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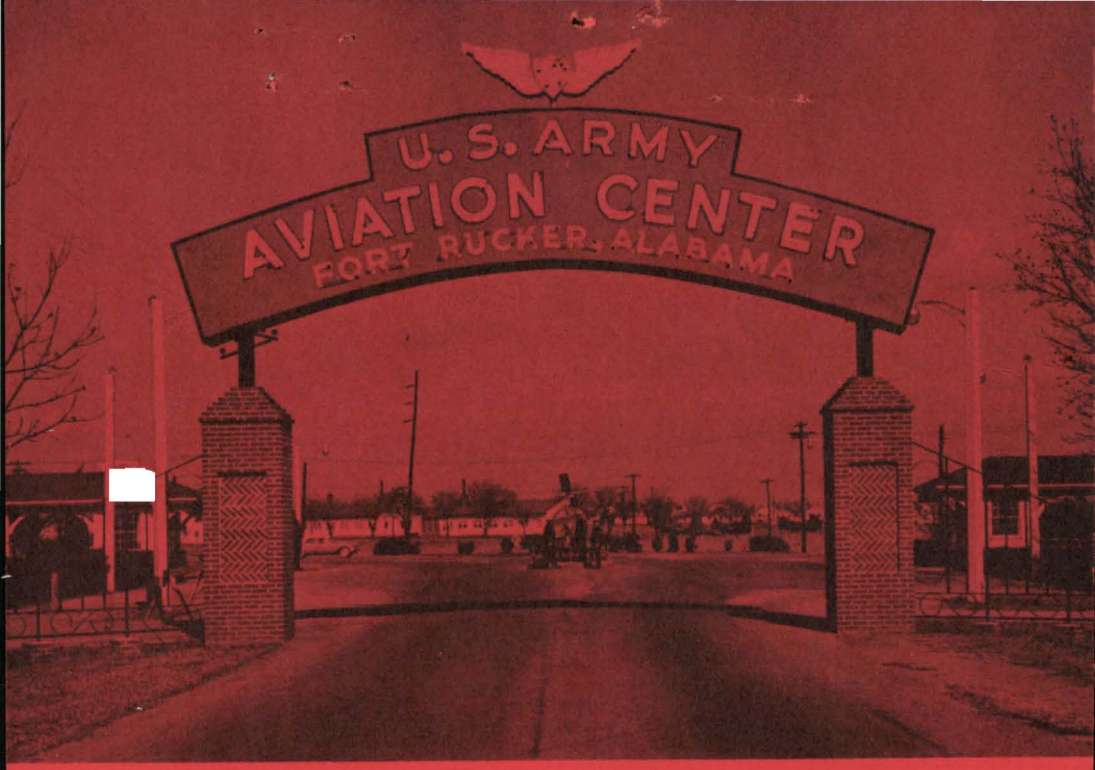

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REMARKS

Please note Avn Crash Injury Critical beginning on Page 13. Mr. Hasbrook has done some work with R+D & OTSG and was present as part of the advisory group for the XH-40 mock-up at Bell aircraft last fall.

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COVER: The YH-32, a lightweight observation-type helicopter under development by Hiller Helicopters for the Army, is powered by ramjet engines mounted at the blade tips. Each engine develops 40 lbs. thrust at 660 fps. Its empty weight, according to Hiller, is 544 lbs., useful load, 536 lbs., and payload, 226 lbs. Cruising speed is 43 knots, with a maximum speed of 70 knots.

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PLEASE READ IT AND PASS IT ALONG

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The printing of this publication has been approved by the Director of the Bureau of the Budget, 13 August 1954.

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Manuscripts, photographs, and other illustrations pertaining to the above subjects of interest to personnel concerned with Army aviation are invited. Direct communication is authorized to: Editor-in-Chief, ARMY AVIATION DIGEST, Army Aviation School, Fort Rucker, Alabama.

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THE COMMANDANT'S COLUMN

Brigadier General Carl I. Hutton, *USA*
Commanding General, The Army Aviation Center

The views expressed in this article are the author's and are not necessarily those of the Department of the Army.—The Editor

Autorotations

OWING TO DEFICIENCIES in our incident and accident reporting procedures, no reliable Army-wide figures from which to determine a sound policy governing autorotation are available. Figures which are available show that 86 percent of all autorotation accidents over a 2-year period occurred during practice autorotations. This would seem to indicate that by banning practice autorotations, 86 percent of these usually costly accidents could be avoided.

Accident figures of The Army Aviation School over this same 2-year period, however, give a clearer picture of the true situation. There were 25 accidents involving autorotation. Twenty-three occurred during practice autorotations, while only two occurred during actual emergencies. However, that is only half of the picture. During the same period 20 additional emergency autorotations occurred but did not result in accidents. In other words, as a result of proficiency gained in practice, only 9 percent of emergency autorotations ended in accidents.

At this stage of their development, helicopters are still susceptible to in-flight emergencies which result in forced landings. Fixed-wing engine and aircraft reliability have been developed to the point where the extreme vigilance of former times can be relaxed. The tendency now is to teach fixed-wing forced landings as another emergency procedure and not as a primary technique. This has quite naturally led some Army aviators to believe that touchdown autorotations are being overemphasized.

There may be some justice to their point of view. However, until engine and airframe reliability is improved in helicopters, proficiency must be maintained in autorotation. This does not mean that every helicopter pilot should be authorized to perform touchdown autorotations at any time and place of his own choosing. Fixed-wing pilots are not permitted to complete forced landings into strange fields indiscriminately. Common sense rules must govern the pilots' authority. They should not be permitted to make the touchdown autorotation a "fly for fun" maneuver.

Cargo helicopters are much too expensive to be exposed repeatedly to the hazards of solo autorotations. Strict rules should govern their practice. A qualified instructor pilot should be aboard, and the landing should be made upon a hard-top surface.

An appropriate objective of the Army aviation training program is to achieve a satisfactory degree of proficiency in autorotation and then to permit practice of the maneuver only enough to maintain this proficiency. Four touchdown autorotations per month should be enough for the average aviator to maintain his proficiency.

Practice touchdown autorotations should not be permitted during passenger carrying flights unless specifically cleared by the aviation officer.

Conditions of loading, density altitude, and wind should be considered and practice autorotations prohibited under critical conditions.

All practice autorotations, whether touchdown or power recovery, should be made toward a spot in order to develop descent-path judgment.

The degree of flare will depend upon the experience and proficiency of the individual pilot. Full-flare autorotations require a high degree of pilot skill and should be practiced only under the supervision of a designated instructor pilot.

In summary, at this stage of helicopter art, proficiency must be maintained in autorotations. Nevertheless, practice autorotations are causing many more accidents than emergency autorotations. Common sense rules of supervision will reduce the number of accidents in practice.

HELICOPTER FUTURE

Larry M. Hewin

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

Air mobility is the key to battle capability today, the ability to deliver men swiftly to the battle zone and support them there.
*—Lieutenant General James M. Gavin**

MARK TWAIN SAID, "Everyone talks about the weather but nobody does anything about it." He might well have been referring to some of the current problems with the helicopter. Millions of words have been spoken in the past 2 or 3 years—industry to Army, Army to industry, commercial operations to Army, and so on around the circle—many of which have been to the accompaniment of only a sage nodding of heads and general agreement that sin is evil. Yet years are slipping by during which little action against this "sin" is forthcoming. This by no means is meant to belittle the efforts of the many individuals and agencies combating the problems at their level with all the vigor and authority at their command but, rather, to indicate that agreement upon the nature of a problem and the remedial action required do not in themselves constitute solution. Action is the only approach to final solution and, further, all actions must be part of a coordinated program.

In 1952 the Army entered into an expanded program of helicopter procurement. This expansion was based primarily on the capacity of the helicopter to expedite tactical and logistical support in the type field army. The acceptance of the program was due largely to successful usage of the helicopter for medical evacuation in Korea

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**From "Tomorrow's Battlefield," Theodore H. White,* THE ARMY COMBAT FORCES JOURNAL, *March 1955.*

and the farsightedness of the Marine Corps in establishing their assault helicopter program.

There is implied in the application of any machine to any job that the return will exceed the investment. Commercially, the helicopter has achieved this state in limited applications only. Surveying, off-shore oil work, and exploration have been profitable, but only because it is so expensive to perform these same jobs by any other means.

Estimation of what constitutes a profitable return on a military helicopter is a great deal more difficult since it involves such intangibles as achieving superior tactical capabilities and winning wars. Certainly instances such as saving a life by rescue or evacuation or placing a mortar team on a hill or a unit in a position of tactical advantage when no other means would be successful are profitable even at today's costs.

However, our program has been founded on usage concepts that extend beyond these limited applications. In view of present costs, there are critics who take the position that the projected broad concepts of giving the Army greater mobility are beyond the point of profitable return, even when the intangibles are considered. If today's costs and complexities were the best that could be achieved, then the critics would be on firm ground. But this would be comparable to estimating the number of American families ultimately buying a television set on the basis of the cost, unreliability, and poor reception of the 1945-model, limited production sets.

Evolution Essential

The Army program for mobility via the helicopter cannot reach its optimum with today's machines. We are *not* now buying the helicopters we want, but, rather, the helicopters we must buy in order

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to evolve those we do want. History is filled with cases, from Leonardo da Vinci to Billy Mitchell, where an idea or a machine was not accepted at the time because the machine proposed had not achieved the degree of success forecast by its proponents. This does not mean that, with enough effort, any crackpot idea will succeed. It does mean that, where basic principles are established and the only obstacle to success is a collection of engineering problems, success can be had through improved design and evolution. The present living standard of this country and the national wealth are visible proof of the truth of this statement. It seems that the success of this nation is due partly to the fact that one-half of the people will work their heads off to perfect a labor-saving device and the other one-half will work their heads off to buy one.

Examination of Programs Needed

If we are not buying the helicopter we want but are, in fact, fostering evolution of what we do want, then some examination of our programs in terms of this concept is in order. We cannot hasten development by procurement alone. The machine must be used, abused, evaluated, and improved. We must learn, take advantage of our learning, and start the cycle again with a new machine.

At this point our alert staff officer (or comptroller) usually asks, "Well, why didn't they design the thing the way it should be (and the way you wanted it) to begin with?"

This is essentially the question the Army asked industry 2 years ago in a joint conference in which helicopter transmissions figured as a key case-in-point. The Army said, in effect, "These transmissions only last 200 to 300 hours; they cost a lot; they are expensive to remove and replace. Why don't you design us one that will last 2,000 hours, and then maybe the helicopter will be successful."

Industry replied, in effect, "We designed this one for 1,000 hours; it just won't go that far. The way to correct it and still carry some payload is development testing, or accelerated usage, to learn its nature and its problems and to develop corrective actions." There were other proposals for improvement, but certainly the case for usage, or accelerated evolution, came to the fore.

What, then, is the nature of mechanical evolution of the helicopter? How fast can it go? How far can it go? What methods can be employed to achieve the maximum rate?

Evolution is partially a process of obtaining information which can be used by the designer, the producer, and the operator.

The designer must of necessity utilize assumptions and empirical formulae in developing such design aspects as proper strength, fatigue life, vibration isolation and damping, and other similar parameters. Unfortunately, much of the material upon which he bases his design calculations is in turn based upon rather fragmentary data. Because of the youth of the rotary-wing art, the records and analysis of thousands of specific experiences are not available to the rotary-wing designer as they are to designers in other fields. The design engineer more often forms detailed theory based on practice than the reverse. The *Comet* disasters provide a dramatic illustration of the limitations of design theory in a field far more advanced than rotary-wing design.

The production engineer is faced with similar problems. He must devise processes, production methods, quality control procedures and methods without benefit of decades of prior experience. The only verification or proof of his judgment comes from extensive use of the product.

The operator of the machine needs information on reliability, maintainability, serviceability, and operating practices in order to plan for personnel, supply, and equipment support.

Of the information required, very little can be determined on the drafting board. Few, if any, concepts ever approach perfection here. Few machines of which only "X" or "Y" models are produced attain maturity. Only where quantities of production and usage are found does the machine really grow in stature. If this is not recognized, we often lose important potential. The machinegun was rejected by both sides in the Civil War because the prototype models did not perform well enough.

Direct Experience

It appears from an examination of the history of other endeavors that the rate of progress is not a function of time in the abstract, but a function of direct experience. In the case of the helicopter this means quantities of flying hours, not on just one machine, or two, but on many. Automotive industry records indicate that occasionally, in spite of extended proving ground tests, a serious defect appears in an automobile after it has reached the public. Obviously, it is a great deal more difficult to remedy such a defect

after this stage is reached. Another classic limit to evolution is the number of new ideas that can be successfully introduced at one time. Fixed-wing aviation has had a number of instances where, because of the introduction of a new propeller, a new engine, and a new wing or other combinations of new ideas in one prototype, the aircraft has figuratively, and sometimes literally, fallen flat on its face. At best, therefore, evolution is a relatively slow process. The best rate attainable is required, however, if we are to reach a satisfactory stage with the helicopter before we reach the point where costs and troubles give rise to serious question as to the value of the program. Needless to say, military necessity indicates the same approach.

How Far?

How far can the helicopter be expected to progress? In an article in the USAF Air Training Command *Instructors Journal* (Summer, 1954), Walter M. Morris, helicopter research specialist at Gary Air Force Base, made the following predictions:

1. Helicopter shuttle services will be established in and about all large cities. (5 years)
2. Cargo helicopters grossing as much as 100,000 pounds will be operating from the centers of cities. (10 years)
3. Small- and medium-sized helicopters will serve as the family vehicle. (1975)
4. Small, one-place helicopters will swarm in large numbers in population centers. (1975)
5. Convertiplanes will be perfected and in commercial use. (1975)

Optimistic? Well, perhaps, but these predictions are based primarily on the potential of the helicopter arising from its vertical ascent and descent capabilities and a belief that engineering solutions will bring increased stability and control, reliability, safety, and reduced costs. Col. William B. Bunker, as Commandant of the Transportation School, in a speech to graduating maintenance officers, expressed it this way:

> "The fact that the mechanical principles or the design of a piece of machinery are complicated does not indicate that it has to be expensive, undependable, or complex to operate or maintain. The best illustration of the fact is found in the

automobile automatic transmission which has become almost standard on our private cars. There is nothing inherently undependable in the helicopter. Mechanically, it relies on planetary reduction gears similar to those found in all types of machinery from Model-T Fords to the L-23 propeller hub. It relies on a simple symmetrical airfoil which has 25 years of test and experimentation. While it admittedly faces problems of vibration and resonance, these problems are susceptible to rather straightforward engineering answers.

"In distinction to specific models available today, the helicopter as an abstract aircraft should be able to achieve the dependability of today's airliners in something less than 5 or 6 more years. Its maintenance will be higher than that of an airplane by some 20 percent for equivalent gross weights—the difference in weight of moving parts—not the 300 or 400 percent now experienced."

What methods can be employed to hasten evolution of the helicopter? Several interesting proposals have been made and are worthy of consideration.

Accelerated Flight Tests

The Transportation Corps' Transportation Research & Development Command has proposed to run accelerated flight tests of approximately 1,000 hours duration on two or more helicopters of each new model. These tests would provide for either maintenance or flight on a 24-hour basis. If required, open end contracts with the manufacturer for supply of spare parts might be established. Such tests would be somewhat expensive but would have an additional advantage of extensive training of Army aviation personnel. This proposal is under consideration by the Department of the Army along with a similar test program proposed by Army Test Board No. 6, CONARC. The CONARC proposal combines the logistical tests proposed by the Transportation Corps with the mission suitability tests currently conducted by Board No. 6.

T/O&E Test Mission

It should be recognized that we need a lot of operational hours, capable analysis of these hours, and action based on the analysis. Perhaps one of the best ideas is to assign a T/O&E company an

accelerated test mission. For example, one of the early H-34 companies might be assigned only a limited number of helicopters, say 7 to 10; be attached to an agency staffed for research and development work; and be charged with accumulating at least 1,200 hours per year per helicopter. In view of the training this company would receive and the benefits of its experience that could be recorded and passed on to other companies, the selected company could be doing little else in the same length of time and for the same costs that would result in nearly as much benefit. Personnel of the H-34 Unit Training Group at Fort Sill recently visited TRADCOM seeking answers to many questions identical to those that plagued the commander of the first H-19 unit in 1951. It is not enough, if future benefits are to be derived, to just do something. Whatever is done must be recorded, analyzed, and used as a basis for future actions. These problems extend beyond the machine itself to the T/O&E and, in fact, to the whole system in which it must exist.

Bench Testing

Bench testing of components has long been used by industry as a method of determining service life and predicting replacement requirements, and in the process speeding up the evolution of the component. To have validity, however, loading conditions must closely simulate those of normal usage; but because of the dynamic loads encountered in helicopters, this is extremely difficult to do. TRADCOM is presently studying the feasibility of bench testing helicopter transmissions in a back-to-back rig with hydraulic devices to simulate cyclic, end, and side loads. These studies are promising and indicate that such testing may be an economical way of hastening the evolution of the transmission as well as other components. Bench tests results would, of course, have maximum value at such time as they could be closely correlated with quantities of flight test data.

Maintainability Tests

Since one of the objectives of evolution is the reduction of maintenance costs and maintenance man-hours, ease of maintenance evaluations, or maintainability tests, should be considered. Some testing of this type is now being performed by the Air Force, the Navy, Army Test Board No. 6, and manufacturers. It is evident

however that, with the ever-increasing significance of maintenance, more detailed testing is required. Such tests on tanks and other vehicles have been used with success by the Ordnance Corps. Essentially this type of evaluation consists of having maintenance crews of only average skill perform *every* maintenance function required by the aircraft under the observation of an experienced maintenance and engineering team. The observer team evaluates the maintenance instructions, the tools, procedures and techniques, and, most important, the aircraft design. TRADCOM has run an evaluation on one fixed-wing aircraft and one helicopter. The results reveal that much improvement on the designs can be made through increased use of quick-disconnects, color-coding, quick-aligning devices, standardization of fittings and fasteners, and preassembled component groupings. Technical orders were found to be faulty and lacking in clarity. The results of such evaluations can be used in two ways: (1) in modification kits for existing aircraft and in revision of existing technical orders and (2) as the basis for improved specifications for future aircraft and new principles of technical order writing. Maintainability evaluations are relatively inexpensive and do not require that the aircraft be flown. Again, however, the results will have maximum value when coordinated with flight test data.

Pinpoint Evolution

Obviously, there are many methods that will speed the helicopter along its path to utility, economy, and dependability. These methods point evolution in a general direction. What is needed next is to pinpoint *exactly* where we would like evolution to take the helicopter. In other words, the Army must decide precisely what it wants the helicopter to be and to do. Army spokesmen have indicated that simplicity and dependability are more desired than comparable increases in speed or payload. Industry complains that such factors are not properly reflected in specifications and therefore are not given commensurate weight in evaluation of design competitions. The Transportation Corps has initiated preparation of a pamphlet intended as a guide to supplement existing specifications and reflecting some of the environmental and usage factors encountered by the Army which should influence the detail design of the aircraft. Additional study should also be made of configurations and decisions

(continued on page 37)

AVIATION CRASH INJURY RESEARCH

A. Howard Hasbrook

THE AVIATION CRASH INJURY Research project of Cornell University—sponsored by the U. S. Navy and Air Force, through a contact between the Office of Naval Research and the University—has, as its objective, the improvement of the "state of the art" of crash-survival design.

Like death and taxes, the traumatic effect of severe aircraft crashes has often been viewed with resignation by engineers, accident investigators and doctors. From a practical viewpoint, this is acceptable in cases of accidents involving total disintegration of the aircraft due to impact forces. On the other hand, when severe or fatal injuries are sustained in survivable accidents, their occurrence should not be accepted as a normal and necessary eventuality.

The concept of looking on the occurrence of injuries from the viewpoint of preventive medicine is not new. During World War II, when a combat soldier's body accidentally stopped a bullet or a shell fragment, it was an accepted conclusion that he would be seriously injured, or killed, if the metal fragment pierced his heart or some other vital organ. After the war military studies of combat injuries, and of seemingly miraculous escapes from death due to stoppage of shell fragments by pocket articles such as cigarette lighters and razors, led researchers to conclude that practical means might be found to give combat troops protection from injury by engineering design. The result was the combat vest which saved many lives during the Korean war. This is an example of how physicians, research men and engineers working together can moderate or eliminate accidental injury.

Today we face an injury problem in aviation which, to be solved, requires close co-operation between physicians, accident investigators, research men and engineers. This problem is one of learning how to design aircraft cabins, cockpits, seats, restraint devices and other interior components in such a way that unneces-

sary injuries and fatalities may be eliminated in survivable accidents.

What are survivable accidents? They are accidents in which major portions of the cabin or cockpit structure remain reasonably intact during impact. When the magnitude of crash force is insufficient to totally demolish aircraft structure, it is insufficient in itself to *directly* cause dangerous injury or death; therefore, such accidents should be survived, and are termed "survivable" even though dangerous or fatal injury may have been sustained.

The past twelve years of crash-injury research in the civil aviation field has shown that most injuries and deaths in severe but survivable accidents are caused by the human body striking specific objects inside of, or a part of, the cabin or cockpit. Such objects are, for example, rigid instrument panels, steel tubes in seat backs, handles, knobs and other hard, sharp, "lethal" surfaces within striking range of the head and upper torso. A good case in point is a transport aircraft which was involved in a survivable accident in which the rear two-thirds of the cabin remained relatively intact. Many of the military personnel in the intact portion of the cabin died from head injury. Investigation and analysis showed that approximately 40 percent of the persons who sustained fatal head injuries died as a result of penetration of the skull by the sharp steel tube uprights in the seat-backs. The seats involved in this accident had been originally designed before investigations and analyses of causes of injuries in survivable accidents had been initiated. Therefore, the "lethal" aspects of this design were not apparent at the time of their installation.

In the past serious and fatal injuries have been usually listed in a gross manner such as depressed fracture of the skull or crushing injuries of the chest. Because all efforts in the past were aimed

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This article is reprinted from THE JOURNAL OF AVIATION MEDICINE, *June 1955, by permission of the publisher. Material included was obtained through Aviation Crash Injury Research of Cornell University, LaGuardia Airport, Flushing 71, N. Y. The Army recently joined the Air Force and the Navy in contracts with Cornell University for aviation crash injury research. Mr. A. Howard Hasbrook was director of the research project covered in this article and presented his findings at the 26th annual meeting of the Aero Medical Association, Washington, D. C. The views expressed are the author's and are not necessarily those of the Department of the Army or of the Army Aviation School. —The Editor*

at accident prevention with little thought given to crash-survival design, detailed reports were seldom made on the precise size, shape and site of injuries, nor were the possible causes of the injuries indicated. This lack of information gave engineers little to go on in designing for crash protection.

Thus, to improve the "state of the art" of crash-survival design, comprehensive medical data *and* related accident details must be obtained from survivable crashes. These related data must then be analyzed and the results given to safety engineers for their use in designing future aircraft and aircraft components.

In the accident described above, an extensively detailed investigation was made of the damage to the floor structure, seats, and seat anchorages; in addition, the general damage to the aircraft, and the magnitude and direction of crash force, as well as other factors were investigated. At the same time, thorough and detailed medical examinations were conducted on all the injured persons; autopsies were performed and photographs were taken of injured body areas. These two groups of data on crash details and medical information were then assembled, sifted, and analyzed.

Some of the highlights of the analysis were:

1. Although this large transport aircraft had struck the ground in a nose-down attitude of about 50° and at a speed in the order of 150 mph, 42 percent of the passengers *survived*—some with non-dangerous injuries.
2. A majority of the passenger deaths in the non-survivable area of the cabin and all the passenger deaths in the survivable area were due to *head injury only*.
3. The fatal head injuries sustained in the survivable, and virtually intact area of the cabin, could be traced to insufficient delethalization of the seats, and insufficient strength in the seats and seat anchorages. [It should be noted here that this so-called design "deficiency" was due to the non-existence of suitable crash-survival design criteria at the time these seats were designed. Furthermore, the seats met all government (CAA) strength requirements.]
4. The use of delethalized seat design, greater seat anchorage strength, and—in the case of military personnel—the use of lightweight crash helmets (during take-offs and landings) would greatly moderate the chances of fatal head injury in similar accidents in the future.

This, aside from many other, more detailed findings, is an example of what can be learned from crash-injury investigations and analyses of survivable accidents, when the physician, the accident investigator, and the research engineer work together as a closely knit team.

Because this work requires the joint efforts of the two professions of medicine and engineering, certain mutually understood "measuring" scales are necessary.

If an engineer is to design a safer crash environment, he must know the seriousness and the site of injuries that are commonly sustained in survivable accidents. In addition, because his first thought is to design for survival and, second, to design for moderation of injuries, it is necessary to provide him with injury data scaled in relation to the *dangerousness* of injury as related to continuance of life under normal and prompt medical care. It is not enough to list injuries only as "minor," "serious," or "fatal." For example, most injury codes classify broken legs and fractured skulls as "serious" injuries. Thus, the term "serious" is uninformative and gives the engineer no comparative data on which to base his design aims. If the design engineer is to know how to design safer cockpit environments, he must have detailed medical information on accident injuries, including their location, size, outline, and their "degree" of dangerousness, as well as the statistical frequency of such injuries.

Injury Classification

What is a dangerous "degree" of injury? From a crash-injury point of view, a dangerous injury is one that eventually produces death as a sequela to injuries from crash impact. Normally, a fracture of the humerus, rib, or tibia, for example, will not result in death if prompt medical care is received.

When a person is killed, how "seriously" is he killed? It makes little difference to the deceased, but to the engineer the "severity" of death provides data on what might have been done designwise to have lessened the degree of death. He is interested in design which might have resulted in survival. If a pilot sustains only one fatal lesion such as a puncture wound of the chest from striking a broken-off control wheel spoke, it is probably that the injury could have been moderated or prevented by improved design of the control wheel. If, on the other hand, a pilot sustains multiple crushing injuries of

the head and torso, it is obvious that the crash conditions encountered were so severe that no amount of crash-survival design of interior cockpit components could have altered the injury results.

It is for these reasons that ten degrees of injury (four of fatality and six of survival) are used by Aviation Crash Injury Research. Of the latter six, the two most serious are termed "dangerous" and consist of injuries that are a definite danger to continuance of life, even under the best of medical care. These include severe concussion, unconsciousness of more than twenty-four hours, injury to the brain, crushing injury to the chest, and so on.

This type of injury classification is also useful in determining, statistically, dangerous cabin or cockpit environments.

Damage Classifications

Human engineers need clear cut, well defined classifications of damage to aircraft resulting from impact. If an airplane is listed as destroyed, did the plane disintegrate on impact, blow up in mid-air, or was it merely damaged beyond economic repair?

To fill this gap in accident classification, six categories are used by Aviation Crash Injury Research to indicate damage sustained by aircraft, due to impact forces. These damage categories are "minor," "moderate," "major," "severe," "extremely severe," and lastly, "extreme." "Extreme" indicates that an airplane has been disintegrated by impact; survival under such circumstances is normally impossible, regardless of optimum crash-survival design; however, injuries in the five lesser categories of damage can be, and are, influenced by safety design.

A recent survivable crash of a military helicopter serves to show the need for greater emphasis on crash-injury investigation and analysis. Two of the four occupants died. No one knows why they died, and why the other two survived. If a flight surgeon and an accident investigator had been able to conduct a crash-injury investigation and analysis, the answer might have been found. This, in turn, could have produced life-saving data for future helicopter design.

Before crash-injury investigation can be undertaken on a full scale basis by the military services, however, medical officers and accident investigators need to be indoctrinated and trained in this new field of aviation safety.

(continued on page 30)

Aeronautical Engineer Graduate Schooling

A 2-YEAR graduate-level civilian education program has been initiated by the Department of the Army because of current and increasing demands for graduate aeronautical engineers in the Combat Arms.

For the fiscal year 1957, 10 spaces have been tentatively allotted for officers of the Combat Arms. Two spaces have been filled for Sep 1956, leaving two remaining spaces for Sep, three spaces for Jan 1957, and three for Jun 1957. Applicants selected are placed on a 2-year education tour at either Georgia Institute of Technology or Massachusetts Institute of Technology with full pay and allowances, plus tuition and book expenses. The first year is spent in refresher training, with successful completion of the 2 year's study resulting in a master of science degree in aeronautical engineering.

Six positions, Army-wide, require Combat Arms officers trained in aeronautical engineering at the master's degree level. Only 10 officers presently in Combat Arms have this qualification; and it is estimated that, making allowance for branch schools, branch qualifications, and similar demands, approximately 24 qualified officers are required to keep the existing positions adequately filled. Further, requirements for aeronautical engineers with master's degrees are expected to increase, rather than decrease.

Army aviators are urged to make applications for this 2-year graduate course. Because of their direct association with Army aviation, they will be given preference when other qualifications are comparable.

General requirements:

1. Spaces are open to officers of all Combat Arms, although Army aviators are preferred when practicable.
2. Applicants must have a bachelor of science degree with a good engineering and mathematical background.
3. Officers with at least 5 years of service who have completed the advanced course of their respective branches are preferred.
4. Applicants should not be over 35 years of age upon entrance into the graduate work; however, occasional waivers are granted.
5. Reserve officers are eligible under certain conditions if they meet prerequisites and have 8 to 12 years of service.

AR 350-200, 9 Dec 1955, outlines eligibility criteria for the course. Procedure for application is contained in AR 350-205, 19 Jan 1956.

COMMUNICATION COURTESY

Nolen G. Howell

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

MAN HAS ENACTED numerous laws endeavoring to enforce the Ten Commandments, and pages of regulations have been written to assure compliance with the basic rules of radio communication. Still, pilots fail to comply with the rules, and frequently even fail to show common courtesy. When you, as an aviator, pick up the microphone to transmit, remember the Golden Rule: "Do unto others as you would have them do unto you." Apply the Rule, and you will be a "number-one" flying communicator. Following are some examples of instances in which the other fellow is very frequently not considered.

Monitor

Ground communicators have many varied and complex problems in dealing with flight situations. Give them a break. If you were a ground communicator, would you like to have a pilot break into your transmission of a lengthy ATC clearance to another pilot, thus interrupting the flow of thought and making the subsequent transmission unintelligible? As the receiving pilot, how would you like this interruption? When possible, *monitor before you transmit.*

What Frequency

Many aviators will transmit a message such as this: "Atlanta tower, this is Army 6178. Over." Atlanta tower transmits on at least eight frequencies. As a busy tower operator, would you not like to know what frequency the aviator is monitoring?

Be Patient

Another type of radio offender is the aviator who assumes that

ground communicators are anxiously sitting by their radios just waiting for his call. If the ground communicator does not reply immediately, this aviator will, without delay, call a second and a third time. Often the second and third calls are unnecessary and only clutter the air and irritate the ground communicator, who is busy at the moment and fully intends to answer the call as soon as possible. Wait a reasonable period of time for a reply when you transmit.

Give Needed Info

Suppose an aviator is cleared by ATC to maintain 1,000 feet on top. The aviator climbs to 1,000 on top, which, let us assume, is 7,000 feet. At the first designated reporting point, he must report his altitude. If you were the air traffic controller, what information regarding altitude would you desire in that position report? That he is flying at 7,000 feet? Absolutely not. You may have an airliner in the same area at the same time flying an *assigned* altitude of 7,000 feet. You would want to know that the aviator is *1,000 feet on top* in the clear. As pilot then, report your altitude as "1,000 on top at 7,000" or "at least 1,000 on top at 7,000," as the case may be. This will generally avoid the ground communicator reporting to the air traffic controller that you are at 7,000 and then receiving a request from the air traffic controller to call you back to determine that you are at 1,000 on top. Reporting your altitude correctly and in accordance with your ATC clearance thus results in two transmissions instead of four or five.

Wait One

It is well known that Interstate Airway Communications Stations (INSACS) transmit weather reports at 15 minutes and 45 minutes

(continued on page 39)

Mr. Nolen G. Howell *is the Flight Educational Advisor for the Office, Director of Instruction, The Army Aviation School, Fort Rucker, Ala. He served with the British and American forces as a flight and ground school instructor during World War II, and has been with the Army Aviation School since 1949, as a fixed and rotary wing flight instructor. During the 2 years prior to receiving his present assignment, he was an instrument flight instructor. He has logged over 9,000 hours flight time in all types of fixed and rotary-wing aircraft. —The Editor*

PUBLIC RELATIONS FOR ARMY AVIATION

Dario Politella

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

ARMY AVIATION began its activities conspicuously unsung and distinctively unnoticed. This, in spite of the fact that its existence provided all the elements of "good copy" for any newsman who could be properly guided.

During the campaigns of World War II, the limited number of artillery air observation pilots were much too busy to exercise any effective type of public relations program, except by radiating their enthusiasm by word of mouth. Only such spectacular events as that of Maj. Charlie Carpenter of Moline, Ill., who mounted bazookas on the wing struts of his L-4 and chalked up kills on a Mark IV and four Panther tanks in October 1944, received printed notices. The February 17, 1945, issue of *Collier's* magazine carried extensive coverage of Grasshopper activities in an article entitled "Wing Talk" by Fred R. Neely. The *Field Artillery Journal* also provided good coverage of the Army air war in all theaters, but its public was limited to military men.

It remained for *Stars and Stripes* to carry the saga of the Grasshoppers on the fighting fronts. But its coverage, unfortunately, was that of secondhand PIO recounting of battle reports, or that of impressionable military correspondents.

The end of the war brought out AA public relations in a semblance of permanent historical form when Air Force Historian Lt. Col. Andrew Ten Eyck published his *Jeeps in the Sky*. The one and only printing of this book in 1946 offered a limited supply of data concerning Army aviation operations in the Pacific to a limited readership.

After World War II Army aviation remained in the category of "Army Air Corps" to the public, an understandable error since both the flying and ground arms at that time wore the same uniforms, but when the Air Force changed into blues, the mistaken association of Army aviator with AF pilot continued. This was undesirable since two different services, as well as two different types of flying, were involved.

Even 14 years after the conception of Army aviation, the fact that Army aviators are still mistakenly linked with the Air Force is a questionable tribute to early Army aviators who neglected the public relations which would have made their infant an acceptable addition to the Armed Services.

Army aviation has grown in many respects. Many of its exploits have been recorded in magazine articles and television displays as well as a Hollywood film. Whether this slow emergence from the darkness of anonymity is a result of public relations activity, or whether it results from the inevitability of growth, is a debatable point.

Public Relations Essential

The only certainty is that the future development of Army aviation will, for a large part, be directly proportional to public relations activity.

When Korea caught Army aviation with its flaps down, a dearth of men and material forced Army aviators into combat under conditions disgraceful to a people who had stood at the pinnacle after World War II. It would be presumptuous to assume that an effective public relations program would have prevented such a condition, but it is fair to state that a good program may have ameliorated the situation.

One of the redeeming features of the Army aviator's Korea is that, at long last, some members of the AA team got the idea that

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Mr. Dario Politella *is an instructor of journalism at Syracuse University and a free-lance aviation writer. He is also a Reserve senior Army aviator, having served on active duty as an aviator in the ETO during WW II and in Korea. While in Korea, he served as PIO on the staff of the Army Aviation Officer, EUSAK. Mr. Politella has worked as a newspaperman and in the magazine and public relations fields. His articles have appeared in* FLYING, AIR FACTS, SKYWAYS, *and* READER'S DIGEST. *He is also the author of an as-yet-unpublished history of Army aviation in Korea entitled* OPERATION GRASSHOPPER. *—The Editor*

public relations, even for such a small organization, was justifiable and desirable. An AA press specialist was therefore assigned as liaison to the Office of the Chief of Information in the Pentagon. Field commanders were encouraged to submit information. PIO's were instructed on the desirability of increased coverage of AA activities.

Korea PR

The effectiveness of the Korea Army aviation PR campaign was measurable best at the grass roots level. The 2d Infantry Division Aviation Section, for example, became well known to the corps of correspondents for their efficient transport of press men throughout South Korea. Army aviators of "Dragon Flight," the air-taxi section of 8th Army Headquarters, brightened Korean flights of such notables as Eisenhower, Ridgway, Van Fleet, MacArthur, Betty Hutton, Margaret Bourke-White of *Life*, Edward R. Murrow, Francis Cardinal Spellman, and numerous senators and congressmen by explaining as the flights progressed the missions of Army aviation and telling of the campaigns fought on the ground below. The results were that people who counted were getting the "word." Army aviators were publicizing Army aviation.

Public relations-conscious aviation section CO's showplaced their installations and staffed them for public relations operations, as well as for efficient combat. They demonstrated to their own commanders that AA is an indispensable member of the Army team because to it few missions are impossible.

Future AA PR

Automation is the new look of an effective Army, as it is of a prosperous industry. Therefore, a great need exists for high intelligence within the Army ranks. In Army aviation, particularly, there is little room for the dregs of the personnel classification barrel. Alert, intelligent, articulate people must be attracted to what must be the elite corps of the Army, and the only way to attract them is by intelligently conceived, professionally guided, and enthusiastically conducted public relations. How should we initiate such a campaign?

Public relations is merely an exercise of common sense. The average, intelligent person who has learned the rudiments of psy-

chology, reads his communications media intelligently, and observes the techniques of 20th century hucksters bellowing their messages to Americans almost every minute of the day, can set up a good program.

Space does not allow a detailed program to be blueprinted, but here are the beginnings of one. Its application is grass roots for the smallest of aviation sections.

1. Collect the following information from each man in the section: Name, hometown address, enlistment date, ratings and dates, oversea tours, decorations, names of hometown newspapers, names of parents and/or wife. Keep this information on file to make up what newspapermen call a "morgue."

2. Have your base PIO, or a good amateur photographer in the section, take pictures of each of the different types of aircraft in your section. Take one of each member of the section. Print enlargements, 4x5- or 8x10-inch glossy pictures, of them. Keep these on file for use when the individuals or aircraft make news.

3. Assign a potential writer in the section (There's always one around.) to make up a form news release which can be mimeographed, completed with a name and other details, and sent to hometown newspapers to tell them that Sergeant Doe or Lieutenant Smith is a member of your organization. Such releases should be made through the division or unit public information officer. The following example might well be used:

000th Infantry Division
Army Aviation Section
Camp Greenwood, Miss.

FOR IMMEDIATE RELEASE 15 June 1956

(SFC John Doe, 1111 Aviation Dr., Grasshopper, Ill.)
has been assigned to the aviation section of the 000th Infantry Division, Camp Greenwood, Miss.

(Sergeant Doe) is serving with the team of maintenance personnel responsible for keeping Army helicopters and airplanes of the 000th in the air.

A graduate of the Army aircraft and engine mechanics school at Fort Rucker, Ala., *(Sergeant Doe)* enlisted

in the Army in _____ *(1950)* _____. He served in _____ *(Korea and Japan)* _____.

_____

(leave space here for other facts)

Other Tips

Names make the news and long-term publicity programs bring more lasting results than concentrated one-shot messages. Therefore, the best start for grass roots PR involves the sending of releases such as the one above. In addition, an education of PIO personnel to the simple expedient of adding "Army" every time the words aircraft, aviation, helicopter, L-19, L-20, L-23, etc., are used will improve the public's realization that the Army also flies.

Another simple application of good PR involves the knowledge that short "fillers" are in great demand by newspapers and wire services. The makeup editor of any newspaper fights a daily battle with space. It is inevitable that holes will appear on his dummy which must be filled with short pieces which will enhance the typography and lengthen the reading time of the page.

An example of such a "filler" is one released by the EUSAK Army aviation section on 3 March 1952:

> "WITH THE ARMY AVIATORS, KOREA—Army aviation is playing its part in the service-wide supply economy program. L-19 aircraft of the 8th Army Flight Detachment have been labeled with cost prices to make Army aviators who fly the small aircraft and the mechanics who maintain them conscious of their responsibilities.
>
> "Stencilled on the right hand side of the fuselage of each aircraft in full view of personnel entering the planes is this information: 'Aircraft cost $13,000. Operating cost $15 per hour.'
>
> "For the benefit of passengers transported by Army aircraft, one plane also carries this reminder: 'Is this trip necessary?' "

The foregoing is intended to serve only as an indication of how an Army aviation PR program might be initiated. It is only a beginning, but public relations begins with the aviation sections in the field. Every man in Army aviation must realize that he can help in publicizing AA and that to keep them flying we must keep them talking about ARMY aviation.

UER HIGHLIGHTS

Major Fred R. Reed, *Transportation Corps*

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

THIS MONTH, we would like to discuss briefly depot maintenance of aircraft. Under present policies depot maintenance of Army aircraft is the responsibility of the Air Force. This support of Army aircraft falls into three general categories: repair of Department of the Army repairable items, area support, and inspection-and-repair-as-necessary (IRAN). It is the latter category, IRAN that we will discuss.

Service life, safety, and operational performance of aircraft are dependent upon organizational and field maintenance facilities effectively performing prescribed functions. The IRAN program was conceived and established as a means of accomplishing depot-level maintenance in the most practical and economical way possible, provided that the lower echelons effectively performed their functions. It is for this reason that all aircraft are processed through the supporting field maintenance shop for inspection prior to delivery to the IRAN site (Reference, letter TAG, AGAC-C(M) 452.031, 10 Dec 1954, subject: "Time Phased Depot Maintenance and Modification of Army Aircraft").

The scheduling of aircraft for IRAN is the responsibility of field commands. The Transportation Supply and Maintenance Command (TSMC) is responsible for monitoring the system and is the point of contact for the Department of the Air Force. Through this monitoring, several problems that can be corrected primarily by field agencies have been revealed to TSMC personnel.

The first problem is delivery. The negotiated contracts for IRAN are predicated on a steady flow of aircraft into the contractor's facility, thus providing a contract economically beneficial to the Government. IRAN facilities operate on production-line systems,

and aircraft must be available for initial inspections and shop input at the scheduled time. Otherwise, a steady work flow is not maintained, and increased IRAN costs result.

The second problem is pickup of completed aircraft at the IRAN site. In the event aircraft are not picked up within 5 days after completion of IRAN, engines must be preserved in accordance with TO 2R-1-11 and additional inspections and preventive maintenance performed. This work is over and above existing IRAN contracts and it increases costs to the Government.

The third problem, and perhaps the most serious, is incomplete organizational and field maintenance prior to delivery of aircraft for IRAN. Reports received from IRAN contractors indicate that a large percentage of the discrepancies found should have been discovered and corrected by organizational or field maintenance organizations. IRAN is intended to supplement, not replace, organizational and field maintenance. TAG letter mentioned above states:

> "Maintenance performed on Army aircraft, under this program, will normally be limited to that properly considered a depot function. Organizational and field maintenance discrepancies, which do not affect safety of flight, will not be corrected by the depot facility, except when prior agreements have mutually been reached by all concerned, to the effect that the work could be more economically and/or efficiently accomplished by the depot facility."

Because of the failure of some organizations to perform assigned maintenance, it has been necessary to deviate from this policy and request IRAN facilities to perform what is normally considered the responsibility of organizational or field maintenance. Because of the resulting workload, the cost and length of time required to perform IRAN have been considerably increased.

In summary: Deliver it when it is due; pick it up when it is through. Further, have enough pride in the work of your organization to insure that all discrepancies within the scope of your shop have been corrected prior to aircraft delivery to the IRAN facility.

The UER Highlights Department, *prepared by Major Fred R. Reed, is compiled from information contained in Unsatisfactory Equipment Reports received by the Transportation Corps Supply and Maintenance Command, 12th and Spruce Streets, St. Louis 2, Mo. Major Reed is Chief of TSMC's Publication Division.—The Editor*

The following items have been selected for highlighting:

Fixed Wing

Problem: Instrument Panel Shock Mounts.

Two factors indicated that something was wrong with the rubber instrument panel shock mounts. The first factor was the many UER's received; the second, the high usage indicated by stock records. An improved instrument panel shock mount has been developed and approved for field retrofit. A military interdepartmental purchase request has been forwarded, and the Air Force has been requested to prepare an applicable time-compliance technical order. We hope that this action cures the problem. However, should the new shock mount not prove out, let us know with UER's.

Problem: Tail Wheel Bracket Failures, L-19.

We have no firm answer to this problem as yet. The cracked tail wheel brackets have been reported by UER's, and also by IRAN facilities. The contractor has investigated this problem and has submitted an engineering change proposal that is being considered. If approved as recommended, this ECP will be incorporated on production aircraft and spares only.

Problem: Cracking of Landing Gear Fairing, L-20.

This is an old problem, and not cured yet. Perhaps you will recall Maintenance Information Bulletin 55-3-L-20, 28 Feb 1955, published by the now deactivated TCAAFSO. Basically, that MIB called for inspection of the compression rubbers and check of the landing gear track under gross static conditions. UER's continued to come in, so the problem was presented to the manufacturer. Labor troubles at the manufacturer's facility have delayed the investigation, but those troubles have been straightened out, and a report is expected soon. Meanwhile, we can use more UER's. Tied in with this is the problem of the fuselage skin cracking where the landing gear fairing is attached.

Rotary Wing

Problem: Main Rotor Blade Overhaul Discrepancies, H-23.

The UER's received so far on this problem have really been a great help. They reported several defects on overhaul blades, most of them detected during preinstallation inspection. A few were

reported after low operating hours. In any event, a complete new set of specifications has been prepared covering overhaul of H-23 blades. In the meantime, here are a few discrepancies to watch for: paint peeled from blades, cracks in bonding areas, checks in root areas, improper filler materials, and cracks in lacquer finish.

Problem: Tail Boom Cracking at Bearing Housing Brackets, H-23.

By the time you read this, TO 1H-23-521 should be in the field. The TO provides for field modification of tail booms to eliminate flexing of the "T" under the tail rotor bearing blocks. To distribute loads and prevent cracking of tail boom skin, a transverse channel will be added to the boom under the bearing blocks.

Problem: Tail Rotor Gear Box Guard Mounting, H-13.

UER's report the tail rotor gear box case cracking at the tail rotor guard clamp bolt holes. The gear box in question is part No. 47-640-044-8. Investigation reveals that the cause of this condition is overtorquing of the clamp bolts, part No. AN3H7, during installation. The correct torque is 20 to 25 inch-pounds. Strict adherence to the correct torque should eliminate this problem.

Power Plant

Problem: Piston Rings and Related Discrepancies, 0-470-11.

Review of the many UER's received indicates the majority of the discrepancies fall into the following categories:

Loss of compression
Excessive oil consumption
Scored cylinder walls
Plug fouling
Piston flaking
Loss of power
Metal filings in the oil
Rough engine operation

An extensive investigation has been made, resulting in approval of ECP 0-470-1182454, which will provide for the following action at time of overhaul:

a. Installation of two chrome-plated compression rings.
b. Installation of one tin-plated, scraper-type, ventilated oil control ring.

This entire problem is directly connected with the air filtration system, and investigation is being continued in an effort to improve the system. Until this is accomplished, the modifications as outlined here should greatly alleviate the discrepancies. The use of chrome-plated compression rings in both compression grooves will provide maximum resistance to wear resulting from dirt entering the combustion chamber. The double-scraper type oil control ring will allow less oil to enter the combustion chamber for any given degree of piston ring wear.

With Spring bringing better weather for flying, more hours will be put on equipment, so the more UER's we will expect to receive. Go right ahead and flood us with them. We like it. And remember: *Don't live, or perhaps die, with an unsatisfactory condition. REPORT IT!*

(AVIATION CRASH INJURY RESEARCH
continued from page 17)

Summary

Crash-injury and crash-survival data on military accidents are needed so that engineers can, by design, moderate or prevent unnecessary injuries and deaths in survivable accidents involving future military and civilian aircraft. To obtain such information, medical officers and accident investigators must work together in the investigation and analyses of accidents, the injuries sustained, and the causes of injury.

In order to properly identify and catalogue the injuries sustained in accidents, flight surgeons and pathologists should make detailed examinations of the injured persons and report in detail the results of the medical examinations or autopsies. The results of the investigation and analyses must be given to engineers in language they can understand, both from a qualitative and quantitative (statistical) point of view. Classifications and terms that are meaningful to engineers, as well as to safety groups and other medical personnel, should also be utilized.

BOOKS

For The Army Aviator

AERODYNAMICS—*Von Karman, Theodore (Cornell University Press, Ithaca, N. Y., 1954. $4.75)*

This presentation of aerodynamic theories and their development will be both interesting and informative for the Army aviator, although he is already well acquainted with aviation fundamentals. It is a reminder of how much mental effort and time went into arriving at the understanding of fundamental aerodynamic phenomena which is so readily available today.

In readable, narrative style the author recounts major findings of aerodynamic research before the era of flight, including those by da Vinci, Newton, Cayley, and d'Alembert. He traces the evolution of the theories of lift and drag through contributions of von Helmholtz, Kirchoff, Rayleight, Lanchester, Prandtl, and others. In a chapter on supersonic aerodynamics Von Karman points out that *aerothermodynamics,* the term combining temperature with fluid mechanics as encountered in supersonic aerodynamics, was introduced in 1931. Since then many such terms, including *aeroelasticity* and *aeroelectronics,* have appeared and a whole new theory of flight, considering air as a compressible rather than practically incompressible fluid, developed. In a final chapter the author discusses progress from the propeller to the space rocket, including theories of jet engine and rocket operation and their development to date.

GAS TURBINES FOR AIRCRAFT—*Driggs, Ivan H., and Lancaster, Otis E. (The Ronald Press Company, 15 E. Twenty-sixth St., New York 10, N. Y., 1955. $10)*

For the past 50 years the airplane and the reciprocating gasoline engine have progressed side by side. It is now clear, however, that the reciprocating engine must be discarded for certain important aircraft types. Further gains in maximum speed appear to be difficult, if not impossible, with these engines. Requirements for

extreme range, very rapid rates of climb, and short takeoff distances also indicate the need for new aircraft power plants. Future aircraft, whether jet or propeller driven, will be strongly influenced by the development of the gas turbine power plant. Further, future engine designs depend upon aircraft requirements, perhaps to the extent of being "tailored" to the airplane.

For the aeronautical engineer, mechanical engineer, and the Army aviator interested in the thermodynamics and flow phenomena, the authors give authoritative, technical coverage to the many considerations involved in performance of the gas turbine. They discuss general principles of the turbojet, turboprop, and other types of jet engines; fundamentals involved in turbine engine operation; potentialities of an engine in terms of cycle analysis; turbines in general, including the various types; compressors; combustion; and gas turbine performance. To aid the reader in applying technical data discussed, problems covering the more important chapters are included. The book also has an extensive appendix and index.

MAN, ROCKETS, AND SPACE—*Leyson, Capt. Burr W. (E. P. Dutton and Co., Inc., 300 Fourth Ave., New York 10, N. Y., 1954. $3.50)*

On the eve of the anticipated launchings of earth satellites here in layman's language is a discussion of rockets.

The author covers basic facts concerning the structure of the earth's atmosphere and its extent; formation of the universe; conditions in the troposphere, tropopause, stratosphere, ionosphere, and exosphere; and the principle of rockets and the status of present-day research projects. Captain Leyson explains why cosmic radiation is one of the greatest hazards facing man in space. In discussing current plans for the conquest of space and considering the possibility of space travel, he gives rather detailed coverage to the theory of Dr. Wernher von Braun, including some of the opposition offered from more conservative sources. He concludes, however, that the mere fact many hazards exist in space will not deter men from going there.

Book reviews are compiled by the ARMY AVIATION DIGEST *staff. Views expressed are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor*

The Gray Hair Department

A PILOT was conducting a routine test flight in an H-13G helicopter. After completing the air-work phase, he flew to an open field with which he was familiar and made several power recovery autorotations to check the autorotative characteristics of the aircraft. Finding these characteristics normal, he decided to make a few touchdown autorotations. He made a normal approach to the field

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Lieutenant Colonel David M. Kyle, *the very senior aviator above, is the commanding officer of the 337th FA Bn, Fort Rucker, Ala. In his 13 years as an Army aviator, he has become qualified in all types of Army fixed- and rotary-wing aircraft. His military career began upon graduation from Oregon State College in 1940 when he was assigned as survey officer for the 188th FA Regt, Fort Lewis, Wash. He graduated from Army liaison pilot training in 1943 and subsequently served in the Italian campaign in WW II as Assistant Aviation Officer for the 13th FA brigade. After the invasion of southern France, he was assigned as 40th Inf Div Aviation Officer and fought the remainder of the War with the 40th through France and Germany.*

Between WW II and the Korean War, he served with the 33rd FA Bn in Europe and as the Army Aviation Advisor for the California National Guard. During the Korean War he was again assigned as Aviation Officer for the 40th Division in combat and, later, Aviation Officer for X Corps. Upon returning to the ZI in 1954, he was assigned to the Army Aviation School as Director, Department of Tactics and General Subjects, where he remained until he received his present assignment. —The Editor

and a reconnaissance by hovering over the length of it. Returning to the downwind end of the field, he landed and taxied over portions of the landing area to determine if the ground was firm and smooth enough for touchdown autorotations.

His reconnaissance, made by hovering and taxiing, satisfied him that the field was safe for touchdown autorotations. He completed four autorotations in the downwind half of the field; however, the fifth was made more to the center of the field. He touched down smoothly and slid straight ahead for approximately 25 feet; the skids began sinking into soft ground; then both skids broke off at their forward supports. The helicopter nosed down, and the main rotor blades flexed into the tail boom, severing the tail rotor drive shaft, shaft extension, and blades, then struck the ground and shattered. The helicopter went over on its nose far enough to burst the Plexiglas bubble then fell back onto its skids in an upright position.

A review of world-wide accident files of autorotation accidents, shows that poor reconnaissance and selection of landing areas are the most predominate factors contributing to these accidents. During a 24-month period there were 72 autorotation accidents amounting to $692,496 in damages and repairs. This group of accidents accounted for 23 percent of all rotary-wing accidents during the period. There is only one solution: designated and carefully prepared areas must be used for touchdown autorotations, whether for proficiency or for test flights.

Incomplete Investigation

The pilot involved in this accident was trained in the H-13, with the exception of approximately 11 hours familiarization flying in the H-25. Three weeks after he completed the Army Cargo Helicopter Pilot's Course he reported to an aviation unit equipped with H-23's. He was given 4 hours and 30 minutes dual transition in the H-23 and had logged 4 hours and 10 minutes solo time.

At the time of the accident he was practicing normal approaches to a panel on a stagefield. The weather was clear, wind south-southwest 19 knots gusting to 27 knots, temperature 85°, dew point

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The Gray Hair Department *is prepared by the* ARMY AVIATION DIGEST *staff with information obtained from the files of the Army Aviation Safety Board. The views expressed in this department are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor*

70°, visibility 15 miles, barometric pressure 29.88.

The pilot turned final and lined up on the panel at 300 feet altitude, 45 to 50 mph airspeed, with a normal approach sight picture. He suddenly noticed a loss of rotor rpm, and immediately decreased collective pitch fully, entering autorotation. From that point on he cannot clearly remember his actions. He remembered going down on pitch but did not remember reducing the throttle or exactly what the reactions of the helicopter were. The helicopter struck in a level attitude and bounced, then rolled to the right and crashed on its side. Fortunately the pilot crawled out of the wreckage practically unscratched; the helicopter, however, was a $29,236.30 loss.

The accident report states *that the primary unsafe act* was: "Error on the part of the pilot in that he went into autorotation after discovering an apparently low rpm and became so excited that he failed to apply the controls of the helicopter correctly and allowed it to strike the ground excessively hard, thereby causing major damage."

Corrective action, as stated in the report, was: "That the instructor pilots, prior to releasing a student pilot for solo flying, while undergoing transition training, will give a thorough flight check and oral examination to determine the accuracy of the student's knowledge of aerodynamics as well as autorotations and other emergency procedures."

It was impossible to determine from the accident report whether the board considered all the possibilities in this case. Several of the factors correspond to the factors which have been determined to be present in cases of known mast bumping (see *Army Aviation Digest* Feb '55). These are (1) solo pilot, (2) low pilot time in H-23's, and (3) gusty wind conditions.

It is obvious that the pilot encountered conditions with which he was unprepared to cope. If this was a case of mast bumping, the corrective actions taken by the pilot were precisely wrong, although normal for his experience level.

Very probably the accident board considered this possibility, but that fact does not appear in the proceedings. It is written off as another rather nebulous "pilot error" accident, with the emphasis upon the pushing of the "panic button." No unsatisfactory report was submitted. Accident boards should consider all possibilities, and it would assist the final reviewing board if the consideration were noted in the proceedings.

Glare

The basic concept of Army aviation is that pilots can operate from unprepared landing areas in the immediate vicinity of the unit positions. This involves certain skills and techniques for safe operations.

In this accident an L-19 pilot was participating in a regimental field exercise. The pilot's flight leader decided that the flight would displace forward and briefed him on the location and layout of the new strip, where he was to land following his next mission. The pilot completed the mission and flew to the new strip. After a high and low reconnaissance, he elected to make the landing to the south. This was directly into the sun, and an existing haze condition diffused the light into a bright glare. As the pilot came lower he was able to locate the ground but unable to discern details. In actuality he had lined up with a road which ran parallel to the strip. The airplane touched down and rolled straight ahead for approximately 400 feet. The road was extremely narrow, and the left wheel ran off the road into the ditch. The right gear sheared off and the aircraft fell to the right, coming to rest on its belly. The airstrip had the same general appearance as the road and lay less than 50 feet to the left.

The proper procedures for relocation of airstrips is outlined in Section II, FM 20-100. Panels should have been ready (a "T" panel at the downwind end pointing into the wind and a "bar" panel at the upwind limit of the strip) with mechanics standing by to display them to the pilot as he flew his reconnaissance and when he turned on final approach. Had the panels been displayed, the pilot might have been able to recognize their contrasting color and land on the airstrip instead of the road.

It is such lessons that we learn from training exercises. Their value guides us in the further development of satisfactory techniques for operating in the field. Carelessness or thoughtlessness is likely to result in accidents much more frequently under field conditions than when carefully prepared airfields are used.

CAA uses 85 planes equipped with racks of electronic testing equipment to check the accuracy of the ground aids to air navigation on the 100,000 miles of U. S. airways.

(HELICOPTER FUTURE continued from page 12)
made relative to the desirability of fuselage loading, pods, "straddle-truck" configurations, and prime mover concepts. Today's helicopter configurations, with internal loading capabilities but used more often in combat for external cargo loads, appear inefficient. If external loads are to be carried extensively, then perhaps the straddle-truck configuration, which will allow efficient carriage of either external loads or a personnel pod, is the answer. Whatever the goals may be, they should be clearly defined now in order that all military and industrial agencies can be working toward the same target. A great deal of talent and energy can certainly be released by clearly defined policies and objectives.

Conclusions

In summary, the following principles should be recognized:

*Today's helicopters are not what the Army requires.

*What the Army does require is attainable through evolution.

*Evolution can be accelerated by obtaining, and acting on, data from large quantities of flying hours, and perhaps bench-test hours.

*Maintainability evaluations will aid in hastening evolution.

*Obtaining sufficient quantities of test data is one of the *most important* things that we can accomplish with today's helicopters.

If the above principles are accepted, then the following actions are indicated:

*Programs for accelerated testing of quantities of helicopters by the Army should be started.

*A program of maintainability evaluations should be started (H-21 and H-34 immediately).

*Bench testing of components should be initiated.

*A program of data collection from other agencies, such as Edwards Air Force Base, Patuxent, and selected operators, should be started and coordinated with all accelerated test data.

*Additional study should be made of state-of-the-art developments and Army requirements in order to clearly define objectives.

*All of the foregoing should be accomplished under the supervision and direction of one agency fully staffed with experienced aviation personnel and competent engineering and research personnel.

*Administrative and command lines should be developed to insure the capability of taking prompt action on data as developed.

There are few, if any, new ideas in the foregoing words, but many of these recognized and obvious measures to speed the evolution of the helicopter are not being taken. Much that is being done is lacking in effectiveness because it is not coordinated with and integrated into related aspects of the program. Many of today's problems in the helicopter field can be solved by providing competent people now in Army aviation with revised and clarified policies and programs and with the direction to act.

(COMMUNICATION COURTESY continued from page 20)
past the hour. As a communicator, how would you regard a pilot who called you at 14 minutes past the hour to ask about the weather at a station ahead when you had one minute to get the information together to start a broadcast which includes weather at that station? When it is actually necessary to contact INSACS, do so regardless of time; however, routine transmissions at times near 15 minutes and 45 minutes past the hour should be kept to a minimum. INSACS, which serve limited traffic, may have only one operator on duty at a time. To make a request of him at 15 minutes or 45 minutes past the hour could delay or interrupt the scheduled broadcast, thereby inconveniencing other pilots in the area.

The Golden Rule is good for all such communications problems. Most of them can be solved through common courtesy and the application of the Rule assures this courtesy. Give it a try. Other pilots and communicators will appreciate it, and you will find your communication work much easier.

The Army has announced that two two-company transportation helicopter battalions will be operational in support of USAREUR by summer.

With the recent arrival of the 587th Cargo Helicopter Co in Europe, one battalion was completed. Unit personnel and 21 H-34's were moved aboard the Navy utility carrier *Corregidor* in February. Units of the second battalion, a headquarters and two companies, are scheduled for movement to Europe during April and May.

Present Army plans call for 12 transportation helicopter battalions, with a total of 36 companies to be in the Army by 1960. First goal is 24 companies organized into 12 two-company battalions. The third company will be added to battalions as personnel and equipment become available. The company TO&E calls for 9 officers, 34 warrant officers, and 97 enlisted men. Aircraft equipment is 21 H-34's and 2 H-13's.

Straight and Level

Needed: Maintenance-Qualified Aviators in All Arms

TO: Editor-in-Chief

From October 1953 to June 1955, while assigned to the Aviation Department, The Transportation School, Fort Eustis, Va., I assisted in the training program of the Aircraft Maintenance Officer Course and six enlisted field maintenance courses. I noted that during this period very few combat arms officers attended the Aircraft Maintenance Officers Course (MOS 4823).

Upon arrival in Korea and assignment as I Corps Aviation Officer, I noted that of the approximately 80 Army aviators assigned to the various Corps units none, other than myself, had a secondary MOS of 4823.

I believe it is imperative that steps be taken to encourage the Army aviators of all arms and services with organic aviation to enroll in and attend this course in order to bring aircraft maintenance standards up to the desired level. All aviation sections, regardless of what level, have a requirement for a qualified aircraft maintenance officer. The schooling he receives gives him the background to be an asset to the unit in which he is serving. The policy, now in effect, of sending a recent graduate of fixed-wing training to Korea with the possibility of utilizing him as an Engineering Officer, or assistant, is not the least bit practical. It will reflect on the standards of unit maintenance and supply, as well as create a very dangerous situation in regard to flying safety.

It is a known fact that, if the using unit does not perform its echelon of maintenance in a proper manner, then supporting units (field or depot) cannot perform their echelon of maintenance in a proper manner.

. . . At the present time there are 119 Army aviators assigned to the I Corps, and of the total only 3 have a secondary MOS 4823. It is my belief, and hope, that through the world-wide distribution of the *Army Aviation Digest* you can pass on this information, encourage the aviators to apply for the training, and help to alleviate the situation.

In short, a unit aviation officer must have a qualified aircraft maintenance officer to supervise maintenance and inspect his aircraft, as well as operate his technical supply. This officer should also be a guiding light for the inexperienced mechanic.

PETER L. STRENNEN
Major, Infantry
Aviation Officer
Korea

Letters of constructive criticism are welcomed by the ARMY AVIATION DIGEST. *To appear in this column they must be signed.—The Editor*

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For explanation of abbreviations used see SR 320-50-1.

ARMY AVIATION SCHOOL CREST

When reproduced in full color, the colors red, blue, and yellow are used in the crest to indicate representation of all branches of the Army in The Army Aviation School. The school's aviation training mission is symbolized by the perched falcon denoting the art of falconry with its patient training of swift, keen birds for hunting. The mailed fist depicts the military ground arm which exercises the control, training, and direction of the flight.