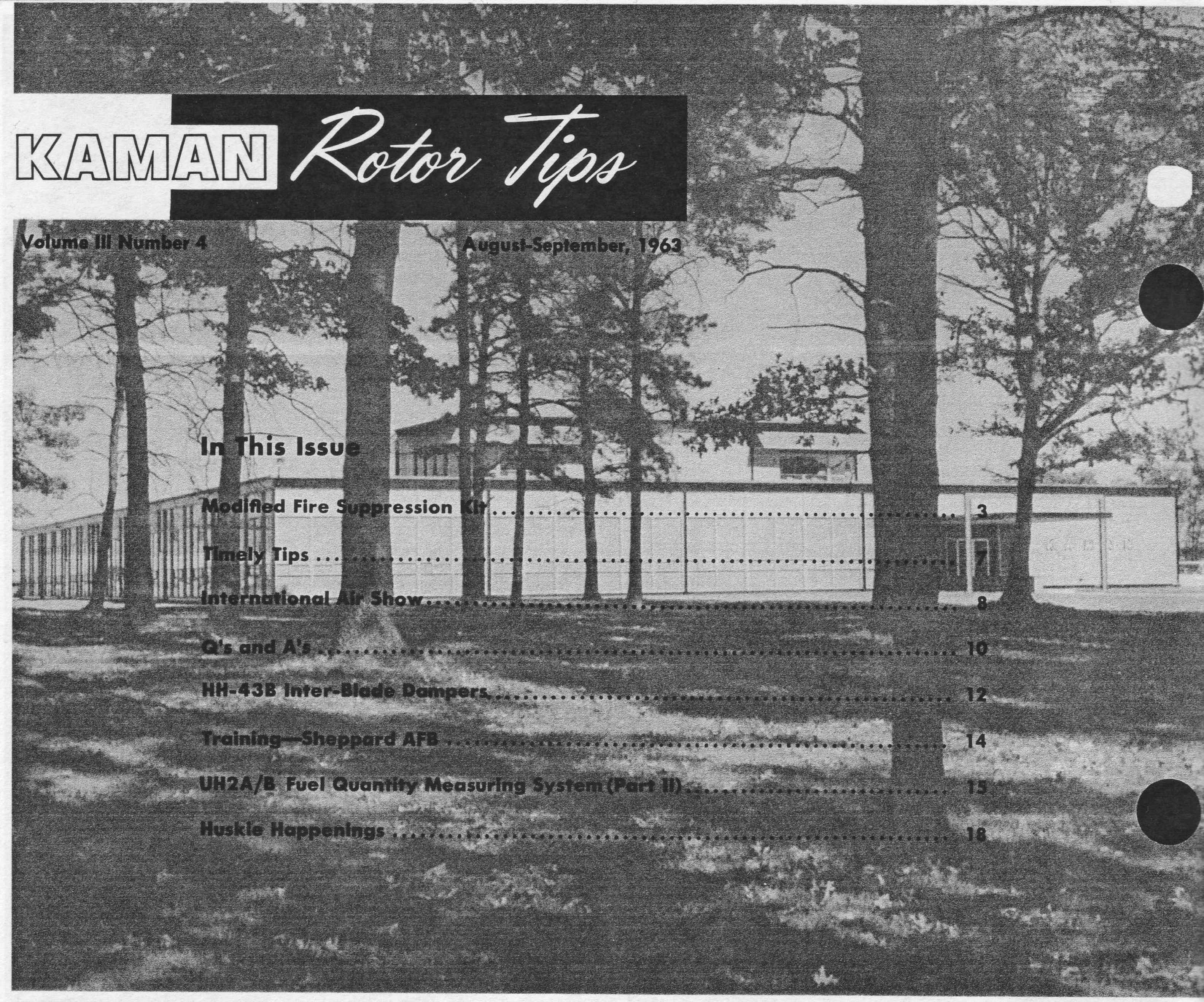
KAMAN

KAMAN AIRCRAFT CORPORATION

PIONEERS IN TURBINE POWERED HELICOPTERS

AUGUST-SEPTEMBER
1963



KAMAN Rotor Tips

Volume III Number 4 August-September, 1963

In This Issue

THE COVER

A sonar-equipped UH-2 SEASPRITE on a practice ASW mission, performed as part of a Navy contract issued to Kaman Aircraft to investigate the possible use of utility helicopters in specialized ASW roles.

ADDRESS ALL INQUIRIES TO:
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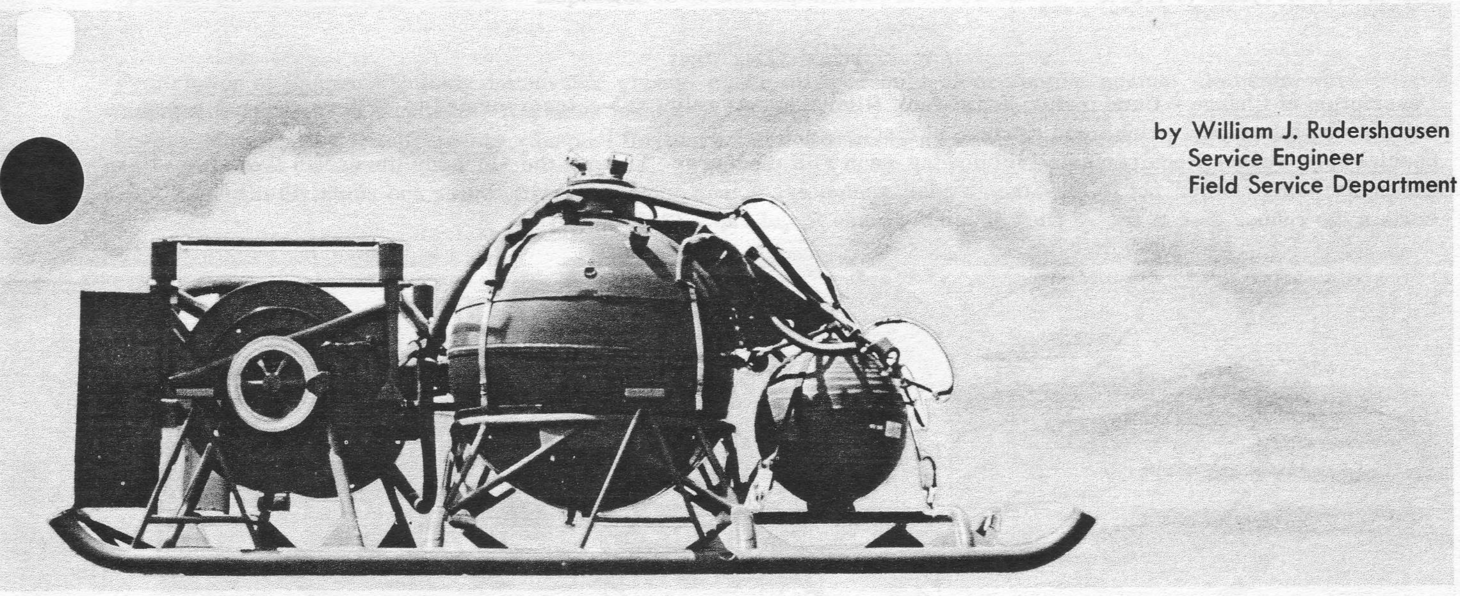
MODIFIED FIRE SUPPRESSION KIT

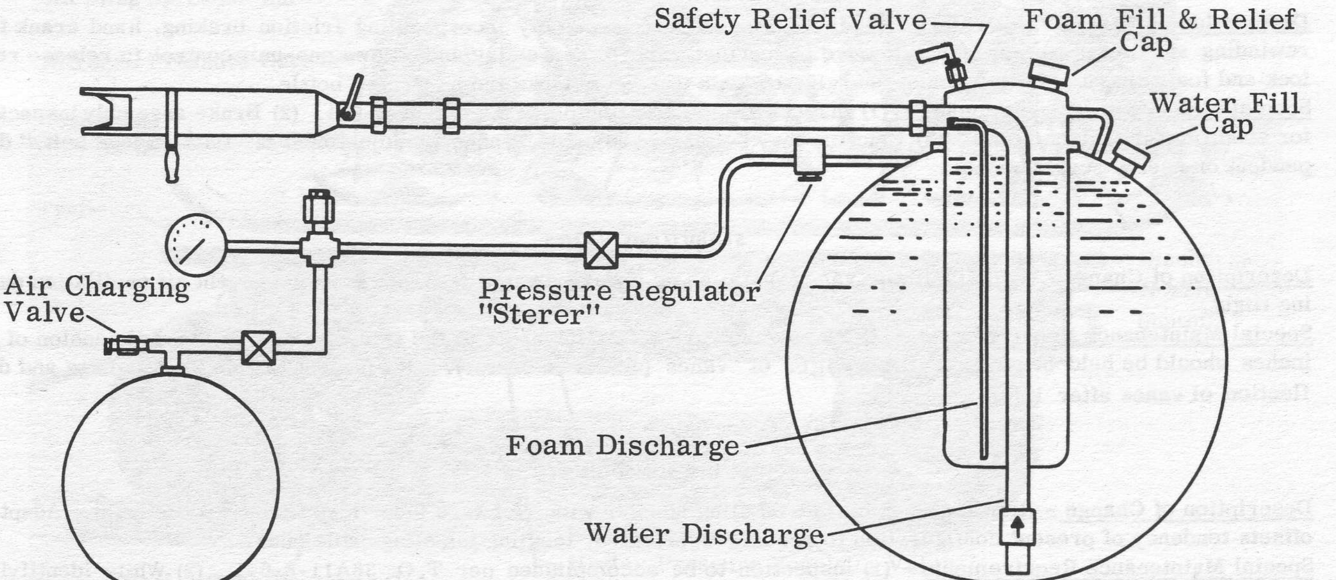


by William J. Rudershausen
Service Engineer
Field Service Department

Several years have passed since inception of the airborne Fire Suppression Kit. Its worth has been proved many times over and it has become accepted as an important element in the Local Base Rescue mission of the Air Rescue Service.

As with any mechanical device, experience in actual use reveals items worthy of further improvement in order to increase operational suitability. Such items have been constantly reviewed by the cognizant Air Force offices and passed to the contractor for further study. Resultant changes have been identified by a series of Technical Orders, 36A11-8-11, and are now incorporated in a modified version of the Fire Suppression Kit presently in use. The new, skid-equipped FSK, P/N K786050, will be placed in service in the near future.

The following resumé identifies the major differences between the two kits. Included is a brief description of the changes, parts affected (including the improved function), and any new or revised maintenance requirements resulting from the changes. The procedure to be used when landing the new suppression kit is also described. This information is provided for interim use with FSK P/N K786050 until official revisions to the affected T.O.'s are released. For general system information refer to the applicable T.O.'s or related article in the February, 1961 issue (No. 11) of Kaman Rotor Tips.



PRESSURE REGULATOR

Description of Change - Grove pressure regulator, P/N 63C75, replaced by Sterer valve, P/N 23470, to improve reliability for mission accomplishment.
Special Maintenance Requirements - (1) Inspect after each discharge for security of mounting. (2) Replace at completion of 15,000 cycles (3 yrs.).

FOAM TANK VENT

Description of Change - Combination foam-tank filler cap and relief valve incorporated to relieve internal pressure buildup which prevents rich foam mixture at discharge.
Special Maintenance Requirements - Following each FSK discharge, remove the -11 body (threaded) from the -7 cap assembly using caution not to lose the -3 puck assembly. Clean thoroughly with water and reinstall the -11. Make certain the rubber disc of the -3 puck assembly faces top of cap. (Ref. Fig. 1)

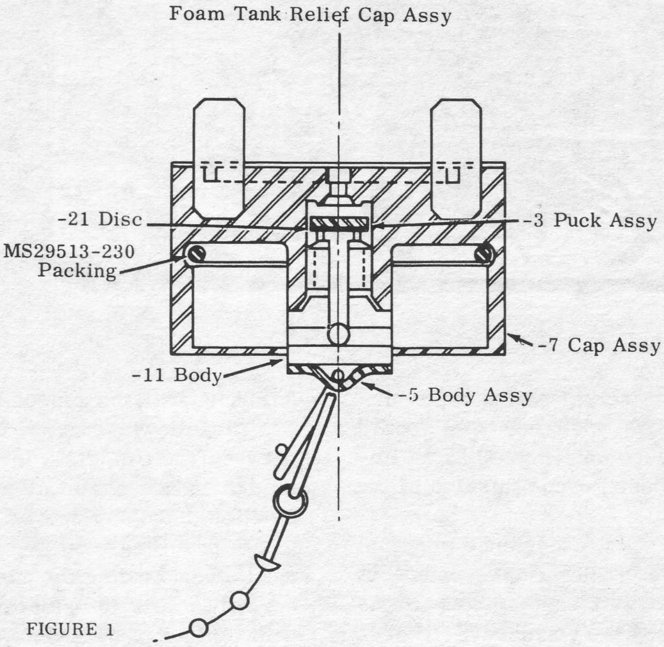


FIGURE 1

HOSE ASSEMBLY

Description of Change - "Soft" hose replaced by 150-foot-long "hard" hose to provide greater strength under pressure and extreme heat conditions. New hose is non-collapsible, wire reinforced and has Bar-Way couplings. "Hard" hose enables kit discharge without any specified amount of hose being unreeled.
Special Maintenance Requirements - Inspection to be accomplished per T.O. 36A11-8-6-1.

HOSE REEL ASSEMBLY

Description of Change - Hose basket replaced by hose reel assembly incorporating friction braking, hand crank for rewinding and unitary 3-way control valve. Provides ease of re-reeling and allows one-unit control to release reel lock and foam nozzle. Also permits charging of foam and water tanks from nitrogen bottle.
Special Maintenance Requirements - (1) Inspect hose reel fitting per T.O. 36A11-8-6-1. (2) Brake assembly inspected for condition of puck and disc. (3) Friction may be increased or decreased by adjustment of "friction lock bolt," dependent on user's requirements.

STABILIZING VANES

Description of Change - Two stabilizing vanes installed on chassis behind reel assembly to prevent kit oscillation during flight.
Special Maintenance Requirements - (1) Fixed vanes are set at 45° angle to the skid. An approximate dimension of 50 inches should be held between trailing edges of vanes (center to center). (2) Inspect for obvious damage and deflection of vanes after kit use.

KIT SLING RING

Description of Change - Ring replaced by welded sling adapter with "forward face" identified by white paint. Adapter offsets tendency of present configuration to become disoriented, tangling the sling cable ends.
Special Maintenance Requirements - (1) Inspection to be accomplished per T.O. 36A11-8-6-1. (2) White identifying paint should be kept in serviceable condition.

SUSPENSION SLING

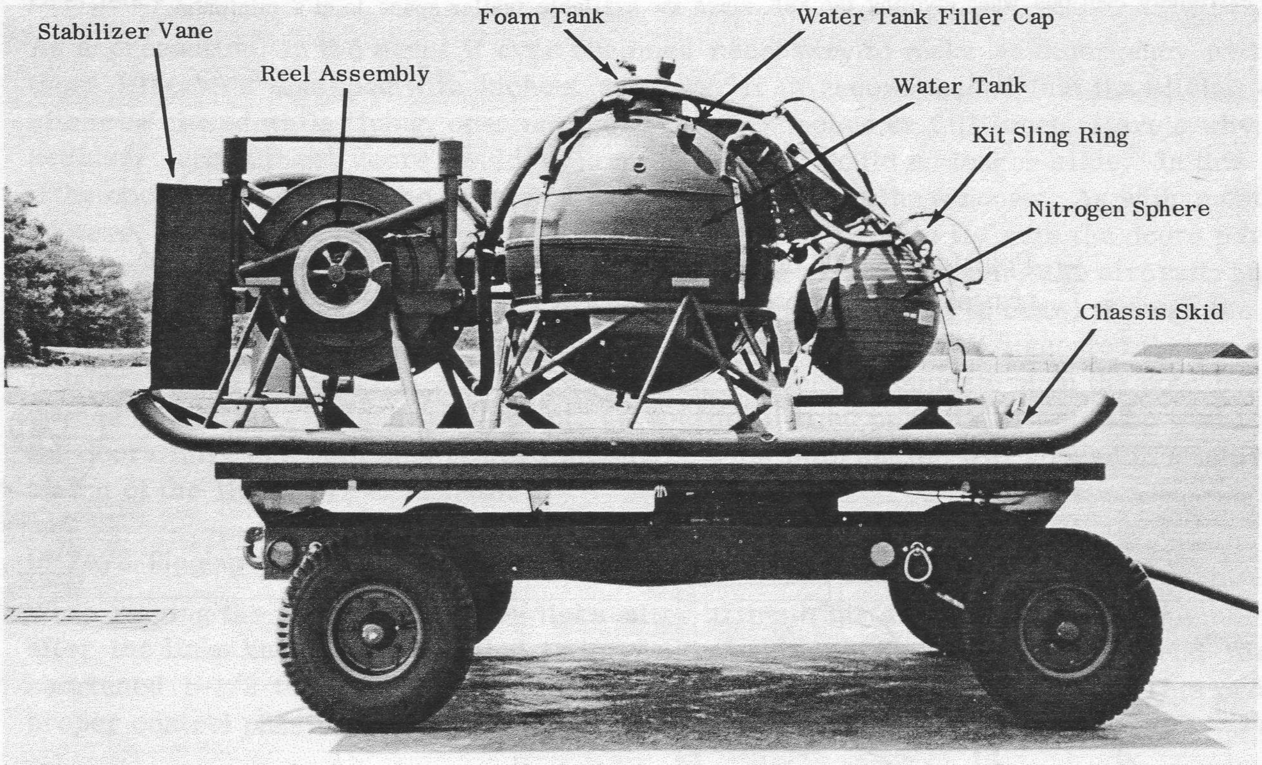
Description of Change - For weight reduction, diameter of sling cable now 3/16-inch instead of 1/4-inch. Pelican hooks replaced with swaged clevis ends to prevent inadvertent hook opening. Spreader bar attached for increased kit stability at low speeds.

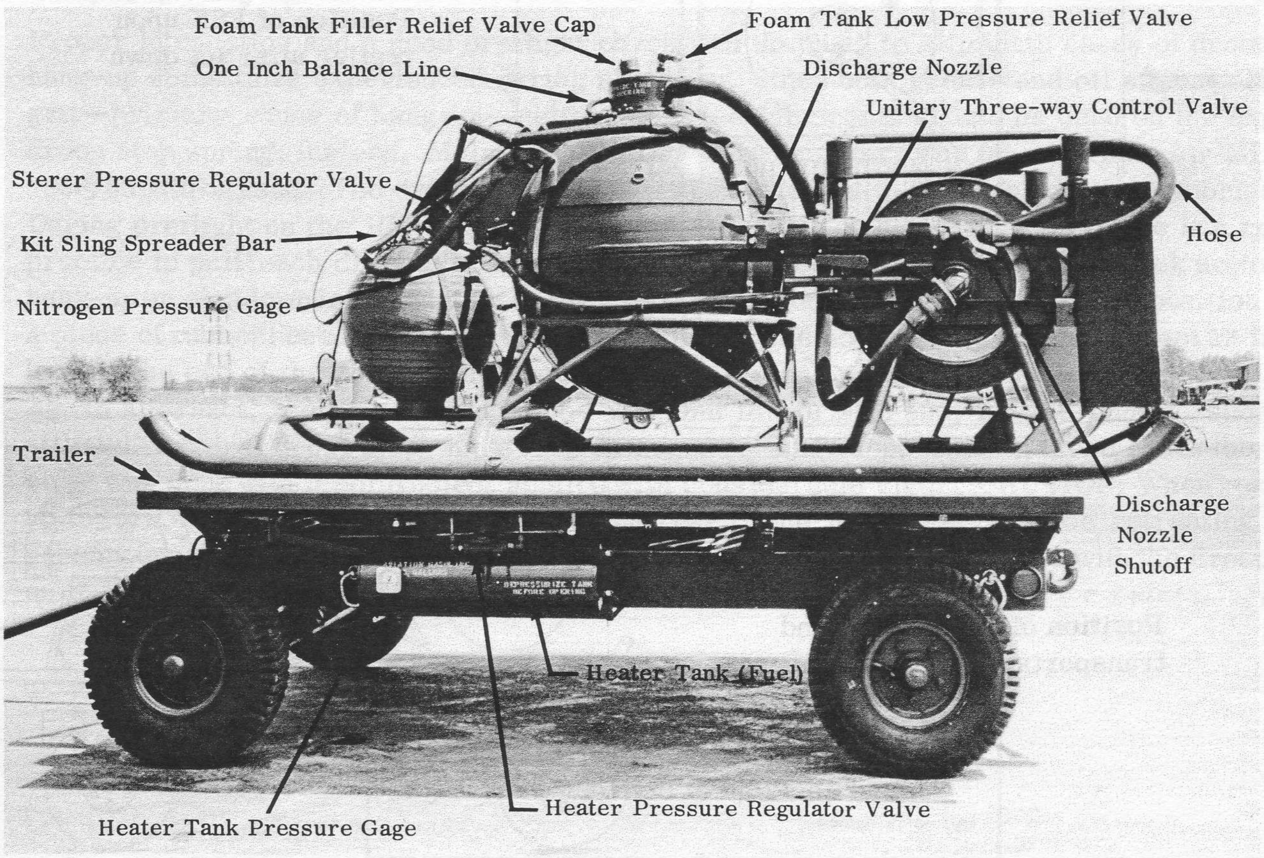
Special Maintenance Requirements - Inspection to be accomplished per T.O. 36A11-8-6-1.

GROUND COVER

Description of Change - Quickly removable ground cover utilized only as protection against elements when outside storage or stand-by is required. Replaces insulation blanket.

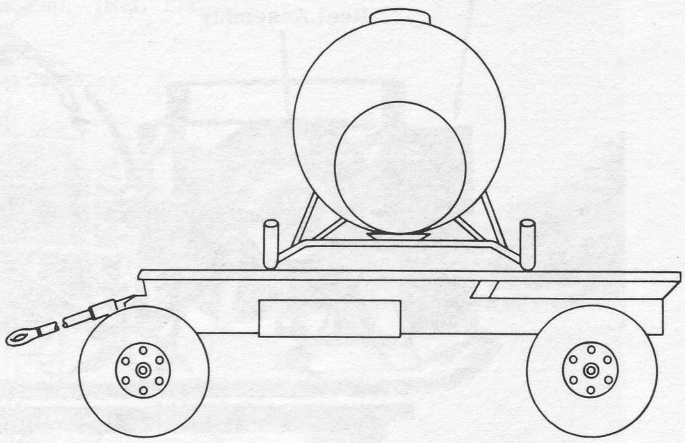
Special Maintenance Requirements - Inspect for tears and condition of asbestos surrounding heat vent tube.



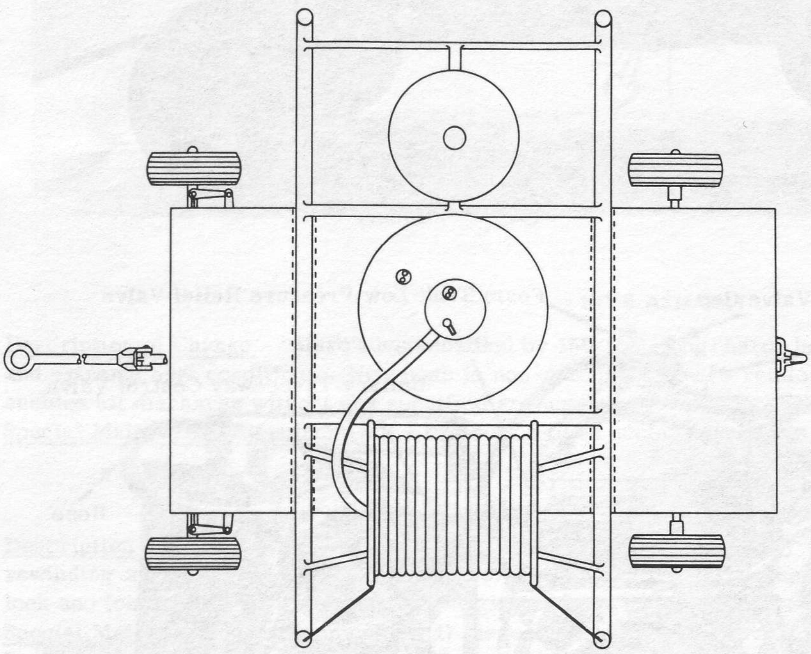


LANDING OF KIT ON TRAILER (Operational)

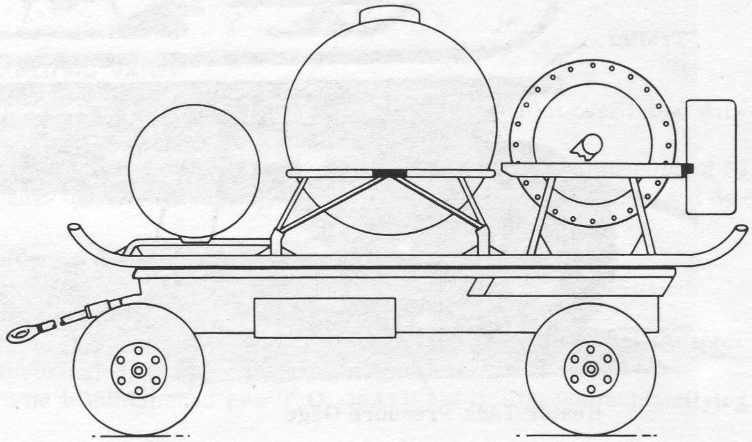
Although the FSK assembly increased in weight and size (1247 lbs.—was 1000 lbs.) the same type USAF MB-1 modified trailer chassis is utilized. However, to safely and properly land the suppression kit on the trailer, the skids of the kit are marked with a band of color extending eight inches beyond the center of gravity limits of the FSK. The trailer is also marked with two color bands to indicate the kit landing area. The suppression kit is landed crosswise on the trailer instead of lengthwise. Ground personnel, by observing that the color band is completely over the trailer and the skids within the bands of the trailer deck, have a quick visual reference for correct touchdown and can signal this to the pilots. It will be necessary after landing for the ground crew to move the kit assembly to a lengthwise position on the trailer for transportation purposes. While this is not a difficult operation, ground personnel should be extremely cautious when pivoting the FSK since the available trailer space is at a minimum.



Position of FSK upon trailer after drop off



Position of FSK upon trailer after let down



Position of FSK for ground transportation and handling

Timely Tips

Emergency Exit

As a precaution, in the event it ever becomes necessary to make an emergency exit from those HH-43B's equipped with kickout windows, it is recommended that the sliding doors either be closed while flying, open not more than six inches, or fully open. Here's why: If an accident occurs these doors could be jammed so they would no longer slide. In this case, if the doors were closed, the crew would exit by kicking out the windows. As with most helicopters, however, it is common practice during hot weather to fly with the doors partially or fully open. If the doors are fully open no problem exists in leaving the aircraft; but, if a door is open more than six inches it becomes extremely difficult to crawl through the kick-out windows due to blockage of the opening by the door frame. It is suggested that as a "reminder," a red stripe may be painted on each door frame to indicate when the door has been opened beyond the six-inch safety point. Of course, if time permits, it would be well to open the doors fully when ditching is contemplated. This information will appear in a future revision of the 1H-43(H)B-1 manual.

R. W. Spear, Service Engineer

UH2A/B Rigging

When rigging the azimuth to mixer links after azimuth installation, always remember that after the links have been gap filled to the neutral azimuth the lateral link rodend must be shortened 1-1/2 turns and the longitudinal link rodend shortened 2 turns. This provides proper control phasing when hovering the aircraft.

P. M. Cummings, Service Engineer

Droop Stop Hang-Up

Proper lubrication and a good preflight check will do much to eliminate cases of droop stop hang-up sometimes experienced during shutdown. Since both grease and oil attract dirt and grit—primary cause of hang-up—neither of these lubricants should be used on the exposed droop stop spring; instead, Molykote 'Z', Dry Lube or Lubribond (an alternate for MIL-M-7866) should be used. The droop stop bearings are sealed and require no additional lubrication. During preflight on the HH-43B, UH-43C and OH-43D, mechanics should make it a routine practice to pull each droop stop down and then release it to check the snap-back action. If hang-up on shutdown is encountered, the droop stop should be gently tapped into position using a piece of rubber hose attached to the end of a pole. The hose should extend at least 12 inches beyond the end of the pole. This assures flexibility and prevents damage to the droop stop. As an alternate, a straw broom can be used but the bristle end, not the handle, should be utilized. Several droop stops have been damaged recently; apparently in these cases the "tapping" was done with a solid object applied with considerable vigor. CAUTION: When reaching up toward the droop stop area, face to the rear of the helicopter with the retreating blade passing overhead. Move the pole or broom slowly in until contact is made with the droop stop as it passes. This should cause it to seat properly.

C. J. Nolin, Service Engineer

How to do it, how to proceed?
Check the manual to answer this need
The trouble saved is well worth the look
If you take the time to use "the book."

Kaman Rotor Tips

INTERNATIONAL AIR SHOW

SEASPRITE AND HUSKIE GO TO PARIS—A UH-2 from Kaman Aircraft and two USAF HH-43B's from Det 5, AARC, Chaumont AB, France; were among the 50 helicopters taking part in the 25th International Air Show held recently at Le Bourget Airport outside Paris. Almost 500 fixed and rotary-wing aircraft were seen by the more than 500,000 persons who attended the 10-day show. In the aerial view above are shown the main exhibition salon, left; the small "chalets," near top, where aircraft companies received those interested in their products; and the static display area. In addition to participating in an aerial flying exhibition with the SEASPRITE, the HUSKIES were also on crash and rescue duty during the show. After the Paris exhibition, the UH-2 proceeded to West Germany for a demonstration flight before German military officials. (Howard Levy photo)

HU-4 RECEIVES UH-2B'S—Crew which ferried first SEASPRITE to be delivered to Helicopter Utility Squadron Four from KAC checks paperwork after touchdown. Several of the helicopters are now in service at NAS Lakehurst, N.J., where the squadron is based. Left to right are William K. Hayes, ADJ1, aircrewman; LCdr Harry J. Sundberg, operations officer, pilot; and Cdr Claude C. Coffey, Jr., executive officer, copilot. (Official USN photo)

ANGEL—Flown and maintained by Det 62 personnel from HU-2, NAS, Lakehurst, N. J.; SEASPRITE is shown hovering over deck of USS Independence.

CONFAB—Plane handlers and crewman from HU-2 SEASPRITE confer during flight operations aboard USS Independence. (Official USN photos)

ARS Anniversary

The Air Force's worldwide Air Rescue Service celebrated the 17th anniversary of its founding on May 29. Basically a combat organization, ARS guards the airlanes of the world. Everywhere, men who fly know that, should trouble strike, highly trained Rescuemen are standing by ready to assist—anytime, anywhere.

As of the first of this year at least 8,300 persons have been found and rescued from certain death by Air Rescue Personnel. In addition, ARS has directly aided a confirmed total of over 52,000 people and saved 84 aircraft from destruction. In this same period, Rescuemen flew 44,418 missions of mercy and logged over 350,050 flying hours for the sole purpose of seeking and saving downed flyers, accident victims and survivors of a variety of natural disasters.

Not included in the hours and missions listed are thousands of others flown over the years on escort and orbit-type missions. Somewhere in the world every day of the year Rescue is called on to fly this precautionary type mission just to be on the scene should serious trouble develop. Should an aircraft in difficulty be forced to ditch or crashland, Rescue experts will be on hand to render instant assistance.

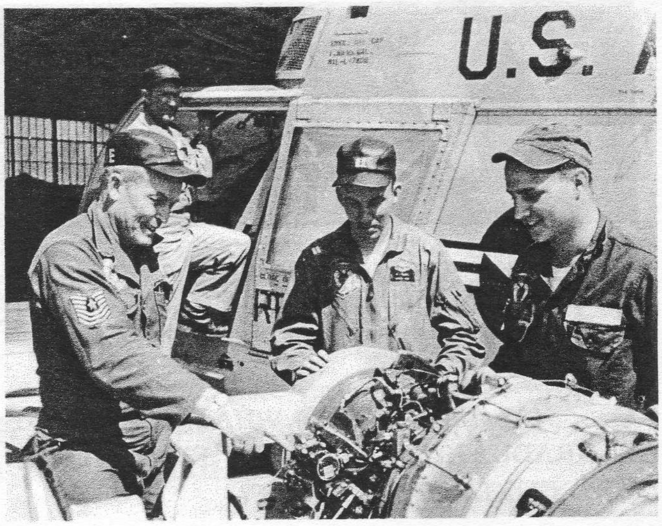
Busy, Busy, Busy

Det 15, WARC, Luke AFB, Ariz., had a busy year from 1 Jan to 31 Dec 62. Along with high in-commission rates for their HH-43B's, they accomplished 586 missions with 793 sorties and 272:10 flying hours. The total flying time by the detachment was 532:30 hours. The 1963 account is already in the black with approximately 100 missions on the tally sheet.

500 Hours

Capt John F. Santos, Jr.; of Det 20, CARC, Minot AFB, N.D.; back after a seven-month TDY, has logged 635 hours in the HH-43B. He passed the 500-hour mark in June, 1962. Capt Marvin L. Palmer, who recently left for duty in the Philippines, has also flown over 600 hours in the HUSKIE and passed the 500-hour mark about the same time as Captain Santos.

Capt Wayne J. Wolf of Det 9, AARC, Moron AFB, Spain; had 468 hours in the HH-43B when he left the states in May of '62. In March, 1963, one month after his unit received the HUSKIES, the captain logged his 500th hour.



PROUD RECORD—Checking out one of the T-53 engines which has supplied the power to keep a Detachment 20 HH-43B aloft for 750 hours, since 1960, are MSgt Robert W. Bradfield, NCOIC; Capt Marvin L. Palmer, pilot; and SSgt Charles L. Husby, crew chief. (USAF photo)

Minot AFB, N. Dak.... Two hundred thousand miles on an automobile engine—without an overhaul—would be a remarkable feat indeed.

It would appear that the equivalent mileage on an HH-43B jet helicopter engine without overhaul would be just as hard, or harder to come by, but that is what the pilots and mechanics of Det 20, CARC, twice have accomplished here.

Only recently Capt Marvin L. Palmer flew one of the detachment's two choppers its 750th hour, equivalent to about 200,000 land miles. Last week, he put the 750th hour on the other "bird," giving the detachment the only two craft within CARC to reach the mark.

Capt Delbert Sayer, Det 20 commander; cites outstanding maintenance teams and programs responsible for the long lives of the two engines, which were originally designed for 300 operating hours before overhaul.

MSgt Robert W. Bradfield, NCOIC, who completed training school at Sheppard AFB, Texas, is fully qualified as an HH-43B maintenance man. Backing him up are crew chiefs SSgt Charles L. Husby, who has been working with and on helicopters since 1953, and SSgt Donald F. Walker. SSgt George O. Williamson, engine mechanic, has done all the engine maintenance on both aircraft since their arrival in August 1960.

Captain Sayer said, "Excellent maintenance contributed materially to the life of the engines."

GREET NEW ARRIVAL—Members of Det 9, AARC, Moron AFB, Spain; pose for group picture after assembly of newly-arrived HH-43B. The detachment, which has rescued over 200 persons since activation nine months ago, has already utilized the two HUSKIES on several missions. In front row, l to r, are, SSgt Saucedo, clerk; SSgt Miller, crew chief; TSgt Umlah, dock chief; SSgt Taylor, engine mechanic; SSgt Coon, crew chief; SSgt Kirner, crew chief; SMSgt Buchanan, line chief. Rear row, Ralph Lee, KAC test pilot; Captain Lee, detachment commander; Robert Lambert, KAC field service representative; Lieutenant Heeter, operations officer; Lieutenant Blaydes, training officer; Captain Wolf, maintainence officer. (USAF 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 CAN CAUSE A GRADUAL INCREASE IN FRICTION ON THE COLLECTIVE STICK?

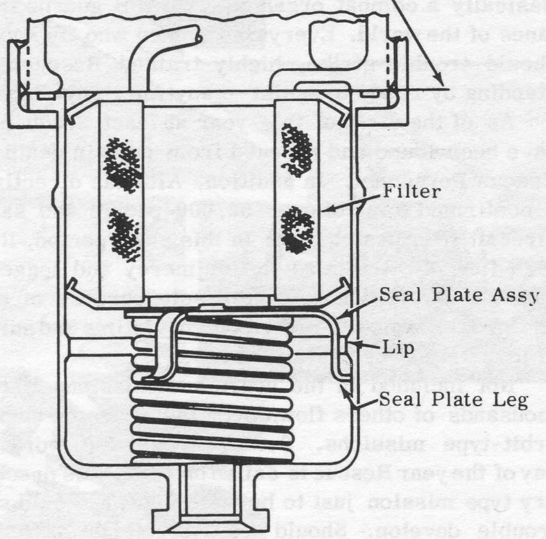
A. The friction device installed by T.O. 1H-43B-565 uses Belleville washers to produce the friction. If the edges of these cup-shaped washers are rough, they gall the smooth surface of the mating material. This, in turn, induces greater friction. The fix is to stone or burnish the washer edges and then reset the friction to the value specified in the T.O.

W. J. Wagemaker, Service Engineer

Q. (Applies UH-2A, UH-2B) THE PHASE-ANGLE VOLTMETER ON THE ASE FLIGHT LINE TEST SET IS ADJUSTED DURING PRODUCTION TO OPERATE WITH AN INPUT FREQUENCY OF 400CPS ± 2CPS. CAN THE METER BE EASILY ADJUSTED TO OPERATE OVER A FREQUENCY RANGE OF FROM 380 TO 420CPS?

A. Yes. If the power source is generating a frequency of from 380 to 420cps., use the following instructions to properly adjust the meter for the frequency variation. (1) Place the "Function" switch on the meter to 90°. (2) Place the "Fixed/Var" switch in the "Var" position. (3) Place the "Range" switch on the 30-volt scale. (Use the 100-volt scale if the "overload" light comes on.) (4) Place the "Voltmeter" switch on position 18 (115v A Ø). (5) Adjust the "Phase Adjust" knob until the indication is exactly zero. (6) The meter is now adjusted to properly operate with the frequency being applied. Do not re-adjust the meter without following the above procedures or erroneous readings may result.

M. T. Fiaschetti, Service Engineer



Q. (Applies UH-2A, UH-2B) WHEN ASSEMBLING THE MAIN FUEL FILTER, WHAT PROCEDURES SHOULD BE USED IN ORDER TO PREVENT CRUSHED STRAINERS?

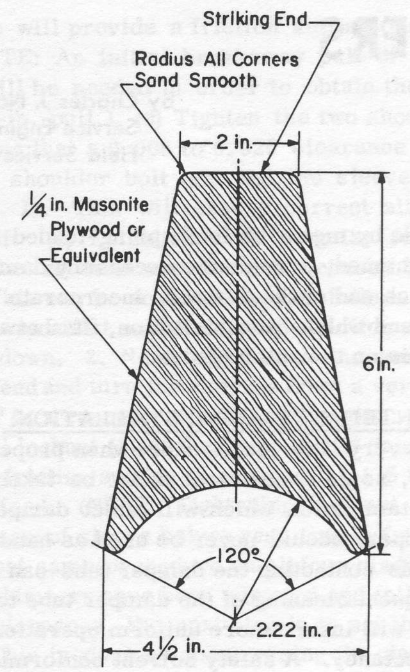
A. Before installing filter can on the housing, the seal plate assembly and strainer should be inserted into the can. The three legs of the seal plate must be below the lip within the can. The strainer is then inserted on top of the seal plate. Slight pressure at the top of the strainer will allow the spring to compress and indicates correct assembly. The can is then assembled to the housing. NOTE the position of the seal plate legs below the lip of the can in the drawing.

F. E. Allen, Service Engineer

Q. (Applies HH-43B) IS IT NORMAL FOR THE FUEL CHANGEOVER VALVE ON THE FUEL CONTROL TO BECOME HOT DURING ENGINE OPERATION?

A. Yes, this valve is supposed to become hot during engine operation since it is a continuous duty, double coil solenoid which receives 28 volts (DC) in both an automatic and manual position. The heat is generated because the valve is an electrical device which requires current to operate.

H. Zubkoff, Service Engineer



Q. (Applies UH-2A, UH-2B) DUE TO THE TIGHTNESS OF THE FIT BETWEEN THE RETENTION AND CROSS ASSEMBLY BUILDUP IN THE ROTOR AREA, MECHANICS MAY EXPERIENCE SOME DIFFICULTY WHEN ATTEMPTING TO POSITION THE K618415 BEARING RACE. WHAT SIMPLE TOOL CAN BE FASHIONED WHICH WILL AID THEM IN PERFORMING THIS TASK?

A. A tool with a concave cutout such as the one shown in the drawing can easily be made by mechanics and will aid in positioning the bearing race. First install the cross assembly buildup between the retention ears (assistance may be required to maintain the relative position of these parts), then place the tool cutout against the protruding race. Gently position the race by using the palm of the hand to strike firm blows on the end of the tool. If the tightness of the fit requires considerable force to position the race, it is suggested thinner shims be substituted, keeping in mind that the tolerances specified in the maintenance handbook must be maintained. With the race positioned in the approximate area, insert alignment tool P/N K604734-1 into the retention flapping bearing. Rotate the tool until the "pick-up" tooth centers all spacers and shims between the cross assembly and retention ears. Remove the alignment tool and install the spindle. After the spindle has been secured, use the tool with the cutout to align the bearing race with adjacent component parts if necessary. (Never attempt to position the bearing race by tapping with a hammer or other hard object. This damages the outer surface of the bearing and can lead to shortened life of the component.)

D. W. MacDonald, Service Engineer

Q. (Applies HH-43B) WHAT COULD CAUSE A "HEAVY" COLLECTIVE STICK?

A. Lack of sufficient oil pressure to the collective limiter will produce a "heavy" collective stick. Insufficient oil pressure can be caused by the transmission oil pump not delivering the specified pressure or by an internal or external leak in the rudder lock system. Since both the limiter and rudder lock operate from the same stage of the transmission oil pump, turning the DSAS "off" will indicate where the malfunction is occurring.

W. J. Wagemaker, Service Engineer

Q. (Applies UH-43C, OH-43D) IS "IMPROPER ADJUSTMENT OF CLUTCH CONTROL" A PROBABLE CAUSE FOR FAILURE OF THE CLUTCH TO DISENGAGE DURING AUTOROTATION?

A. Improper adjustment of the clutch control is NOT a probable cause for failure to disengage. The information given under "probable cause" in Section Three of the trouble-shooting chart on Page 15 in the April, 1963 issue of KRT (clutch fails to disengage during autorotation) is erroneous and should be deleted. Disengagement of the clutch during autorotation is accomplished by the reversal of torque applied to the torque ring. This causes the ring to move aft thereby opening the power piston dump valve. The resultant loss of pressure in the power piston cavity allows the power piston to retract thereby removing the force which held the driven and driver discs together.

F. E. Starses, 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, Group Leaders.*

HH-43B INTER-BLADE DAMPERS

by Charles J. Nolin
Service Engineer
Field Service Department

Maintenance of the rotor blade dampers on the HH-43B is comparatively simple, but the procedures outlined in the Maintenance Handbook must be followed if a shortened service life for this component (and unnecessary work for maintenance personnel) is to be avoided. This article was written to re-emphasize the importance of always "going by the book" when adjusting these dampers and to draw attention to the fact that it is not necessary to replace dampers in pairs or ship sets. This practice has, in the past, resulted in excessive use of these components.

FUNCTION: The rotor dampers installed on Kaman Synchropters are unique in their function in that they provide a blade-to-blade dampening action rather than the conventional blade-to-hub action common in the industry. The inter-blade dampers installed on Kaman helicopters provide a friction-type dampening action in the high, as well as low, rotor RPM ranges to reduce any unequal lead-lag rotor blade motion that may exist.

DESCRIPTION: The damper (reference Fig. 1) consists primarily of two major components, an aluminum tube assembly (4) and a split sleeve (7 and 3). The tube assembly is plated with a very tough, long-lasting Martin hard coat finish and slides between the halves of the split sleeve. The sleeve halves are lined with a brake lining material and are adjustable. Adjustments are made by means of four spring-loaded bolts which, when tightened, provide the necessary dampening friction. Each end of the dampers incorporate a large uniball rodend which, at installation, fits between the grip ear clevis on the rotor blades.

MAINTENANCE AND INSTALLATION: The damper requires very little maintenance when properly adjusted; however, some precautions must be taken to prevent tube contamination which will affect dampening action. The dampers should never be used as hand holds since oily hands contacting the damper tube can contaminate it. Frequent cleaning of the damper tube to remove oil and grit will insure more uniform operation and extend life expectancy. A safety solvent conforming to specification MIL-S-18718 should be used when cleaning the damper tube. As in any area where brake lining is present, no gasoline or other oil-base liquid must ever be used to clean the damper tube. By practicing these maintenance tips and adhering to the following adjustment and installation procedures, damper problems should be reduced to a minimum.

Prior to placing the damper in the friction-setting fixture, P/N K304707-5, it is very important that the lock nut (2) at the large end of the damper be loosened. This will prevent preloading the sleeves (7 and 3), which will create an incorrect friction reading. With this precaution noted and the damper positioned in the fixture, proceed as follows: (a) Loosen the two shoulder bolts (5). (b) Attach a spring scale, with at least a 20-lb. capacity, to the vertical handle of the friction setting fixture. (c) Tighten the friction setting bolts (6) evenly, keeping the sleeve halves parallel until it takes a pull of 17 lbs. to move the fixture handle. The pulling force should be 90° to the handle at all times to obtain a correct reading, (reference Fig. 2). This

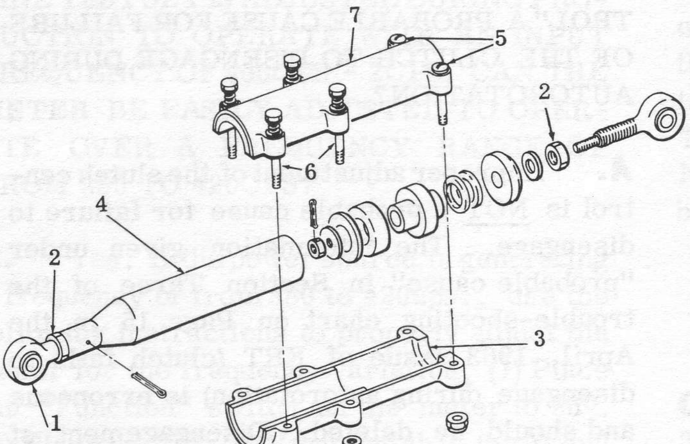
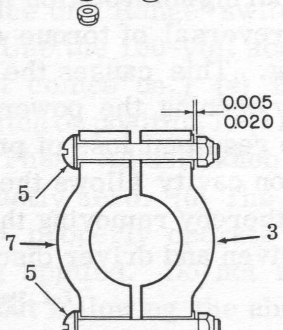


FIGURE 1



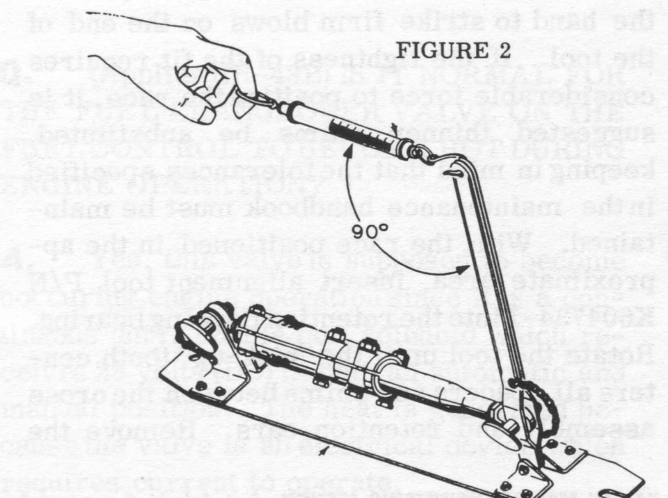


FIGURE 2

procedure will provide a friction setting of 115 to 125 lbs. (NOTE: An initial breakaway pull of more than 17 lbs. will be needed in order to obtain the required steady 17-lb. pull.) (d) Tighten the two shoulder bolts (5) ensuring that a 0.005 to 0.020 clearance exists between the shoulder bolt nut and the sleeve (see end view, Fig. 1). This will ensure correct alignment of sleeve half. (e) Establish a 45^o angular relationship between the rodends and the gap between the sleeve halves. This can be accomplished as follows: 1. Place the damper on a flat surface with the friction setting bolt heads (6) down. 2. Next, sight down the damper from the small end and turn the rodends from a vertical position to 45^o in a counter-clockwise direction. (f) Tighten the rodend locknut (2) at the large end of damper. Recheck the friction setting to ensure that 115 to 125 lbs. is maintained. (NOTE: Tightening lock nut can cause misalignment of sleeve halves resulting in friction drop-off.) Repeat same procedure on all four blade dampers. After all dampers have been adjusted and fall within the friction tolerances, the next step is to set the nominal length. This is done by compressing the damper fully and placing a pencil mark on the tube (4) adjacent to the edge of the sleeves (7 and 3). Next, withdraw the tube 1-1/8 inches from the sleeve. This locates the tube at the midpoint of its travel. Then adjust the tube (small end) rodend (1) so that a setting of 16.5 inches is obtained between the two rodend centers. This is damper neutral. The dampers are now ready for installation between the blade grip arms of the opposing blades.

When installing the damper between the blade grip ears, make sure that the small end (tube) is toward the end of the hub on which the blade folding lock is located. The bolt heads should be turned away from the hub. If the bolt heads are turned toward the hub they will interfere with the blade-folding hook. Recheck that the 45^o relationship between the rodends and sleeve halves have not been disturbed (reference Fig. 3).

TROUBLE SHOOTING: The dampers are frequently singled out as the culprit when aircraft vibrations are encountered. Many times in these cases the dampers are the cause or at least a contributing factor. Most

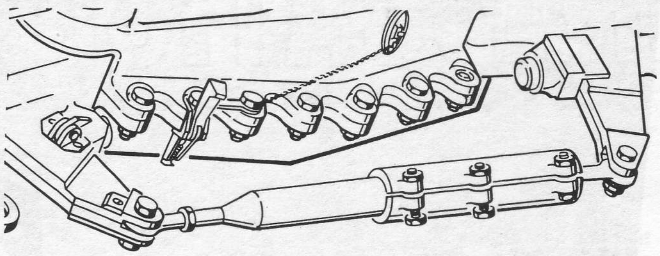


FIGURE 3

of the trouble stems from loose or unequally adjusted dampers. Loose dampers will reveal themselves during aircraft shut down prior to rotor brake engagement by causing excessive aircraft wobble. This will also be evident to a lesser extent during rotor engagement. Excessively tight or unevenly adjusted dampers will also cause abnormal vibration during flight operation. During a turn the vibration level will noticeably increase with improperly adjusted dampers.

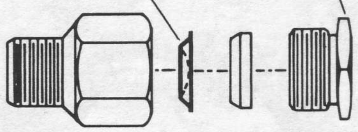
CONCLUSION: Generally speaking the interblade damper will provide a reasonable length of service, usually exceeding 450 hours, providing adjustments are made in accordance with the maintenance manual. The service history of this part indicates that when maintenance or other personnel "experiment" with various friction settings, using feel rather than scale readings, the operating interval is greatly reduced. This, of course, increases the maintenance workload, the down-time of the aircraft, and the number of spare components used. Anytime a damper is suspected of being out of tolerance it should be checked using the friction tool, P/N K304704-5, and fish scale system. Whenever possible, this should be done after removing the component from the helicopter.

When replacing a damper there is no need to change the other dampers unless a check reveals that this action is necessary. Arbitrarily changing all dampers has, in the past, caused a needless drain on the supply system. K

Timely Tip

When installing a new rupture disc, P/N 63C80-2, in the low pressure relief valve on the Fire Suppression Kit, it is of the utmost importance that (a) the rupture disc be installed as shown and (b) the safety head is tightened to the proper torque. If the disc is installed backward it is impossible for the disc to seat properly when the safety head is tightened and the disc may push out during operations. This could allow the foam to escape and render the kit useless. If a rescue were being attempted at the time this might have dire consequences. If the safety head is not tightened properly, the same thing could also occur.

W. J. Rudershausen, Service Engineer



Breakdown assembly for No. 63C80 pressure relief valve

GRADUATION

HH-43B TRAINING
SHEPPARD AIR FORCE BASE

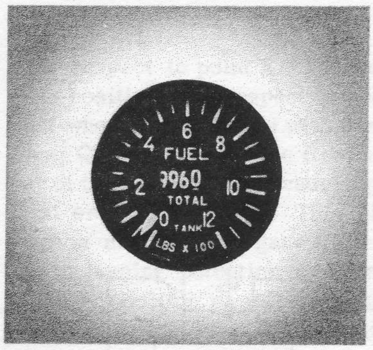
3750TH TECHNICAL SCHOOL, USAF (ATC)

MAY 14, 1963——Front row, l to r, MSgt C. C. Tomlin, Det. 29, WARC, Vance AFB, Okla.; A2C C. A. Lorenz, Det. 44, EARC, Westover AFB, Mass.; A2C J. Alvarez, Det. 10, WARC, Kingsley Field, Oreg.; A1C Bobbie R. Smith, Det 6, APO 16, N. Y. Rear row, Fred Morrison (Instr.), Sheppard AFB, Texas; MSgt L. C. Harbrucker, Det. 35, WARC, Kirtland AFB, N. M.; A2C D. M. Cunningham, Det. 53, EARC, Craig AFB, Ala. A1C J. H. Jones, Det. 5, AARCE, APO 119, N. Y.; 1stSgt Azari-Hossein, Iran; WO Fatemi Hadi, Iran; Richard Maxwell (Instr.), Sheppard AFB. (USAF photo)

JUNE 4, 1963——Front row, l to r, MSgt Drew L. Sheffield, Det. 14, Nellis AFB, Nev.; SMSgt Andrew Donato, Det. 37, England AFB, La.; 1stSgt Ollah Sharafati Vali, Iran; A1C James A. Currie, 474 FMS, Cannon AFB, N. M.; A1C Hubert A. Powers, 1370 OMS, Turner AFB, Ga.; A1C David L. Shroud, 1370 FMS, Turner AFB. Rear row, Fred Morrison (Instr.), Sheppard AFB; MSgt Orville A. Lemke, Det 9, WARC, Portland IAP, Oreg.; A3C James H. Fox, Det. 29, CARC, Vance AFB; 1/WO Shahbakhti Akbar, Iran; SSgt Edward J. Manghum, A900 CAM Sqdn, Kirtland AFB; A2C William C. Ahern, 1370 OMS, Turner AFB; A2C Frank T. Simms, Jr., Det. 23, CARC, K. I. Sawyer AFB, Mich.; Richard H. Maxwell (Instr.), Sheppard AFB. (USAF photo)

JUNE 4, 1963——Front row, l to r, A1C Harold H. Bailey, Det. 51, EARC, Myrtle Beach AFB, S. C.; A1C William C. Brown, 1370 FMS, Turner AFB, Ga.; A2C LeRoy Erickson, Jr., 1370 OMS, Turner AFB; A2C Oscar W. Davis, 1370 OMS, Turner AFB; SSgt William A. Pearson, 1370 OMS, Turner AFB. Rear row, SSgt Delmar F. Mapes, Det. 36, CARC, Laredo AFB, Texas; SSgt Hermon C. Crumpler, 1370 OMS, Turner AFB, Ga.; SMSgt Jerry Taylor, 41 ARS, Hamilton AFB, Calif.; A1C James O. Benson, Det. 32, CARC, Webb AFB, Texas; A1C Charles A. Presley, 1370 OMS, Turner AFB; TSgt William Terrace, Jr. (Instr.), Sheppard AFB. (USAF photo)

JUNE 11, 1963——Front row, l to r, A2C I. C. Christopher, 1370 OMS, Turner AFB; A1C J. F. Britten, 1370 FMS, Turner AFB; A2C T. C. Potter, 57th CAMRON, Paine Field, Wash.; SSgt L. H. Mirza, Pakistan AF; TSgt S. A. Khan, Pakistan AF. Middle row, A1C J. D. Wensel, 1370 FMS, Turner AFB; SSgt L. J. Ansley, 1370 OMS, Turner AFB; A1C R. C. Ellegood, 1370 OMS, Turner AFB; A2C G. R. Lore, 1370 OMS, Turner AFB; A2C J. J. Green, 1370 OMS, Turner AFB; A2C B. M. Fowler, 1370 OMS, Turner AFB; TSgt Alla Din, Pakistan AF. Rear row, Fred Morrison (Instr.), Sheppard AFB; A1C W. A. Cobb, Det. 8, AARC, APO 286, N. Y.; MSgt F. C. Holler, 1370 OMS, Turner AFB; TSgt M. Siddique, Pakistan AF; 1stLt A. K. Sherwani, Pakistan AF; SSgt M. Khan, Pakistan AF; SSgt M. Idris, Pakistan AF; A1C D. R. Maloy (Instr.), Sheppard AFB; TSgt W. H. Lillico (Instr.), Sheppard AFB. (USAF photo)



UH2A/B FUEL QUANTITY MEASURING SYSTEM

by Robert W. Olsen
Service Engineer
Field Service Department

PART II

The first part of this article, which appeared in the June-July, 1963 issue of Rotor Tips, was aimed at the aircraft mechanic who might be called upon to perform routine maintenance on the system. This part, dealing with more advanced theory, is furnished for the electrical technician. The following description involves circuit analysis: Figure 1 is a simplified fuel system schematic of the entire circuit showing the electrical relationship of the system components. Further simplification is depicted in Figure 2 which shows only the counter amplifier and the equivalent tank unit capacitors. By rearranging the circuit in Figure 2, an AC bridge becomes appar-

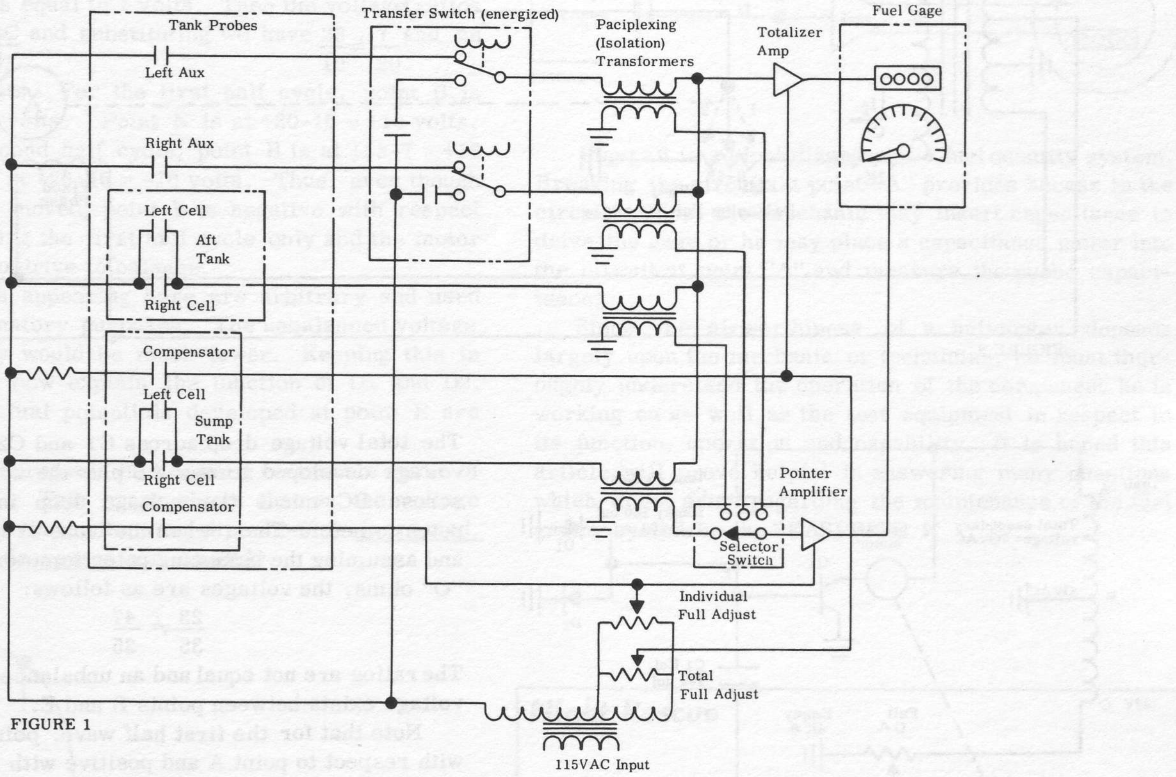


FIGURE 1

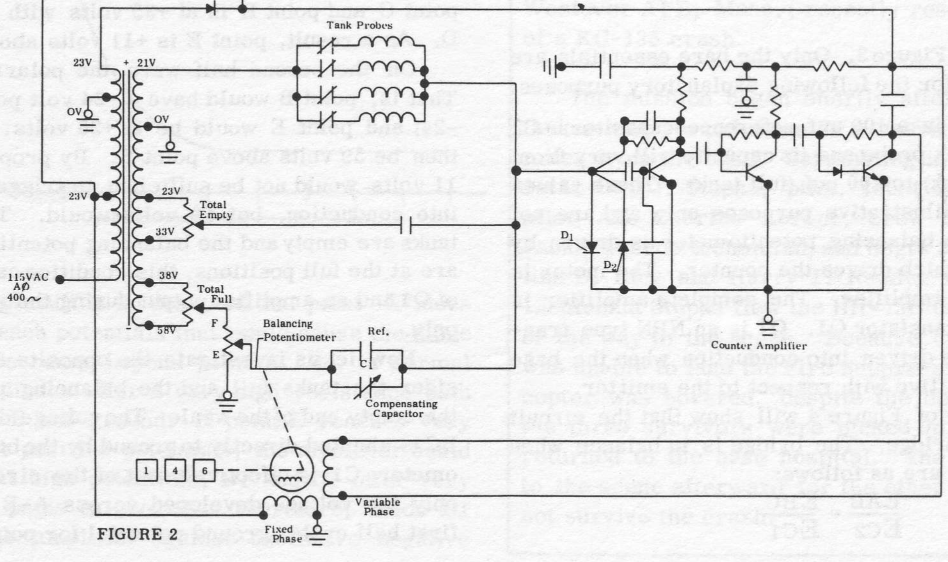


FIGURE 2

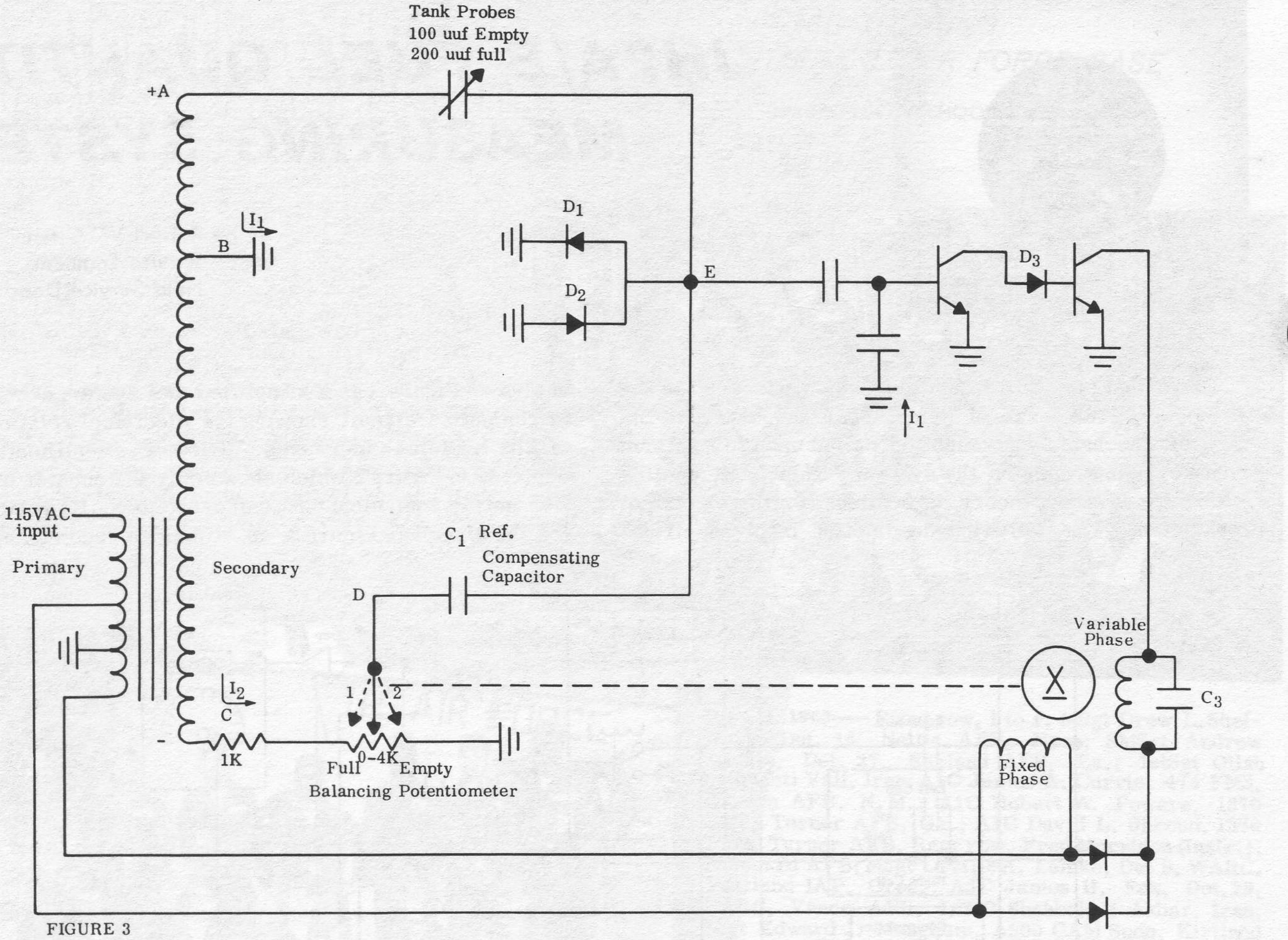


FIGURE 3

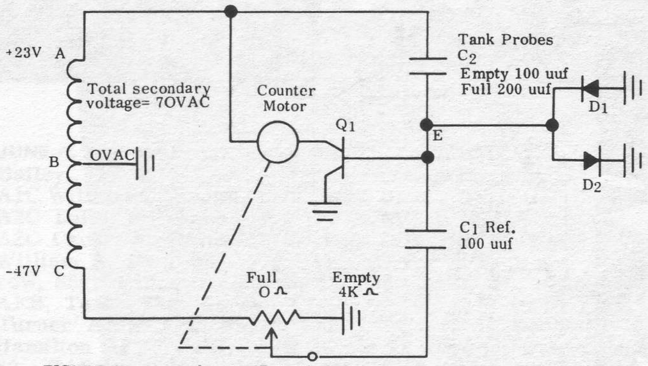


FIGURE 4

ent as depicted in Figure 3. Only the bare essentials are shown in Figure 4 for the following explanatory purposes.

Capacitor C1 is a 100 uuf reference capacitor. C2 represents the tank probe and its capacity will vary from 100 uuf (empty tank) to 200 uuf (full tank). These values are selected for illustrative purposes only and are not true values. The balancing potentiometer is driven by the same motor which drives the counter. The motor is energized by the amplifier. The complete amplifier is represented by transistor Q1. Q1 is an NPN type transistor and will be driven into conduction when the base is sufficiently positive with respect to the emitter.

Further study of Figure 4 will show that the circuit is a simple AC bridge. The bridge is in balance when the voltage ratios are as follows:

$$\frac{E_{AB}}{E_{C2}} = \frac{E_{BC}}{E_{C1}}$$

The total voltage drop across C1 and C2 is equal to the voltage developed across AB plus the voltage developed across BC minus the voltage drop in the balancing potentiometer. Thus, when the tanks are empty, C2=C1, and assuming the balancing potentiometer to be at "F" or "O" ohms, the voltages are as follows:

$$\frac{23}{35} \neq \frac{47}{35}$$

The ratios are not equal and an unbalanced or differential voltage exists between points B and E.

Note that for the first half wave, point B is negative with respect to point A and positive with respect to point C. Therefore, for the first half wave, point B would have a +24 volt potential (-23+47 = +24) with respect to point C and point E is at +35 volts with respect to point D. As a result, point E is +11 volts above point B.

On the second half wave the polarity is reversed. That is, point B would have a -24 volt potential (+23-47= -24) and point E would be at +35 volts. Point E would then be 59 volts above point B. By properly biasing Q1, 11 volts would not be sufficient to trigger the transistor into conduction, but 59 volts would. Therefore, when tanks are empty and the balancing potentiometer and gage are at the full positions, this condition causes conduction of Q1 and an amplifier output during the second half cycle only.

Now let us investigate the opposite condition. Consider the tanks full and the balancing potentiometer at the empty end of the scale. The voltage developed across BC is shunted directly to ground by the balancing potentiometer; C1 is effectively out of the circuit and Q1 sees only the voltage developed across A-B. Thus, on the first half cycle, ground potential (or point B) is negative with respect to point E. On the second half cycle point B is positive with respect to point E. Q1 can only conduct when B is negative with respect to point E. Therefore, Q1 conducts on the first half cycle only. The output of the amplifier is occurring 180° earlier than in the first set of conditions. This phase shift causes the induction motor in the gage to reverse direction, driving the balancing potentiometer and indicator until a new balance position at full is attained. As the balancing potentiometer wiper moves, BC potential is no longer shunted to ground. Instead, part of the potential developed across BC plus all of the potential across AB is applied to C1 and C2. But, the fuel level change on capacitor C2 has caused a change in the capacitive reactance of C2. (In this case Xc will be halved when the capacitance is changed from 100 to 200 uuf.) C1 will then have twice the voltage drop of C2.

For discussion purposes assume the wiper is at a position such that the part of BC voltage which is applied to C1 and C2 is equal to 7 volts. Then the voltage ratios are $\frac{E_{AB}}{E_{C2}} = \frac{E_{BC}}{E_{C1}}$ and substituting we have $\frac{23}{10} \neq \frac{7}{20}$ and an unbalance exists. For the first half cycle, point B is at -23+7 = -16 volts. Point E is at +20-10 = +10 volts. During the second half cycle, point B is at +23-7 = +16 and point E is at -20+10 = -10 volts. Thus, even though the wiper has moved, point B is negative with respect to point E during the first half cycle only and the motor will continue to drive to balance.

The values appearing here are arbitrary and used only for explanatory purposes. The unbalanced voltage values actually would be much lower. Keeping this in mind, we can now explain the function of D1 and D2. Remember, actual potentials developed at point E are quite low.

Figure 5 represents the forward resistance curve of diode D1 or D2. This graph shows that as the voltage across a diode (in the forward direction) is <u>increased,</u> the resistance <u>decreases</u> non-linearly.

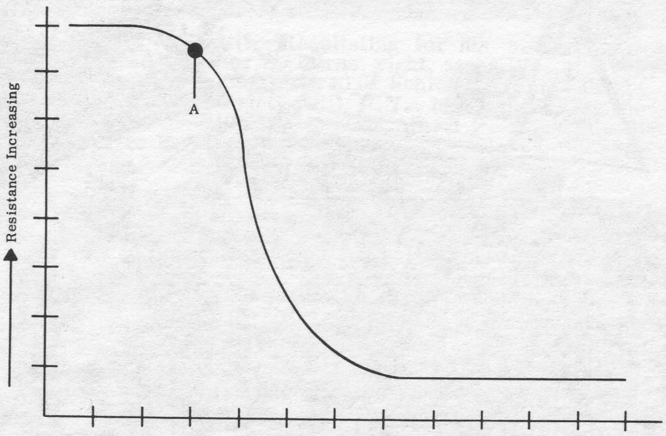


FIGURE 5

The bridge circuit is so designed that point "E" does not normally reach potentials that would cause the diode resistance to decrease beyond point A. So, in normal operation, the diodes offer a very high resistance path between points E and ground. If point E reaches very high negative or positive potentials, the amplifier could be damaged. At high potentials, D1 and D2 offer very low resistance paths to ground. Therefore, diode D1 will protect the amplifier against excessive negative potentials, and D2 will protect the amplifier against high positive potentials.

The principles of quantity system testing are relatively simple and may be broken into two parts. First a method for driving the gage for calibration purposes is necessary. Secondly, a means must be available to check the capacitance value of the probes while the probes are installed.

It is apparent, then, to drive the gage, the tank units must be simulated for both empty and full conditions. This is accomplished by providing a precision variable capacitor with a scale calibrated in micro-micro farads. Probe measurement is a simple matter of connecting the probe to a capacitance meter and directly measuring the capacitance of the probe.

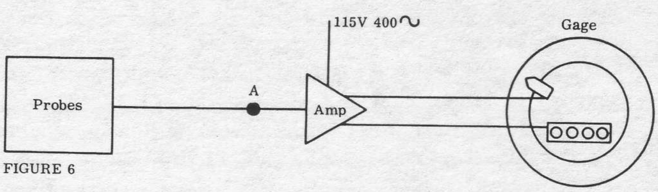


FIGURE 6

Figure 6 is a block diagram of a fuel quantity system. Breaking the circuit at point "A" provides access to the circuit. Thus, the mechanic may insert capacitance to drive the gage or he may place a capacitance meter into the circuit at point "A" and measure the probe capacitance.

Since the airworthiness of a helicopter depends largely upon the mechanic or technician, he must thoroughly understand the operation of the component he is working on as well as the test equipment in respect to its function, operation and capability. It is hoped this article will prove helpful in answering many questions which might arise regarding the maintenance of the fuel gaging system in the SEASPRITE. K

Night Rescue

Flying on instruments at night in a heavy, wind-driven rain, the crew of an HH-43B from Det 44, EARC, Westover AFB, Mass.; recently rescued the survivors of a KC-135 crash.

The mission began shortly after 1 a.m. when the tanker was forced down in a heavily wooded area six miles from the base. Scrambling in the HUSKIE were 1stLt Otto J. Stupka, pilot; 1stLt Jack Forsythe, copilot; A2c Charles Lorenz, crew chief; SSgt Dennis Jacks, rescue technician; and SSgts Joe A. Hooten, Collins D. Rice and Harry T. Reedy, rescue specialists. Lieutenant Stupka flew the HH-43B on instruments part of the way to the scene. Because of the high trees he was unable to land the Fire Suppression Kit so the helicopter was hovered, despite the dense smoke, while the three survivors were picked up. They were then returned to the base hospital. The HH-43B returned to the scene afterward for the other crewman who did not survive the crash.

Huskie Happenings

...1stLt Darvan E. Cook and his copilot, Capt John M. High of Det 59, EARC, Andrews AFB, Md.; scramble in HH-43B in 2 a.m. search over Chesapeake Bay for family of seven in missing small boat. Search conducted through darkness blanketed by 300-foot overcast reveals small bonfire on island beach and half-submerged boat 50 yards off shore. Helicopter makes difficult landing on sloping beach and all seven survivors loaded aboard. Their boat had struck a submerged object.

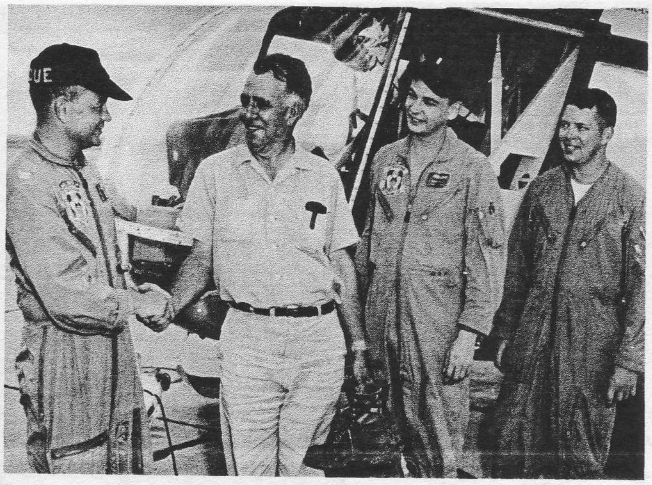
...HH-43B crew from Det 4, WARC, Paine Field, Wash.; fly through low hanging clouds and gathering dusk to aid mountain climber seriously injured in fall. Pickup made at 5,480 feet near top of Silver Peak in Cascades. 1stLt Karl G. King, pilot; brings HUSKIE to high hover because of 45-degree slope and tall trees. Mr. Ome Daiber of Seattle Mountain Rescue Council with Stokes litter lowered into confined area by A2c Roger L. Vipperman, medic. Rescuee hoisted aboard as heavy fog curls down valley threatening to close it. Helicopter proceeds to hospital as aid is given to survivor by Dr. Otto Trott, another council member. Others in HUSKIE crew are Capt Ronald L. Bachman, copilot; and SSgt Benny DeGaetano, crew chief.

...1stLt Otto J. Stupka of Det 44, EARC, Westover AFB, Mass.; presented Colombian Air Force pilot wings and named honorary pilot in that country's air force for his "contribution to friendly and professional relations between USAF and the Colombian Air Force" while serving as an adviser in helicopter operations and as an instructor pilot.

...HH-43B dispatched by Western Air Rescue Center at Hamilton AFB, Calif.; after wreckage of light civilian aircraft spotted in deep canyon by searching CAP plane. Three occupants of aircraft, one man and two women, picked up by helicopter which hovered for 30 minutes in turbulent winds during rescue operation. HUSKIE crew consisted of Capt William T. Hayes, Jr., pilot; Capt Franklin A. Lamb, copilot; TSgt Derald Parks and A1c Manley Olson....Capt Wayne J. Wolf and Capt Robert E. Lee from Det 9, AARC, Moron AB, Spain intercept "callout crash trucks" message from tower while on training mission in HH-43B. Check area and see F-105 veering off runway during landing ground roll. Aircraft slides 2000 feet before stopping and HUSKIE lands nearby as pilot climbs out. Pilot off-loaded at hospital as crash trucks arrive. Total time from accident to hospital —3-1/2 minutes. No fire and pilot unhurt.

FIRST EUROPEAN HH-43B SCHOOL—Maj Grant M. Bird, Commander of Det 1, AARC Helicopter Section at Spangdahlem, Germany; officiated at graduation activities for the first class to complete the European HH-43B helicopter mechanics school at Spangdahlem. Ten air bases in seven countries were represented, including members of Det 1, AARC and the 49th TFW Camron Sqdn. The HH-43B will soon be operational at all rescue detachments in Europe. Classes are taught by TSgt Andrew Benton and TSgt Robert F. Hunter members of the Air Training Command from Sheppard AFB. Subjects covered are the T-53 engine and the HH-43B. The first class began on April 15, and graduated on May 17. One aircraft, four engine and six system classes are to follow.

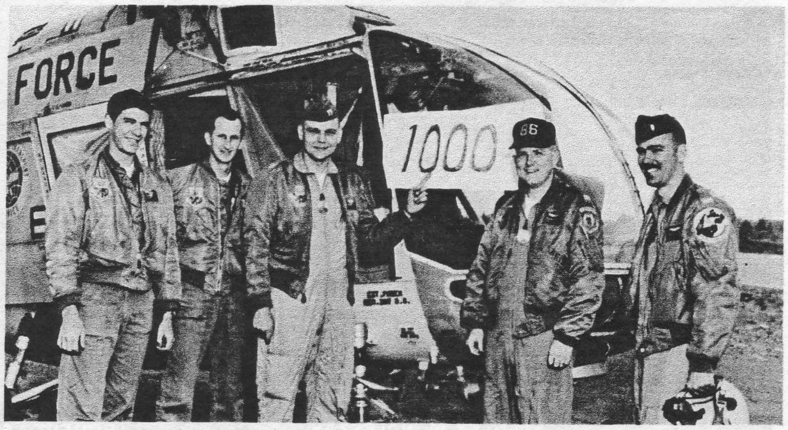
Shown are, front row, Major Bird; TSgt M. Hinojosa, Det 7, AARC, APO 283; TSgt J. C. Marks, Det 84, Tuslog, APO 289; SSgt J. L. Heckman, Det 1, AARC, APO 123; A2c L. D. Phillips, Det 10, AARC, APO 293; A1c F. Alvarado, 54th ARSQ, APO 406; SSgt J. F. Hodges, 49th TFW Camron, APO 123. Rear row, Sergeant Hunter; A1c J. R. Ozmar, Det 1, AARC, APO 123; SMSgt D. R. Buchanan, Det 9, AARC, APO 282; A1c L. E. Brown, Det 4, AARC, APO 12; SSgt D. J. Reese, Det 7, AARC, APO 283; SMSgt J. W. Woodall, Hq AARC, APO 12; TSgt C. H. Spann, Det 8, AARC, APO 286; A1c M. A. Grippando, A3c J. J. Pilkasukas, A3c M. F. Rebeck, 49th TFW Camron, APO 123; Sergeant Benton. (USAF photo)



100TH CIVILIAN RESCUEE—J. B. Porterfield, Texas oil rig worker, thanks Capt Theodore C. Vurbeff, left, Laredo AFB helicopter pilot, after being rescued from an oil rig isolated when rains washed out the roads. Looking on are 1stLt Donald E. Van Meter, center right, co-pilot; and TSgt Donald D. Kieft, crew chief. Mr. Porterfield is the 100th civilian given aid by Det 36 during the last three and one-half years, and the 80th civilian rescued by Det 36 personnel under ARS. Because of a heart condition, Mr. Porterfield could not accompany the rest of the crew when they walked out from the rig so his employers requested Air Force assistance. The 30-minute mission was flown with the approval of Col Woods W. Rogers, Jr., commander; Laredo AFB. (USAF photo)

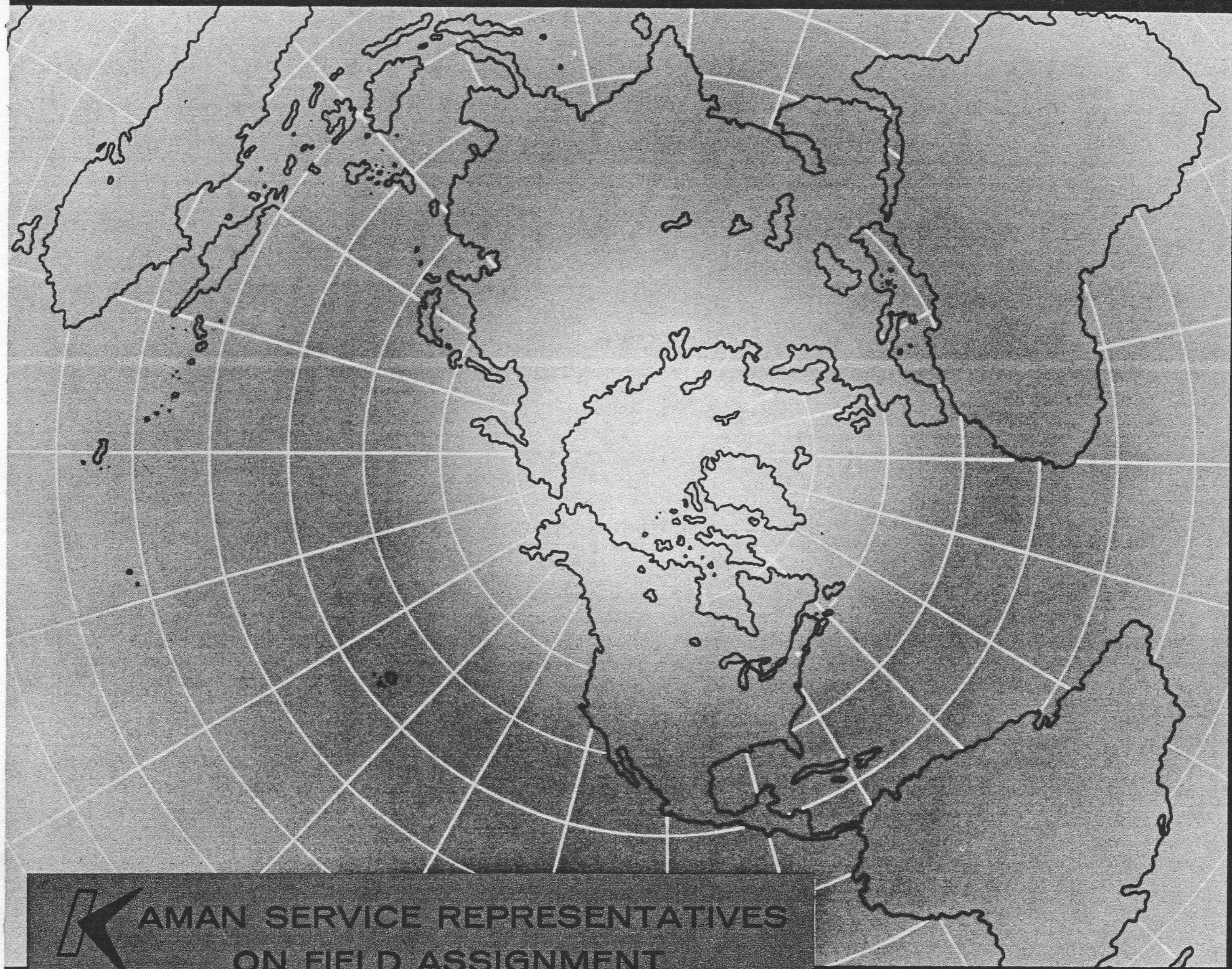
JUST FOOLIN'—If only moving day could be this easy but, alas, it is a darkroom trick played by A2c Donald S. "Buzz" Sawyer, photographer at Dow AFB, Maine. In real life, the building, which belongs to Det 42, EARC, was moved the hard way (muscle and sweat) to a new location on the base. (USAF photo)

1,000-FOOT ENLISTMENT—Reenlisting for his second four-year hitch is A1c James W. Burns, right, as he flies at 1,000 feet in an HH-43B. Capt Konrad J. Schiessl, commander of ARS Det 46, Suffolk County AFB, N.Y., is administering the oath. Pilot of the HUSKIE was Capt Albert P. Lupenski and 1stLt Charles E. Mayes, was copilot. (USAF photo)



1,000 HOURS—On May 22, 1963, Capt W. K. Davis landed the HUSKIE after a local training flight, topping 1,000 hours for Det 5, WARC, McChord AFB, Wash. Since the detachment was formed 20 months ago, personnel have carried out numerous rescue missions, many of them under hazardous conditions. Proudly displaying their "1,000-hour" sign are, l to r, A3c R. H. Landry, SSgt R. A. Warren, Captain Davis, 1stLt W. A. Luther, and 1stLt J. L. Cantey. (USAF photo)

DETACHMENT 32 HONORED—Capt John H. Larson, maintenance officer of Det 32, CARC, Webb AFB, Texas; points to Air Force Outstanding Unit Award Ribbon prominently displayed on side of HH-43B. The award was received for outstanding service in providing helicopter emergency rescue coverage in support of flight operations at the base from October, 1961 to October, 1962. The presentation was made during the observance of Armed Forces Day at Webb. Capt William F. Glover, Jr.; of Det 32 was presented the MATS Flight Safety Award for his skill in coping with an in-flight engine failure at 400 feet. He landed the HH-43B in a small clearing among mesquite trees. The tire prints were 1/8-inch deep at the point of touchdown and the landing roll only six feet. An additional forward movement of four feet would have brought the blades into contact with the trees. There was no damage to the aircraft or injury to the crew. (USAF photo)



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DONALD LOCKRIDGE
ROLF SCHWARZ
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