at the earliest possible hour.

#### SEASPRITE CREWS OVER DROP AREA

Four runs over the drop area were made this morning, but the ruggedness of our men and 'birds' was no match for nature's worst. Commander Coffey, in Arctic dress, emerged from his helo and said, "It's wild up there. The turbulence gave us quite a pushing around at 3,000 feet. The 40 knot winds made it unsafe to attempt anything." The commander said these runs were not useless, however. They familiarized our crews with the area, which is treacherous at best, and especially so when augmented by the

vibrant gusts of wind that now bounce off the mountain's sides.

We were up and stirring at 4:30 this morning and on the headquarters scene at Togue Pond shortly after daybreak. Newfoundland Game Management Officer Lloyd Russell fired a sleep-inducing tranquilizer pellent from a special gun, and felled the first caribou. The shot contained a capsule with a dart-shaped head to penetrate the tough hide. Russell struck the animal in the hind quarters and 12 minutes later it was sound asleep. Crews then entered the large corral, turned the animal over, and trussed and bound the four legs with heavy rope before carrying it to an adjacent compound where it was further prepared for the lift. Dr. Ladd Heldenbrand, a Portland veterinarian, injected each animal with penicillin, a precautionary measure against any injuries or illness in the 20-below-zero weather. A team of biologists next took their turn. They attached metal tags to the ears and antlers, and painted large yellow markings on the caribou. This was to help Game Management personnel maintain a constant vigilance on the herd.

**VIOLENT WINDS ENCOUNTERED**

Then at 8:40, a radio report cautioned us of the violent winds whipping across the scarred, jagged face of Katahdin. Our crew made a practice run over the area, but Commander Coffey ordered a one-hour delay in anticipation of the


winds becoming more manageable. While we waited, we talked; for it seems our 24 friends captured in Newfoundland and marked for residence on the vast Katahdin have caused no end of excitement in these parts.

A messenger interrupted us and said the decision was made to postpone the lift for today. So our project moved back one day, and as we all return to Millinocket the talk continues; of caribou, of the elements, of the country, of many things.

Tuesday, December 3..

Our whole 33-man contingent went into action about 4:30 this morning. The helos were airborne at 7:20 in 18-degree weather, ferrying the five-man team and 300 pounds of supplies up to the drop sight. The weather at this time was clear and crisp. A three-knot wind rippled the green growth laying against the snow-crowned Katahdin. Our helo was over the pick-up point at Togue a few minutes before eight o'clock. The first two caribou were placed upon the wooden cradle, their legs trussed, and blanketed with canvas. The machine then eased them upward, like a giant bug lifting a baby, and at 8:04 a.m. the first two caribou landed on the slopes of Katahdin, where they had once thrived in abundance. All of us involved felt a particular sense of accomplishment and pride as they were hoisted skyward, dangling from the Scooter, and deposited safely in habitation


equally as unspoiled as they. At exact intervals, the lift continued with perfect ground-to-air coordination. On the ninth trip of the day the weather suddenly and quickly developed for the worst. One of the caribou on this ride apparently worked her head loose in flight, and a line holding the canvas strangled her to death.

**UH-2'S LIFT FIVE FROM MOUNTAIN**

Commander Coffey ordered a halt in the proceedings. The weather had become too dangerous for operation. The two jet helos just did beat the approaching storm, lifting the five men at the drop area back to Togue Pond, and with a sigh of relief we all returned to Millinocket. At this time six does still remained in the Togue compound. Tonight Game Biologists John Hunt and Dana Holmes said that when they saw the animals released up on Katahdin, they were frisky and healthy and "took off," high-tailing it for the upper slopes. This report eased the minds of all those who have worked so hard and long on this project. There has been considerable concern over how the animals would react after the week-long ordeal of a 1,300 mile trip climaxed by a dramatic aerial lift. That concern has now been eased. All that re-

mains is that break in the weather which will enable us to complete the shift of the remaining six does. It is a cold and bitter night.

Wednesday, December 4..

Commander Coffey told everyone last night that the helos would have to return to Lakehurst tomorrow, come what may. We all hope the storm will let up long enough for us to put the finishing touches on this task before going home. But opening our eyes this early morning it was still there, as intense as ever. Things did not look promising. At mid-morning, the Maine Fish and Game Department decided on their only other alternative. They would lug the last six caribou via trucks up the side of the mountain as far as possible. There the does would inevitably find and join the rest of their herd. We all feel this is the best decision, because no one can foretell what may occur during an indefinite delay. A move had to be made immediately.

As this final entry is made, we are heading back to Lakehurst in our trusty Scooters. Over the radio we learned that back on Katahdin, all had gone well as could be expected. The trucks made it through and delivered their passengers, thus completing the last phase of "Operation Caribou." Now there is nothing to do but wait for the reports that will tell us what the caribou thinks of his new home. Will he again move on, continuing an endless search, wandering further into no-man's land, or will he perhaps again become indigenous to Katahdin?

We, needless to say, hope the nomad of the north has come home to stay.

**CAPTIONS**

Crew from HU-4, left to right, D.N. Battingly, AT2; A. Palmer, AM2; H. Zuckerman, ADC; C.D. Bryan, AE2; D.L. George, AD2; Cdr C.C. Coffey, Jr.; LCdr H.J. Sundberg; LCdr P.H. Kirchner; Lt F.J. Lakeway; H.J. Pelton, AD2. Firing sleep-producing pellet. Blindfolding and marking caribou. Chief Zuckerman directs UH-2. Pelton is lowered to Mount Katahdin as Bryan directs SEASPRITE flown by Commanders Coffey and Sundberg. The 250-pound animals are gently deposited. Seconds after being untied, caribou awoke and scampered off. (Photos by NAS Brunswick, Maine, and Bangor Daily News.)

## 1000-Hour Pilot Award

Five more military pilots will receive Kaman Aircraft's recently established award honoring those who have logged 1,000 hours in helicopters produced by the company. They are: Capt S.J. Kuczynski, USMC (ret), of Ontario, Calif., and formerly of VMO-6, Camp Pendleton, Calif.; Capt James Okonek, ARS Det 33, CARC, Perrin AFB, Texas; WO Robert L. Norton, USMC, VMO-1, MCAF, New River, Jacksonville, N.C.; Capt Pasco Parker, ARS Det 24, CARC, Kincheloe AFB, Mich.; and Capt Richard C. Pfadenhauer, ARS Det 54, EARC, Moody AFB, Ga. Nine other pilots have already received awards.

## Mountain Mission

The altitude was 3,500 feet. The front landing gear of the HH-43B was firmly planted on the ground but the rear wheels, due to the slope, were just touching. Twenty pounds of torque was required to hold the helicopter in the spot. The right rotor blades were clearing the jagged rocks by six feet and the wind was getting stronger—these were the conditions recently encountered by an HH-43B rescue crew from Det 14, WARC, Nellis AFB, Nev.

The mission began after a jeep left the road and rolled 300 feet to the bottom of a ravine. One occupant, a civilian, was seriously injured. Since a landing was not possible due to the terrain and power lines, Capt Charles A. Saffell, flight surgeon, was lowered to a rocky ledge near the survivors. Under his direction the injured man was moved to a spot 200 yards away and Capt Thomas E. Fallows, RCC, then hovered the HH-43B so the front wheels rested on the ground as described above. Just as the survivor was being placed aboard, however, the wind picked up to a point where the pilot could no longer hold the helicopter in position. Captain Fallows took off and then hovered so the injured man could be hoisted to safety in a Stokes litter. Sharing in the hazardous mission were Capt Robert S. Adams, copilot; and A1c John V. Sells, crew chief.

In another mission, detachment personnel scrambled when an F-86F pilot, unable to lower the left main landing gear, elected to land on one wheel and the nose gear. The aircraft slid down the runway with the HH-43B following closely. As it slid to a stop, a small fire started so the FSK was immediately placed close by and the firefighters offloaded. It was not necessary to use the kit, however, as the fire went out and the pilot had scrambled free. Captain Fallows was HH-43B pilot and A1c Carlos L. Trujillo and A2c Donald T. Nehmelman, firefighters.

On a third mission, the HH-43B crew scrambled after word was received a Marine A4B was believed down 75 miles north of the base. An hour later the wreckage was sighted on the side of a mountain and the helicopter landed on a small rocky knoll at 6,500 feet. It was determined the A4B pilot had not survived the crash. A letter of commendation was received from the commander, Marine Air Reserve Training, for the detachment's efforts during the mission. Aboard the HUSKIE were Captain Fallows, RCC; Captain Adams, copilot; Captain Saffell, Airman Sells, and SSgt Earl L. Cheak, medical technician.

## Night Rescue

Members of Det 58 at Brookley AFB, Ala., are the proud possessors of a "thank you" letter from Col. C. L. Frisbie, base commander, who was saved by an HH-43B crew after standing for hours in bone-chilling water sweeping over a mud flat in Mobile Bay. With the colonel were his son and another companion. All were suffering from exhaustion, exposure and frostbite when they were hoisted aboard the HUSKIE shortly before 2200. The search in rain, sleet, fog and snow began after the trio failed to return from a duck hunting party at nightfall as agreed upon. Their boat had been swamped by heavy waves hours before and after swimming and pushing the boat to the mud flat, they waited in the freezing cold most of the day and part of the night. Colonel Frisbie's survival training during 23 years in the Air Force was credited with saving their lives. The HH-43B, piloted by Capt R. N. Greene, began the search soon after dark and later the gleam from the colonel's cigarette lighter was spotted as he stood in the waist-deep water below. He had worked on the water-soaked lighter for hours so that it would be ready to signal the rescue helicopter he knew would come.

HH-43B crews from Det 58 also participated in a night search for a hunter lost in a swamp and aided the Coast Guard in locating the body of a fisherman who had disappeared in Mobile Bay. Detachment personnel were also called on to aid in still another search mission, lasting two days, for two missing duck hunters.

## Research and Rescue

Under a contract received from the General Electric Company, Kaman Aircraft is continuing development of an automatically controlled helicopter to act as a stabilized platform for supporting special equipment. HH-43B HUSKIE helicopters will be used to develop the automatic flight control system and remote controls.

KAC has also received initial contracts totaling more than a million dollars covering the installation of special rescue equipment for UH-2 SEASPRITE helicopters which it is producing for the United States Navy. Part of this equipment—the rescue boom, net and ramp—were demonstrated at the Navy's third annual Open Sea Rescue Symposium.* The new contract covers the boom and another piece of rescue equipment, a loud hailer, which require modification. Navy and Coast Guard officials have described the new equipment as "the most significant innovation in open sea rescue since the personnel hoist."

A UH-2 SEASPRITE with a General Electric YJ-85 jet engine mounted on the side is being used at Kaman Aircraft as part of a high-speed fiight test research program. The helicopter, modified under a U. S. Army Transportation Research Command, Ft., Eustis, Va., contract, will be utilized to investigate the flight characteristics of the rotor system at speeds well above those usually reached by the fastest of today's helicopters.

*See October, 1962 issue of Kaman Rotor Tips.

# Timely Tips

## Collective Limiter Check-out (HH-43B)

Collective limiters have been reported in short supply. At the same time some of the limiters reported defective and returned for overhaul are checking out all right on the test stand. To remedy this situation, it is suggested that before shimming or removing the limiter, a thorough inspection be conducted of all areas which may affect limiter operation (ie: rudder lock system, transmission oil pump, collective sticks and torque tubes). The dash two handbook outlines complete trouble-shooting procedures. The collective limiter article in the April, 1963 issue of Kaman Rotor Tips will also be helpful.

*W. J. Wagemaker, Service Engineer*

## Oil Tank Clearance (OH-43D, UH-43C)

To maintain clearance between the oil tank and the magneto harness—secure the harness with three rubber-cushioned clamps, type MS 21919 or NAS 476, to the tank support tubular strut under the rear of the tank. Attach another clamp to the tubular strut near the rear face of the tank at a point immediately before the Y-fitting where the right and left magneto leads are "taken off" from the magneto harness.

*H. Zubkoff, Service Engineer*

## Step To Safety (UH-2, HH-43B, OH-43D, UH-43C)

The last step by aircraft maintenance crews, and perhaps the most important one, is to make sure all equipment has been properly secured and tools and other items removed from the work area when a job is finished. That loose articles can seriously damage an aircraft in flight or even cause an accident has been proven time and again. Latest example occurred when an AN/ARC-39 receiver/transmitter became loose, damaged a helicopter's frame and skin and put the aircraft in a "down" status. Extensive work was required to repair it and, of course, the "angel" was unavailable for search and rescue missions or other important tasks during this time. Remember, it only takes a second to—MAKE A SAFETY CHECK!

*M. T. Fiaschetti, Service Engineer*

## Not Under The Seat (HH-43B)

Stowing any type of personal gear or aircraft equipment under the pilot's seat should be discouraged. Bulky or heavy articles, or an accumulation of smaller items placed under the seat may depress the floor panel until it contacts the throttle crank, P/N K773503, on the collective torque tube. In addition to causing crank wear, several instances of binding throttle have been attributed to this contact. The possibility also exists that the stowed gear may become loose, causing more serious difficulties.

*W. J. Wagemaker, Service Engineer*

## Flap Horn Bearing Check (HH-43B, OH-43D, UH-43C)

When trouble-shooting rotor track problems, place one hand on the flap horn bearing and apply steady (not heavy) pressure while checking for rod-roll freedom. Pressing on the flap horn bearing will simulate centrifugal force loading. This procedure should disclose a bearing which binds under CF but rolls freely without such loading. Replacing the bearing in such cases will probably correct the tracking problem.

*D. W. MacDonald, Service Engineer*

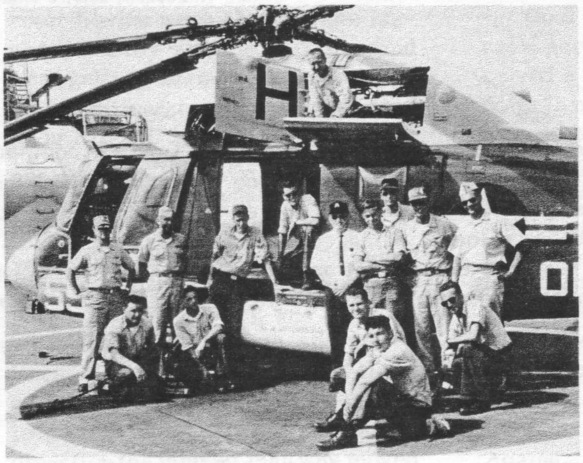
## Prevent Contamination (UH-2)

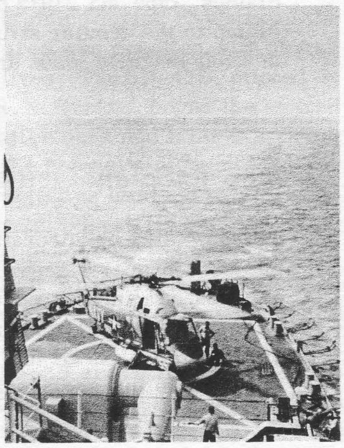
The hydraulic filters, AC2228 and AC2225, used in the UH-2 hydraulic system are designed and manufactured to remove all contaminants larger than 25 microns from the system. Twenty-five microns is approximately equal to one, one thousandth of an inch. The danger then exists that the filter may be contaminated by dust in the air if it is left exposed to the atmosphere for any length of time. With this in mind, maintenance personnel should leave the filter in its protective wrapping until a few seconds before a filter element change is made.

*P. M. Cummings, Service Engineer*

# SEASPRITE ACTIVITIES


**SECNAV INSPECTS**— Secretary of the Navy Paul H. Nitze and Admiral U.S.G. Sharp, commander-in-chief of the Pacific fleet, arrive in UH-2 piloted by LCdr Edward Moore to inspect Naval Training Center at San Diego, Calif. Three SEASPRITES from HU-1 at NAAS, Ream Field, Calif., carried the secretary and his party to naval establishments in the area and to the aircraft carrier Bennington at sea. A few days before, Secretary Nitze visited NAS Jacksonville, Fla., and utilized an OH43D during his inspection of the station, NAS Cecil Field and NS Mayport. (USN photo)





**CONTRAST**—From the sea to the Maine woods is but a step for the men who man the UH-2's. Shown on a cruise aboard the USS Albany are members of Det 46 from HU-4, NAS Lakehurst, N.J. Several later participated in "Operation Caribou" described on page three. Left to right sitting, are G. Davis, AN; W. Hayes, ADJ1; J. Webb, AN; M. O'Riordan, AM3; G. Burns, AE2. Standing, Lt(jg) D. Aldrich; Lt E. Arnold; B. Brown, AM2; J. O'Connor, AT3; P. Whitten, KAC rep; J. Prenevost, AN; R. Winslow, ADR1; LCdr P. Kirchner, officer in charge; and LCdr J. Trimble. D. George, AD2, is on the work platform. R. Segal, PR2, not shown, was also a member of the detachment. In second photo, Hayes is hoisted from flight deck during practice pick-up. Third, shows a view of the SEASPRITE just prior to launch. (USN photos)

## Polio Battled

As part of a large-scale civilian operation, "Victory Over Polio," a UH-2 crew from HU-4 recently flew 700 pounds of Sabin Oral Polio Vaccine from NAS Floyd Bennett Field, N.Y., to three hospitals in Ocean County, N.J. Approximately 100,000 persons turned out for doses of the vaccine. Aboard the SEASPRITE were LCdr Joseph Gardner and Lt(jg) James Joplin, pilots, and Richard Hamlet, AD2, crewman. The helicopter was utilized since the vaccine must be kept in dry ice at all times and it was felt air distribution was the most expeditious method. The squadron was extended a "very gracious thanks" for a job well done.

## Oriskany Rescue

A UH-2 crew from Det Golf aboard the Oriskany went into action after a fixed-wing aircraft taxied off the flight deck and landed inverted in the water. The pilot exited safely but appeared to be dazed so John M. Stevens, AMS3, jumped into the water from the SEASPRITE to assist him. Other than this, the rescue was reported as "routine." Lt John O. Williams was UH-2 pilot, Lt(jg) Barry G. Brandow, copilot, and the crewman who acted as hoist operator was Charles E. Delaney, ATN2.

## For The Record

Helicopter Utility Squadron Two, Naval Air Station, Lakehurst, N.J., achieved its best safety record during the past fiscal year. Only two aircraft were damaged during the 16,450 hours flown by the squadron. This gave HU-2 an accident rate of 1.85 per 10,000 hours. The best accident rate previous to this year was 2.81. Approximately 4,000 of the above hours were flown by the UH-2A.

# SEASPRITE at Cherry Point

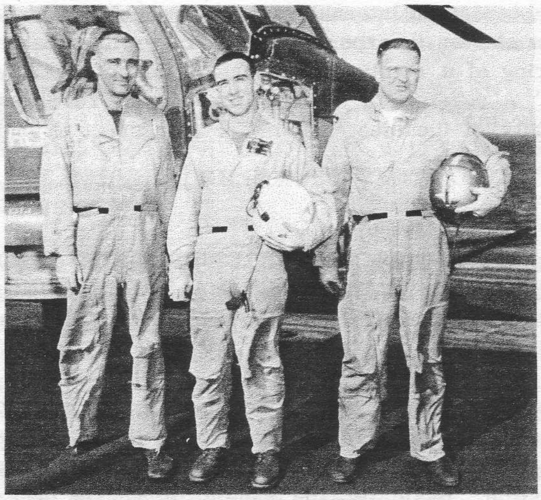
By LCpl John Heseltime
Informational Service Office
2nd MAW, Fleet Marine Force, Altantic

CHERRY POINT, N. C. —Cherry Point has a new "Pedro." The Air Station's Search and Rescue unit took delivery of a new UH-2B SEASPRITE helicopter on January 7. The new helicopter, called Pedro by Marines here, has double the capabilities of the present SAR helicopters according to Operations officials. Witnessing the arrival were BrigGen John P. Coursey, air station commanding general; LtCol James W. Shank, SOES commanding officer; LtCol V. R. Martin, airfield operations officer; and other dignitaries. General Coursey took off in the new chopper shortly after its arrival here for a short familiarization flight with Capt John L. Pipa.

**GENERAL TESTS—** General Coursey, adjusts mike prior to making familiarization flight in the new Search and Rescue helicopter delivered to Cherry Point recently. The new chopper, UH-2B SEASPRITE has twice the capabilities of present SAR aircraft. (USMC photo by Pfc Tom Keach)

The SEASPRITE is capable of flying 200 nautical miles to pick up four downed pilots and return to base cruising at a speed of not less than 125 knots. Also, with the increase in communication and navigation equipment, the new Pedro can now operate in any type of weather. Flown by a crew of three, pilot, copilot and plane captain, the SEASPRITE is powered by a General Electric T-58 gas turbine engine which operates a single main rotor and a tail rotor. The aircraft is equipped with retractable landing gear.

Captain Pipa and four mechanics attended training on the new aircraft at NAS Lakehurst, N. J. Additional pilots and maintenance personnel will be trained here through on-the-job training. A second SEASPRITE will be delivered here in the near future according to Operations officers.



**3,000 LANDING—** A UH-2 crew from Det "Charlie," HU-1, recently made the 3,000th helicopter landing aboard the USS Kitty Hawk. Shown afterward are, left to right, LCdr R. E. Tobias, OIC of Det Charlie and pilot of the SEASPRITE; Lt(jg) W. W. Beck, copilot; and L. J. Jaynes, ADR1. Sharing in the king-size cake baked afterward in observance of the occasion are, front row, R. E. Niswander, ADR3; Petty Officer Jaynes; Commander Tobias, Lieutenant Beck and R. E. Johme, AM1. Second row, D. P. Kelsey, ADR3; L. E. Rupright, ATN3; D. W. Middleton, AE3; and E. F. Rutherford, ADRAN. Rear row, Lt(jg) H. K. Phinney; R. L. Blue, AN; J. Duncan, AN; Lt(jg) L. W. Beguin and Lt(jg) D. G. Holmes. (USN photos)


**SEASPRITE "BOARDS" CARRIER—** Many years have passed since the U. S. Navy used grappling hooks to board a vessel, but this age-old custom was revived recently by the crew of a UH-2 from Helicopter Utility Squadron One's Detachment Echo. They wanted the distinction of making the 94,000th "trapped" landing aboard the attack aircraft carrier Bon Homme Richard, but there was a problem—since helicopters have as much need for arresting gear as Noah had for a bucket of water during the flood, they don't come equipped with "hooks" like their fixed-wing brothers. That's where the grappling hook came in. One was lowered from the SEASPRITE and used to snag the arresting cable on the carrier deck, thus truly qualifying the helicopter for the record landing. The unusual recovery was made aboard the San Diego-based "Bonnie Dick" while the 43,000-ton carrier operated in Hawaiian waters in December. Aboard the SEASPRITE were LCdr L. F. Bowman, pilot; Lt(jg) E. K. Williams, copilot; C. J. Britt, aviation machinist's mate airman and C. R. Sears, aviation electronics airman. (USN photo)

# 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 HH-43B) WHAT IS THE PROBABLE CAUSE IF FUEL IS SEEN TRAILING FROM THE BOTTOM OF THE HELICOPTER AFTER MAKING HARD TURNS?

**A.** Check the fuel filler cap for tightness. It should take 6 to 10 pounds to pull up the handle of the cap. The nut on the stud should be cotter pinned. While TO 1-1A8, section V, paragraph 5-7 states that bolts 1/4-inch and less should have cotter pins, it is permissible to use self-locking nuts in an emergency. At the first opportunity, however, the proper 1/4-28 castellated nut, AN 310-4, and a cotter pin, AN 380-2-2, should be installed. It is also possible that venting of the fuel cell is occurring. This can be checked while servicing the aircraft with fuel. If venting occurs after topping off the fuel cells, replace the fuel cell vent valve.

H. Zubkoff, Service Engineer

**Q.** (Applies UH-2) ON UH-2'S WITH CLEVELAND LANDING GEAR, P/N K631001, THE "SHIP AGROUND" SWITCH YOKE, P/N 9809-10, OCCASIONALLY CRACKS OR BREAKS. WHY?

**A.** When trouble-shooting the automatic blade tracking and landing gear control systems, it is sometimes necessary to cycle the ship aground switch. The correct procedure for checking this switch is to jack the aircraft and hydraulically cycle the landing gear. The switch yoke should never be pried open in order to disconnect the switch linkage so the switch can be manually cycled. Using the "pry method" often exceeds the bending limits of the yoke material, causes material failure, and necessitates a part change.

W. J. Wagemaker, Service Engineer

**Q.** (Applies OH-43D, UH-43C, HH-43B, UH-2) WHY IS PROPER OLEO STRUT AND TIRE SERVICING IMPORTANT?

**A.** Oleos and tires are essentially cushioning devices. Too much air and/or oil will cause "hard" struts and tires with resultant shock loads transmitted to the airframe. Conversely, too little air and/or oil results in "soft" struts and tires with resultant aircraft wobble. Soft struts may also bottom easily on landing. This will give the same effect as hard struts in that the load is transmitted to the airframe. Proper strut and tire servicing is, therefore, one of the most important jobs in maintaining a "safe to operate" aircraft.

R. W. Spear, Service Engineer

**Q.** (Applies HH-43B) WHEN REMOVING SKIDS (BEAR PAWS) IS IT NECESSARY TO JACK UP THE AIRCRAFT?

**A.** It is not necessary to jack up the aircraft to remove the skids if the following procedure is used. The skid should first be detached, following the instructions in the maintenance manual. The aircraft is then rolled forward until the wheel has moved out of the well in the skid. Care should be taken to insure sufficient clearance between the aircraft components and foreign objects.

W. J. Rudershausen, Service Engineer

**Q.** (Applies OH-43D, UH-43C, HH-43B) WHAT EFFECT WILL TOO LITTLE OR TOO MUCH FRICTION ON THE ELEVATOR AND TAB FRICTION DEVICES HAVE ON THE FLYING QUALITIES OF THE HELICOPTER?

**A.** Too little friction will cause the aircraft to "porpoise." Too much friction stiffens the tail to the extent that an excessive amount of control input is required to change the nose pitch attitude. These tendencies will be most noticeable in rough air and autorotation flight.

W. J. Wagemaker, Service Engineer

**Q.** (Applies UH-2) WILL REVERSAL OF THE INPUT VOLTAGE OVERHEAT OR DAMAGE THE JACK AND HEINTZ STARTER, P/N 20069-005?

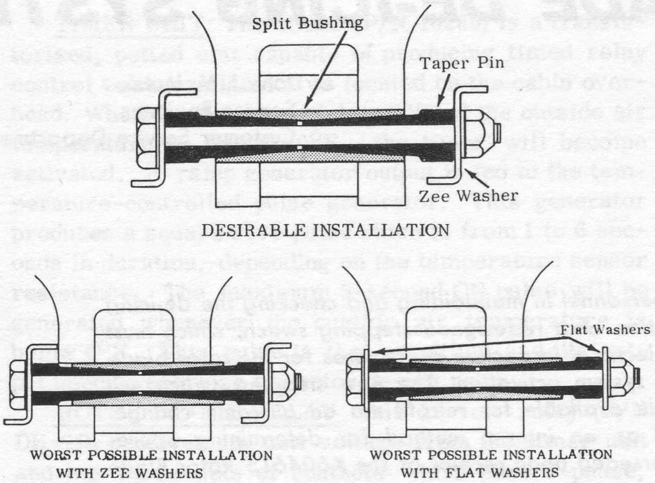
**A.** No, because the internal connections are not grounded. This starter incorporates a non-reversible motor with wiring of a configuration that is not affected by polarity. A reversal of input voltage merely reverses the polarity of the electrical fields in respect to one another.

J. E. Kucka, Service Engineer

**Q.** (Applies HH-43B) IF A PRESSURE (FUEL-OIL) TRANSMITTER APPEARS TO BE MALFUNCTIONING, SHOULD THIS COMPONENT BE CHANGED IMMEDIATELY?

**A.** The transmitter should not be changed until certain checks have been carried out to determine if the trouble is really in the transmitter or actually somewhere else in the system. Basically, the transmitter senses pressure and converts this pressure into electrical impulses which are then transmitted through electrical circuitry to the indicator. With this in mind, the mechanic should check (1) for proper power source (2) the condition of the electrical connections (3) the electrical circuit. The indicator should be bench checked and the pressure line to the transmitter examined to make sure it is connected to the "P" port. Also make certain the "V" port is connected to the atmospheric pressure inlet line. Check the pressure line for leakage. Afterward, "crack" the pressure line connection at the transmitter with the line under pressure to expel any trapped air which may be present. Check the security and condition of the transmitter mountings and also make sure the correct pressure snubbers are installed. If the malfunction still exists after the above inspections have been accomplished, then, and only then, should the transmitter be replaced.

H. Zubkoff, Service Engineer




**Q.** (Applies HH-43B) WHAT PURPOSE DO THE ZEE WASHERS, P/N K732524-11, SERVE IN THE TRANSMISSION STRUT INSTALLATION?

**A.** The purpose of the zee washers is to assure that during installation the split bushing, P/N K732512-11, is centered (to a reasonable degree) in the strut bore prior to tightening of the long AN4-33A bolt. Were it not for the zee washers, it would be possible to tighten the bolt when the bushing is engaged in only one of the two clevis legs. Incorrect positioning of the split bushing in this manner may result in an overstress condition in the clevis leg which is in contact with the bushing.

*F. E. Starses, Service Engineer*

**Q.** (Applies HH-43B, UH-43C, OH-43D) WHEN CLEANING CORROSION FROM ALUMINUM AND MAGNESIUM SURFACES ON THE HELICOPTER, IS IT PERMISSIBLE TO USE STEEL WOOL, EMERY CLOTH OR A STEEL WIRE BRUSH?

**A.** None of the articles mentioned above should be used on aluminum or magnesium surfaces due to the possibility of causing scratches. In addition, small metal particles which might be left on the surfaces could cause dissimilar metal corrosion. The recommended implements to be used for cleaning corrosion from aluminum surfaces are: aluminum wool, a phenolic scraper or a fibre brush. For magnesium surfaces, the use of a phenolic scraper or a fibre brush is suggested.

*W. J. Rudershausen, Service Engineer*

**Q.** (Applies HH-43B) WHAT ACTION CAN BE TAKEN TO PREVENT THE POSSIBLE LOSS OF SCREWS FROM THE ANTI-COLLISION LIGHT, P/N 40600-4?

**A.** Three screws, MS35223-40, and one screw, MS35273-40, are now used to secure the anti-collision light connector, P/N A-7738-1. Experience has shown that these screws, although retained by lockwashers, may loosen and fall out thereby creating a potential FOD hazard. To prevent such an occurrence in the future, the three MS35223-40 screws can be replaced with MS35273-40 screws which will allow all four to be safety wired. The vendor will lockwire all screws on light assemblies produced in the future.

*J. E. Kucka, Service Engineer*

**Q.** (Applies HH-43B, UH-43C, OH-43D) IS IT NECESSARY TO RELIEVE THE COLLECTIVE LIMITER SPRING LOAD FROM THE CONTROL SYSTEM WHEN MEASURING AZIMUTH BAR RUN-OUT?

**A.** Yes, it is required that all controls be positioned at neutral, with control locks installed, while measuring azimuth bar run-out. Any force or load which tends to disturb the neutral control position will also affect the run-out reading. The limiter spring load must, therefore, be relieved since it tends to pull the collective control from neutral.

*W. J. Wagemaker, Service Engineer*

**Q.** (Applies HH-43B) WHAT IS THE PRIMARY CAUSE FOR OIL OVERFLOWING FROM THE OIL TANK?

**A.** Overfilling! Hot oil scavenged from the engine and returned to the tank, foams and expands. If insufficient expansion space is left in the tank, overflowing occurs. The 7808 oil used is extremely harmful to painted surfaces and to the cabin door upper track rubber rainshield which swells, causing the door to bind. Preventive action is obvious—make sure the oil is topped off to the upper hole in the dipstick, but no higher!

*H. Zubkoff, Service Engineer*

**Q.** (Applies UH-2A) WHAT COOLANTS SHOULD BE USED FOR SERVICING ELECTRON TUBE COOLERS HD-334 OR HD-334B?

**A.** The only useable coolant fluids are Monsanto OS-45 IV or Monsanto Coolanol 45. No substitute is recomended. Both are identical except OS-45 IV has a wider temperature range, -65° to +550°F, as compared to -65° to +400°F for Coolanol 45. Coolanol 45 can be ordered under FSN 9150-551-4022 (one quart cans) and 9150-754-2519 (five gallon cans).

*J. E. Kucka, Service Engineer*

**Q.** (Applies HH-43B) MUST THE HELICOPTER BE PLACED IN A DOWNED STATUS IF ITS IN-FLIGHT TRACKING SYSTEM (IFT) IS INOPERATIVE?

**A.** In most cases there should be no objection to using such an aircraft. However, if trouble-shooting identifies the problem as a lack of continuity in all four wires routed through the rotor shaft housing, further investigation is necessary prior to the next flight. Such a finding may be an indication of failure of the slip ring assembly retention. A loose slip ring installation can cause serious damage to the rotor shaft and/or shaft housing and should be corrected immediately.

*F. E. Starses, Service Engineer*

**Q.** (Applies HH-43B) IF ONE SERRATION MOVEMENT IS MADE ON THE AZIMUTH ECCENTRIC BUSHING, HOW MUCH CHANGE WILL THERE BE IN THE TOE-IN READING?

**A.** Approximately 0.007-inch per serration. It will be slightly more in the center of the range and less at the range extremities.

*W. J. Wagemaker, Service Engineer*

**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, Group Leaders.*

# THE UH-2 ROTOR BLADE DE-ICING SYSTEM

Checking

by John J. McMahon
Service Engineer
Customer Service Department

*The following information is furnished to aid personnel in maintaining and checking the de-icing system on the SEASPRITE. Included is a description of a redesigned stepping switch, which must be installed before the system is activated, and electrical inspection procedures for the rotor blade de-icing boot. This inspection is required before system activation. The new stepping switch will be installed in production aircraft and made available for retrofit via an airframe change. Trouble-shooting procedures are also provided as an interim method for determining operational readiness of the system and will be superseded upon receipt of the K604615 Rotor Blade De-Ice System Test Set.*

The SEASPRITE utilizes an electrical heating element de-icing system. The elements, imbedded in the leading edge of the main rotor blades, are heated in sequential order thereby destroying the ice-to-blade bond and allowing the centrifugal force of the rotor blades to remove the accumulating ice. The component parts of the de-icing system are shown in figure 1. The essential parts of the system are shown in figure 2.

TEMPERATURE SENSOR The temperature sensor (P/N 10308) is a thermistor type resistor with a negative temperature coefficient. When the ambient air temperature is decreased, the resistance of the sensor will increase. At 40° ambient the resistance will be sufficient to energize the timer unit. It is mounted adjacent to the ARN-59 antenna on the bottom of the fuselage.

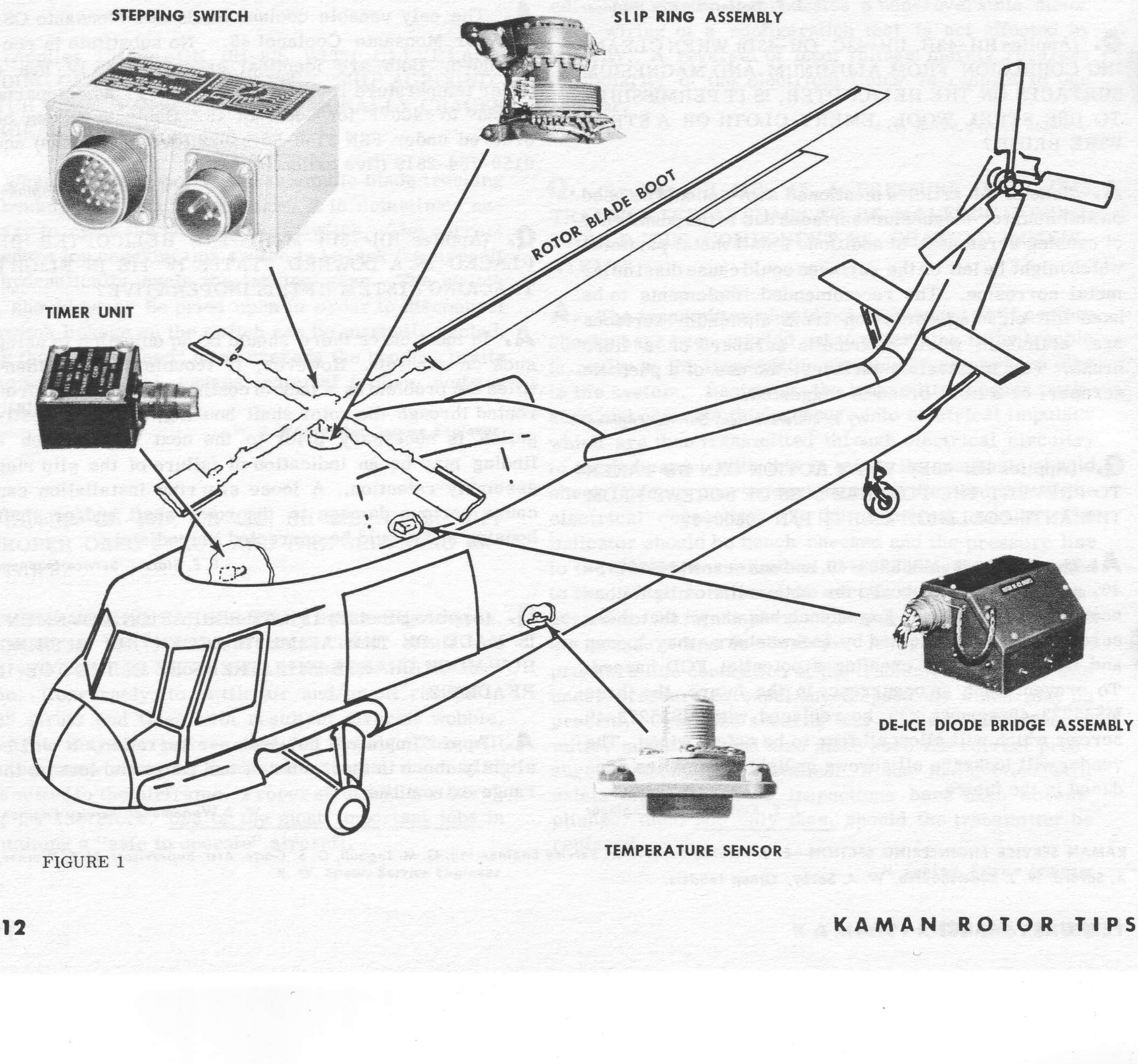



FIGURE 1

TIMER UNIT The timer (P/N 10260) is a transistorized, potted unit capable of producing timed relay control voltage pulses. It is located on the cabin overhead. When the de-ice switch is ON and the outside air temperature is below 40°F., the timer will become activated. A ramp generator output is fed to the temperature-controlled pulse generator. This generator produces a square wave pulse which is from 1 to 6 seconds in duration, depending on the temperature sensor resistance. The maximum 5-second ON pulse will be generated whenever the outside air temperature is below 0°F. This pulse is then amplified and the output used to energize the rotor de-ice relay.

ROTOR DE-ICE RELAY This 28-volt relay (P/N DH-7B) receives its coil voltage from the timer unit and has three sets of contacts which pass 3-phase, 115 VAC power from the number two generator bus to the de-icer diode bridge whenever the relay is energized. When the relay is de-energized, the normally closed contact A3 passes 115 VAC, A-phase power to the stepping switch. The diode box, located in the transmission compartment, contains the relay.

DE-ICE DIODE BRIDGE ASSEMBLY The de-ice diode bridge assembly in the diode box is a 3-phase, full-wave rectifier bridge which converts the incoming 3-phase, 115 VAC to a positive and negative 140 ± 10 VDC level. The negative voltage is routed to common return leads from all four blades and the positive voltage is directed to the stepping switch.

STEPPING SWITCH The redesigned stepping switch (P/N 10692) is an electro-mechanical device located on the rotor hub. It consists of a solenoid-controlled mechanical stepping section and an 18-contact drum assembly. The solenoid is energized through the normally de-energized A3 contact of the rotor de-ice relay. When the solenoid is energized, the drum is mechanically stepped to the next contact position. When the rotor de-ice relay is energized, the positive DC voltage from the de-ice diode bridge is transmitted through one of the drum contacts and routed to the rotor blade elements.

ROTOR BLADE BOOT Each rotor blade boot consists of 8 nichrome heating element wires and a common blade-return wire imbedded in the neoprene portion of the de-icer boot. The incoming DC power is directed to each of the element wires in diametrically opposed pairs of rotor blade boots. When all 8 elements of these boots have been cycled in sequence, the DC power will then be directed to the adjacent pair of diametrically opposed blade boot elements.

## INTERIM TROUBLE-SHOOTING PROCEDURES

**All safety precautions should be observed during these tests since the use of high voltage power is often involved. Unless correct testing procedures are strictly adhered to, dangerous residual voltage may be present even after power has been disconnected from the test equipment.**

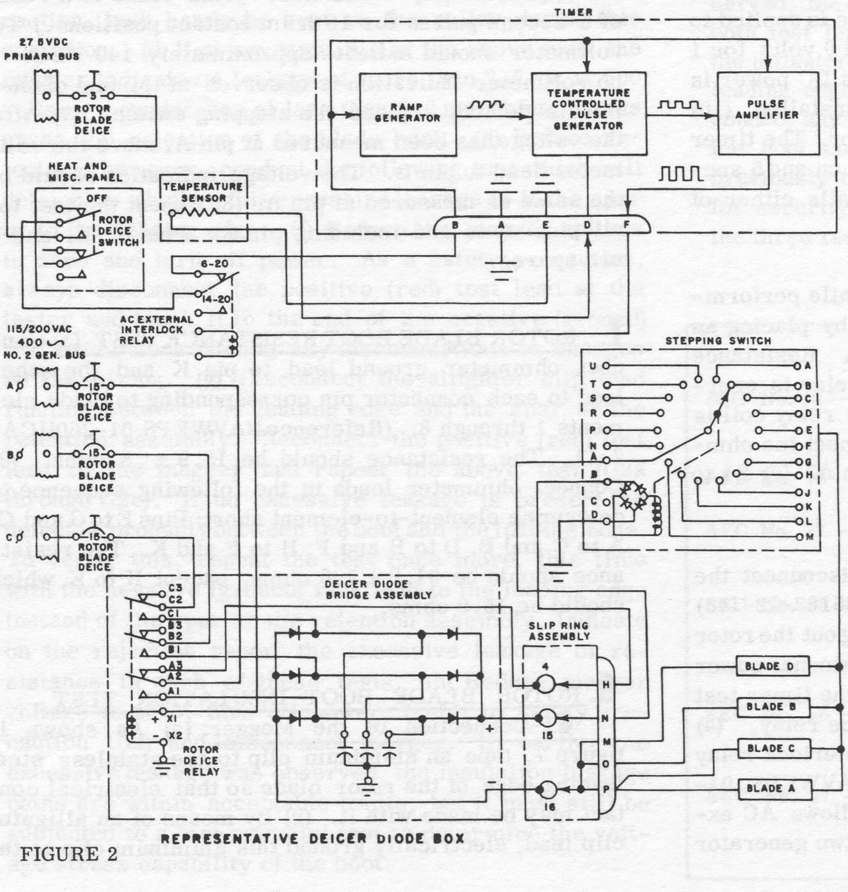



FIGURE 2

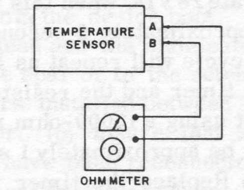



FIGURE 3

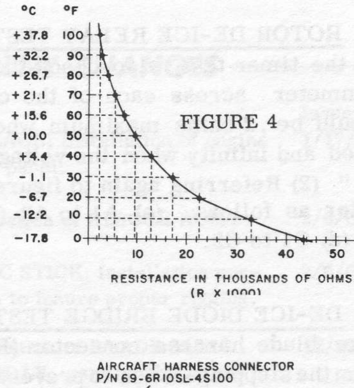



FIGURE 4

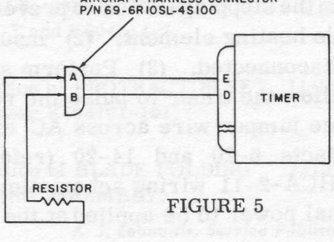



FIGURE 5

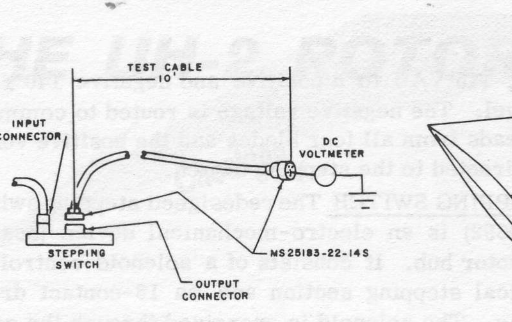



FIGURE 6

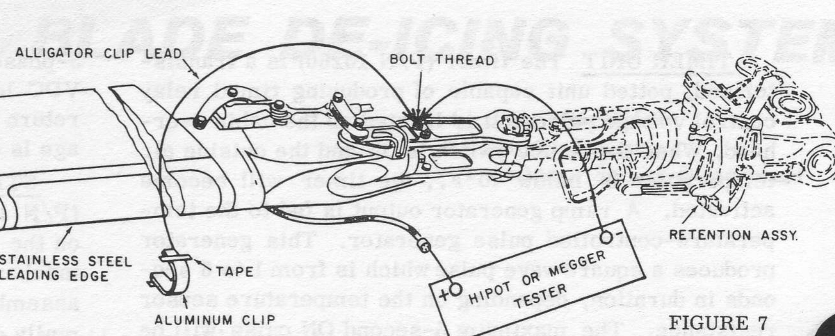



FIGURE 7

**A.** TEMPERATURE SENSOR TEST (1) Open all four circuit breakers labeled "Rotor Blade De-Ice." (2) Disconnect plug (P/N 69-6R10SL-4S100) from sensor. (3) Connect ohmmeter as shown in figure 3. (4) Observe outside air temperature indicator. (5) Correlate the ohmmeter indication with the temperature-versus-resistance curve shown in figure 4. The ohmmeter indication should equal the chart indication, plus or minus 10-15%. (6) Replace the sensor if it fails this test.

**B.** TIMER TEST (1) Open all four circuit breakers (one 3-amp, three 15-amp) labeled "Rotor Blade De-Ice." (2) Insert 50,000 ohm 1/2 watt resistor in pins A and B of aircraft harness connector (P/N 69-6R10SL-4S100) as shown in figure 5. (3) Open the 3-amp circuit breaker labeled "AC Ext Pwr." (4) Connect a DC voltmeter (set on the 28 VDC scale) to the coil circuit of the rotor blade de-ice relay (P/N DH7B). (5) Connect the voltmeter positive lead to the relay terminal X1. (6) Connect the voltmeter negative lead to the relay terminal X2 or ground. (7) Apply external DC power to the aircraft and close the 3-amp circuit breaker labeled "Rotor Blade De-Ice." (8) Place rotor de-ice switch to the ON position. (9) Observe the voltmeter. It should indicate 28 VDC when this voltage is applied to the coil for approximately 5 seconds and 0 volts for 1 second. This cycle will repeat as long as DC power is supplied to the timer and the resistor is installed. (10) Repeat the test using a 15000-ohm resistor. The timer cycle will now be approximately 1 second on and 5 seconds off. (11) Replace the timer if it fails either of these tests.

**C.** ROTOR DE-ICE RELAY TEST (1) While performing the timer test, also check the relay by placing an ohmmeter across each of the contacts. Resistance should be .2 ohms maximum when the relay is energized and infinity when the voltage to the relay coil is "0." (2) Referring again to figure 2, connect the ohmmeter as follows: (a) A1 to A2 (b) A2 to A3 (c) B1 to B2 (d) C1 to C2.

**D.** DE-ICE DIODE BRIDGE TEST (1) Disconnect the rotor blade harness connector (P/N MS25183-22-14S) from the stepping switch to prevent burning out the rotor blade heating element. (2) Insure that external power is disconnected. (3) Perform step 2 in the timer test to allow the timer to pulse the rotor de-ice relay. (4) Place jumper wire across AC external interlock relay contacts 6-20 and 14-20 (reference NAVWEPS 01-260HCA-2-11 wiring schematic). This allows AC external power to be applied at the number two generator bus. (5) Apply 115 VAC 3-phase external power to the aircraft. (6) Place the rotor de-ice switch to the ON position. (7) Place DC voltmeter positive lead on slip ring terminal number 15 and the negative lead on slip ring terminal number 16. Voltmeter should indicate approximately 280 ± 20 VDC during the "ON" cycle of the pulse and 0 VDC during the "OFF" cycle. (8) If the above voltage is not present, individual diode checks must be made to locate the faulty diode.

**E.** STEPPING SWITCH TEST (1) Perform steps 1 through 4 under De-Ice Diode Bridge Test. Refer to figure 6 and fabricate a test cable approximately 10 feet long. (2) Attach the test cable connector (P/N MS25183-22-14S) to the stepping switch output connector, (P/N MS25183-22-14P). (3) Connect a DC voltmeter from pin A on the free end of the test cable to ground as shown in figure 6. (Use voltmeter scale suitable for measuring 150 VDC.) (4) Apply 115 VAC 3-phase external power to the aircraft. (5) Place the rotor de-ice switch to the ON position. Voltmeter may not indicate because the stepping switch contact is not at pin A position. (6) Allow the stepping switch to operate for approximately 2 minutes. (This value is a result of 6-second pulses for 18 drum contact positions.) The voltmeter should indicate approximately 140 VDC. If no voltmeter indication is observed at the end of the 2 minute period, replace the stepping switch. (7) After the voltage has been measured at pin A, move the voltmeter lead to pin B. The voltage indication should be the same as measured at pin A. (8) Repeat the test for all pins up to and including pin S. Pins T, U, and V are spares.

**F.** ROTOR BLADE BOOT RESISTANCE TEST (1) Connect ohmmeter ground lead to pin K and the other lead to each connector pin corresponding to blade elements 1 through 8. (Reference NAVWEPS 01-260HCA-2-11. The resistance should be 15.9 ± .8 ohms. (2) Connect ohmmeter leads in the following sequence to determine element-to-element short: Pins E to G and C, A to C and B, D to B and F, H to F and K. The resistance should be 31.8 ± 1.6 ohms, except H to K which should be 15.9 ohms.

**G.** ROTOR BLADE BOOT INSULATION TEST

**G**1-Connection of the Megger: (a) As shown in figure 7, tape an aluminum clip to the stainless steel leading edge of the rotor blade so that electrical contact may be made with it. (b) By means of an alligator clip lead, electrically ground this aluminum clip to the

| LIST OF MATERIALS |
|---|
| Multimeter<br>Insulation Tester - 500 VDC<br>High Potential Tester - 1000 VDC - 5 ma indication<br>Insulated Roller<br>Resistors - 50,000 ohm, 15,000 ohm<br>Wire - 18 gage, length as required<br>Alligator Clips - as required<br>Aluminum Clip - fabricate<br>Test Cable -<br>Length 10 feet<br>Connectors (2) - MS25183-22-14S |

spar or to an unpainted part of the retention assembly. (c) Connect test leads to the appropriate terminals on the megger. (d) Connect the negative (ground) test lead to the spar or to an unpainted part of the retention assembly. (e) Connect the positive (red) test lead to all pins A through L simultaneously. (f) Make sure that the power switch on the megger is in the OFF position, prior to connecting power plug to 110 VAC outlet.

**G**2-Megger Testing of the Boot: (a) Operate the megger as specified by instructions. (b) Turn the power on, apply voltage to the boot and increase the voltage to 500 VDC. (c) With a force of 4 to 6 pounds, run an insulated roller over the boot and stainless steel leading edge while monitoring the leakage meter on the megger. (WARNING: This should only be done while standing on a dry deck or rubber mat. Extreme care should be taken not to come in contact with personnel or metal objects. It is suggested, as a safety precaution, both hands be kept on the roller during this operation.) (d) If, at any time during the above test, the megger indicates a leakage of more than 2.5 ma at 500 volts or a resistance of less than 0.2 megohms, this is cause for rejection of the blade boot. (e) Before rejection, however, conduct the following test which will determine whether this excessive leakage is to the spar or to the leading edge. (f) Reduce the megger voltage to zero and turn off power. As a safety precaution, always disconnect the positive (red) test lead at the tester and touch it to the end of the negative (ground) test lead before making any disconnections or changes on the wiring. (g) Disconnect the alligator clip lead running between the leading edge and the spar or the retention assembly. Reconnect the positive (red) test lead to the megger and repeat the above test (G2a through G2c). If no excessive leakage is present the defect is probably between the boot and the leading edge. To verify this, repeat the test once more, this time with the negative (ground) test lead to the leading edge instead of the spar or the retention assembly. Indicate on the rejection report the excessive leakage or resistance in each of these tests. (h) Reduce megger voltage to zero, turn off power, (refer to safety precaution G2f) and disconnect megger. If, earlier, no excessive leakage was observed, the insulation leakage paths are within acceptable limits, but it must still be subjected to a high potential test to determine the voltage stress capability of the boot.

## H. ROTOR BLADE BOOT HIGH POTENTIAL TEST

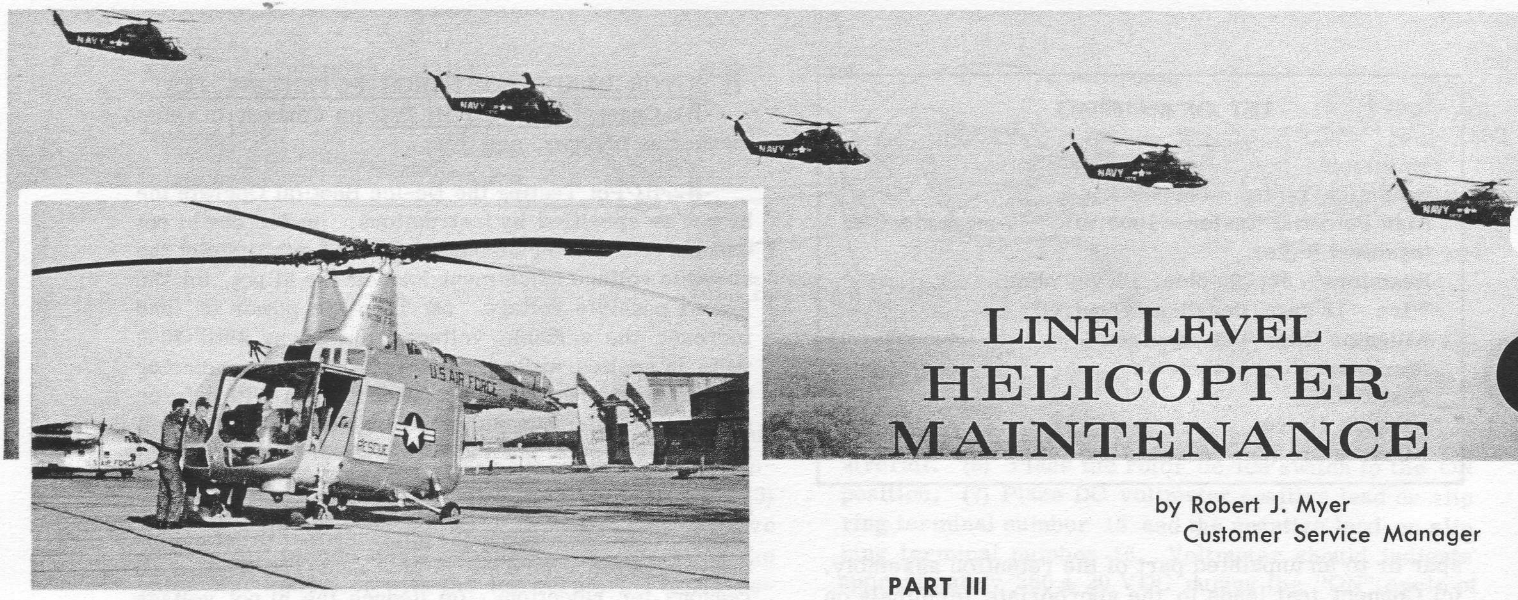
**H**1-Connection of the Hi Pot: (a) Connect in same manner as Megger, see G-1.

**H**2-Hi Pot Testing the De-Ice Boot: (a) Operate the hi pot as specified by instructions. (b) Set the hi pot unit current limiter or indicator, for 5 ma. (c) Set the variable voltage adjustment knob on the hi pot, for the lowest possible voltage. (d) Turn the power on, and increase the variable voltage adjustment until 1000 volts is applied while monitoring the hi pot indicator for an overcurrent or short condition. (e) With a force of 4 to 6 pounds, run an insulated roller over the boot and stainless steel leading edge. (Observe warning G2c) If an overcurrent or short indication appears, this is cause for rejection of the blade boot. (f) Before rejection, however, conduct the following test to determine the exact area where the failure occurred (record all reasons for rejection). (g) Reduce the hi pot voltage to zero and turn off the power. (Observe safety precaution G2f.) (h) Disconnect the alligator clip lead running between the leading edge and the spar or the retention assembly. By disconnecting the clip, the stainless steel leading edge is isolated from the spar and retention assembly. (i) Reconnect the positive (red) test lead to the hi pot and repeat the test (H2a through H2e). If no short or overcurrent indication appears, the defect is probably between the boot and the stainless steel leading edge. (j) To verify this, repeat the hi pot test once more, this time with the negative (ground) test lead connected only to the leading edge instead of the spar or the retention assembly. The boot can now be rejected since the required information has been gathered and recorded. (k) Reduce the hi pot voltage to zero, turn off the power, refer to safety precaution G2f and disconnect hi pot. (l) If, earlier, no overcurrent or short indications were observed, the boot is now acceptable. (m) Disconnect both test leads from the de-ice boot. (n) Disconnect the alligator clip lead and the aluminum clip from the leading edge to the spar or to the retention. (o) Disconnect any jumpers installed between pins on the de-ice boot connector. (p) Insure that all components previously tested have been reconnected and checked for security. Repeat test procedures F, G and H on the three remaining rotor blades. **K**

## CURRENT CHANGES

| | | Issue Date |
|---|---|---|
| ASC No. 5 - | FUSELAGE; Installation of engine access panel. | 1/17/64 |
| AFC No. 16 - | Modification of RESCUE HOIST. | 2/6/64 |
| AFC No. 27 - | CYCLIC STICK; Installation correction to insure proper rigging. | 2/6/64 |
| SEC No. 55 - | Modification of BLADE SLING ASSEMBLY, part numbers K604014-5 and K604014-7. | 12/19/63 |
| SEC No. 56 - | Modification of PROTRACTOR SET, part number K604701-101. | 11/25/63 |
| SEC No. 57 - | Modification of BLADE FOLDING RETAINING ASSEMBLY. | 2/13/64 |

*A. J. Leonaitis, Service Publications*




# LINE LEVEL HELICOPTER MAINTENANCE

by Robert J. Myer
Customer Service Manager

## PART III

*Continuing with the broad category of "Routine Maintenance" let us consider the subject of SERVICING.*

### SERVICING

Major maintenance concerns related to the use or application of fuels, oils and lubricants, hydraulic fluids and pneumatics will be covered in this area. Inasmuch as many excellent articles have been prepared on these subjects, and most related fixed-wing aircraft recommendations and precautions apply, repetition here will be kept to a minimum.

Fuels - The common fuel requirements of correct grade or type, minimum water content, cleanliness and safe handling precautions apply. Those items relating to power output are of particular concern in helicopter operations due to the continuous use of higher power settings and the precarious circumstances to which helicopters are frequently exposed. The practice of using the next higher grade gasoline in reciprocating engines, when the desired grade is not available, is acceptable for most helicopter powerplant installations. However, substitutions for specified turbine engine fuel cannot be covered so simply. Turbine fuel BTU and density variations must be considered relative to closely monitored power requirements, temperature limitations and fuel control operation. In addition, use of high octane gasolines can result in build-up of lead deposits on closely held surfaces, requiring complete engine overhaul in a very short period. As indicated above, turbine engine fuel control performance is affected by fuel density and is very sensitive to fuel cleanliness. Because of the intricacy and close tolerances of the many internal parts, malfunction can be easily brought about by the presence of foreign matter in the fuel. System strainers are effective in guarding against small quantities of foreign matter but, because of the required fineness, cannot cope with excessive amounts. It is, therefore, essential for reliable helicopter engine operation, whether reciprocating or turbine, that all applicable fuel usage and handling instructions be closely followed.

An added note relative to pressure fueling accommodations being incorporated into some current helicopter models: Be certain to take the time to make positive prechecks! Failure to assure that the shut-off valves are working properly can result in blow-up of fuel tank(s) and structure.

Oils and Lubricants - A majority of the significant maintenance considerations relative to helicopter "lubrication" have been presented in an article by that name in the Kaman Rotor Tips, March '61 issue, and reprinted in the July, 1961, issue of Aerospace Accident and Maintenance Review. Highlights from this article are included here in connection with the broad subject of helicopter maintenance.

The use of oils and other lubricants is a necessity in all aircraft, as well as other mechanical devices, but with the helicopter there are additional factors to be considered — the high centrifugal and rotational forces involved and the tasks this type aircraft is called upon to perform. Helicopters must operate in every conceivable environment during the course of carrying out assigned missions. Rotor downwash, especially in arid areas, causes sand and dust to be circulated through the rotor system, which tends to contaminate the lubricant used on the many special bearings peculiar to helicopter rotor, drive and control systems. Special care must, therefore, be taken to insure that these areas are always properly lubricated and purged of any accumulated foreign material. Recommendations concerning good lubrication practices are:

1. Use lubricant specified for affected application and temperature. Incorrect lubricants cannot only reduce lubricating efficiency, but they may also be incompatible with previously used lubricant, resulting in caking, or have a detrimental effect on adjacent finishes when slung out.
2. Insure that grease containers and equipment are kept well identified as to content and clinically clean. Leaving grease containers uncovered or dipping into them with unclean equipment can nullify any amount of diligent lubrication and generally cause more harm than inadequate lubrication.
3. Wipe grease fittings clean prior to lubricating to avoid forcing foreign matter into joints and, after

lubricating, to reduce tendency for foreign matter to cling to fittings and excess grease from being slung onto adjacent surfaces.

4. When it is suspected that a different grease has been used in bearings or equipment, they should be thoroughly purged or washed in solvent prior to re-servicing with a new type. Always consult the applicable maintenance handbook for specified lubricant.

Consideration should also be given to the recent application of nonmetallic bearing liners, particularly in helicopter control system mono-ball rod ends. These liners are principally fabricated from Nylon or Teflon materials which have an inherent lubricating characteristic. For the most part these bearings require no supplementary lubrication; however, in certain applications the use of special lubricants such as Nylube are specified. Again, be certain to apply only the prescribed lubricant.

Many of the above grease concerns and recommendations, as well as those mentioned relative to fuels, apply to the use of oils in helicopter systems. These systems should be serviced only with specified types of oil for the operating ambient temperature and be handled with appropriately clean equipment. Oil systems of costly components can be contaminated by such offhand carelessness as failure to wipe off a dirty dip stick prior to reinserting it into a tank, or installing unclean plugs into sumps.

Until recently, most helicopter transmission systems were serviced with a heavy duty oil containing an extreme pressure additive specially compounded to withstand the high reduction rotor driving gear loads. The clinging characteristics of this oil provided fairly good internal corrosion protection, even during extended periods of system inactivity. With the advent of turbine engines, newer lightweight synthetic base oils were developed to provide the required lubrication of the close tolerance turbine engine components under extremely high loads and temperatures. One such oil spec. is MIL-L-7808.In order to reduce supply system problems, this same oil is usually also specified for use in transmissions installed in turbine-powered helicopters. Not only does this oil attack most finishes and common seal materials, but its light weight and lack of adhesive characteristics make for poor internal corrosion protection. Therefore, when such oil is used, frequent runup to normal operating temperatures is recommended to insure against internal corrosion. When it is anticipated that the drive system will be required to remain idle for periods longer than two weeks, applicable preservation action is strongly recommended.

Hydraulics - Again the principal theme is use of specified fluid and cleanliness. Until the advent of automatic stabilization and control boost equipment in helicopters, their hydraulic systems consisted primarily of wheel and rotor brakes. There was (and is) an occasional hydraulically actuated hoist or landing gear, but like the brake systems, although important, these are relatively simple and forgiving. This is far from the case with the hydraulic portions of automatic stabilization equipment. Like the turbine engine fuel control mentioned earlier, the required close tolerances in the stabilization components require use of only the cleanest fluids and laboratory-type care of open components, lines and filters. Second to unclean fluid in a cause of malfunction is particles left in the system during assembly or maintenance operations. Cloth lint particles or excess sealant are prime offenders. Inasmuch as the filter fineness in these systems is as low as 10 microns (one micron = 0.000039 inch, lower in special cases) system starvation can easily result if exposed to even small quantities of foreign matter. Relatively trouble-free operation of these systems can only be attained through close adherence to applicable maintenance procedures, use of specified special equipment and the exercise of extreme care.

Pneumatics - The primary pneumatic maintenance consideration is personnel safety. In the past few years, for reasons of increased size and ground stability, helicopter tire pressures have reached the dangerous levels previously only attributed to larger fixed-wing aircraft tires. The safety margin built into aircraft wheels only applies when all parts are intact and properly secured. If the wheel is ruptured or otherwise damaged, for instance from a high impact landing, or if hub bolts are loose or partly removed, all bets are off. Similar caution applies to shock struts or any pneumatically, hydraulically or "spring loaded" component. Accident statistics, relative to maintenance personnel that have been permanently maimed or fatally injured while working on such items, are dire proof of the consequences of treating "pressure loaded" components carelessly or with disrespect. In short, before doing any work on a normally pressurized component, insure that it is deflated or properly discharged! Also, when a high pressure air bottle is used for inflation, be certain it is provided with gages and a regulator to indicate bottle pressure and control servicing pressure. An air bottle without such equipment is like an armed bomb with a hair-trigger firing device.

Another pneumatically and hydraulically serviced unit that takes on special significance when associated with helicopters, is the landing gear shock strut. The requirement to provide adequate landing and taxiing load absorption is further compounded by ground stability and side-hill landing considerations. Improper servicing can nullify one or more of these important strut operational requirements and under certain conditions result in major structural damage. It is obviously impractical to attempt to maintain strut inflation requirements throughout the normal range of temperature environment and gross weight variations encountered in the normal operating day. Hangar or noonday higher temperatures can contrast sharply with outside morning and evening lower temperatures and gross weight variations are even less predictable. It is, therefore, recommended that when graduated servicing instructions are not provided, the struts be serviced to the norm or average temperature and load conditions for the particular season and operational mission. K

# Huskie Happenings

...Injured mountain climber rescued from 7,000-foot level by HH-43B crew from Det 4, WARC, Paine Field, Washington. Hoist pickup made after helicopter crew lowers crayon message on plywood directing climber to move from base of cliff. Earlier, mountaineer's companion, on way for help, picked up by HUSKIE. Crew lowers 80 feet of cable to make pickup from 65° slope at 5,800-foot level. Experienced climbers estimate three days would have been necessary to evacuate injured man without help of HH-43B. Capt Jerry D. Stroh, pilot on rescue mission; Lt Clifton E. Cushman, copilot; SMSgt Thomas J. Sternad Jr., medic; and A1c Hubert O. Marsh, hoist operator.

...Five sorties flown in high winds by crew of HUSKIE from Det 58, Brookley AFB, Ala., to rescue civilians stranded overnight on island after storm damages boat. Aboard HH-43B are Capt Herbert G. Gates, pilot; SSgt Thomas C. Felts, rescue and survival technician; SSgt George S. Lamont and A1c Norman B. Tenney, fire rescue technicians. Rescuees write thank-you note in newspaper afterward reading, in part, "These men came to our rescue when were stranded on Sand Island. It is this display of courtesy and reliability that makes us proud of our armed forces.

...Injured Navy pilot rescued from wreckage of A3D by HH-43B crew from Det 5, WARC, McChord AFB, Wash. HUSKIE piloted by Capt Edwin A. Henningson, makes 150-foot vertical, ground-speed decent to small clearing at rim of ravine. Chopper crew then makes way to crash scene on foot. Afterward, with survivor safely aboard, Captain Henningson makes vertical takeoff and heads for hospital....HH-43B crew from Aerial Survey Team (AST) 7, Port Moresby, New Guinea, makes 445-mile 'round trip to pick up ground station man seriously injured in fall. Navy helicopter assists in mercy mission by carrying four drums of fuel to airfield halfway to site.

...Det 1, 36th ARSQ, Misawa AB, Japan, scrambles HH-43B to carry emergency medical supplies urgently needed by expectant mother in Hokodate City Hospital. Drug supplied by 6038th Hospital after American Embassy contacted for help. Capt Dennis M. Chase, pilot on mission. Since becoming operational with HH-43B a few months ago, Det 1 has responded to 21 precautionary missions and three accidents.

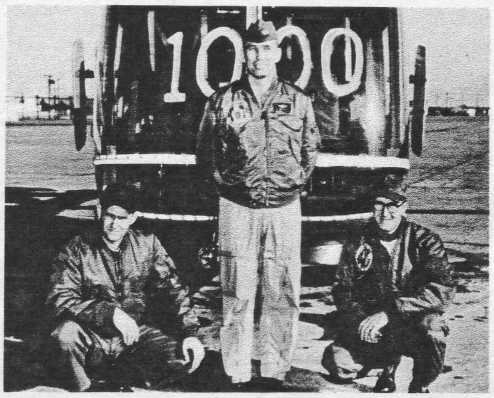
...Crew of HUSKIE from Det 8, AARC, Zaragoza AB, Spain, scrambles after two planes collide and pilots eject successfully. HH-43B stops by base hospital, picks up doctor and heads for bail-out area. Both pilots safely in hospital within 15 minutes after crash horn sounds. Capt Richard Schriber pilot of helicopter, Capt John Wells, copilot; SSgt Robert Ainsley, crew chief; SSgt Charles Rose and A2c Joseph Walenta, firemen....In second mission, Det 8 crew flies 70 miles to pick up pilot who had flameout. On way back to base within 45 minutes. HH-43B pilot, Captain Wells; copilot, Captain Schriber; medic, A1c Roy McNeel; firemen, A1c Roy Bunting and A2c John Gundolf....In third mission, fighter pilot ejects near base, picked up few minutes later by HUSKIE crew. Lt Bruce Ware, pilot; Captain Wells, copilot; and Airman Bunting, fireman. Detachment 8 crews also on three flights during search for lost hunter.

A hunter, seriously injured by a rifle bullet in a Thanksgiving Day accident, was airlifted to a waiting ambulance by an HH-43B crew from Det 43, EARC, Griffiss AFB, N.Y. The accident occurred in the rugged Adirondack Mountains and, because of the serious nature of the wound, it was feared the man would not survive a ground trip over the rough terrain. Landing at the site was impossible, so Capt Laurence W. Conover held the HUSKIE in a 75-foot hover below the tree tops and over a sand bar in a small creek. Winds up to 25 knots were blowing and considerable turbulence was encountered. SSgt Robert A. Collins, pararescue and survival technician, was lowered and the hunter was secured in a Stokes litter. He was hoisted aboard by SSgt Robert A. Johnson, fire rescue technician. The other member of the rescue crew was SSgt James A. Wyatt, fire rescue technician. Shown after the mission are, left to right, Captain Conover and Sergeants Wyatt, Collins and Johnson. (USAF photo)


**1,000 HOURS SAME DAY**—Men of Det 23, CARC, pose in front of base operations at K.I. Sawyer AFB, Mich., after their HH-43B's both passed the 1,000-hour mark on the same day in December. The 2,000 total hours of flying time have been accident-free. Front row, left to right, are 1stLt J.P. McCollum, 1stLt B.S. Washburn, Capt N. D. Dunham, detachment commander; 1stLt A.G. Volonis and 1stLt J. R. Johnson. Rear row, CMSgt R. B. Harrison, TSgt D. Summerfield, SSgt L. Flint, SSgt H. Linderborn, A1c W. E. Helmer, A1c W. Edwards, A2c F. Simms and A3c J. Zielinsky. (USAF photo)

**WELCOME TO BROOKLEY**—BrigGen Adriel N. Williams, ARS commander, is greeted by Capt Herbert G. Gates, commanding officer of Det 58, EARC, and Col Curtis L. Frisbie, base commander, on recent visit to Brookley AFB, Ala. (USAF photo)

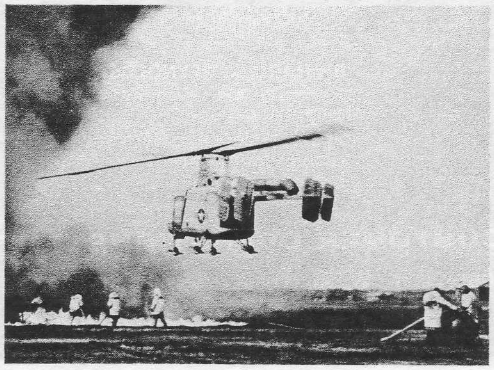
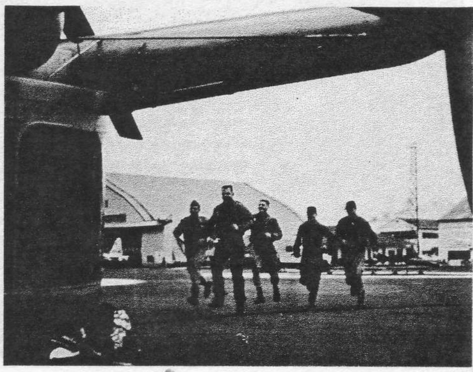
**BUSIEST DETACHMENT?**—Personnel at Det 54, EARC, Moody AFB, Ga., are justly proud of the fact that, during 1963, the unit scrambled 634 times in response to aircraft emergencies. Can any other unit top this? Shown is Capt Richard C. Pfadenhauer, Det 54 commander, who recently logged his 1,000th hour in the HH-43B. Congratulating him after touchdown is LtCol Charles H. Duncan, deputy commander for training at Moody. (USAF photo)

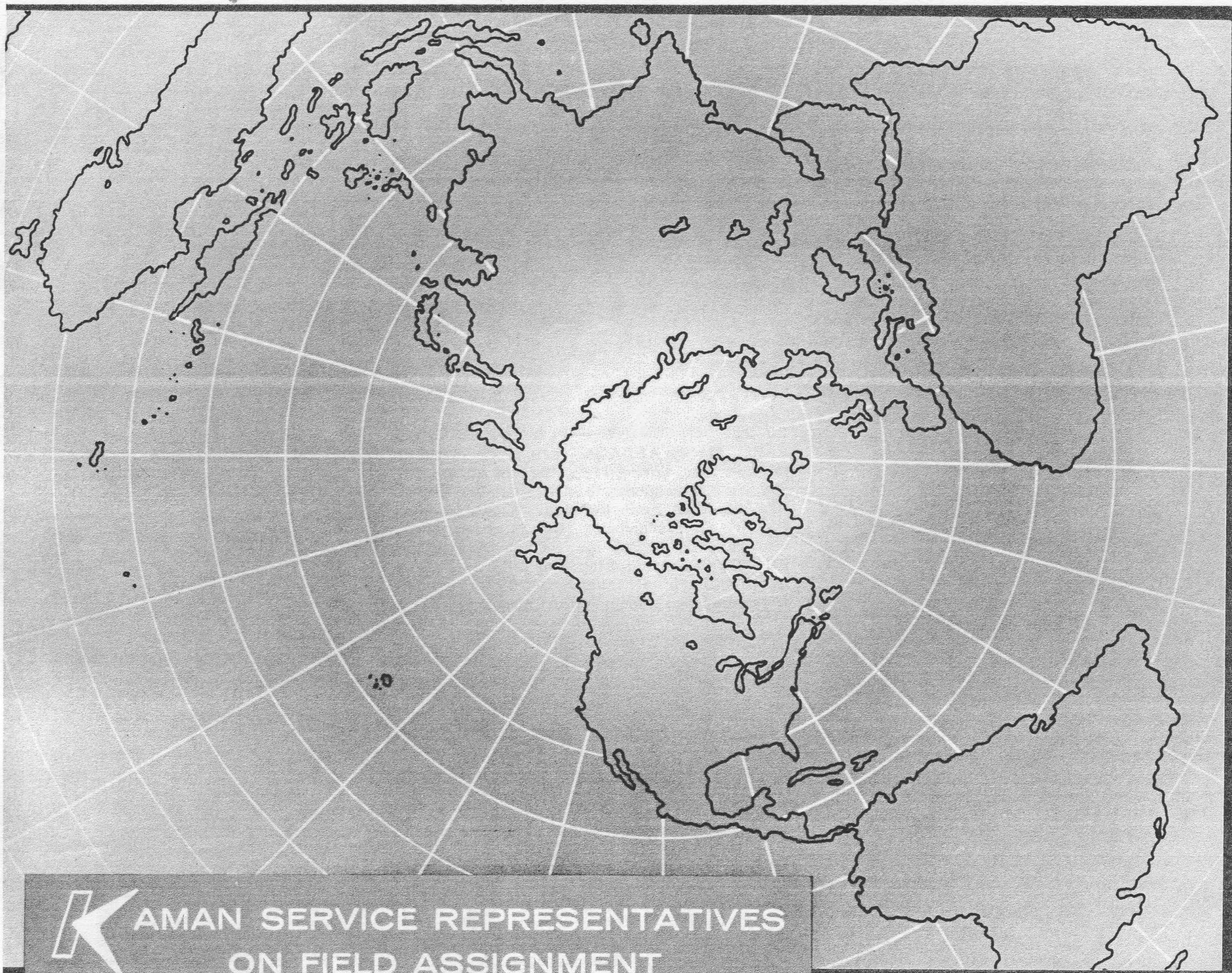


**BOTH LOG 1,000**—Shown after marking his, as well as the HH-43B's, 1,000th flying hour is Capt Pasco Parker of Det 24, CARC, at Kincheloe AFB, Mich. With Captain Parker are, left, A1c Sylvan C. Olson, crew member, and SSgt Basil I. Gray, flight chief. It is believed to be the first time that an HH-43B pilot and aircraft have simultaneously attained 1,000 hours. (USAF photo)


**SECOND HUSKIE HITS 1,000**—On December 15 the second HH-43B assigned to Det 41, EARC, at Loring AFB, Maine, passed the 1,000-hour flying mark. Shown with the sign made in observance of the event are, front row, left to right, Capt Dale R. Tyree, detachment commander; SSgt Cleophus Mattison, administrative technician; CMSgt Robert T. Hamilton, maintenance superintendent. Rear row, 1stLt Bruce B. Duffy, operations officer; 1stLt Joseph T. Connell, maintenance/supply officer; A1c John A. Perry, engine specialist; SSgt Robert J. Watson and A1c John F. Dorgan Jr., helicopter mechanics. Other members of the Loring rescue team are Capt James H. Black Jr., and 1stLt Wilson T. Arnold. The detachment's first HUSKIE logged 1,000 hours on July 17, 1963. (USAF photo)

**HUSKIE AT MISAWA**—Shown in action are members of Det 1, 36th Air Rescue Sq., at Misawa Air Base, Japan. Since becoming operational with the HH-43B recently, the detachment has responded to 21 precautionary missions and three accidents. (USAF photos)



# KAMAN SERVICE REPRESENTATIVES ON FIELD ASSIGNMENT

**DONALD P. ALEXANDER**
**WAYNE ZARLING**
**RICHARD FAIN**
**HOMER HELM**
NAAS Ream Field, Calif.

**WILLIAM C. BARR**
Morocco

**JOHN D. ELLIOTT**
Tachikawa AB, Japan
Osan AB, Korea
Clark AFB, P.I.
Naha AB, Okinawa
Misawa AB, Japan
Itazuke AB, Japan

**HORACE F. FIELD**
Burma

**CLINTON G. HARGROVE**
Pakistan

**DARRELL HEICK**
Colombia

**JACK L. KING**
**FRANCIS HEFFERNAN**
**FRANK McINNIS**
NAS Atsugi, Japan

**JOHN R. LACOUTURE**
O&R, NAS North Island, Calif.
Midway Island
NAS Barbers Pt., Hawaii
VMO-6 Camp Pendleton, Calif.

**ROBERT LAMBERT**
Torrejon AB, Spain
Moron AB, Spain
Zaragoza AB, Spain

**DONALD LOCKRIDGE**
O&R, NAS North Island, Calif.

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

**WILLIAM C. MORRIS**
NAS, Norfolk, Va.

**RICHARD A. REYNOLDS**
Ramstein AB, Germany
Toul AB, France
Spangdahlem AB, Germany
Chaumont AB, France
Laon AB, France

**DAVID M. RUSH**
**PAUL WHITTEN**
**GORDON FICKES**
**MARTIN WHITMORE**
**THOMAS C. LEONARD**
NAS Lakehurst, N. J.

**JACK E. SMITH**
New Guinea

**DONALD TANCREDI**
Okinawa

**HENRY J. TANZER**
NAS Atsugi, Japan
NAS Agana, Guam
NAS Cubi Point P.I.
NAS Sangley Pt. P.I.
Shin Meiwa Ind. Co., Ltd.
Toyonaka City, Japan

**TERRELL C. TURNER**
Thailand

**ROBERT I. WILSON**
Wheelus AB, Libya
Aviano AB, Italy
Cigli AB, Turkey
Incirlik AB, Turkey

## CUSTOMER OPERATIONS SECTION

**G. D. EVELAND, Supervisor, W. G. WELLS. Asst, Supervisor, Field Service Representatives.**