KAMAN Rotor Tips

厚木富士山

KAMAN AIRCRAFT CORPORATION

APRIL-MAY, 1964

PIONEERS IN TURBINE POWERED HELICOPTERS

KAMAN Rotor Tips

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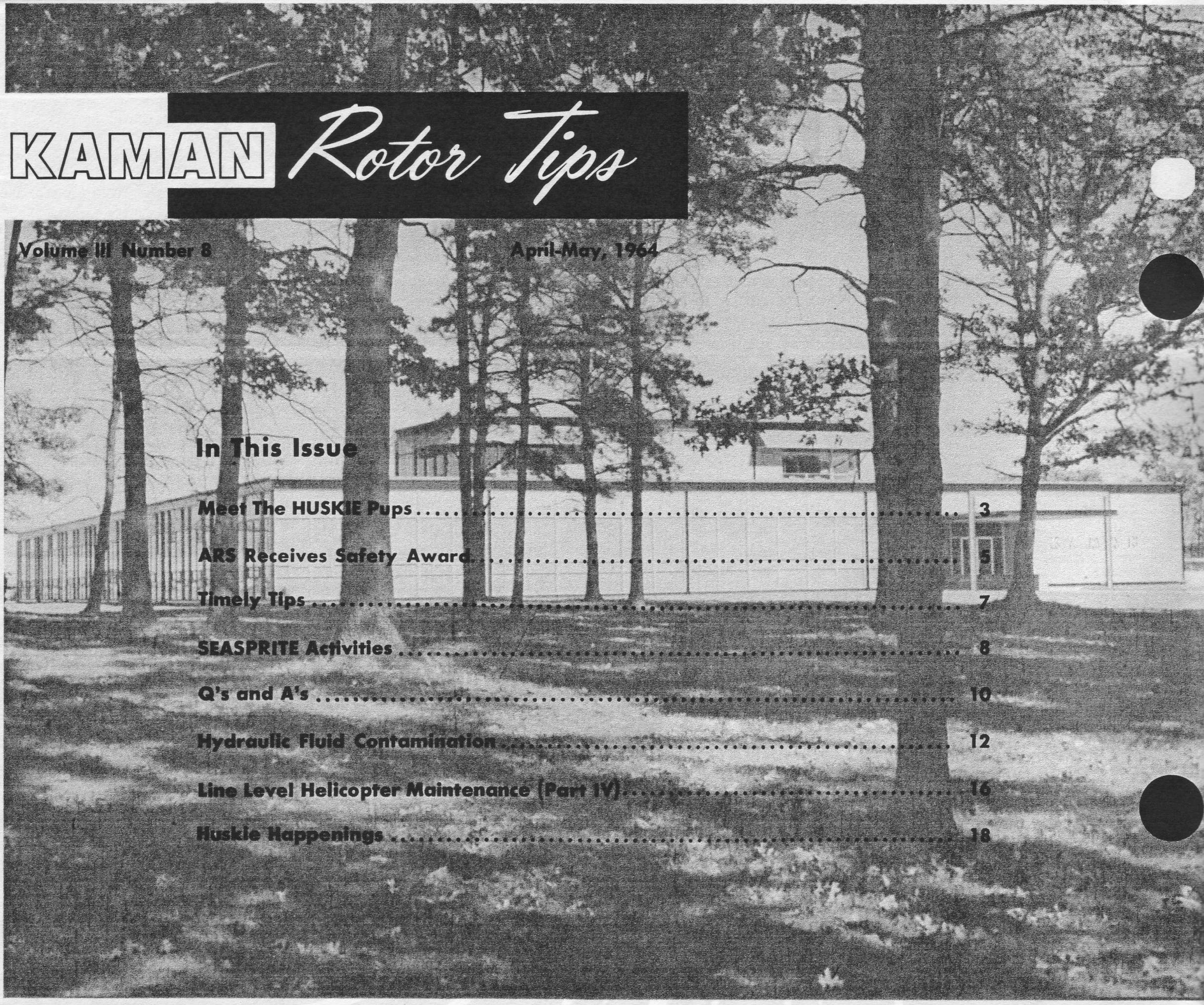

In This Issue

Meet The HUSKIE Pups 3
ARS Receives Safety Award 5
Timely Tips 7
SEASPRITE Activities 8
Q's and A's 10
Hydraulic Fluid Contamination 12
Line Level Helicopter Maintenance (Part IV) 16
Huskie Happenings 18

THE COVER

Kaman-produced HH-43B, UH-2A, UH-43C, and OH-43D in aerial rendezvous at NAS Atsugi, Japan. For actual photograph see page six. Cover by Donald D. Tisdale, Service Publications.

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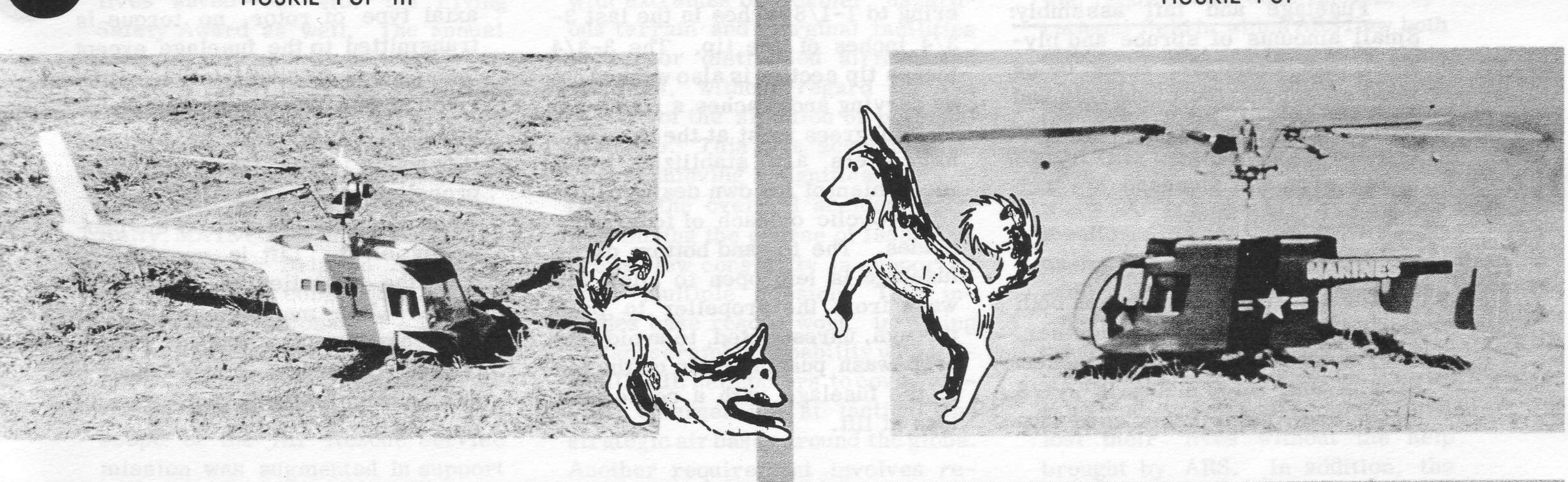
MEET THE HUSKIE PUPS

by Dr. D. Lee Taylor
Lakewood, Colorado

"Pup III" Model Wins First Place in National Contest

HUSKIE PUP III

HUSKIE PUP



My interest in model helicopters began while I was stationed in Germany with the U. S. Army in 1955. I had been passing my spare time building model airplanes and was given a model helicopter kit by an acquaintance who had lost interest in building it. Although it flew successfully better than 50 percent of the time in Germany, on returning home, I was sabotaged by Denver's mile-high air. Off and on during a four-year period I tried to find the secret of stability and was finally successful in the summer of 1960.

The remainder of 1960 was spent developing a "brain storm" of mine which resulted in an improved stabilizing mechanism later dubbed "Gyro-Cyclic." An improved version of my 1960 helicopter, using Gyro-Cyclic stabilizing mechanism, placed first in the helicopter event of the 1961 National Model Airplane Championships at Willow Grove Naval Air Station in Pennsylvania. A patent on Gyro-Cyclic was applied for on 16 March 1960 and granted 29 October 1963 under the number 3,108,641.

In striving for a more scale appearance for my 1962 National Championship entry, I was impressed with the appearance of a non-flying scale model of the Kaman HH-43B HUSKIE. Using this model and information generously supplied me by the Kaman Aircraft Corporation, the HUSKIE PUP was designed and built. It placed third in the 1962 national contest. For the 1963 National Championships I realized I needed a design with better "weather-vane" effect of the fuselage. When I saw the photos of Kaman's new HUSKIE III, I knew I had a fine pattern for an improved model helicopter. Again using photos from Kaman, the HUSKIE PUP III was built. This design's over-all stability and smooth flying characteristics proved successful enough to capture first place in the 1963 National Contest at Los Alamites Naval Air Station in California.

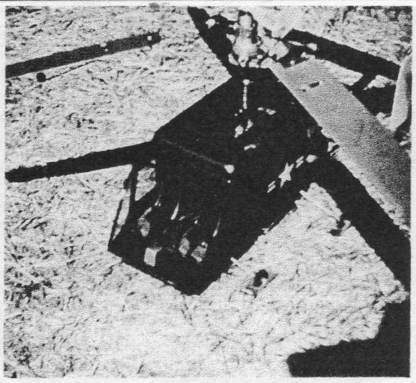
To date all my efforts with model helicopters have been in the area of torque-reaction-coaxial-type configurations. However, recent and future experiments are directed toward adapting the syncropter rotor system to model helicopter use. I also want to develop direct drive from the engine through a clutch and transmission to the syncropter rotors.

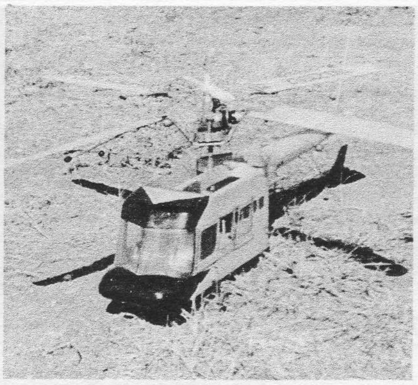
DESCRIPTION

The HUSKIE PUP is a semi-scale flying model of the Kaman HH-43B HUSKIE. Its companion, the HUSKIE PUP III, is a semi-scale model of the Kaman HUSKIE III. Both model helicopters are ground adjustable, free-flight models which are capable of rising off the ground unassisted and once in flight are not controlled by radio, control line or other means. Duration of flight is effected by limiting the amount of fuel. Maximum fuel capacity of 10 cc permits flights of two to three minutes. The 'copters land by autorotation after running out of fuel.

MATERIAL USED

Rotor system: Rotor blades are 3/32 inch sheet balsa wood reinforced with plywood and nylon. The remainder of the rotor system is built with 3/64 inch and 1/16 inch music wire, 1/16 inch and 3/32 inch ID brass tubing short lengths of 1/8 inch aluminum rod, number 9 lead fishing "bell" weights, sheet metal from tin cans, and 2-56 machine screws and bolts. The tank, which is an integral part of the rotor system, is made of brass shim stock and brass tubing.





Fuselage and tail assembly: Small amounts of spruce and plywood, the remainder being balsa wood except for the windshield and windows of cellulose acetate buterate and the landing gear of 1/16 inch music wire and standard 3/4 inch model airplane wheels.

FEATURES

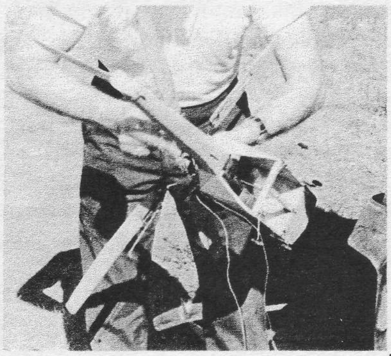
The rotor systems used on both models are identical to each other. The rotor diameter is 25-1/2 inches. Each of four rotor blades is 9-1/2 inches long, 1-5/8 inches cord tapering to 1-1/8 inches in the last 3-3/4 inches of the tip. The 3-3/4 inches tip section is also washed out by carving and reaches a maximum of -5 degrees twist at the tip. The helicopters are stabilized by a mechanism of my own design called Gyro-Cyclic on each of four rotor blades. The top and bottom of the fuselage is left open to allow the wash from the propeller to pass through, unrestricted, to avoid said prop-wash pushing down on the top of the fuselage with a consequent loss of lift.

POWER

Both the Tee Dee .051 or .049 and the Baby Bee .049 manufactured by L. M. Cox Co., have been used on my helicopters. The engine is bolted to the rotor system with its propeller rotating in a plane parallel to the plane of the rotor blades. The engine is free to turn with the rotors thereby powering it by torque reaction from air drag on the propeller. Since this is akin to a co-axial type of rotor, no torque is transmitted to the fuselage except that caused by the friction of the rotor mast. The dominant factor affecting the fuselage and causing it to rotate is that of the swirl of the propeller wash. This is counteracted by vanes imposed in the propeller blast. Lift is supplied by both the propeller and the rotor blades. The maximum weight of my 'copters is around 11-1/2 ounces. However, I find about 9 ounces much better in Denver's thin air.

FUSELAGE DIMENSION

Model	Fuselage width	Height less land. gear	Main rod length	Boom length	Total length	Vertical Fin		Horizontal stabilizer	Over-all height of helicopter
						Large	Small		
Huskie Pup	3-7/8"	4"	9-7/8"	5"	16"	3-1/2" x 2-7/16"	3" x 1-1/2"	8-5/8" x 1-3/4"	9-1/2"
Huskie Pup III	3-7/8"	4"	11"	12"	23"	Height 4-5/8" avg. cord 1-3/4"		none	9-1/2"



READY TO LAUNCH

ENGINE START

INTO THE BLUE

HUSKIE III FLIGHT OPERATIONS

WARM UP

BACK TO BASE

14,348 Saves and Assists by HH-43B Crews

ARS RECEIVES SAFETY AWARD

Training and strict observance of safety procedures and techniques have paid off for the Air Rescue Service—not only with an impressive record of missions flown and lives saved—but with the Flying Safety Award as well. The annual award, a huge silver trophy, is given by the Military Air Transport Service to the MATS organization contributing the most to the command's over-all aircraft accident prevention program. Gen Joe W. Kelly, MATS commander, presented the trophy to BrigGen Adriel N. Williams, ARS commander, at the recent MATS commander's conference at Orlando AFB, Fla.

The citation accompanying the trophy reads in part, "....The scope of the Air Rescue Service mission was augmented in support of Department of Defense space efforts, markedly increasing span of control and placing great reliance on aircrew judgment and ingenuity. Air Rescue crews operated C/CH-54s, HU-16s and HH-43s into all areas of the free world. They coped with extremes of weather, hazardous terrain and marginal facilities to succor distressed airmen and civilians, without regard for the gravity of the situation or personal hardship. This was accomplished while achieving a significant reduction in the over-all accident rate. ....During the course of 1963, ARS crews flew constantly in support of their multiple mission. This includes base rescue work, involving instant scramble capability with HH-43 HUSKIE helicopters to cover aircraft emergencies at tactical and strategic air bases around the globe. Another requirement involves retrieval of space equipment and personnel, which grows regularly with each U. S. advance in aerospace exploration.

"Search and rescue operation for both downed military aviators and civilians, including foreign nationals who require aid, adds another operational field in which ARS flew both effectively and safely in 1963. This area of operations often involves special flight hazards which adds significance to the safety achievement."

A great many of the missions mentioned were flown by HH-43B crews. During a two-year period, ending Jan. 31, 1964, these men saved 262 lives and assisted 1,473 other persons. Many were rescued from extremely precarious situations and, undoubtedly, would have lost their lives without the help brought by ARS. In addition, the HUSKIE crews scrambled 12,613 times to assist aircraft in trouble.

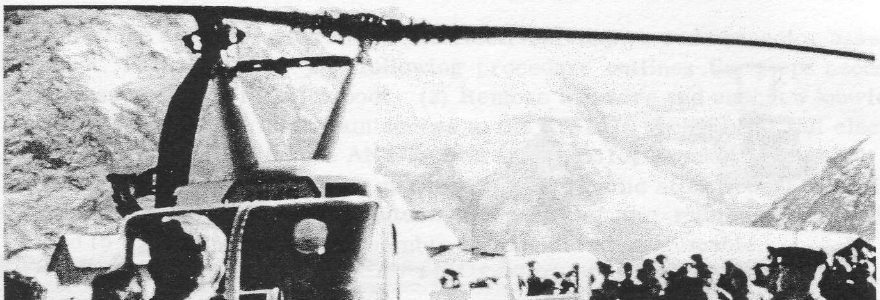
High Altitude, 1100-Mile Mission

One of the highest, and probably the longest, HH-43B rescue missions ever flown was carried out recently by Det 84, TUSLOG, stationed at Incirlik Air Base, Turkey. The HUSKIE crew took their helicopter on a 1100-mile round trip and flew at altitudes up to 14,000 feet over the rugged Toros mountains in order to evacuate a Turkish Army officer suffering from acute appendicitis. He was in an isolated village surrounded by peaks, some 13,000 feet high.

Aboard the HH-43B were Capt Alma L. Williams, RCC; Capt Gary L. Alden, copilot; and A1c Edward D. Erickson, crew chief. Two Turkish doctors and a navigator later joined the HUSKIE crew when it set down for refueling. A 55-gallon drum of JP-4 was also loaded aboard. A Turkish helicopter, unable to make the trip because of the altitude involved, assisted by carrying additional fuel to a location below the mountain range.

After flying at 14,000 feet density altitude for approximately 45 minutes, the village was sighted in a valley approximately 6,000 feet below the peaks. Captain Williams landed the HUSKIE in very tight quarters while hundreds of villagers stood by, cheering and clapping. The patient was speedily loaded aboard and the pilot made an almost vertical takeoff with the aircraft grossed out at 7500 pounds. The Turkish officer was delivered directly to the hospital and underwent immediate surgery for a ruptured appendix. After 14 hours of flying time and over 1100 miles, the helicopter arrived back at the detachment. Turkish officials later said that without the aid of the HUSKIE crew the patient would never have survived the long journey.

An HH-43B crew from Det 84 was also called on recently to fly Sargent Shriver, Peace Corps head, and four other members of the organization to several Turkish villages to confer with local corps reorésentatives. Most of the trip involved flying over snow-capped mountains at five to seven thousand feet. Captain Williams was pilot of the HUSKIE, Capt Carlton P. Vermeys, copilot, and Airman Erickson, crewchief.



MISSION TO BEYTUSEBAB—— Villagers surround Det 84 HUSKIE after landing to evacuate seriously ill Turkish army officer.

NO NEED TO BOLT OR CLAMP

Permanent Mounting Provision for the UH-2 K604621 Rod and Strut Fixture

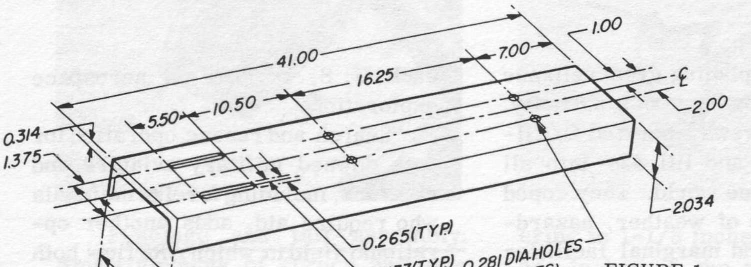


FIGURE 1

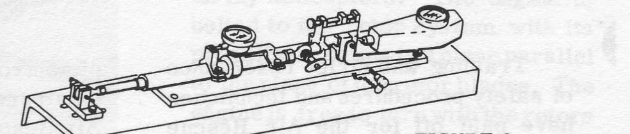


FIGURE 3

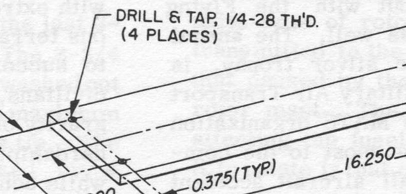


FIGURE 4

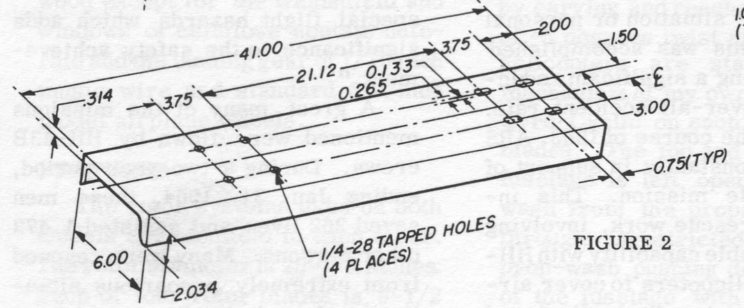


FIGURE 2

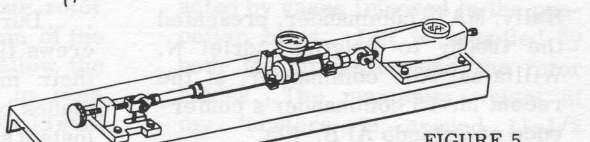
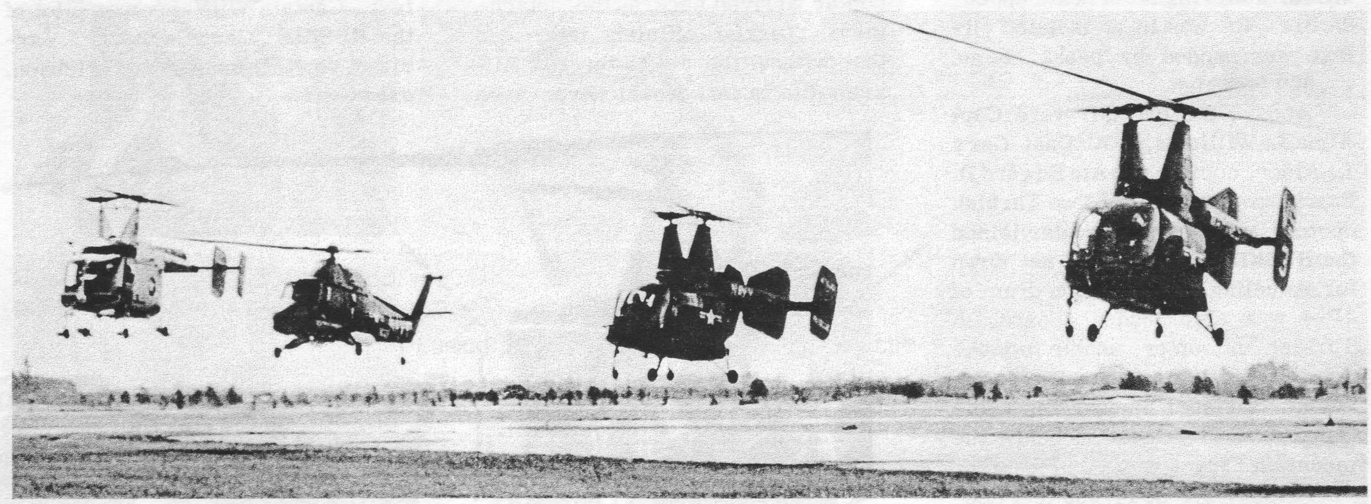


FIGURE 5

Figures 1 and 2 depict permanent mounting bases for the K604621-101 and -201 rod and strut fixtures which eliminate the need for bolting or clamping them to a bench. The dimensions shown in figure 1 are required to fabricate a base for the -101 fixture. The slots provided allow installation of either the K654012 cyclic and directional trim strut or the K652170 collective force rod without unbolting and moving the fixture. Dimensions required to fabricate a similar base for use with the -201 fixture are provided in figure 2. Both bases are to be fabricated from 6061-T6 aluminum channel.

1. Fixture Mounting Instructions - K604621-101(Figure 3) (a) Drill and tap the existing fixture base plate as shown in figure 4. (b) Secure the fixture base plate with four AN4-6A bolts and four AN960-416 washers. Bolt heads must be down. (c) Secure the clevis portion of the fixture to the slots provided in the channel with two 1/4-20 by 1-1/4-inch long carriage bolts. The bolts must be installed so that the square portion directly under the bolt head engages the slot of the fixture. Secure the bolts with two AN960-416 washers and two AN335-4 nuts. By loosening the nuts, the clevis end of the fixture may be moved in or out, accommodating either the force rod or trim strut.
2. Fixture Mounting Instructions - K604621-201(Figure 5) (a) Mount the screw jack portion of the fixture to the channel using four AN4-7A bolts and four AN960-416 washers. (b) Using four 1/4-20 by 1-1/4-inch long carriage bolts, four AN960-416 washers, and four AN335-4 nuts, secure the force gage mounting plate to the channel. The square portion of the carriage bolt should be engaged in the channel slot.



"ANGELS" RENDEZVOUS— The cover was inspired by this unusual photograph of four generations of Kaman-produced helicopters hovering at NAS Atsugi, Japan. (Admittedly, a few liberties were taken in the name of art.) From right to left are an OH-43D flown by 1stLt Dave Elpors, USMC, of VMO-2, Sub Unit One; a UH-43C piloted by Cdr Gus Bello, USN, aircraft maintenance officer; and a UH-2 flown by Lt(jg) Dave Presnell, USN, of HU-1 Detachment 1. All are based at NAS Atsugi. The HH-43B is piloted by Capt Charles Carpenter, USAF, 36th ARS, Tachikawa AB, Japan. Since the first Kaman helicopter was placed in service years ago, men and aircraft such as these have participated in literally thousands of missions during which the lives of hundreds of persons, military and civilian, were saved. (USN photo)

Timely Tips

SEASPRITE Hoisting (UH-2)

Normally, hoisting of the UH-2 with the K604010-1 adapter is performed with the rotor retentions installed. In this manner the weight of the helicopter is distributed between both the upper and lower arms of the rotor hub. In some instances, however, it may be necessary to hoist aircraft that do not have the rotor retentions installed. When this becomes necessary, it is imperative that the retention cross bearing liner, P/N K618287-11; lead-lag pin, K610027-13; washer, K610013-13; and nut, K610028-13; be installed. By installing these items, the aircraft weight is distributed equally between the upper and lower hub arms. Lead-lag pin torque need only be snug (approximately 25 foot pounds) for this purpose.

D. W. MacDonald, Service Engineer

Hose Saver (HH-43B)

Air Rescue Service detachments report a substantial increase in hose life if the following procedure is followed: After the hose has been used six times, either for fires or during drills, it should be reversed, end for end, so that the wear pattern is evenly distributed.

W. J. Wagemaker, Service Engineer

VTVM Application For Aircraft (UH-2)

In certain applications it is necessary to use a vacuum tube voltmeter instead of an ordinary multimeter. However, a VTVM is not always readily available for flight line work. The following procedure will enable the technician to utilize the vacuum tube voltmeter section of the ASE flight line test set for other than ASE testing. (1) Connect ASE cable between J-1 on the test set and the ASE amplifier for VTVM power. (2) Insure that all switches are in the "OFF" position. (3) Place power switch to the "ON" position. (4) Place function switch to the "TOTAL" position. (5) Place range switch to the required range position. (6) Place leads from item under test to the VTVM and Sig Gnd test point jacks on the panel.

J. J. McMahon, Service Engineer

FSK Heater (HH-43B)

If the Fire Suppression Kit heater has a tendency to go out, set the flow regulator to 10 psi and maintain 10-12 psi air pressure. Reports indicate that with this setting, and once the heater is warmed up, even hovering over the trailer will not put the heater flame out.

W. C. Barr, Field Service Representative

Removing Assembly From Cyclic Socket (UH-2)

Although not routine maintenance, it may become necessary to remove the electrical adapter and connector assembly, P/N K651061, from the cyclic stick socket, P/N K651016. The following procedure outlines the steps necessary: (1) Remove the pilot or copilot seat. (2) Unsnap the cyclic stick boot. (3) Remove lockwire and unscrew knurled nut at base of cyclic stick. (4) Remove deck panels as required to gain access to the K651016 socket. (5) Cut electrical wiring leading from K651016 socket at wire splices. (6) Remove AN3-5A bolt from K651016 socket. (This bolt holds adapter assembly in position.) (7) Push wires and K651061 adapter up through top of cyclic stick socket. Installation is the reverse of removal. This information will appear in future revisions of the maintenance handbook. NOTE—The electrical connector is bonded to the adapter. This assembly is considered consumable.

M. T. Fiaschetti, Service Engineer

Actuator Mounting Check (UH-2)

When replacing RD12-16-2 or -3 tracking actuators, make sure the K659537-13 outer bearing retainer REMAINS INSTALLED on the K659538 bracket assembly. Experience has shown that, because of the snug fit between the bearing retainer and actuator, the retainer may inadvertently be left attached to the actuator and consequently be forgotten during installation of the new actuator. Several outer bearing retainers have been found on tracking actuators turned in for overhaul.

D. W. MacDonald, Service Engineer

Squadrons Report On

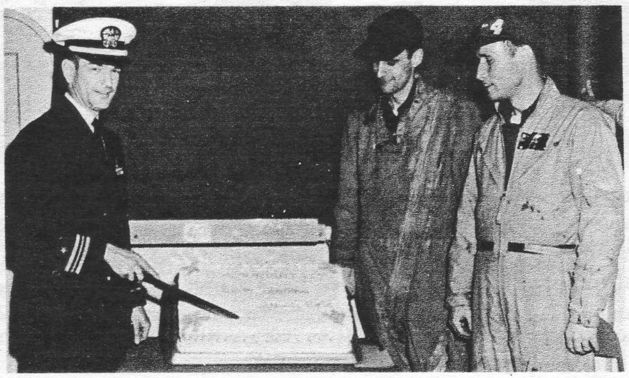
SEASPRITE ACTIVITIES

HU-4 In Double Mission

USS Wright... The crew of a SEASPRITE from Det 85, deployed aboard the USS Wright flew 250 miles through heavy overcast and freezing rain to evacuate a sailor with acute appendicitis from the USS Outpost. The ship was operating 400 miles offshore in heavy seas. Later, that night, the same helicopter crew flew 150 miles from the Wright to NAS Norfolk, Va., with the sick man. The detachment is attached to Helicopter Utility Squadron Four, NAS Lakehurst, N.J.

LCdr Joe Gardner, OIC of Det 85, was pilot and Lt(jg) Pete Reber, copilot of the UH-2. Richard B. Hamlet and Raymond B. Sprouse, AD2's, were crewmen on the double mission. They were accompanied by a doctor from the Wright. The helo first launched at 1300 and encountered the freezing rain 50 miles away from the carrier. It took approximately an hour to cover the 125 miles between the two ships. Sprouse was lowered to the pitching deck of the Outpost inorder to assist with the litter hookup and then Hamlet and the doctor maneuvered the litter into the helicopter. After Sprouse was taken back aboard the SEASPRITE, the return trip was made to the Wright. The carrier began steaming toward Norfolk but at 2000 hours it was decided to launch again because of the patient's condition and low blood count. Despite the poor visibility, the 150-mile trip to Norfolk was made without incident and the sick man was taken to the hospital. The helo then returned to the Wright. The crew of the SEASPRITE later received a commendation from the commanding officer of the Outpost for "an outstanding job under very adverse conditions."

ABOARD THE WRIGHT— SEASPRITE attached to HU-4's Det 85 is shown just before launch from flight deck. In second photo LCdr Joe Gardner, right, and Lt(jg) Pete Reber, UH-2 pilots, watch as LCdr Roberts, operations officer of the USS Wright, prepares to cut traditional cake baked in observance of 100th landing. Commander Gardner is OIC of the detachment. Third photo shows other members of Det 85. Kneeling, left to right are, H.J. Beaudry, ADR3; W.J. Maxson, ADR1, crew leader; T.E. Pearey, AMSAN; R.S. Burton, AE2. Standing are J.M. Crosswhite, ATAN; R. V. Kober, ADJ3; E. R. Bailey, AMS2; B. R. Monroe, ADR2. (USN photos)



HU-2 In Night Mission

USS Franklin D. Roosevelt... Two UH-2 crews from Det 42 aboard the Roosevelt recently participated in one of the first night missions involving personnel transfer in the Atlantic. The detachment was deployed from Helicopter Utility Squadron Two, NAS Lakehurst, N.J.

One SEASPRITE, "Angel 23," was piloted by Lt J.D. Chilcoat and Lt(jg) R.W. Knight. D. E. Wright, AMS1c, and J.C. Hauser, AD2 were crewmen. The other SEASPRITE, "Angel 22," was piloted by Lt W.B. Lester and LCdr W. L. Richards with W.W. Reece, as crewman. The mission began for the two crews when the giant carrier received a call for assistance from the USS Robinson, a destroyer.... An officer suffering from appendicitis was in need of immediate medical care. It was decided a night helo transfer would be faster and safer than the high-line transfer originally planned when the two ships met. The helicopters took to the air and, flying almost completely on instruments, made contact with the Robinson a half-hour later.

Angel 23 moved in and deposited Hauser on the destroyer's fantail, then Angel 22 made its approach and dropped a stokes basket stretcher to the deck. Hauser moved the ailing officer onto the litter and rigged it for return to the hovering Angel 22. With the patient safely aboard, Angel 23 then recovered Hauser and both helicopters returned to the Roosevelt.

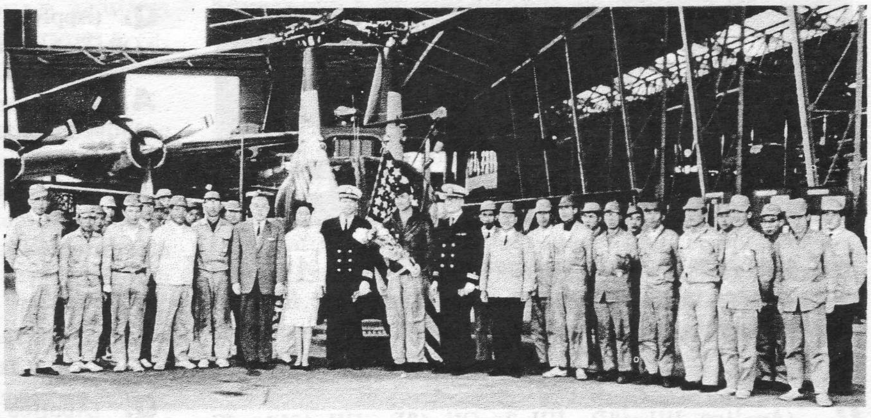
HU-1 In Night Rescue

USS Bon Homme Richard... The first UH-2 rescue in Pacific waters at night occurred recently when Jerry P. Doolin, AN, fell overboard from the USS Bon Homme Richard while 1,000 miles from the nearest land. The helicopter was from Detachment "Echo" deployed aboard the attack carrier from Helicopter Utility Squadron One at NAAS Ream Field, Calif.

Lookouts aboard the ship sounded the "man overboard" alarm upon hearing Doolin's calls for help and the ship was immediately put through a hard starboard turn so the man in the water would not be struck by the giant propellers. The "Bonnie Dick" then headed at maximum speed back over its course. The evolution put the ship through a 265-degree turn and brought it so close to Doolin that one of the crew was able to throw him a life jacket. Meanwhile, soon after the alarm sounded, the UH-2 was airborne and began searching the dark waters. Moments after he was spotted in the sea, the sailor was taken aboard the helicopter. Thirteen minutes elapsed from the time he fell overboard to the time the SEASPRITE'S crew deposited him safely on the carrier deck. Lt(jg) F.J. Hall and Lt(jg) J. C. Brady were pilots aboard the UH-2; P. L. Dibble, AMS2 and C.R. Sears, SA, were crewmen.

Atsugi Mercy Mission

A UH-2 attached to Station Operations, NAS Atsugi, Japan, was dispatched on a 200-mile trip to Matsushima to pick up a skier requiring immediate medical assistance. He had broken his leg and was snowbound. Lt B. G. Garvin was pilot of the SEASPRITE and C.V. Lindley, AD3, crewman. The mission was reported as "uneventful."



COMMEMORATION— The UH-43C/OH-43D (HUK-1, HOK-1) rework program at the Shin Meiwa Industry Co.'s Itami, Osaka, Japan, facility was completed recently with delivery of the 39th helicopter. During the ceremony, held by the Osaka Detachment of Fleet Air Western Pacific, U.S. Navy, to mark the event, flowers were presented to Capt Francis E. Martin, USMC pilot, by the attractive Japanese girl. With captain, are Cdr Edward O. Crosby, USN, facility management officer; and Lt D. D. Conquest, USN, contract administrator.

UH-2A Completes First Mediterranean Deployment

Helicopter Utility Squadron Two... On March 5th, HU-2 welcomed Detachment 62 back from a seven-month deployment in the Mediterranean aboard the USS Independence (CVA-62).

After departing the parent squadron at NAS Lakehurst on August 4th, the 10 pilots and 40 men of the detachment immediately began putting three UH-2A Utility Helicopters through their paces. On August 10th, the UH-2A demonstrated one of its capabilities by making the first night stokes litter transfer from the USS Nantahala (AO-60). This performance was later repeated with a destroyer.

During the cruise the UH-2A proved its versatility as a Utility Helicopter by: making over 1,000 personnel transfers, ship-to-ship and ship-to-shore; transferring over ten tons of mail and cargo; and flying over 1,000 hours of plane-guard both day and night.

With its night capabilities the UH-2A provides faster "on the scene" rescue potential after sunset, thereby freeing the night plane-guard destroyer for other duties such as ASW. Using the latest navigation equipment and its longer range, the UH-2A can conduct searches far from the carrier. With its around-the-clock potential the UH-2A is proving itself a valuable addition to the fleet.

For The Record

In addition to their routine duties, SEASPRITE crews from Helicopter Utility Squadron One, NAAS Ream Field, Calif., rescued 20 persons during a 13-month period.

Five of the rescues were carried out in the Ream area, the others by detachments aboard various aircraft carriers. Six rescues were made aboard the USS Bon Homme Richard; four aboard the USS Midway; three, USS Oriskany; one, USS Bennington; one, USS Hornet.

— CURRENT CHANGES —

			Issue Date
ASC	No. 6	Replacement of MAIN ROTOR FLAPPING SPINDLES.	3/17/64
AFC	No. 17	Installation of BATTERY START CAPABILITY.	3/5/64
AFC	No. 22	Modification of NUMBER 2 GENERATOR PROTECTIVE PANEL.	3/19/64
AFC	No. 30	Modification of ELECTRON TUBE COOLER.	2/20/64
AFC	No. 33	Modification of MAIN LANDING GEAR LIQUID SPRING SHOCK STRUT.	2/14/64
AVC	No. 97	Modification of ASE AMPLIFIER CHASSIS.	2/13/64
TCTO	1H-43(H)B-570	Increased strength ROTOR HUB.	2/17/64

A. J. Leonaitis, Service Publications

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, UH-2, OH-43D, UH-43C) IS THERE A WAY OF REDUCING THE EFFECTS OF ACCUMULATED STATIC ELECTRICITY ON PLASTIC-FACED, LOW TORQUE METER MOVEMENTS?

A. Yes. The annoying effects of static electricity build-up on meter movements, such as poor repeatability on low ranges, the pointer sticking to the meter face plate, and reduced meter sensitivity, can be reduced by the application of a commercial anti-static solution called "STATNUL." This solution is manufactured by the Weston Instrument Division of Daystrom Incorporated of Newark, New Jersey.

A. Savard, Service Engineer

Q. (Applies HH-43B) IF THERE IS TOO MUCH FRICTION ON THE COLLECTIVE STICK, YET THERE IS NO PRESSURE ON THE FRICTION DEVICE ON THE STICK, WHAT SHOULD BE DONE?

A. Check the friction device on the collective limiter. If the washers are burred, they will increase the friction no matter how loose the torque on the nut. Best field fix is to stone the edges of the washer and reset the friction per -2 instructions.

W. J. Wagemaker, Service Engineer

Q. (Applies UH-2) CAN AN ERROR STILL EXIST IN THE FUEL QUANTITY SYSTEM AFTER CALIBRATION?

A. Yes. If the calibration of the TF20-1 capacitance type liquid system test set has not been checked. The test set has a built-in capacitance indication calibration feature which allows verification of indicator accuracy. An error of only 3 micro-microfarads may cause the indicator to drive off scale. To preclude this type of error, insure that the test set has been calibrated prior to use.

J. J. McMahon, Service Engineer

Q. (Applies HH-43B) HOW SHOULD THE DATA PLATE ON THE TAILS BE REINSTALLED?

A. Data plates can be installed with pliobond cement and cherry rivets. Be sure to use soft aluminum washers on the cherry rivet tails to prevent "pull through."

W. J. Wagemaker, Service Engineer

Q. (Applies HH-43B) WHAT IS THE STOCK NUMBER FOR THE RESCUE SLING?

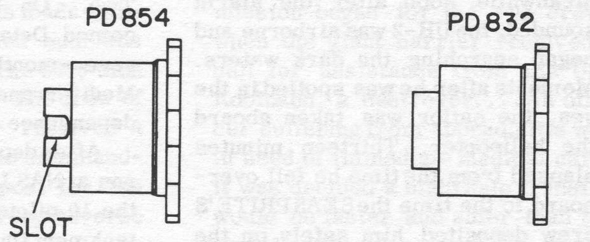
A. The correct stock number for the rescue sling is 4240-565-0239, part number ARS 001, Mfg. Code 02694. According to the H4-1, Federal Supply Code of Manufacturers, the sling is manufactured at Orlando AFB, Fla. The stock number for procuring a 200-pound dummy for practice hoist work is 1670-491-0976.

W. J. Wagemaker, Service Engineer

Q. (Applies HH-43B) CAN BEAR PAWS CAUSE THE HELICOPTER TO TURN?

A. Yes, the bear paws may have an effect upon the flight characteristics of the helicopter. If, for example, the left forward bear paw is tilted forward it may create enough drag to turn the aircraft to the left. The maintenance manual should always be followed when installing bear paws to avoid the possibility of this occurring.

W. J. Wagemaker, Service Engineer



Q. (Applies UH-2) ARE THE P/N PD854 AND PD832 ZURN COUPLINGS IN THE TAIL ROTOR DRIVE SYSTEM INTERCHANGEABLE AND HOW DO YOU TELL THEM APART?

A. The two assemblies are not interchangeable. In order to allow for more axial movement in the PD854 coupling, the sleeve, P/N 31978, was made 0.153 inches longer than the PD832 sleeve, P/N 30273. To make it easy to visually identify the PD854 coupling, a slot was machined into the end of the hub, P/N 31979. When installing this coupling, be sure that the sleeve and hub serial numbers match and that it is installed onto the oil pump shaft with the slot and the pin engaged. The pin is shown in NAVWEPS 01-260HCA-4-2. Failure to assemble and install the PD854 coupling correctly can result in the bottoming out of the hub in the sleeve. This condition will result in an overheat condition and/or vibration.

F. E. Allen, Service Engineer

Q. (Applies HH-43B) WHAT IS THE NOMENCLATURE AND PART NUMBER OF THE STRIPS OF MATERIAL TO WHICH THE SOUNDPROOFING IS ATTACHED?

A. This material is known as Velcro Strip, P/N V320-1(80)-75-SA0142A. It is manufactured by American Velcro, Inc., of Manchester, N.H., and may be ordered directly from the manufacturer.

W. J. Wagemaker, Service Engineer

Q. (Applies UH-2) WHAT ACTION SHOULD ALWAYS BE TAKEN AFTER A GAS GENERATOR BOTTLE ON THE FLOTATION SYSTEM HAS BEEN FIRED?

A. Whenever a gas generator bottle on the flotation system has been fired, it should be flushed out as quickly as possible. This pertains to any inflation, emergency or otherwise, as the products of combustion induce corrosion. If this procedure is not adhered to the corrosion will rapidly form and eventually the bottle may become inoperative for future use. In one case, for example, corrosion had formed to such an extent that the impression was given that the neck of the generator bottle had expanded on firing to the point where it could no longer be used. To prevent corrosion—clean out the inside of the bottle and propellant chamber with warm water and then dry by flushing with acetone, spec. O-A-S1. The gas generator tube assembly should be vapor blasted, cleaned with warm water, and acetone dried. Make certain that the small hole in the baffle at the end of the tube is clean.

R. W. Spear, Service Engineer

Q. (Applies OH-43D, UH-43C) HOW CAN GROUND PERSONNEL CHECK THE COLLECTIVE LIMITER FOR PROPER FUNCTIONING?

A. The only check that can be made is to make sure a definite hesitation exists in the downward movement of the collective stick when released from its full up position. The hesitation indicates hydraulic fluid is being properly metered as it flows from one chamber to the other inside the limiter. Other checks for proper limiter operation must be performed by the pilot.

W. J. Wagemaker, Service Engineer

Q. (Applies HH-43B) CAN THE SEAT COVERS FOR THE PILOT, COPILOT AND CABIN SEATS BE ORDERED SEPARATELY (WITHOUT THE CUSHIONS)?

A. Yes, the seat covers can be ordered separately. The part numbers are: (a) Pilot and copilot seat cushion cover, P/N 6205-10. (b) Pilot and copilot back cushion cover, P/N 6213-10. (c) Rear seat cushion cover (right hand, aft) P/N 6491-1. (d) Rear seat cushion cover (center, aft) P/N 6492-1. These are numbers assigned by C. R. Daniels Inc., Daniels, Maryland. The covers may be ordered through Kaman Aircraft or directly from C. R. Daniels.

W. J. Wagemaker, Service Engineer

Q. (Applies UH-2) WHAT OCCURS IF EITHER THE MAIN ROTOR GEARBOX OR ACCESSORY GEARBOX IS ROTATED WHILE THE ACCESSORY DRIVE SHAFT IS DISCONNECTED?

A. Rotation of either the main rotor gearbox or accessory gearbox, while the accessory drive shaft is disconnected, will cause loss of phasing between the main rotor and the in-flight tracking resolver. Should either gearbox be independently rotated, the shaft reinstalled, and the aircraft flown, erroneous signals will be coupled to the tracking system. This may result in the rotor system being driven out-of-track rather than maintaining a normal in-track condition. To avoid this trouble: (1) Engage the rotor brake to lock the accessory gearbox. (2) Note the position of the main rotor prior to disconnecting the shaft and secure the blades, if possible. (3) Inform your co-workers of the situation and request that the rotor head not be turned. (4) Prior to reinstalling the shaft, be certain that neither gearbox has been rotated. If you are certain or suspect that rotation has occurred, check resolver phasing (Ref: NAVWEPS 01-260HCA-2-9) prior to next flight.

F. E. Allen, Service Engineer

Q. (Applies UH-2, UH-43C, OH-43D, HH-43B) WHAT ARE THE FEDERAL STOCK NUMBERS FOR THE VARIOUS TYPES OF "LOCKTITE" OR COMPARABLE SEALING COMPOUNDS?

A. Federal Stock Numbers for these sealing compounds appear in the chart on the right.

W. J. Wagemaker, Service Engineer

		MIL-S-22473A		VENDOR DATA		
Federal Stock No.	Nomenclature	Grade	Unit	Name	Code	P/N and/or Nomenclature
8030-081-2286	Sealing Compound	EV	50cc			
8030-081-2325	Sealing Compound	H	50cc			
8030-081-2326	Sealing Compound	H	10cc			
8030-081-2327	Sealing Compound	EV	10cc			
8030-081-2328	Sealing Compound	E	50cc			
8030-081-2329	Sealing Compound	E	10cc			
8030-081-2330	Sealing Compound	CV	50cc			
8030-081-2331	Sealing Compound	CV	10cc			May be procured from various qualified manufacturers provided manufactured to the MIL Spec shown-i. e. MIL-S-22473A.
8030-081-2332	Sealing Compound	C	50cc			
8030-081-2333	Sealing Compound	C	10cc			
8030-081-2335	Sealing Compound	B	10cc			
8030-081-2336	Sealing Compound	AV	50cc			
8030-081-2337	Sealing Compound	AV	10cc			
8030-081-2338	Sealing Compound	A	50cc			
8030-081-2339	Sealing Compound	A	10cc			
8030-081-2340	Sealing Compound	AA	50cc			
8030-081-2341	Sealing Compound	AA	10cc			
8030-081-9022	Sealing Compound	B	50cc			
8040-705-8530	Kit	--	---	American Sealants	05972	110A Kit
8030-803-1843	Sealing Compound	--	50cc	American Sealants	05972	Loctite, Gr. C
8030-803-7458	(Consolidated with FSN 8030-816-1945)					
8030-816-1945	Sealing Compound	--	10cc	American Sealants	05972	Loctite, Gr. C
8030-980-3975	Activator-Primer	--	6 oz.	American Sealants	05972	Locquic Gr. C
8030-980-3976	Activator-Primer	--	6 oz.	American Sealants	05972	Locquic Gr. Q

NOTE: In the majority of the items listed, the vendor is not specified. Any responsible manufacturer of sealing compounds can furnish the material, provided it is made to Military Spec. MIL-S-22473A and approved by the proper authority.

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.*

HYDRAULIC FLUID Contamination

by Paul M. Cummings
Service Engineer
Customer Service Department

This article concerns the contamination of hydraulic fluid—its causes, results, and preventative measures as applied to the electro-hydraulic servo systems of the UH-2 helicopter.

As modern hydraulic systems become more complex, the control of contamination becomes more critical. Hydraulic fluid contamination problems in Kaman Aircraft helicopters were practically nonexistent until the automatic stabilization system requirement was established for the UH-2. Earlier aircraft, such as the OH-43D, utilized hydraulic power only for wheel and rotor brake systems which were, by and large, immune to contamination when compared with the complex, more sensitive servo systems used today. Through the evolution of the UH-2 servo system, Kaman has been continually improving methods and procedures for contamination control.

Since the difficulty in controlling contamination is directly related to the complexity of the system, this article will emphasize in some detail the operation of the UH-2 servo system, how it is affected by contamination and how, through efficient filtration and maintenance practices, the level of contamination can be maintained within safe limits.

Contamination of hydraulic fluid is defined as any foreign matter present in the fluid, and is measured by the size and number of individual particles per unit volume. Normally, a fluid sample of 100 cubic centimeters (approx. 3.5 ounces) is analyzed; therefore, the contamination level is given as the number of particles per 100 cubic centimeters of fluid. The size of the particle is measured in microns which is the standard of measure used throughout the filter industry.

In order to appreciate the problem of controlling contamination, an understanding of the relative size of a micron is necessary. One micron is equal to approximately four, one hundred thousandths of an inch (0.00004). A grain of ordinary table salt is one hundred times larger or four thousandths of an inch in diameter. Talcum powder, measuring only 10 microns in diameter, is the approximate size of the particles we are most concerned with. Since 40 microns is considered to be the smallest particle visible to the naked eye, it is apparent that the contamination causing the greatest concern will not be seen. The larger particles seen clinging to the outside of a filter element, although still cause for concern, will neither pass through nor clog the filter. This means that even though a visual inspection of a filter or fluid sample indicates no obvious contamination, tens of thousands of particles, 40 microns and smaller, may be present.

The effects of contamination are felt to some degree by all components within the hydraulic system. Close tolerance component parts are naturally more susceptible to failure or malfunction due to contamination than those whose tolerance and operation is less critical. The following are examples of the results of excessive contamination within the UH-2 hydraulic system:

a) Electro-hydraulic servo valve - The servo valves, which convert the electrical signals created by the ASE system into fluid power, are the system components most susceptible to contamination problems. In order to meet the sensitivity requirements of the ASE system, ultra-fine tolerances are maintained in the machining of internal parts of the valve. Each valve incorporates its own filter which, in some cases, has become contaminated to the point that the valve was almost completely starved of hydraulic pressure, rendering that portion of the ASE system inoperative.

b) Reservoir filter - The hydraulic reservoir contains a 10-micron filter which filters all fluid delivered to the pump. In a few cases this filter has become clogged to the point that the pump has been starved of fluid and system pressure was lost.

c) Hydraulic pump - The pump is of the variable flow, constant pressure type, which relies on a compensating piston to regulate the flow in proportion to system demand. Contamination has caused this piston to stick, producing pressure fluctuations which rendered the entire system inoperative.

The electro-hydraulic servo valve in the ASE system is the point in which the electrical signals created by the various "black boxes" are converted into hydraulic power. This power or pressure is directed to the appropriate side of a cylinder piston which, in turn, applies an input directly to the aircraft's primary flight control system. The UH-2 utilizes two types of servo valves, fast (lateral channel) and slow (collective, longitudinal, and directional channels). The fast and slow classifications refer to the gain or response of the valve to a given electrical signal.

To understand the effect of contamination on the servo valve, its operation and working clearances must be appreciated. Figure 1 schematically illustrates the type of servo valve used in the UH-2 ASE system. This figure depicts valve operation with equal electrical currents or signals applied to valve coils. This state is commonly referred to as "null." With the valve in this state and ASE engaged, fluid at 1,000 psi is flowing into the pressure port "P." The fluid passes through the servo valve filter and enters both ends of the spool and sleeve section of the valve. Here the pressure is reduced to approxi-

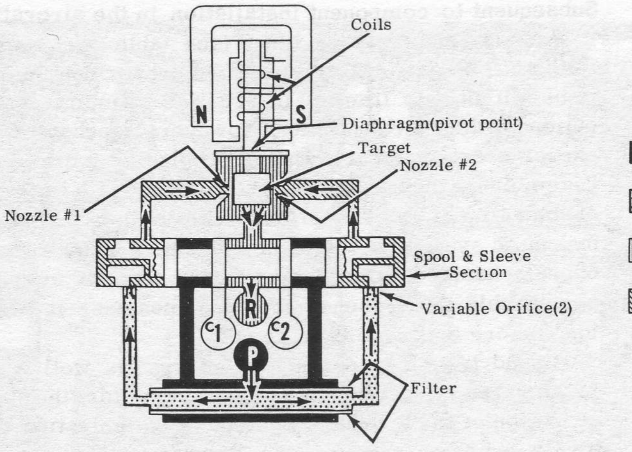


FIGURE 1

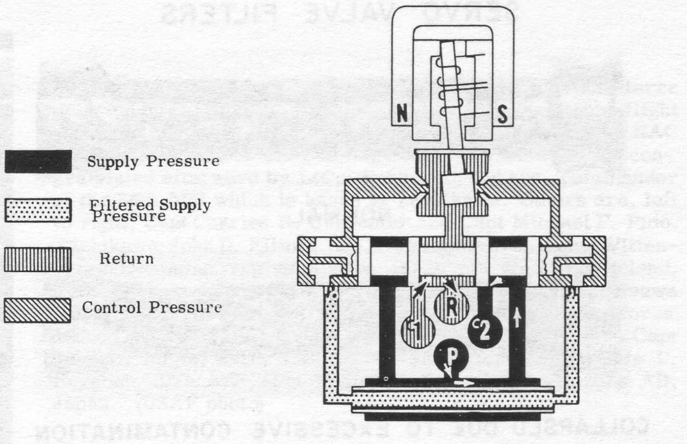


FIGURE 2

mately 500 psi as fluid passes through the variable orifices. Fluid then flows up and through the two nozzles to the return port "R." At this point the orifices are approximately 0.004 or 100 microns wide. The #1 and #2 nozzle diameters are 0.017 and the clearance between the nozzles and the target is 0.0017. As was explained earlier, the electrical signals to the valve coils are equal in the null state; therefore, the "target," due to equal magnetic attractions on its stem, remains halfway between the two nozzles. With the spool in the position shown, C_1 and C_2 ports are sealed off, allowing no fluid flow.

Figure 2 illustrates an exaggerated valve response to an electrical signal from the black box portion of the ASE system. This signal causes an unequal current between the two coils, moving the stem which, in turn, pivots at the diaphragm. If the electrical signal received was such that the top of the stem moved to the left, the target, which is attached to the stem below the pivot point, would move to the right, partially restricting the flow of fluid from nozzle #2. This causes the pressure on the right-hand side of the spool to increase.

The target would also move away from nozzle #1, allowing the fluid on that side to flow more freely and reducing pressure on the left-hand side of the spool. The spool, reacting to the difference in pressure, will move to the left, connecting C_2 port to pressure and C_1 port to return, as shown. The fluid which flows through C_2 port passes around the filter, tending to wash contamination away from the outer surfaces. Also, as the spool moves to the left, the variable orifice on the right side of the spool is being reduced in size while the orifice on the left is being enlarged. This causes a decrease in pressure on the right side of the spool and an increase in pressure on the left side of the spool. Thus, varying the orifices by moving the spool balances the effect of target movement. This reaction is known as hydraulic "feedback." Due to this feedback, the amount and velocity of spool movement is directly proportional to the magnitude of the input signal. The entire operating sequence of the valve just described involves movements which vary from 0.0004 (10 microns) at the target to more than 0.004 (100 microns) movement at the spool, establishing the size and number of particles which can be tolerated.

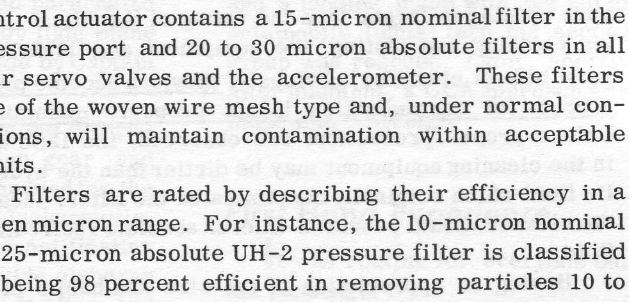
Basically, the effects of contamination on electro-hydraulic servo valves may be divided into two categories: contamination within the nozzle target area, causing the valve to "drift" or move from the null position; and contamination of the filter, causing sluggish valve action.

Contamination within the target area has the same effect on the valve as a constant unbalanced electrical input; in either case, the spool will move. Contamination of the servo valve filter will cause the valve to lag or become sluggish because the pressure available to move the spool has been reduced. In either case aircraft performance is affected. Contamination of the target area of the longitudinal valve, for instance, will cause the nose of the aircraft to move up or down. This can be overcome by disengaging the ASE or by maintaining control pressure on the cyclic stick. Contamination of the filter will cause the aircraft to "hunt" or oscillate, since the correction will lag behind the input signal.

In order to provide protection against excessive contamination, the UH-2 hydraulic system incorporates two, 10-micron nominal filters. In addition to this, the ASE control actuator contains a 15-micron nominal filter in the pressure port and 20 to 30 micron absolute filters in all four servo valves and the accelerometer. These filters are of the woven wire mesh type and, under normal conditions, will maintain contamination within acceptable limits.

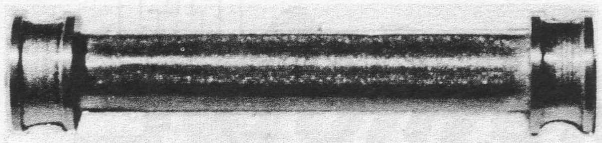
Filters are rated by describing their efficiency in a given micron range. For instance, the 10-micron nominal or 25-micron absolute UH-2 pressure filter is classified as being 98 percent efficient in removing particles 10 to 25 microns in size, and 100 percent efficient in removing particles larger than 25 microns. The servo valve filter rating is 5-micron nominal, 20 to 30 micron absolute. The aircraft system filters, being much larger in size, have a larger contamination holding capacity than the relatively small servo filters and will not become clogged as quickly when exposed to excessive amounts of contamination. It has been found that excessively contaminated fluid must recirculate through the filter many times, rather than just once, in order to reduce the contamination to acceptable limits.

It is generally not recommended that a filter be cleaned which has been contaminated to the point of causing system

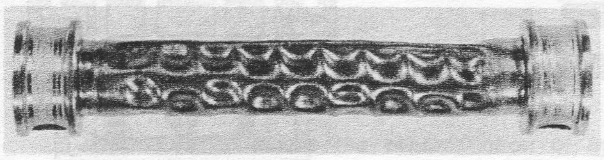


Microns magnified approx. 3,000 times

SERVO VALVE FILTERS



NORMAL



COLLAPSED DUE TO EXCESSIVE CONTAMINATION

malfunction. In this case, the contamination has usually been driven deep into the wire mesh and it is difficult to remove sufficient amounts to make cleaning practicable. For this reason, a differential pressure indicator is provided on the pressure line filter to forecast contamination buildup so maintenance personnel can take action far enough in advance to prevent a possible malfunction. The filter should be inspected daily for a red button which will pop up indicating filter contamination. The indicator is set to "pop" at 100 pounds differential pressure, when contamination is neither extensive nor deeply imbedded in the mesh and the filter can be quickly and easily cleaned. There is no such indicator on the reservoir filter so it must be removed and cleaned periodically (240) hours to insure proper operation.

After cleaning a filter, maintenance personnel must conduct a "pressure drop" test to determine the degree of cleanliness, and a "bubble point" test to insure that no pore opening is larger than the rating of the filter. During cleaning and testing, the equipment and fluids used must be kept clean for, obviously, they can become prime sources of contamination if not properly maintained. Unless proper precautions are observed, the fluid used in the cleaning equipment may be dirtier than the hydraulic fluid which originally contaminated the filter. Ideally, the cleaner should provide 2-micron absolute recirculated fluid.

Having an appreciation of the size and habits of the culprit causing trouble in the hydraulic system, it is easy to understand why the simple act of changing a component can introduce contamination into the system. Ordinary atmospheric dust averages 5 microns in size! Therefore, even during manufacture and operation of the hydraulic system, contamination is continually being either added to the system or generated by it. Ordinary component wear within the system, such as that which occurs within the pump or windshield wiper motor, is a prime cause of contamination generation within the system.

Kaman Aircraft implements and maintains rigid control over the conditions under which the hydraulic system components are manufactured, assembled, and tested.

TABLE 1

Maximum Contamination Level For UH-2 Hydraulic System

Particle Size	No. of particles per 100 cc sample
Fibers	Record
5-10 Micron	16,850
10-25 "	4,020
25-50 "	580
50-100 "	83
100 + "	8

Subsequent to component installation in the aircraft, the system is flushed using clean (see table one) hydraulic fluid until an analyzed fluid sample proves contamination to be within safe limits. In order to maintain contamination within these limits, however, mechanics must exercise extreme care whether replacing a simple hose assembly or the complex servo valves. The importance of cleanliness when working with either the aircraft hydraulic system or the local hydraulic "jenny" cannot be overemphasized. One contaminated aircraft or jenny is comparable to the schoolboy with measles--it won't be long before everyone is infected.

Sound trouble-shooting procedures as well as good maintenance practices are necessary for the proper operation of the hydraulic system. Contamination should be suspected when any of the following symptoms arise: a) loss or fluctuation of system pressure, b) aircraft oscillations when operating with ASE engaged, and c) still or sluggish "control feel" when operating with either hydraulic boost or ASE engaged. In any case, when contamination is suspected, a fluid sample should be immediately subjected to a laboratory analysis. If the analysis indicates excessive contamination as the cause of the trouble, the system must be flushed and all filters replaced.

The first (and by far the most important) step in flushing the hydraulic system is to insure that the hydraulic power supply or jenny contains clean (see table one) fluid and serviceable filters of at least 5 microns capacity. 1) Apply 1500 psi hydraulic pressure to the aircraft using a clean (see table one) jenny. 2) Engage hydraulic boost and continually cycle the cyclic and collective sticks and the rudder pedals. Do not engage ASE. 3) Cycle all other hydraulic components periodically for one hour. 4) Replace all filters including those in the servo valves and the accelerometer.

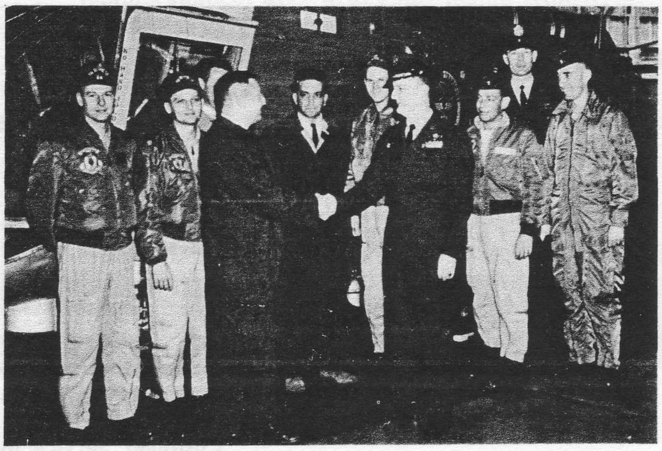
It should now be clear that unless every precaution is taken to maintain clean hydraulic oil, the problems which arise will result in costly filter replacement and/or aircraft down time. The following do's and don'ts should always be kept in mind when working with hydraulic systems of any kind:

DO

1. Analyze hydraulic jenny fluid regularly.
2. Analyze hydraulic fluid from aircraft system whenever contamination is suspected.
3. Use lint-free cloths when working with open hydraulic components.
4. Keep lines and components parts tightly capped and sealed until just before installation.
5. Use only clean tools during assembly and disassembly.

DON'T

1. Use hydraulic fluid which has been stored in an open container.
2. Assume that any hydraulic fluid is clean.
3. Leave components exposed to the atmosphere during storage.
4. Use any material other than MIL-H-5606 as thread lubricant on line connections.
5. Disassemble components in dust-laden atmosphere.



Personnel from the 36th Air Rescue Squadron and three detachments recently attended an HH-43B functional flight check school at Tachikawa Air Base, Japan. Ralph Lee, KAC pilot who conducted the two-day course, is shown being congratulated afterward by LtCol Robert R. Dyberg, commander of the 36th ARS which is based at Tachikawa. Others are, left to right, Capt Charles R. Carpenter and Capt Michael P. Pido, Tachikawa; John D. Elliott, KAC representative; Lionel Wittenberg, Lycoming representative; 1stLt Marvin A. Cleveland, Tachikawa; 1stLt Leonard D. Fialko, Det 1, 36th ARS, Misawa AB, Japan; Capt Stanley O. Schaetzle, Det 4, Osan AB, Korea; 1stLt David E. Mullen, Det 1. Others who attended were Capt Juan H. Migia, 1stLt Lawther O. Smith and CMSgt Gale P. Burgoon, 36th ARS; SSgt Mike Mewkalo, Det 3, Itazuke AB, Japan. (USAF photo)

Det 14 Stakes Claim

With the recent arrival of the fifth HUSKIE, Det 14, EARC, MacDill AFB, Fla., now lays claim to being the largest unit in Air Rescue Service. The new HH-43B was delivered by Maj Harlan Davis and Capt John Calhoun, EARC Headquarters. A1c Lenzy M. Autry from Detachment 14 handled the flight mechanic's duties. The detachment is made up of units from Langley AFB, Va., and Charleston AFB, S. C., and its present strength consists of 20 men—eight pilots, 11 maintenance men and a clerk typist. Nine firemen and nine medics are attached for alert duty. The eight pilots represent more than 13,500 hours of flying. Capt Guy S. Hahn is nearing the 3,000-hour mark and the detachment commander, Capt Herbert A. Lee, has the high time in the HH-43B. Of his 1,700 hours, 975 have been in the HUSKIE. The detachment covers MacDill and the Avon Park Gunnery Range 60 miles away.

Recently Detachment 14 demonstrated its fire-rescue capability at the St. Petersburg-Clearwater International Airport before a crowd of 35,000. Crew of the HH-43B was Capt Waino E. Arvo Jr., pilot; Captain Lee, copilot; SSgt William E. Perrin and A1c Junior K. Tasker, firefighters; and A2c George S. Armstrong, medic. A detachment HUSKIE recently evacuated an airman suffering from smoke inhalation from the gunnery range to the base hospital. Capt Carl G. Layman, pilot, made the 60 miles in a quick 45 minutes.

Detachment 14 began a search soon after receiving word a T-33 was believed down. Aboard the HH-43B were Captain Hahn, RCC; Capt D. J. Frazier, copilot; Sergeant Perrin, fireman, and SSgt C. J. Montgomery, flight mechanic. Bad weather forced a postponement of the search, but later a HUSKIE took off again with Captain Arvo as pilot, Captain Lee, copilot, and TSgt W. T. Smith, flight mechanic. Another crew consisting of Capt J. E. Hartley, pilot; 1stLt P. D. McComb, copilot; SSgt J. G. Regan, flight mechanic and A2c Burau, medic; took off a short time later. Afterward, the survivor who parachuted to safety was spotted by light plane and the pickup was made by Captain Hartley's crew.

Two HH-43B's from the detachment, fire suppression gear and complete crews were headed for the Naval Air Station at Jacksonville, Fla., three hours after notification that they were to provide airborne coverage during the landing and takeoff of the President's plane. A C-123 transported the firemen, medics and fire kits to the air station. Immediate alert coverage was also maintained at MacDill and Avon Park Gunnery Range during this extra commitment.

Det 8, CARC, Rescues Seven

Seven fishermen, trapped on ice floes in Lake St. Clair, were airlifted to safety by an HH-43B crew during a midnight rescue carried out in a snow storm with winds gusting 10 to 20 knots. The mission began for ARS Det 8, CARC, Selfridge AFB, Mich., after Canadian police requested assistance in rescuing the men, trapped about two miles from shore when the ice began breaking up. Three fishermen were in one group and four in the other. Capt John A. Simmons, RCC, piloted the HUSKIE through the snow to an area marked by the lights of police and civilian vehicles and then to the spot offshore where the survivors were huddled. A1c Gerald L. Glover manned the hoist and gave Captain Simmons and Capt Ernest L. Neville, copilot, directions as the men were lifted to safety through the swirling snow. The first group was taken to shore and a landing made with the aid of automobile lights; then the second group was rescued. Later, shortly after midnight, a GCA approach was made into Selfridge.

First Hand Experience

It was routine for everyone but the passenger!

The engine on a Navy SNB C-45 couldn't make up its mind whether or not to keep going so Lieutenant Commander Krysprin, the pilot, diverted to nearby Moody AFB, Ga. As on numerous other occasions, an HH-43B from Det 12, EARC, scrambled with the fire suppression kit. The SNB pilot feathered the engine and skillfully landed without further difficulty. As it touched down it was "routinely" escorted to a stop by 1stLt David A. Cochenour, pilot of the HUSKIE.

The door of the SNB opened cautiously and a passenger emerged, smiling but with just a trace of perspiration on his forehead.... "It is always nice to see a company product in action..." Bill Magnan, KAC field service representative at NAS Jacksonville, Fla., the erstwhile SNB passenger, reported later.

Line Level HELICOPTER MAINTENANCE

by Robert J. Myer
Customer Service Manager

Part IV

Other important areas of "Routine Maintenance" are INSPECTIONS and PART/COMPONENT REPLACEMENT. The following information is concerned with these two subjects.

INSPECTIONS

There has been much published recently about the many aspects of Quality Control, which seems to be related to everything connected with aircraft operation. In this section we will deal primarily with that portion of Quality Control that usually rests with the line maintenance personnel, namely, the daily and periodic inspections. Even in those activities that use specially assigned inspectors for the periodic inspections, certain basic points are worth reviewing and stressing.

1. Follow the book! Take sufficient time and don't short-cut. There are too many repeated reports of problems cropping up in obvious places shortly after a prescribed inspection has been completed. As boring and repetitious as many inspection items and procedures may seem, it must be appreciated that they were conceived and reviewed by highly qualified personnel with a thorough understanding of the equipment involved. Omissions or changes should only be permitted after official analysis and approval.
2. Develop a good knowledge and understanding of the various parts of the equipment. Learn the critical areas or those more susceptible to problems and place particular emphasis on them. Helicopter systems deserving particular attention are the rotor systems, drive systems and control systems. Flight control system interference can be determined by what is commonly known in the trade as "boxing the controls." This involves placing the collective stick at both extreme and significant intermediate positions and while in each position, moving the directional pedals and cyclic stick to all extreme combinations. Binding or roughness so determined should be investigated further.
3. Be systematic to insure full coverage and facilitate compensation for interruptions if they should occur. Many helicopter inspectors find the major systems most convenient for this purpose.
4. Pay special attention to the security of doors, panels or any component that could become detached in flight. Rotor collision with such loose objects can easily result in strike damage.
5. Use proper tools and equipment. A good inspector will insist on adequate stands, ladders, etc.; lights; mirrors; magnifying glasses; and measuring equipment when required. In addition, the availability of crack-detecting material such as Dychek is a must when suspicious areas require more than visual analysis.
6. Place particular emphasis on all safety and torque requirements, especially on helicopter rotor and control systems. Insure that incorrect attachment hardware installation or method of safetying do not cause interference between closely positioned components.
7. Learn to identify telltale signs of impending trouble, such as excessive leakage (fuel, grease, oil) from a specific area; discoloration or finish blistering (including cadmium plate) usually indicates an overheated condition; black lines on an aluminum surface can indicate initiation of crack; whitish color under fiberglass indicates void; white crazing line indicates crack or surface failure; defects such as lines in finish, especially on fabric or wood, can foretell of cracks developing underneath; buckled or distorted skin* indicates possible damage underneath; rubbing or chafe marks indicate something has shifted, etc.
8. Use other senses in addition to sight. Sound is quite useful in detecting voids or unbonded conditions. Such checks are usually performed by

*One effective method of detecting defects on a flat surface such as the top or bottom of a rotor blade is by checking with light shined on the surfaces at an angle. (Sunlight can often be used if angle of rays is reasonably adequate.) Any sharp shadows so created indicate skin discontinuity that should be investigated further.

tapping suspect area with coin. Sound from firm, solid area varies greatly from area containing a void. Feel is of the utmost importance in the detection of roughness, especially relative to bearings and revolving components, as well as looseness or excessive play.

These practices are equally applicable to inspections performed on restricted areas after a major maintenance task or rework is accomplished. In such cases, pay particular attention to nicks or gouges that may have inadvertently been inflicted on such critical helicopter components as rotor blade retention areas, rotor hubs, dynamic drive system connecting joints, mounts and drive shafts.

Always make thorough checks to insure that all caps and covers are properly replaced, and work platforms and protective shields are removed after inspections, maintenance or servicing. Such components can cause extensive damage if left loose or are not removed prior to helicopter run-up.

Maintenance personnel must be made to realize that in the same sense that "reliability" must be designed into a piece of equipment, "quality" cannot be inspected into it but must be built into it. Don't rely on the inspector to catch your goofs! Put out quality workmanship on your own. Who knows — the inspector may have a bad day — and like the old saying goes "you may be required to fly in the machine!"

This communication to ARS Detachments from the Central Air Rescue Center neatly sums up the importance of conducting thorough inspections. It says, in part: "All facets of preventive maintenance must be stressed and adequately performed to insure that maximum quality of assigned aircraft is achieved. Inspections performed by both maintenance and flying personnel must not become routine to procedure or area of coverage. To inspect is to 'look at carefully' and 'examine critically.' A fast walk around the "bird" you think you know so well and a quick signature in the right block on the proper form is not an adequate inspection. That small item you failed to inspect today may be the one that kills you tomorrow. Inspect critically and fly safely so that 'both you and others may live."

PART AND COMPONENT REPLACEMENT

The primary reason helicopter parts and components subject to replacement require more consideration than their fixed-wing counterparts is simply that there are usually more of them. For those not closely associated with helicopters, we again point out the various rotor, drive,and control systems which are subjected to continuous operation at relatively high loads. As in the case of fixed-wing engines and propellers (those remaining) a majority of the components in these systems require periodic overhaul. Also, where cyclical fatigue loads are involved, finite service lives are specified. The requirement for replacement of such components is covered in applicable handbooks and is reasonably straightforward. As indicated under the section on "Paperwork," care must be taken to insure compliance with the specified operating interval limitations; component records should indicate correct operating time and reason for removal, etc.; and records must accompany removed components. As indicated under the section on "Ground Handling (Storage)," proper preservation during periods of idleness and when packaging for return to the overhaul facility is essential to avoid excessive loss of these high value components.

Prior to putting a removed component in the "can," carefully check any attached parts relative to the handbook configuration and the component being prepared for installation. The part going back for overhaul should be as complete as required to be compatible with its identity; however, sending unnecessary accessories with it can result in a work stoppage until additional unplanned for parts can be obtained.

Practical maintenance considerations to be employed during the changing of components are:

1. Follow the book. (This comment more or less covers all related recommendations; however, the following items are provided for emphasis.)
2. Insure that all required parts are available to avoid a work stoppage in the middle of the job.
3. Attempt to insure that parts being installed are correct and airworthy. If a part drawn from supply differs from that specified or from part removed, it should be brought to the attention of the next echelon of supervision.
4. When the component involved is heavy, large or cumbersome, take all required precautions to avoid injury to personnel or material -
   (a) Have sufficient personnel available. Medium size helicopter blades, transmissions or engines require at least three men to safely handle them.
   (b) Use correct equipment, including work stands, hoists, special slings, when required, and component stands. Insure that this equipment is in good condition and adequate for the job.
   (c) Never replace major components or perform heavy maintenance on the upper sections of a helicopter while it is on jacks or is having any work done on the landing gear.
5. Avoid exposure of the interior of critical components such as gear boxes or engines. Keep mounting pad covers in place until related accessory or part is to be installed.
6. Treat removed component with same respect as the one being installed. Avoid handling damage and provide proper preservation and packaging. The better the shape upon arrival at the overhaul facility, the lower the processing cost and the quicker the part can be returned in an RFI (ready for issue) condition.

Another aspect of part or component replacement that is seldom condoned officially,but nevertheless exists, is the swapping of parts from one aircraft to another. This "cannibalization" as it is better known is usually a last resort tactic to increase availability when the supply system bogs down. It is not our intent to debate the pros or cons of such practice as this is a matter for resolution within the respective operating commands. However, recognizing that it does occur in most activities at one time or another, our plea is for more consideration to the associated paperwork. If you must swap parts, make every effort to keep the records straight. The time you spend doing this today will more than pay off tomorrow when you are trying to trace down a part time or identity for any number of important reasons.

Huskie Happenings

...Crew from Det 6, EARC, Andrews AFB, D.C., makes night flight through driving wind and rain storm with civilian volunteer fireman, critically injured in highway accident. During mission, emergency transfer of survivor from one hospital to another, 1stLt Darvin E. Cook, HH-43B pilot, flies at 200 to 300 foot altitudes while being guided by another fireman turned navigator for hazardous journey. Landing made by lights from automobile headlights. With Lieutenant Cook are Capt Daniel M. Thomsen, copilot; Capt Clifford P. Peddicord, flight surgeon; and A1c Kenneth S. Morrin, helicopter mechanic. Letter from injured fireman's mother afterward says, in part, "You probably regard your action as 'line of duty,' but you really helped save a life. Marcus(the injured fireman) is doing fine and will soon be back to normal. Please accept my thanks. You will be remembered in our prayers to be guided safely on all your future missions."

...HH-43B crew from Det 8, AARC, Zaragoza AB, Spain, makes long and hazardous trip to evacuate airman seriously injured in fall at isolated radar site. Two landings made to refuel, one in cleared field after dark with aid of flares. Part of flight made through heavy overcast while on instruments and in extreme turbulence. Aboard the HUSKIE are Capt John Wells, pilot; Capt Frank Schnee, copilot; Capt Thomas Malone, doctor; MSgt Martin Prisock, medic; and A1c Arlin Parsons, crew chief.

...HUSKIE crew from Det 7, AARC, Torrejon AB, Spain called on when three officers and two enlisted men on fishing expedition are thrown into water as boat capsizes in turbulent river current. All swim safely to shore and HH-43B flown by Capt David Randall and Capt John West makes pickup.

...ARS Det 15, WARC, Luke AFB, Ariz., cited for exceptionally meritorious service during period from 1 Oct., 1961 to 8 July, 1963. During this time, unit rescues 29 persons from precarious positions in Grand Canyon. At same time, detachment keeps up with heavy workload of providing base rescue support at Luke....HH-43B crew from 58th Air Rescue Squadron at Wheelus AB, Libya, scrambles when F-105 pilot ejects 45 miles from base after aircraft catches fire. Squadron C-54 acts as communication relay and helicopter pickup is made half-hour later. Aboard HUSKIE are 1stLt Dan L. Reeder, RCC; SSgt Charles R. White, medic; A1c Huber L. Stover, and A2c Calvin F. Redemske, firemen....HH-43B's at Wheelus also being used regularly at fighter gunnery range as support-type helicopter transporting personnel, parts and supplies. Also utilized for retrieving missile components.

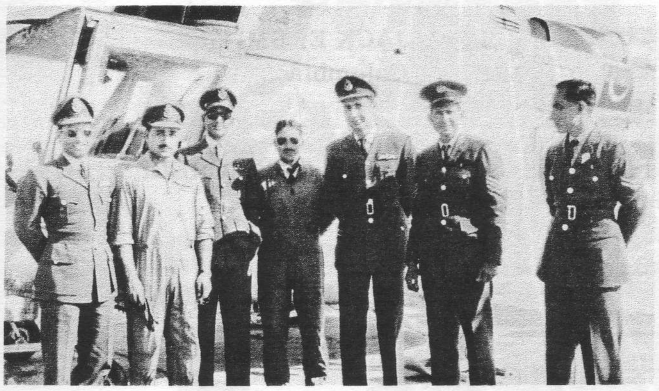
...Thirteen-year-old boy rescued from thin ice at junction of creek and Potomac River by HH-43B from ARS Det 6, EARC, Andrews AFB, D.C. Five minutes after notification of lad's plight, and in spite of turbulence encountered, he is lifted to safety. Helicopter crew consists of Capt Ronald Haglund, pilot; SSgt Samuel Pilgrim, Jr., crewman; SSgt James A. Kaufmann and SSgt William L. Hawkins, rescue specialists; and A1c William J. Mattern III, medic. Captain Haglund and teenager appear on TV program later on as part of safety program.

...HH-43B crew from Det 5, AARC, Hahn AB, Germany, locates F-102 pilot who bailed out of disabled aircraft 25 miles from base. Only 40 minutes elapse between scramble and time bruised pilot off-loaded at hospital. Aboard HUSKIE are Capt Steward S. Jordan, pilot; 1stLt Charles R. Dunn, copilot; SSgt Colunda, fireman and acting medic; A1c Bradley and A2c Brand, firemen.

...During night mission HH-43B crew from Det 6, EARC, Andrews AFB, D.C., flies seriously injured airman from base hospital to Bethesda hospital for emergency operation. Winds up to 35 knots and moderate to severe turbulence encountered. Aboard HUSKIE are Capt Joseph P. McMonigle, pilot; Capt Ronald L. Haglund, copilot; and SSgt Robert B. McConnie, hospital corpsman. Hospital surgeon says afterward patient would never have regained consciousness if not for prompt action of ARS personnel.

...Woman who almost drowned in boating accident and later broke leg while attempting to climb cliff to safety rescued by HH-43B crew from Det 5, WARC, McChord AFB, Washington. 1stLt Donald Welsh flies HUSKIE into canyon and holds helicopter in hover while SSgt John Glen hoists survivor to safety from narrow cliff ledge. Mountain Rescue Council says more than five hours saved through use of Air Rescue Service helicopter. Sharing in the mission are Capt Warren Davis, copilot, and A1c William J. Emery, Jr.

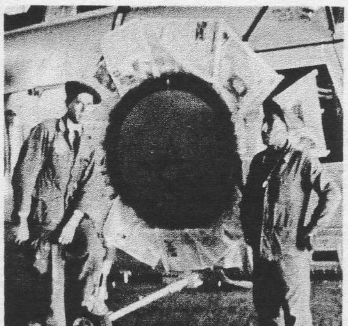
...Moroccan Air Force puts HUSKIE to good use. B-5 workstand slung beneath HH-43B and carried 40 miles to site where C119 made emergency landing when trim tab came off....HH-43B crew from Det 10, AARC, Aviano AB, Italy, makes 55-mile trip, part of it on instruments while flying through fog, to transfer woman to Army hospital. Patient hemorrhaging internally and badly in need of special type blood. Aboard HUSKIE are 1stLt Theodore E. Angle, RCC; Capt Jerry A. Crupper, copilot; A2c Arthur D. Daniel, medic; and A2c Curtis E. Nickles, crew chief. Flight greatly contributed to saving woman's life, doctor says afterward.

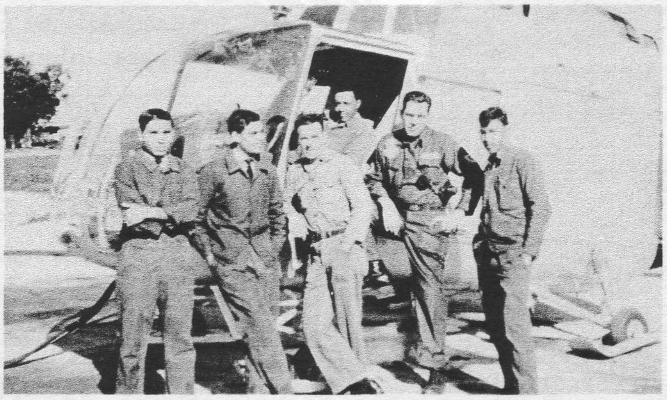


PAKISTAN ARMED FORCES DAY—— PAF HUSKIE flies by crowd at Chaklala AFB during observance of Armed Forces Day. Two HH-43B's took part in an aerial exhibition and later were placed on static display. Shown, left to right are, F/O A. Mahmood, HH-43B pilot; Flt/Lt C. Rahman, Sargodha detachment commanding officer; F/O A. Sherwani, Chaklala HH-43B maintenance officer; Flt/Lt M. Yunus, HH-43B IP to be Peshawar detachment commanding officer; Flt/Lt K. Khalid, HH-43B pilot; Sgt Zaidi and Cpl F. Rehman, HH-43B mechanics. (PAF photos)

PROFICIENCY DRILL—— HH-43B crew and civilian firefighters assigned to Det 14, CARC, Vance AFB, Okla., in one of the numerous drills conducted at the base. Under the command of Capt Ferdinand E. Perry, each helicopter pilot must participate in at least one such "live" drill per month. (USAF photo)

GENERAL INSPECTS—— Capt Herbert G. Gates, commander Det 13, EARC, Brookley AFB, Ala., assists MajGen Emmett B. Cassady, commander, Mobile Air Materiel Area, Ala., into his LPU in preparation for local flight to inspect area facilities. (USAF photo)





SOLO DAY IN MOROCCO—— In top photo, left, welcoming party greets Capt T. Alami of Moroccan Air Force after his return to Sale AB from soloing in HH-43B. Left to right are Mr. Lahcem, civilian interpreter; Sgt O. Rahal, pilot; Captain Alami; Sgt A. Laamiri, pilot; Sgt Houssam, helicopter mechanic; Sgt M. Ouahri, pilot; Sgt Ziat, helicopter mechanic. Top photo, right, Sgt Houssam, Sgt Ziat, SSgt McGinnis (USAF), Sgt Tomir, TSgt Michaels (USAF), and Sgt Fate'h, all helicopter mechanics. In bottom photos, HUSKIE flap is installed and Moroccan insignia painted on.

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