KAMAN

Rotor Tips

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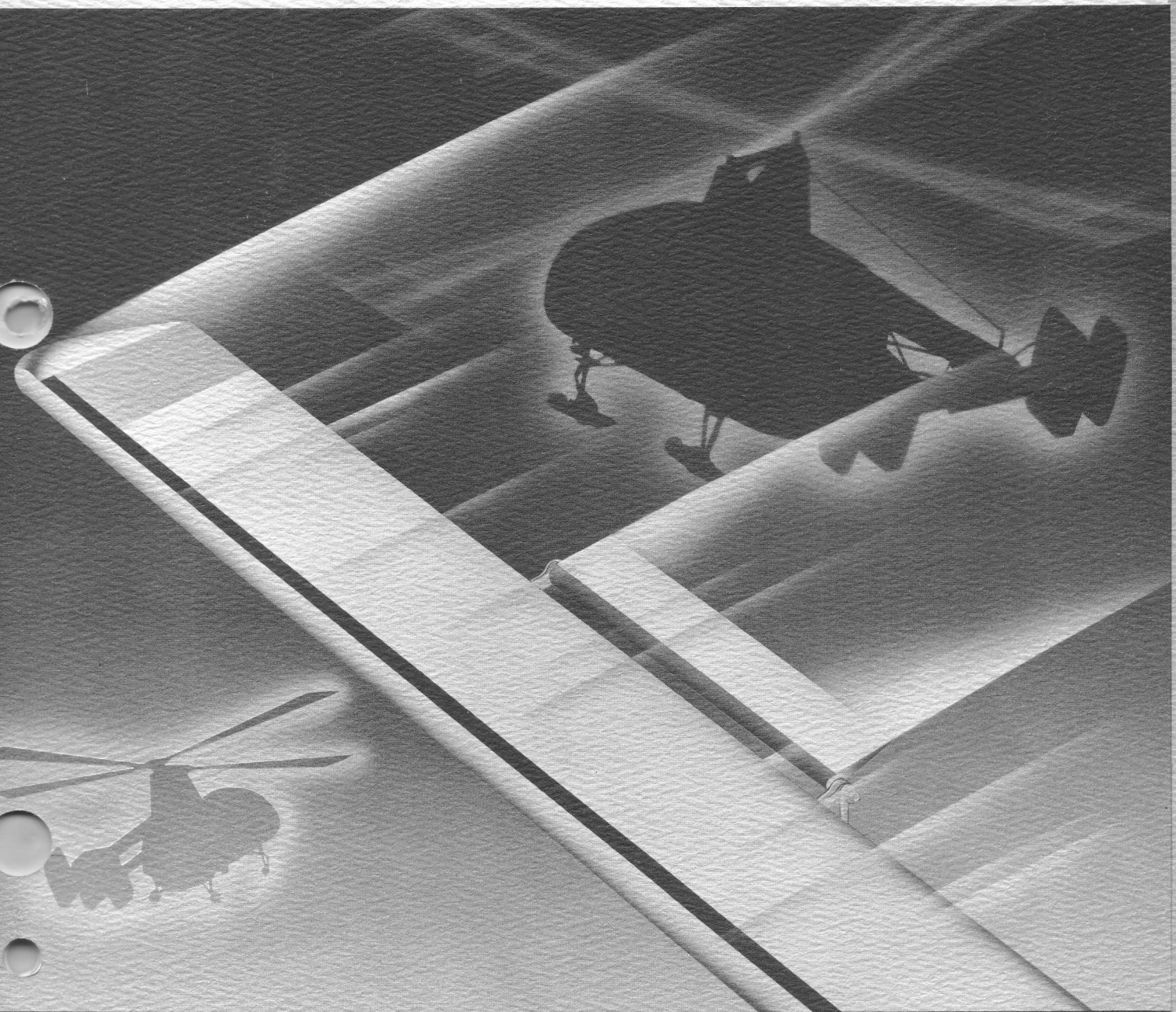

THE KAMAN AIRCRAFT CORPORATION

PIONEERS IN TURBINE POWERED HELICOPTERS

KAMAN

Rotor Tips

MAY, 1961

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IN THIS ISSUE

THE COVER

Rotor blades like the one shown play an important part in the helicopters' unique rescue capabilities. Proper care and performance go hand in hand.

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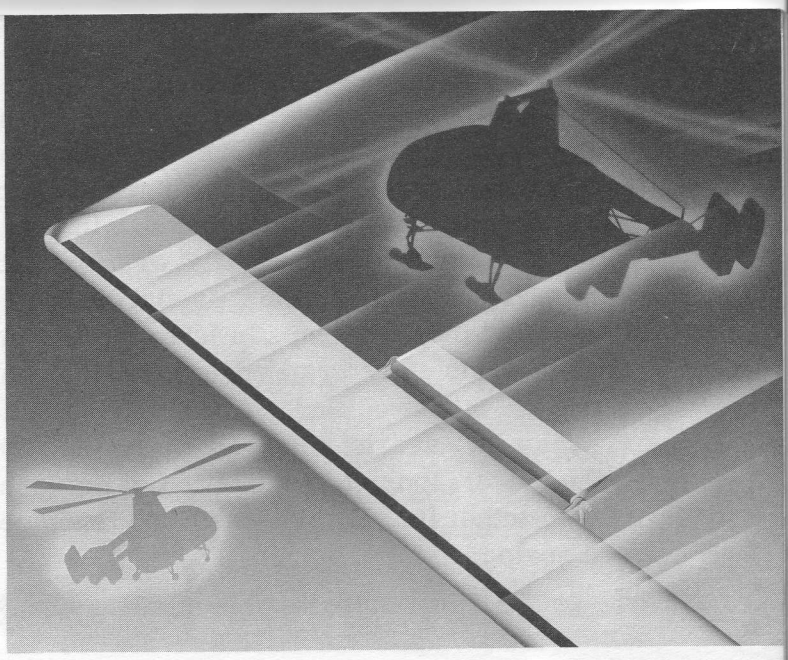
ROTOR BLADES



by G. M. LEGAULT
Group Leader, Air Frames; and
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We seldom think of the helicopter as being a "high speed" aircraft, and yet, in some ways, the slow flying, versatile helicopter is subject to the same stresses and strains as a first line fighter plane. The tip speed of most helicopter rotor blades is nearly 400 miles per hour, and if one ounce of weight is added at the tip, it will exert a pull at the hub of approximately 30 pounds. It is easily seen that with such speeds and centrifugal forces at work, the design, manufacture and maintenance of the rotor blade must be of the highest quality.

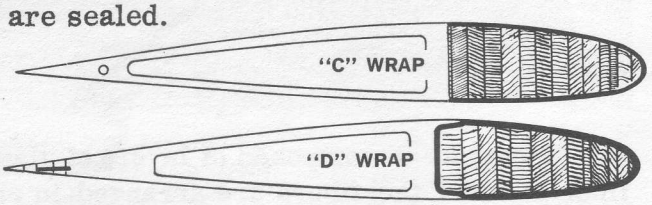
Pilots and mechanics are usually very much aware of the stresses set up by the natural forces at work in the flight envelope of modern helicopters, but often even the most experienced lose sight of the job which the rotor blade is designed to do. This article will deal with the design, test, fabrication and maintenance of rotor blades with the idea that it will prove of interest and furnish information both to the experienced and the newcomer to the helicopter operating and maintenance field.

The Kaman synchropter features the fixed-angle grip, wood-and-fiberglas constructed rotor blade with the patented rotor control servo flap. The rotor blade consists of a laminated spruce and maple spar with the butt end attaching point of maple, strengthened with Fiberglas reinforced plastic and Scotchply. Scotchply is composed of layers of glass fiber in which the fibers are arranged in alternate layers of 5^{o} to 15^{o} from an established reference line. The blade grip of the H-43B consists of an upper and lower half made of shot-peened steel, and on the earlier models (HOK-1, HUK-1, and H-43A), of a steel upper and aluminum lower half. The grip is bolted onto the blade with seven aluminum bolts after being carefully fitted to the butt end of the blade. Wood ribs of Sitka spruce, located approximately three inches apart, form the chord and span of the blade and are attached to the spar with Penocolite, a specially compounded glue having extremely high strength and flexibility. Ribs in the H-43B blade are laminated with a center of birch plywood. The upper and lower surfaces of the blade are formed by bonding birch plywood to the ribs and spar.

Inboard of the servo flap the plywood skin is built up to form what is called an area of "spring constant." The spring constant area permits control of blade torsional stiffness so that when servo flap control is applied, the blades will react in the same manner and to the same degree. It is the controlled stiffness which, combined with the action of the servo flap, permits changes in angle of attack and varies the lift of each blade by twisting the blade instead of rotating the entire blade

NEXT MONTH: **MAINTENANCE IS THEIR MISSION**

as most helicopter control systems do. The advantages of this blade and servo flap combination in control, stability and reduction of pilot fatigue are well established. In early models the spar was partially wrapped with woven glass fibers. This partial wrapping was called the "C" wrap. In later models the spar is completely wrapped to increase spar torsional stiffness and to better distribute spar loads, and is referred to as the "D" wrap blade. Prior to application of the glass fiber or other finishes, exposed wood surfaces are sealed.



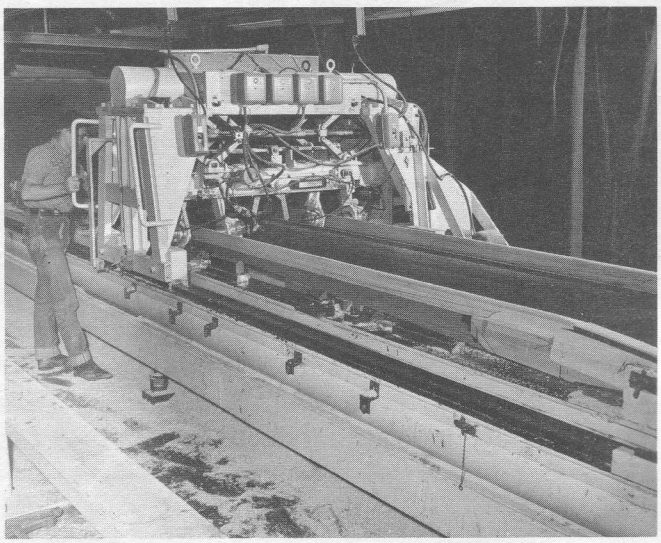
Aircraft balloon cloth is adhered to the plywood with clear cellulose-nitrate dope and the finish is then built up with many coats of pigmented cellulose-nitrate dope. Finally, a stainless steel leading edge and glass fiber tip are bonded on, several coats of wax are applied to the finish to protect the surface, and the blade then is ready for installation of control linkage. Blade control linkage consists of a series of push-pull rods, bellcranks, and idlers which manipulate the trailing-edge-mounted servo flap.

Kaman synchropter blades are matched pairs to ensure good dynamic balance, and should have sufficiently high mass, or weight, to provide good rotational momentum for efficient autorotational flareout characteristics. To ensure similar performance characteristics, a laminated spar block is built up and then split lengthwise to provide two spars of like composition relative to grain count, mass distribution, density, etc. Lead weights are inserted in the leading edge of the spar to establish the basic chordwise center of gravity. A three-scale balance procedure is then used to adjust the chordwise and spanwise center of gravity on HOK, HUK, and H-43A rotor blades. The chordwise balance of H-43B blades is determined dynamically to provide improved performance. A slight difference in weight is acceptable provided the dynamic balance of the two completed blades in a matched pair is equal.

Provisions are made for an in-flight tracking system. One blade of each pair is fitted to accomodate an electrical actuator so arranged that it can vary the length of the linkage to the servo flap, thus adjusting the flight path of that blade to its mate. The actuator is pilot-controlled from the cockpit and can be used in hover or forward flight. This feature reduces high maintenance and "down" time for ground tracking procedures, and provides improved performance and pilot comfort throughout all flight regimes.

Kaman synchropter rotor blades are classified as asymmetrical since the lower camber is relatively flat. This cambered airfoil of the 23-foot-long blade has the advantage of giving more lift at lower speeds. During the Korean conflict one of the problems encountered with helicopters was poor altitude performance and the constant threat of blade tip stall. These problems were virtually eliminated in the Kaman synchropter by use of the rotor blade design and servo flap combination. When the angle of attack of an asymmetrical airfoil is varied, the center of pressure travels chordwise causing an unstable condition, which is compensated for by the servo flap. The Kaman-designed rotor system has successfully utilized the asymmetrical airfoil in helicopters because of the stabilizing influence of the servo flap.

Much effort has gone into the design and fabrication of these rotor blades. Special containers were designed to protect them while being shipped to the using activity. Each of these efforts is directed toward the achieve-



PRECISION PLUS—This machine cuts matched spars simultaneously to within 0.010 inches of the final dimension.

ment of optimum performance and life. As with many other helicopter components, however, proper maintenance greatly influences whether or not this goal is achieved. Two of the most overlooked maintenance requirements are cleaning and waxing of blades. It is a known fact that "dirty" blades reduce the aerodynamic efficiency of the airfoil. This in turn requires a greater percentage of collective control input and/or engine power to hold a given altitude. In reciprocating engine aircraft this loss in efficiency can amount to approximately two inches of manifold pressure. Also, in the synchropter, "dirty" blades on one side of the aircraft may cause the pilot to hold rudder in hover and forward flight because of the difference in lift between rotors. In light aircraft with fabric-covered wings, waxing reduces rate of break-down of the dope finish and helps protect the underlying dope and fabric from the sun and weather. This is equally true of fabric-covered rotor blades. The best insurance for increased rotor blade surface life and proper performance of the blade is regular cleaning and waxing, which should be done at least every intermediate and/or periodic inspection routinely, or sooner if local conditions require. Recommended wax is: Paste wax, Navy Federal Stock No. R7930-266-7125-G600. Care should be used in selecting any other wax to be applied to rotor blades to be sure it contains no solvents which would tend to attack the dope used in the finish. (See T.O. 1H-43B-2, Section I, Table of Specifications.)

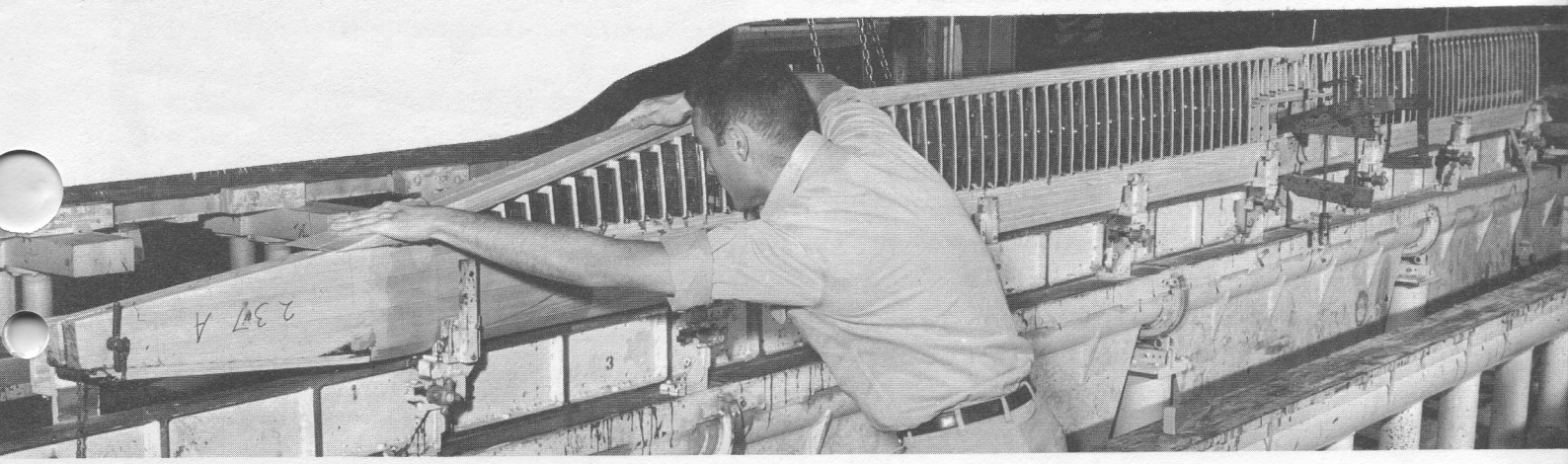
Packaging and shipping activities are often the cause of blade damage and maintenance trouble. Containers are carefully designed to withstand the elements and rough handling. There are, however, cases on record of apparent "mysterious forces" entering the picture. Two particular examples are recalled here.

In one case, an overseas activity, after being AOCP for a period of time, finally received a pair of rotor blades. Upon opening the container, it was found that one of the internal container cover supports had been forced through the blade plywood skin. Evidently, in the process of transportation, the blade-box cover was removed for shipping inspection, and was erroneously reversed when replaced, thereby damaging the blade beyond use. That problem has since been eliminated through a change in the shipping container design, and better instructions for the techniques of handling.

In another case, a blade box was opened after being in storage for some time and footprints were found up and down the length of the blade. They're still looking for the guilty party at that base!

Another problem area, which is not confined to rotor blade components, is failure to get the AF form DD829 or NAVY form NAVER 100-418A-1 component cards to the overhaul facility promptly. It is impossible to determine history of the parts without these cards. The scrap which is often generated for lack of knowledge of component history, of course, contributes needlessly to increased operating costs.

CRAFTSMAN AT WORK—This rib-bonding fixture holds and locates ribs, spar and trailing edge spline during bonding operation.



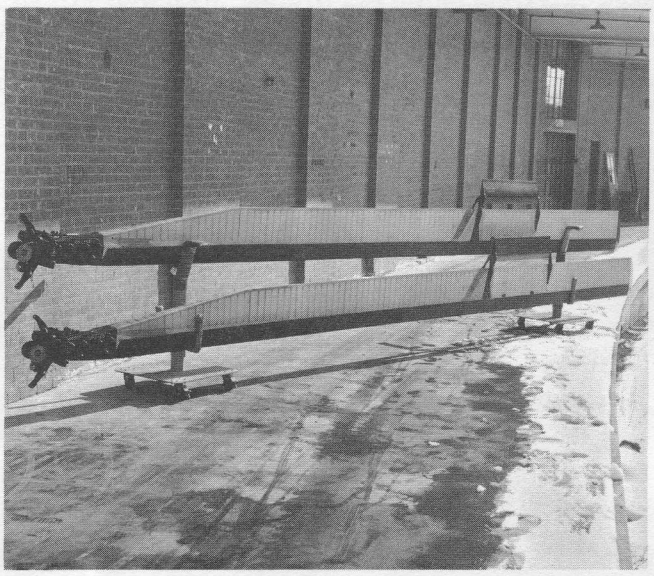
READY FOR SHIPMENT—Special container is used to protect the rotor blade from damage while being transported.

Last but not least, is the mysterious disease known throughout the industry as "hangar rash." This illness usually attacks during the dark of night when no one is around. Healthy aircraft are tenderly tucked away for the night in a modern hangar complete with guard, and by morning the epidemic is raging. The most common symptoms are damaged trailing edges and broken plywood skin on the upper and lower cambers. To date there is no known cure. A special symptom is damage to the lower surface at station 45, located 45 inches outboard from the center of the hub. Logic says this could occur readily if the blades were rotated with the droop stop left out, but usually this special damage is also laid to the mysterious "hangar rash."

An all glass fiber rotor blade has been under development at KAC for quite some time. The construction of this blade is similar to the wood and fiberglas blade except that all details are made of Fiberglas reinforced plastic or Scotchply. The potential of glass fiber construction lies in its great resistance to fatigue and the superior strength of uni-directional Scotchply. The all glass fiber rotor blade is highly resistant to corrosion and weathering elements which have plagued metal and wood blade materials, and has a natural resistance to grease, oil and other solvents. It is ideally suited to easy field maintenance since these blades have the distinctive feature of lending themselves to exacting inspection by the naked eye. Slow, progressive crazing of the resin is clearly visible in the very early stages of fatigue long before separation of the glass fibers occurs. This characteristic greatly facilitates detailed structural inspection by line-level personnel. In addition, field maintenance difficulties will also be reduced dramatically because of the elimination of finish problems. Pigment can be added to the specially developed resins used during construction of the blade which removes the need for exterior finish.

Perhaps the most important factor in the use of the all glass fiber rotor blade is that the operating interval will be increased considerably over wood or metal blades because of the increase in fatigue strength. One experimental pair of all glass fiber blades have been whirl-rig tested at overspeed rpm with full control forces applied for more than thirty million cycles without failure.

These features, coupled with the lower material cost that reduces over-all manufacturing cost by one-third, gives rise to our opinion that the success of the glass fiber blade will be a major step forward in rotor blade design and manufacture. K



LATEST BLADES—Development by KAC of these glass fiber helicopter blades marks a significant advance in resistance to rotor blade fatigue and makes possible major savings in manufacturing and maintenance costs.

Maintenance Mailbag

Dear Sarge,

So how goes it at the new base? We have been doing plenty of practicing with the fire suppression kit and I think Whitey has fallen in love with the rescue hoist since he took over your old job. He's really enthusiastic in spite of what happened the other night. Seems Whitey was home telling his boy about operating the hoist. To show him how it was done, he rigged up a basket on a clothes line and used an awning pulley to lower it out of the bedroom window into the garden, then gave him a "briefing" on cable handling while he was hauling in on the line. Whitey said he thought the basket was heavier but it wasn't until he hauled it over the window sill that he found out why——a skunk was in it!

Poor Whitey, its been four days now and he's still temporarily grounded. When he's on the runway or somewhere where it's real windy, it isn't too bad, but the pilots won't let him in the chopper yet because they say he makes their eyes water and they get air sick. He's taken about four baths, six showers, an alcohol rub and shampooed his hair twice with tomato soup, which is supposed to be a good de-skunker. Whitey says he feels like a walking ketchup bottle with no place to go.

One of the boys slipped the other day and put his foot through a top window on the "B." He said he was only going to be up there a minute so didn't bother with the protective shield. Last week another guy dropped a wrench through a window. These things can sure add to the down-time and make a lot of unnecessary work.

Got a 'business card' yesterday from one of the sergeants in the Helo Section at Westover which reads, "HAVE CHOPPERS - WILL TRAVEL" and carries a picture of the H-43B. Thought you would get a charge out of this, it's a good idea and certainly shows they are raring to go.

We had a problem starting the engine on one of our "B"s this week after a PE. The tail pipe temperature wouldn't come up and the N1 speed wouldn't accelerate. A quick check showed someone had forgotten to remove the inlet cover. After this bit one of the mechs came up with,"Tail pipe temp failed to show, N1 turbine wouldn't go. Mechanic took corrective action, eyeballed system with satisfaction." Now he's working on another "poem." Something to do with oleos. He's having trouble.

Gotta' go now, here comes Whitey.

Burt

More From Les . . .

From time to time in this column, C. L. Morris, Assistant Vice President—Field Service Manager, will comment on subjects of particular interest to operating activities.

SUPPLY. Seems to me that the one problem that all aircraft have in common is spare parts. AOCPs are the ever-present and universal reminder of this fact of life.

There is no single solution. Even in the automotive industry, it is often necessary to leave a car in the shop for a day or more while a part arrives from some central supply point. In aviation, the problem is compounded by relatively small quantities of widely dispersed aircraft, making it uneconomical to stock complete inventories at each site.

In close coordination with the military supply agencies, Kaman Aircraft has taken several cuts at easing the support problem. First, of course, is getting our spares deliveries out on time, and this seems well in hand right now. On the H-43B, for instance, we have accelerated our deliveries so that we are ahead of schedule on all critical items. The earlier H-43B AOCPs were due largely to one or more of the following factors:—

1. The initial spares procurement was based on planning which indicated longer operating intervals (TBO) than have so far been authorized;

2. Many of the H-43Bs have been flown a greater number of hours per month than originally anticipated, so the parts have been used up faster;

3. The start of the overhaul program was delayed for essential approvals.

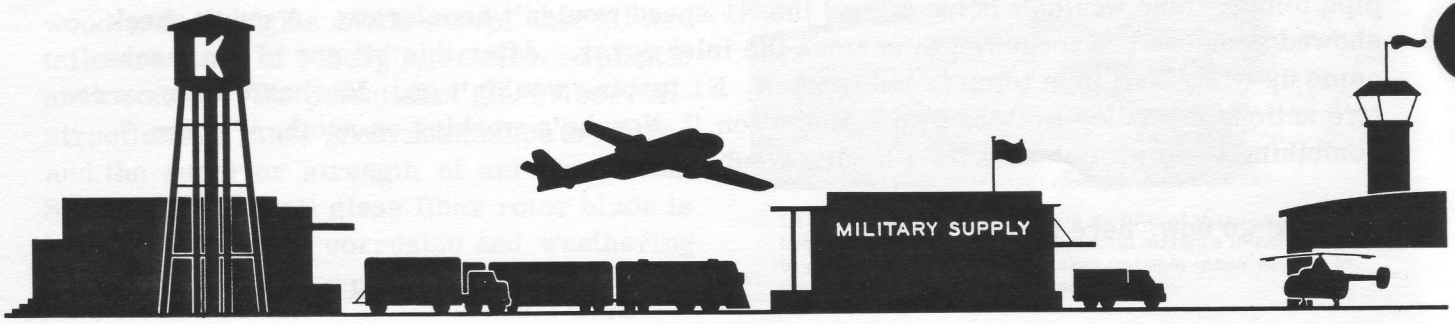
These factors are resolved now to the point where the H-43B AOCP rate is improving. The operating intervals for most components have been increased and others are in work. Additional spare parts have been ordered, and overhauled parts are being regularly returned to the supply channels. As the pipe-lines get filled, the only remaining problem should be getting the parts from the supply depot to the user. In the case of the H-43B, this will probably continue to be a more difficult problem, because of the large number of operating bases with only two aircraft per base. Nevertheless, considerable improvement can be realized by pre-ordering parts under AFM 67-1 (Vol. 2, Chap. 2),1 November, 1961, Amend. 86. Use of this procedure can provide parts at operational level in anticipation of scheduled requirements. Spare engines and engine parts continue to be a problem which is receiving special attention.

I mentioned earlier that Kaman has taken several actions to help the supply problems related to helicopter models now in service with the military. A full understanding of those actions on the part of using activities and supply organizations can benefit the entire program.

1. Shipping Lists. We furnish our field service representatives with latest shipping data (DD250's), so local tracers can be initiated if a part cannot be located.

2. Stock Number Lists. The field reps are furnished cross reference stock number lists, periodically updated, to facilitate identification of parts needed.

3. Reps' Kits. For many years, we have furnished our Navy-assigned field service representatives with kits of minor spare parts that can be drawn on in emergency. Before someone gets upset at this idea, let me hasten to add that this does NOT bypass the standard supply system. The representative simply lends the part to the user, to avoid an AOCP; but the user puts in a requisition through stand-



ard channels, and when the part arrives, the rep gets his part back. Thus, the usage records and supply channels have complete knowledge of the situation, but the aircraft has been retained in flight status.

The idea behind the above procedure was to help get the local base supply system started. The Air Force "SOS Kit" concept went one step further and bought expanded kits for each new base to do the same thing on an official basis. The SOS (Squadron Operational Support) kit is shipped to each base prior to the arrival of the aircraft. The location of the kit after arrival is left to the option of the base supply officer. It can either be kept in supply or be assigned to the operating unit. The desired method of operation is to order the part from supply. If not in stock, the part is taken from the SOS kit while the order continues through standard channels. When the part finally arrives on the base it should be put on the supply shelf and listed in the on-base stock level (table two). Further information on SOS kits may be found in Vol. II, AFM 67-1.

4. Pre-shipped Parts. From time to time, the company has pre-shipped a part against an anticipated order. We assume the financial risk if the order fails to come through. Although we have occasionally had some difficulty in settling the records later, the benefits to the flight program have been worth the risk many times over.

5. Parts on Loan. The reps' kits and "SOS Kits" can't properly provide bulky or expensive items. Therefore, occasionally when urgent flight commitments require it, we can borrow from production stocks and lend a part to the field. Again, as in the case of the reps' kits, the part would be simply on loan until the standard requisition was filled, at which point the rep would return the part to the plant.

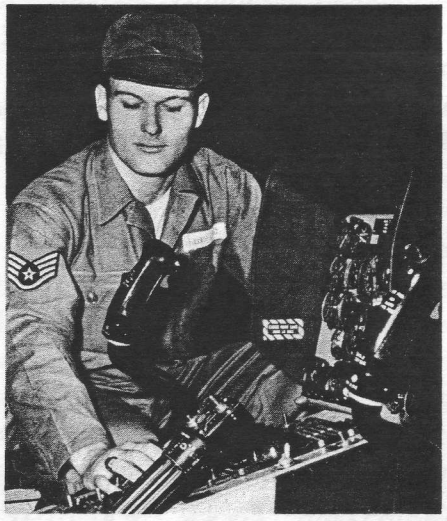
These various devices can be valuable in obtaining fullest utilization from aircraft in the field, which in the final analysis is the primary objective of both the manufacturer and the user. K

MAINTENANCE EXPERT

S/Sgt. Carl L. Jarrad, 4170th Organization Maintenance Squadron at Larson Air Force Base, Wash., has won the 4170th Strategic Wing "Maintenance Man of the Month" honors. As helicopter flight chief, Sergeant Jarrad's duties include maintenance of the base's H-43Bs.

Each month each technical squadron in every SAC wing reviews the performance of all maintenance personnel and selects an airman who has contributed most to the overall performance of their squadron during the past month. Emphasis is placed upon those individuals who have contributed in the following areas: (a) Systems reliability (b) Organizational improvements (c) Development of maintenance aids or improved job procedures (d) Improving safety practices and procedures (e) Elimination of maintenance problem areas (f) Outstanding accomplishment of a difficult job (g) Increased maintenance capability.

Upon the squadron selection of the maintenance man, the senior maintenance man, the senior material officer of the base, along with

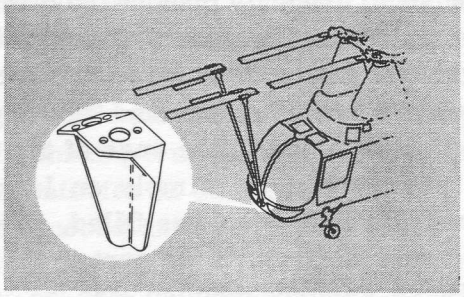


his staff, reviews all nominations and selects the most deserving individual to be designated as the Wing Maintenance Man of the Month. This individual is also nominated to higher headquarters for the Strategic Air Command Maintenance Man of the Month.

In recognition of the individual's outstanding performance, the Wing Commander presents him with a letter of recognition and appreciation along with a lapel pin which designates to all that he has received his honor. In addition, press releases are furnished local newspapers. K

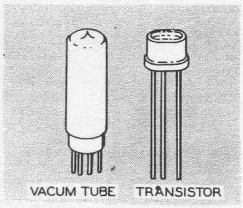
Q's AND A's

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



Q. WHAT IS THE PURPOSE OF THE BRACKET IN THE CENTER OF THE NOSE BUBBLE FRAME ON THE H-43B. (Applies H-43B)

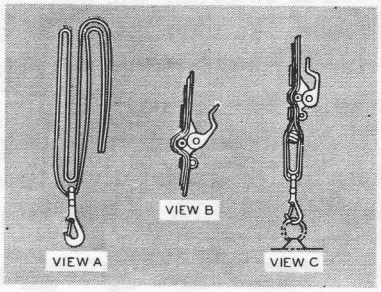
A. The bracket is used with a new design blade support assembly, P/N K704020-1. The new supports will be used to hold the blades when wind velocity exceeds 25 mph, and during extended storage. They will be delivered to the field in the near future. — R. S. W.



Q. WHAT ARE THE ADVANTAGES OF TRANSISTORS OVER VACUUM TUBES? (Applies H-43B)

A. Transistors are, at the present time, considerably more reliable than the most reliable vacuum tube. Whereas the vacuum tube has elements which may short-out or open, the transistor has no known failure mechanism. Careful construction techniques determine transistor reliability. They are capable of operation in excess of 30,000 hours at maximum ratings without appreciable loss of performance. For this reason they are usually soldered into equipment like resistors and capacitors and it is reasonably safe to assume that a transistor failure has been caused by another malfunctioning component in the system.

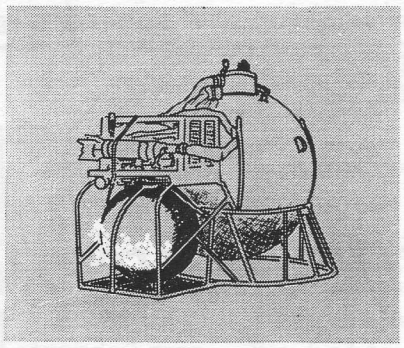
Due to the small size, weight and power requirements of the transistor compared to a vacuum tube of equivalant rating, equipment can be designed much smaller, lighter and with less heat dissipation trouble. These, plus the transistor's ability to withstand higher "G" forces, makes it a great asset to the aircraft and missile industries. — M.W.



Q. WHAT IS THE PROPER METHOD OF ASSEMBLING AND INSTALLING THE LITTER STRAP ASSEMBLY P/N A-5906 AND CLAMP ASSEMBLY P/N 43A1736 USED IN SECURING THE FORWARD LITTER HANDLES? (Applies H-43B)

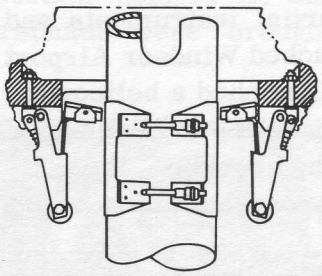
A. The litter strap is folded as shown in view (A) so that, with the folds brought together, a total of six thicknesses of material exist. The six thicknesses of material are then threaded into the clamp, making sure all the material passes under the clamp roller before passing out through the opposite end of the clamp, as shown in view (B). The snap fastener is hooked to the floor ring and the litter handle is passed through the loop in the belt between the snap fastener and the clamp, as shown in view (C). By pulling up on the strap and pushing down on the clamp simultaneously the litter is held secure. When the clamp lever is depressed the assembly is locked.

This assembly and installation procedure is the same for securing the forward end of both litters. — A. D. C.



Q. ARE THE BUBBLES SEEPING FROM THE SURFACE OF THE FIRE SUPPRESSION KIT AIR TANK AN INDICATION OF IMMINENT FAILURE? (Applies H-43A, H-43B)

A. No, the bubble seepage is due to normal expansion of the Fiberglas layers during charging of the tank. The expansion of the tank is normal. The tank, in the normal course of use, comes in contact with foam and water and the Fiberglas, being porous, allows the moisture to penetrate. When the tank is pressurized, expansion takes place at a greater rate inside the tank than outside and the moisture trapped within the Fiberglas is forced to the surface causing small bubbles to escape, thus giving the appearance of a leaking tank. — A. D. C.



Q. IF, WHEN SHUTTING DOWN AN AIRCRAFT, A DROOP STOP (P/N K317017) REMAINS OUT, OR DISENGAGED, WHAT PROCEDURE CAN BE USED TO ENGAGE THE STOP? (Applies HOK-1, HUK-1, H-43A, H-43B)

A. When rotor speed is down to about 40% or around 85 rpm and the droop stop does not engage, increase rpm and attempt shutdown a second time with a ground crewman standing by to tap the droop stop in if necessary. A stick of suitable length may be used for this purpose; however, Bill Wells, one of our Senior Field Service Representatives recommends using a piece of rubber hose attached to the end of the stick to save wear and tear on the rotor head. When the shutdown is completed, check the droop stop for freedom of movement and proper alignment. Check the arm (P/N K317017-103) for distortion or bending, and the spring for proper tension. Five pounds compression plus or minus three ounces is correct when the spring is compressed to 1.24 inches in length. Lubricate the stop with powdered graphite or Lubribond. Do not use oils as dirt or sand can easily adhere to the oil and aggravate or create a sticking condition. — N. E. W.

Q. WHAT IS MOLY-COTE LUBRICANT? (Applies HOK-1, HUK-1, H-43A, H-43B)

A. Moly-cote is the trade name of a product which is basically composed of purified molydenum disulfide, freed of all traces of abrasive matter. Its lubricating quality lies in its unique molecular structure. Each layer of molydenum atoms in the compound has an additional layer of sulphur atoms on each side. One of these sulphur layers adheres strongly to metal surfaces upon contact but the other layers slip easily because of the weakness of the sulphur-to-sulphur bond. This, in part, accounts for the low coefficient of friction at high bearing pressures. Molydenum disulfide (MIL-C-7866 AER) is intended for use as a dry lubricant or may be mixed with a suitable oil or grease for special applications where no specification lubricant is satisfactory. — C. W. J.

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ANALYSTS—*R. A. Berg, A. D. Cutter, P. M. Cummings, P. A. Greco, C. W. Jenkins, G. M. Legault, J. McMahon, C. J. Nolin, A. Savard, W. J. Wagemaker, N. E. Warner, A. A. Werkheiser, M. Whitmore, Jr., R. S. Wynott, W. H. Zarling.*

Report FROM THE READY ROOM

GREAT LAKES RESCUE BY SELFRIDGE CREW

As a means of aiding other helicopter rescue units in their programs, 1st Lt. Alan Heeter, USAF, agreed to a Rotor Tip's request for a personal account of the mission describing the conditions encountered and the action taken. Similar accounts written by Air Force, Navy and Marine helicopter pilots will appear from time to time with this purpose in mind.

1ST LT. O. A. HEETER
Selfridge AFB

On Wednesday, 22 February, an H-43B was scrambled to rescue twelve fishermen stranded on an ice floe in Lake Erie out 500 yards from shore, near Leamington, Ontario. The pilots were 1/Lts Jerry Petty and Alan Heeter and crew chief T/Sgt. Don Anderson acted as hoist operator. This was Selfridge Air Force Base's first chance to test the "HUSKIE" in an actual rescue.

Leamington was about 55 miles and we cruised between 80 and 90 knots, sometimes going up to 100 knots. The weather was a little worse than the weatherman had briefed us on. The ceiling was about 800 feet and visibility about two miles when we took off from Selfridge. As we neared the mouth of Lake St. Clair, near downtown Detroit, the ceiling went down to about 500-600 feet and visibility lowered to approximately one mile; winds were 15 knots, gusting to 20 knots. We were flying partial instruments and tracking on the Windsor Radio Beacon. As we approached Windsor Airport we called Navy Grosse Isle Tower, which had also dispatched a helicopter, and were told that their chopper was following the shoreline to Leamington due to the low visibility and ceiling. As we neared the shoreline, the ceiling lowered to about 400 feet, visibility dropped to one-half mile and a light drizzle was starting to fall.

We made contact with the Navy helicopter and determined his direction from us with the AN/ARA 25, ADF. We headed in his direction since he was over Leamington at that time. When the Navy chopper came into view we headed out toward the open water and the ice floes. About five minutes later we spotted the fishermen huddled together on a large ice floe, separated about 200 feet from the main body of ice. About that time we received word over the radio that two other men were sighted on a fast-moving ice floe near Colfax, Ontario. We decided to get these men to safety first and the Navy helicopter made his approach with us right behind him. The Navy chopper picked up two men, the maximum number it could, and we picked up four with the sling. After carrying them to the safety of the ice near shore, the Navy helicopter decided to go and look for the two others stranded while we brought the three remaining fishermen to safety. We used the hoist and sling to bring the fishermen up and into

the helicopter, which was hovering at about ten feet. To let the men off we hovered a few inches off the ice and they climbed out of the side cabin door.

Over the lake, the ceiling had dropped to 200-400 feet variable and one-quarter to one-half mile visibility. The Navy chopper was out of sight so we again used the ADF to find him and then joined him in the search for the other two stranded men. We had to use the ADF continually to keep track of the other helicopter during the remainder of the search, since we were out of sight of each other most of the time. The Navy helicopter finally spotted the men and took them to safety.

On the return trip the ceiling was obscured, the visibility dropped to one eighth of a mile and the drizzle continued. Aided only by the flight instruments and the LF ADF we flew for about thirty minutes and finally, about ten miles from Selfridge, the weather got a little better and two hours after take-off we landed back at Selfridge.

Lieutenants Petty and Heeter praise the performance of the "HUSKIE" and the reliability of the AN/ARA 25 ADF.

This mission brought out a few things which factory and field personnel might think about. Our hoist operator pointed out that when the rescued personnel were brought into the "HUSKIE," they experienced some difficulty in avoiding the hoist control cable or the operator's headset cable, depending on which side of the operator they entered. Maybe placing both cables on one side or the other would help; also, another jack-box for a headset connection would help.

We found that the seat at the entrance of the side cabin door caused much interference when bringing a rescued person through that door. It might help to remove the cushion prior to a hoist pick-up since the seat is easily removed by quick-disconnects.

It was noted by the hoist operator that six out of the seven persons picked up had put the sling on improperly. One of the reasons for the difficulty might have been the cold weather; however, we feel the main reason is that most civilians are not familiar with the procedure for slipping into the sling. We lost several minutes while they experimented with the sling. Maybe the anchor seat would have been less difficult to figure out; of course, this is a much discussed theory—the sling versus the anchor seat.

We hope you have gained some knowledge or new ideas from our experience—we certainly did. K

EDITOR'S NOTE: *The comments and suggestions made in Lieutenant Heeter's article are being given further study. Information such as this, directly from those who fly or maintain our helicopters, is an extremely valuable aid to Kaman Aircraft in its present and future programs.*

THE TEAM THAT DID THE JOB—Left to right, T/Sgt. Donald A. Anderson, crew chief; 1st Lt. Alan Heeter, pilot; 1st Lt. Gerald F. Petty, co-pilot. Congratulating them is Bill C. Welden, KAC Field Service Representative. (USAF photo)

1/Lt. Owen A. Heeter was born in 1936 and is from Rochester, Ind. He entered the service in 1958 and went to H-43B school at Stead in Dec., 1960. He is assigned to the 1st Operations Sqdn. at Selfridge. Lieutenant Heeter has 800 hours flying time and 500 hours logged in helicopters.

1/Lt. Gerald L. Petty was born in 1934 and is from Olney, Ill. He is assigned to the 1st Operations Sqdn. at Selfridge AFB, Mich. He entered the service in 1957 and has 1100 hours flying time with 800 hours logged in choppers. He finished H-43B school at Stead AFB, Nev. in Nov., 1960.

T/Sgt. Donald A. Anderson was born in 1923 and is from Minneapolis, Minn. He has served 19 years. Sergeant Anderson has been a helicopter crew chief for 10 years, four of which were with the U. S. Marine Corps. He is currently assigned as Assistant Flight Chief in the 1st OMS at Selfridge AFB.

OPERATION HIGH LIGHT—John Vares, civilian worker at NAS Barber's Point, Hawaii, is hoisted into HUK by Lcdr. R. E. Long prior to beginning of Waianae Range mission. K. S. Ching, a fellow employee, waits his turn. (U.S. Navy photo)

THE PROBLEM — The navigation and obstruction lights high on Oahu's rugged Waianae Range were rapidly running low on the acetylene gas which powered them, but it was impossible to follow the usual procedure and truck in the eleven heavy gas bottles—the already hazardous trails had been washed out by heavy rains and rebuilding would mean an expensive and time-consuming use of men and bulldozers.

THE SOLUTION — Lcdr. Robert E. Long, Operations, Barber's Point Naval Air Station; and Donald R. Orr, AD3; utilized an HUK-1 for aerial delivery service at the request of the station maintenance director. First they flew K. S. Ching and John S. Vares, Civil Service plumbers attached to the station, into the mountainous area and lowered them to the rugged terrain, then the HUK returned and began ferrying in the cylinders which were lowered in a specially devised sling.

END RESULT — The new system required eight man-hours. The old method required 24 man-hours plus periodic maintenance and reconstruction of the mountain trails. K

H-43 Record Was Result Of Teamwork

An H-43 flying time record recently set by the Base Flight Section, 42nd Aircraft Support Squadron, cannot be attributed to any one man, but was a matter of teamwork and coordination, MSgt. Joseph P. O'Brien, helicopter flight NCOIC, told the LIMELITE this week.

The helicopter, a gas-turbine "Huskie" was flown for 117 hours, 35 minutes recently, setting a new Air Force mark. The craft flew 46 sorties, day and night, in all types of weather, with no aborts because of maintenance.

The section operates under Capt. Stanley Atkinson, with Sergeant O'Brien as NCOIC. Included are A1C Hugh L. Hobbs, crew chief, 59-1543; A1C James A. Phillips, crew chief, 59-146; and mechanics, A1C Bobby J. Mixon, A1C Ronald D. Arpino and A2C Gary S. Archdeacon. Pilots are Capt. Robert J. Brejcha, Capt. James H. Black, Capt. Richard C. Pfadenhauer, Lt. Jerry A. Crupper, Lt. Harry J. English and Lt. Gerald Maddox.

RECORD MAKERS—Members of Loring's Base Flight Section, who helped set a new 117 hour flight record for the H-43B helicopter look over tail modifications made to give the aircraft greater stability. A1C Hugh L. Hobbs, Jr., right, crew chief, shows how vertical stabilizer was dropped 14 inches and moved away from the fuselage. Others are from left, MSgt. Joseph P. O'Brien, NCOIC of helicopter flight, A2C Gary S. Archdeacon, mechanic and A1C James A. Phillips, crew chief. All are members of the 42nd Aircraft Support Squadron. (USAF photo)

Reprinted from
LIMELITE
LORING AFB, MAINE.

TESTING THE HU2K-1 TAIL ROTOR

by E. A. WATJEN
Group Leader, Mechanical Test Section,
Test and Development Department

ENGINEERING

One of the principal factors to be considered in the testing of helicopter tail rotors is the effect of forward flight upon the blades and hub assembly. This problem is brought about by the fact that the tail rotor, of necessity, must provide its thrust perpendicular to the relative winds resulting from forward flight. This means that the advancing tail rotor blade feels the full effect of forward flight air blast and will react accordingly to it. This reaction will show up in edgewise bending of the blade, with attendant effects on the pitch bearings, blade grip and hubs; and in blade flapping angles. This condition has been known to present many problems in the development of new helicopters but, unfortunately, the problems usually become apparent only after forward flight is achieved.

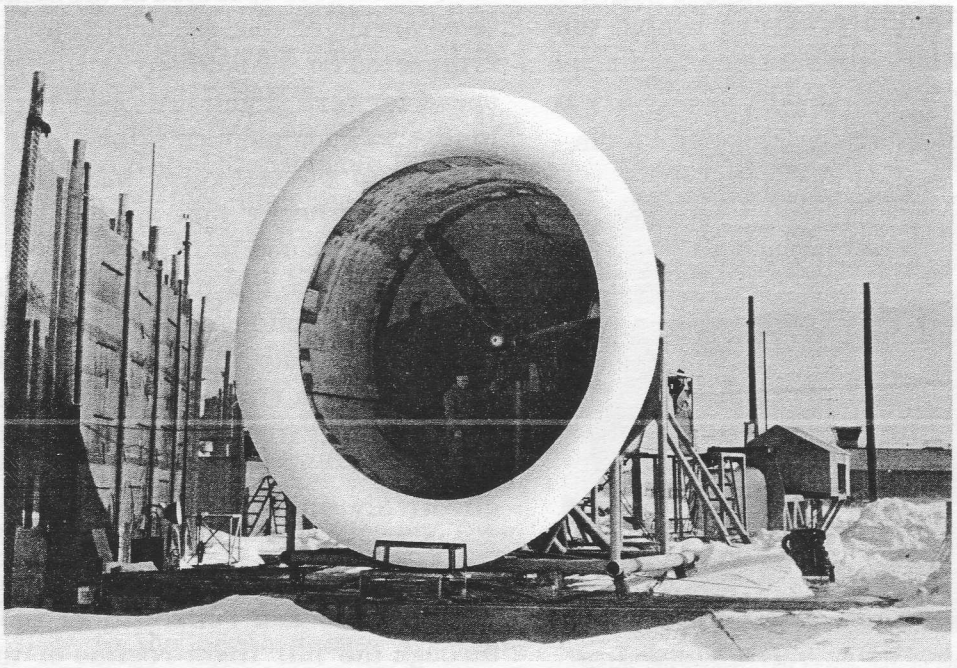
Prior to the HU2K-1 design, the customary practice was to whirl the tail rotor for many hours in an attempt to prove the structural integrity of the blades and associated hardware. This amounts to operation at hover and cannot be considered as realistic testing because the tail rotor is not subjected to the same loading cycles as it would have to endure under forward flight.

When the test program for the HU2K-1 tail rotor was being considered, KAC engineers felt that a source of wind should be provided to duplicate the effects of forward flight during the development of the tail rotor and throughout the endurance program. This would provide early answers to the problems expected to result from the effects of forward flight. In addition, the endurance program could be conducted under simulated flight conditions with realistic blade loading cycles that would duplicate the conditions encountered in service.

To accomplish the goals of this test program meant that KAC would have to design and build a wind machine, capable of sustained operation for endurance and with an exit speed close to the high-speed flight of the helicopter. This looked like a huge undertaking but the facts were all considered and it was decided to carry the project through in spite of the costs involved.

The final design of the wind machine consisted of a 14-foot diameter enclosure that reduced progressively to an ellipse over a distance of 16 feet.

A 13-foot 10-inch diameter, three-bladed,



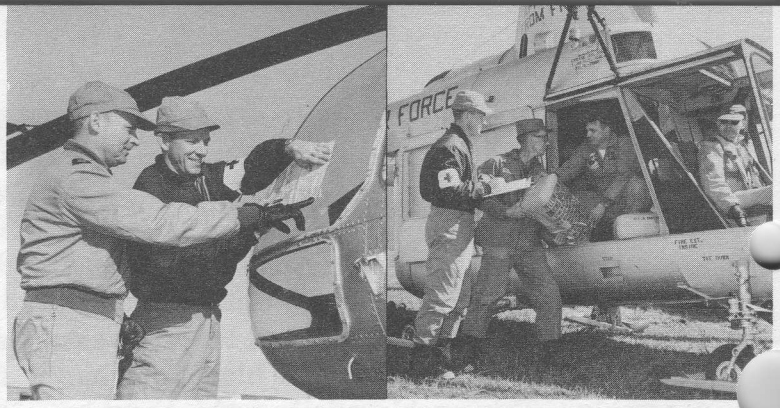
HU2K-1 TAIL ROTOR TESTER—Front view of wind machine specially designed by KAC in order to realistically duplicate the effects of forward flight. Use of the machine permitted considerable development and endurance testing of the tail rotor without costly and time-consuming helicopter flights.

HUSKIE CREW HELPS HUNGRY

A helicopter crew from Brookley Air Force Base and the American Red Cross combined forces recently to bring relief to the citizens of Yellow Bluff, Ala., isolated by raging flood waters and without food for two days.

Capt. Milton Gordon, S/Sgt. William Fulford and A1/C Bradford Smith in an H-43B made three trips to Yellow Bluffs, each time carrying approximately 1,000 pounds of food. The bulkiness of the parcels prevented them from carrying more. Landings were made in a cotton field. Total flying time to complete the mission was seven hours and 15 minutes. Eighteen-knot winds with occasional gusts over 30 knots were encountered.

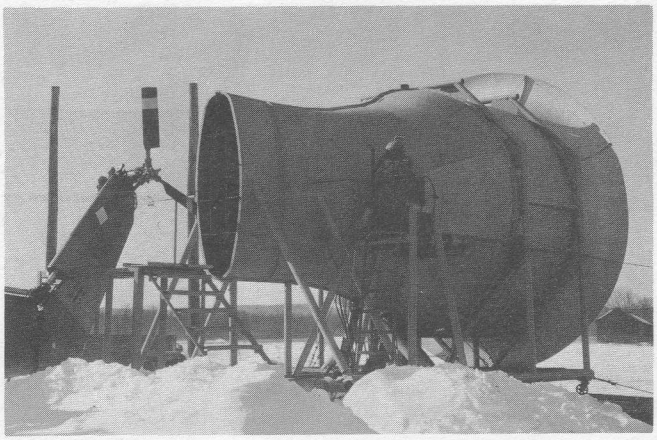
Yellow Bluffs, which is located in the central part of Alabama, had been supplied by boat 10 days before the helicopter landings were made, but then the recession of the river made this impossible. K



GETTING READY—Capt. Milton Gordon and Rev. Jack Green, Red Cross volunteer, plot course before take-off. Reverend Green checks list while National Guardsman Jackson Knight and Air Force Sgt. William Fulford load precious cargo. Captain Gordon looks on.

ON THE WAY—Flooded sections of Wilcox County, Ala., as seen from the H-43B on mercy flight. (Red Cross photos by Jack Shere)

propellor, powered by a V1650 Packard-built Merlin engine, is mounted inside the enclosure on a T-shaped structure. A propellor tip clearance of only one inch is maintained to permit a build-up of static pressure behind the propellor. This static pressure is then converted to velocity by the change in area from 154 square feet to 20 square feet over a distance of 16 feet.



READY FOR TEST—Rear view of wind machine with HU2K-1 tail rotor in position ready to receive the high-velocity air blast which will simulate high-speed forward flight.

During the endurance program the tail rotor is operated at a typical rpm and blade pitch setting for the simulated flight condition. The wind machine is operated at the same time, and is so arranged that the high velocity air blast is directed on the rotor so as to simulate high-speed forward flight. The test rig is operated in this way for periods of one hour with pitch changes of the tail rotor introduced periodically in a manner that approaches the pedal input experienced in flight.

Operation of the program in this way has permitted considerable development of the HU2K-1 tail rotor blades, grips, and hubs to take place in a short period of time and without costly test flights on the aircraft. Changes in the hardware have been evaluated on the rig effectively and rapidly and in complete safety.

All of the work done on this program has resulted in a high degree of confidence in the performance and reliability of the tail rotor through the full flight regime of the HU2K-1 helicopter. K

MAX EFFORT SAVES FIVE B-52 CREWMEN

H-43B crews play key role in search and rescue

This account is concerned primarily with the efforts of the H-43B crews who participated in this tremendous rescue effort since space limitations make it impossible to report fully on all aspects of the operation and to name individually the other members of the air-ground rescue team. The nine fixed-wing aircraft flew 20 sorties and approximately 68 hours. The four helicopters flew 55 sorties and approximately 50 hours. Over 120 officers and men were connected with the operations of the various aircraft; more than 100 military personnel and civilians were in the ground party and approximately 44 vehicles and 11 horses were used. The effort made and the individual skill and valor shown in the face of extremely adverse weather conditions are a tribute to each participant in the rescue of the crew of the downed B-52.

High winds, a low ceiling which threatened to close down any minute, poor visibility and mud so deep it mired almost a dozen ground vehicles—a courageous Air Force crew in an H-43B encountered them all, but pressed on to successfully accomplish the high-altitude rescue of three crewmen who bailed out of a B-52 after an aerial training accident over mountainous territory in New Mexico.

Word of the accident was flashed to Kirtland Air Force Base about noon, April 7, and started a gigantic search-rescue operation which involved two H-43Bs and another helicopter from Holloman AFB and one other helicopter and nine fixed-wing aircraft from Kirtland. A large ground rescue party, also dispatched from the base, was joined by Military and State Policemen, newsmen, civilians and personnel from the Forest Service, Mounted Patrol and Civil Air Patrol.

The B-52 wreckage, first spotted by a pilot from the Kirtland Helicopter Rescue Unit, was on a sloping 8,700-foot-high mesa about 60 air miles from Kirtland. After reporting his position, the pilot hovered the 'copter over the wreckage but could see no sign of life. Running short of fuel and with the visibility steadily becoming worse as the winds rose, the helicopter turned back and arrived at the Floyd Lee Ranch, 30 miles away, with about 15 minutes of fuel left.

Meanwhile, Capt. Ronald Hansen from Holloman AFB arrived in a turbine-powered H-43B and with Capt. William M. Greener of Kirtland flew to the crash scene; crewmen were T/Sgt. John Cicciu from Holloman and A1/C Baudimo Baca from Kirtland. The helicopter bucked winds gusting up to 35 knots, the ceiling was marginal and a ground blizzard had started. Despite the weather, the HUSKIE made its way to a spot a short distance from the crash site where two of the bomber crew, both injured, had been sighted. When the H-43B landed to make the pickup, the bear paws on the landing gear sank into the water-covered mud, leaving about three inches of tire showing. The HUSKIE crewmen said later the rescue could not have been effected without the bear paws. The H-43B had 150 gallons of fuel and at least 200 pounds of gear aboard, plus a total of six men. In spite of the load and 8,700-foot-altitude, the HUSKIE pulled out of the mud and took off without trouble.

Soon after take-off, a third B-52 crewman was located and again the H-43B landed and made the pickup. As the wind-buffeted helicopter flew through the storm back toward the Sandia Army Base Hospital in Albuquerque, Airman Baca and Sergeant Cicciu administered first aid to the injured. They were safely delivered to the hospital less than two hours after the HUSKIE first began its flight to the crash scene.

BACK SAFE—Maj. Ted Lewis, left, in charge of rescue teams, and S/Sgt. John Cicciu, right, unload one of the survivors from H-43B at Sandia Base hospital. Man at center was not identified. (USAF photo)

After refueling, the helicopter flew to Kirtland where ground crews checked it. By this time it was too dark for spotting possible survivors, winds were up to almost 50 knots and the blizzard was keeping the ground search party back from any efforts to move up the mountain side. Undaunted, the H-43B crew took off again in an attempt to drop survival equipment to a portion of the ground party. Almost a dozen vehicles strung out over a nine-mile stretch had bogged down in the deep mud. The winds continued to rise, however, forcing the HUSKIE's crew to abandon the attempt. Reluctantly they turned back to Kirtland. A ground party from the base later fought its way through the storm to the vehicles.

Early the next day the valiant helicopter crew again took off but after covering 35 miles they encountered snow, rain, sleet and even dust, all hurled at them by winds which occasionally gusted up to 70 knots. Unable to see the ground and knowing ridges were nearby, they set the H-43B down in the rugged hills. The terrain was uneven and high winds kept raising the nose of the helicopter. Lacking the tie-down boots and lines, Airman Baca located a sheepherder and, talking to him in Spanish, borrowed a logging chain, stakes and rope to secure the aircraft.

When the winds diminished, the H-43B crew landed at the Lee Ranch from which rescue operations were being directed. All search aircraft were grounded soon afterward when another spring blizzard struck, and it wasn't until late in the afternoon that the turbulent winds died down sufficiently to resume the search for stranded ground rescue parties. Some of those located had been without heat or shelter all night. Flying shuttle service were the H-43B, the helicopter from Kirtland and another helicopter which had joined them from Holloman. The HUSKIE, still flown by the same crew, conducted the search above the 8,000-foot level. Weather was so poor that several ground vehicles, including a Weasel, became mired in mud and snow. After two hours of search operations in dusk and darkness, flying was halted.

JOB WELL DONE—Capt. Ronald Hansen, left, and Capt. William N. Greener, wearily unbuckle safety belts at end of rescue operation during which they encountered high winds, snow, sleet, dust and mud. (USAF photo)

A second H-43B, piloted by Capt. D. J. Passman of Cannon AFB, temporarily attached to Holloman, arrived the next day; he was accompanied by A2/C R. E. Fitzgerald. During the search operations for the remaining members of the bomber crew, 1st Lt. R. P. Smith of Kirtland acted as co-pilot in this aircraft.

Two of the bomber crew members were found soon afterward in an area about eight miles from the crash scene. One man was taken to a nearby lake shore by one of the other helicopters and then transferred to an H-43B. The second man was picked up by a HUSKIE. During the remainder of Sunday and all day Monday the H-43Bs continued searching for wreckage and ferrying investigative personnel to the crash scene. K

READIED FOR RESCUE—H-43B from Holloman AFB is checked and serviced by ground crew at Kirtland AFB before leaving for B-52 crash site. Three survivors were later rescued by the HUSKIE's crew. (Albuquerque Journal photo)

A few weeks before participating in this operation, Captain Greener was one of the pilots in an H-43B which rescued a woman and three children lost overnight in the rugged Jemez Mountains. Flying with Captain Greener in the HUSKIE which made the pickup was Capt. Warner A. Britton, also from the Kirtland Helicopter Unit. Crewmen were S/Sgt. John Mapes, T/Sgt. L. R. Griffin and Airman Baca. The helicopter crew accomplished in minutes what other combined rescue efforts failed to do in 12 hours.

Helicopters of Sub-Unit 1, VMO-2 Always Ready, Able and Willing

READY TO ROLL—1st Lt. Robert D. Blanton, wearing "poopie" suit and full flight gear prepares to depart for a routine "range sweep," at Fuji-McNair.

In the operations room of Sub Unit One of VMO-2 at Atsugi, the telephone rings. The unit's duty officer, 1st Lt. John D. Friske, answers the phone. Even before he speaks into the receiver he is sure the call will be for one of three things. A request for transportation from Tachikawa; a special-ordered aircraft part is ready for pick up at Yokosuka; or as in this case, an emergency evacuation of an injured Marine at Fuji-McNair.

Lt. Friske completes the call and nods to the unit's senior enlisted man, S/Sgt. William J. Steffan and says, "Evac." That one word is enough for Steffan who turns, starts for the door, shouting to his crew as he goes. "Get No. 13 ready; turn it up!" Within minutes, No. 13 HOK-1 helicopter is in the air heading for Fuji-McNair.

Not all calls for the MAG-11's unit are of such an emergency nature. The majority of requests are for routine missions that allow each of the VMO-2 pilots to log in an average of 40 flying hours per month.

Sub Unit One of MAG-16's VMO-2 originated last Sept., and was placed under the operational control of MAG-11. Currently commanded by Captain Billy D. Womack, the unit boasts a complement of three HOKs, four pilots and five enlisted men.

UP AND AWAY—One of Sub Unit One's three HOK "Choppers" in flight.

MAINTENANCE CHECK—Two of the five crewmen attached to Sub Unit One hold a 30-hour maintenance inspection on an HOK helicopter.

COMMUNICATIONS CHECK—Cpl. Rafael Vasquez-Rivera, the radio technician for Sub Unit One, checks out one of the radios in an HOK.

Reprinted from

TORII TELLER

MCAF, IWAKUNI, JAPAN

"HOME OF THE FIRST MARINE AIRCRAFT WING"

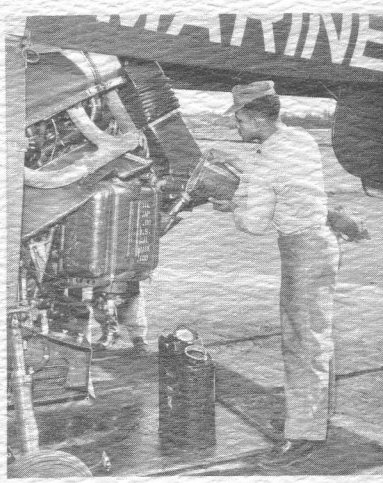
CONFAB—Cpl. John L. Davis (left) talks over a maintenance problem with Capt. Billy D. Womack, Commanding Officer, Sub Unit One.

The designated mission of the unit is three fold: support 3rd Mar Div training exercises at Fuji-McNair; expedite handling of high priority supply items between the 1st MAW and Naval Supply Depot, Yokosuka, and improve liaison operations in the greater Tokyo area. Until just recently when a third "chopper" was picked up from the Itami Repair Facility, the sub unit operated with two HOKs and three pilots. Since last October, the unit has made 13 emergency evacuations from Fuji-McNair.

After 30 hours of flying time, each HOK-1 is given a routine maintenance check. Blades are washed and waxed; the aircraft is given an overall grease job; flaps are checked and serviced and the check is completed with a visual inspection.

Normally, one HOK-1 departs from the MAG-11 heliport at 6:15 a. m. daily for a range sweep of firing ranges utilized by the 3rd Marine Division at Fuji-McNair. Another HOK-1 makes a daily run to Yokosuka to pick up badly needed parts. In addition to scheduled sorties, the HOKs and pilots of Sub Unit One are available for liaison runs from NAS Atsugi to Tachikawa and Johnson Air Force Bases, and other military installations in the greater Tokyo area.

Whatever the reason, whatever the time of the call, VMO-2's Sub Unit One is ready, able and willing to comply with the request.



FILL IT UP—A member of the maintenance crew completes an engine check by refilling the oil tank of an HOK.

STORY BY:
S/Sgt. John Boring

PHOTOS BY:
Sgt. J. E. Horecka

Kaman Service Representatives

on field assignment

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Sheppard AFB
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Perrin AFB
Sherman, Texas
James Connally AFB
Waco, Texas
Vance AFB
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BILL MAGNAN

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