USAARL
SCI SUPPORT CENTER
P.O. BOX 620577
FORT RUCKER, AL 36362-0577

UNITED STATES ARMY
AVIATION DIGEST
JULY 1972

AWO Career Patterns

Pages 2 and 3

UNITED STATES ARMY AVIATION DIGEST

JULY 1972 VOLUME 18 NUMBER 7

Views From Readers 1
Aviation Warrant—Where To From Here? 2
Aviation Warrant—A New Career Pattern 3
Rotary Wing Instrument Flight Examiners: Help Us Help You! 10
Beware!! Loose Adiabats 12
Enlisted Aviation MOS Tests 14
Aeromedic—The Flight Surgeon's "Medical Team" In Aircraft Accident Investigation 16
Charlie And Danny's Write-In 20
Instrument Corner 21
Maintenance Matters 22
Ferry Flight 24
We Cover The Americas 32
280 Feet Too Low 36
Evolution—Helicopter Crashworthy Fuel System 44
The Checklist 46
Aviation Accident Prevention Forum 48
No New Causes 50
Pearl's 55
It Ain't Necessarily So 56
Hazard-Free 60
Home Safety Hints 62
USAASO Sez 64

DIRECTOR OF ARMY AVIATION, ACSFOR DEPARTMENT OF THE ARMY
BG William J. Maddox Jr.

COMMANDANT, U. S. ARMY AVIATION SCHOOL
MG Allen M. Burdett Jr.

ASST COMDT, U. S. ARMY AVIATION SCHOOL
COL Hubert S. Campbell Jr.

EDITOR, U. S. ARMY AVIATION DIGEST
Richard K. Tierney

ABOUT THE COVER

The summer of '52 marked a significant milestone in Army aviation history with the formation of the Army's first cargo helicopter company which was the first unit with a TOE (table of organization and equipment) providing aviation warrant officers as operators of the helicopters. The DIGEST salutes the AWO's first 20 years.

Cover photograph by CPT Tom Greene

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

The DIGEST is an official Department of the Army periodical published monthly under the supervision of the Commandant, U. S. Army Aviation School. Views expressed herein are not necessarily those of Department of the Army or the U. S. Army Aviation School. Photos are U. S. Army unless otherwise specified. Material may be reprinted provided credit is given to the DIGEST and to the author, unless otherwise indicated.

Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, Ala. 36360.

Use of funds for printing this publication has been approved by Headquarters, Department of the Army, 1 October 1970.

Active Army units receive distribution under the pinpoint distribution system as outlined in AR 310-1. Complete DA Form 12-4 and send directly to CO, AG Publications Center, 2800 Eastern Boulevard, Baltimore, Md. 21220. For any change in distribution requirements, initiate a revised DA Form 12-4.

National Guard and Army Reserve units under pinpoint distribution also should submit DA Form 12-4. Other National Guard units should submit requests through their state adjutants general.

For those not eligible for official distribution or who desire personal copies of the DIGEST, paid subscriptions, $4.50 domestic and $5.50 overseas, are available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

VIEWS FROM READERS

Sir:

In your May issue you published an article fraught with thought-provoking comment by Major Peter Barrett entitled "A Strange Kinda Bird." It seems, however, that the article missed its mark as it should have been directed not only to Army aviators but also to ground unit commanders who employ aviation assets. It seems very doubtful that there are many "prima donnas in the ranks" as MAJ Barrett suggests! The vast majority of Army aviators are highly trained professionals who are highly mission oriented.

Indeed, as is suggested, there are times where conflicts arise over the employment of aviation assets; however, this is often due to the fact that the great majority of nondivisional aviation units will be responsible to two chains of command. For this reason it seems as though a joint education program on both sides is in order, and with the normal rotation of commissioned officers through in-branch assignments a meeting of the minds and an exchange of information can take place outside of the arena where petty jealousy often surfaces.

It is vital that both aviation and nonaviation personnel alike gain an understanding for each other's problems, for in the long run mutual understanding and respect will achieve far more than the harangues that are delivered when parallel missions seemingly conflict. The end result of such a comprehensive education program can only aid in an increase of overall Army effectiveness.

CPT Craig R. Whited
Department of Advanced
Flight Training
U. S. Army Aviation School
Ft. Rucker, AL 36360

Sir:

I am an avid reader of AVIATION DIGEST and have learned many useful procedures and ideas from articles in your magazine. I was under the impression that it served as a supplement for the safety and standardization programs and as a means for exchanging experiences and ideas to further these programs as well as an occasional article on the history and evolution of Army aviation.

The article "A Strange Kinda Bird" by Major Peter J. Barrett tends to belie that impression. I realize that the article is MAJ Barrett's opinion of Army aviation as he sees it. However, many of the ideas and opinions he expresses can only be termed as detrimental to all established safety and standardization practices we now know.

I am a fixed wing driver and have had very little experience, to date, with the rotary wing side of aviation. However, it seems the epitome of asininity to attempt an extraction of a disabled aircraft, in an insecure area, at night, with any type of helicopter, especially a CH-47 or CH-54. The very size of the aircraft, combined with the relative security from detection and counteraction afforded the enemy by cover of night, make the aircraft a prime target for enemy fire. Result: another aircraft downed and possibly five soldiers dead.

Does MAJ Barrett purport to proclaim this sort of action as professionalism? I hope not.

As for the transportation of propane gas internally in a helicopter, I have a question: Why were slingloads invented?

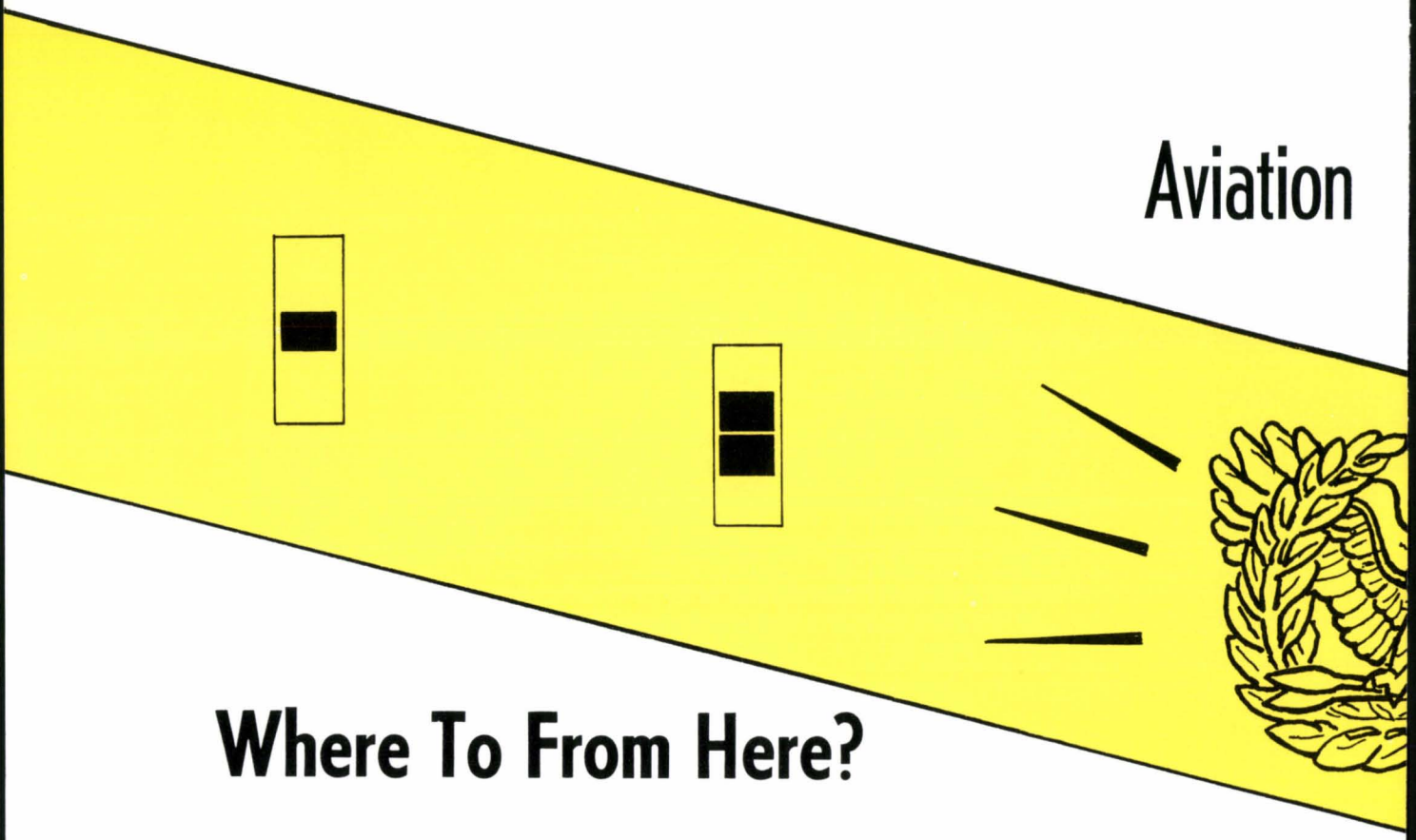
I know of no pilot who would relish the idea of transporting propane or any type of gas internally or externally in any kind of aircraft because of the very instability of any gas. Add to this the possibility of enemy fire and you get a very nervous aviator. Would MAJ Barrett relish the idea of riding in an aircraft carrying gas of any type? Perhaps, while we are on this subject, someone can tell me of a tactical emergency that would require the transportation of propane, and risk of lives and equipment, into an insecure LZ.

The rigid scheduling, flying hour and maintenance programs MAJ Barrett so disdainfully refers to are necessary so that the aviation assets available will be there on a daily basis to support everyone who requires their support. Would he suggest that we shortchange one unit to play favorite to another? I understood him to state later in his article that he and other commanders understood these problems. If so, why is he criticizing them?

MAJ Barrett suggests that a single aviation unit support a single ground unit. This is ideal *if* it is possible. Unfortunately with our current assets this is not always possible. Only proper management and planning by responsible personnel and strict adherence to the rules they set up by individual pilots will ensure the ability to support as many units as is required on a daily basis.

Possibly MAJ Barrett met with one or two isolated incidents that brought about his present views. I sincerely hope

Continued on page 21



Aviation

Where To From Here?

Captain Michael L. Moran
Warrant Officer Career Development
Department of General Subjects
U. S. Army Aviation School

The Background

Historically and traditionally the warrant officer has been a specialized technician. The trend toward staff and management has made it appear that the aviation warrant officer's existence as a separate entity may be in jeopardy. The author reviews the problem of indefinability and the need for spelling out the role and function of the aviation warrant officer in the Army's overall picture

A FEW YEARS ago an ambitious and far-reaching concept evolved at the Department of the Army (DA). It was indeed one of the most profound ideas the Army has developed—a career course for its aviation warrant officers.

Heralded by commissioned and warrant officers alike, the course appeared to answer the need for career schooling for professional aviation warrant officers. To that extent the Aviation Warrant Officer Career Course (WOCAR) is performing its mission. In so doing it may have a tremendous impact on both the career aviation warrant officer and the entire Army.

The U. S. Army Aviation School at Ft. Rucker, AL, was the first to develop a career course for warrant officers. Its ability to meet the requirements of DA will determine the future of career courses for other warrant officer specialists.

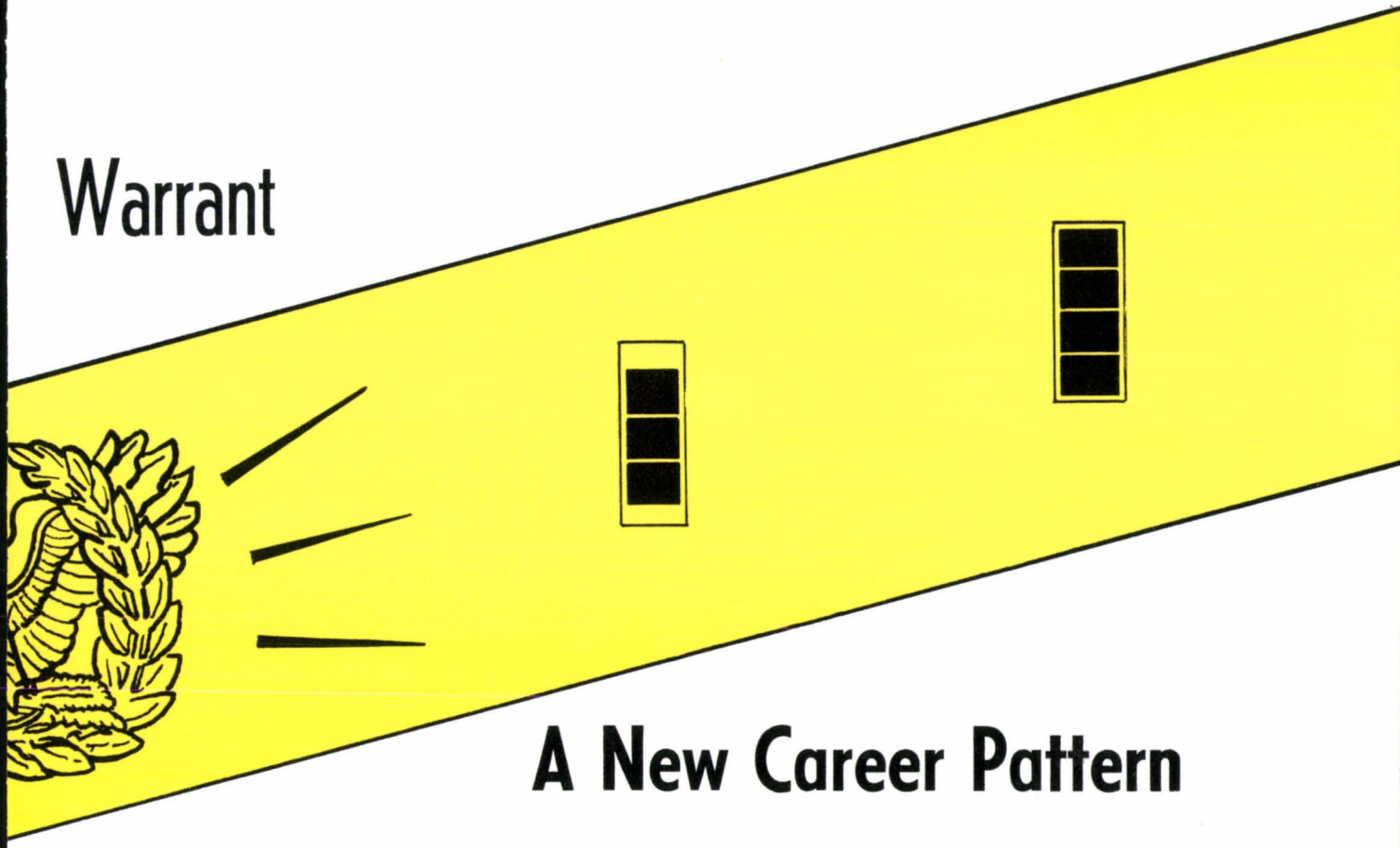
To understand the concept and impact of the Aviation Warrant Officer Career Course, we must look at the course itself. It is based on two levels of training:

- The first level, or the intermediate course, is designed primarily for the experienced CW2/CW3 with about 6 years' active service. It is designed to be the counterpart to a commissioned officer's career course.
- The second level, or the advanced course, designed for the senior CW3 or junior CW4, is

Continued on page 30

Views expressed in this article do not necessarily represent those of Department of the Army

Warrant



A New Career Pattern

Colonel Thomas E. Anderson
Chief, Aviation Warrant Officer Branch
Office, Personnel Directorate

The Solution

Today's aviation warrant officer is the backbone of Army aviation, but for the first decade of his existence he had no firm career pattern. The program, developed in 1966, lacked the establishment of a definitive career pattern. Recently the Department of the Army has approved a more meaningful aviation career development pattern which has visibility both to the individual aviator as well as personnel managers at all levels

TWENTY YEARS AGO, in the summer of 1952, the 1st Transportation Company (Helicopter)—later redesignated the 6th Transportation Company (Helicopter)—moved to Ft. Bragg, NC, from its birthplace in Ft. Sill, OK, to conduct unit training. This unit was unique because of two significant features: Not only was it the first cargo helicopter company in Army history but it also was the first unit with a TOE calling for aviation warrant officers to operate the helicopters. The Army's first aviation warrant officers had received their wings in December 1951 and joined the unit in January 1952. The "large" UH-19 helicopters were delivered in the fall of 1952. After an intensive training program the unit deployed to Korean combat in early 1953, and the aviation warrant officer received his baptism of fire.

Since that time nearly 22,500 warrant officers have worn Army aviator wings. Initially the warrant officer was limited to flying only cargo helicopters, but as the role of Army aviation expanded and the value of using warrant officers to fly and maintain all aircraft was recognized, the Army grew increasingly dependent upon the warrant officer aviator in a variety of roles.

Today the aviation warrant officer has become the backbone of Army aviation. He is the Army's professional aviator who can be employed in repetitive aviation assignments over the complete span of his career. Because his career field is dedicated solely to flying and aviation related assignments,

he acquires a depth of flying expertise far in excess to most commissioned aviators.

During the Republic of Vietnam buildup aviation warrant officer strengths increased from approximately 2,000 to nearly 13,000 in only 4 years. This buildup was keyed not only to the changing *role* of Army aviation but also was a reflection of the changing *structure* of the Army to accommodate the large number of aviation units which were becoming an integral part of the combat support structure. The aviation warrant officer with his long term cockpit utilization potential became the backbone of the aviator population. For the first decade of his existence no firm career patterns were developed. The Vietnam buildup, however, dictated a pressing requirement to provide a full career pattern for these individuals. The current career program for aviation warrant officers was developed in 1966 from an in-depth study of warrant officer career programs.

Before any career development patterns could be implemented, however, the expanding requirements for basic and advanced skills in Vietnam, the problems inherent in the requisition cycle versus training time to meet requirements and the desirability for equity among short tour assignments, all played a part in delaying the establishment of definitive career patterns. Hundreds of individuals were trained in advanced aviation skills based solely on their availability and with little regard to any meaningful development pattern.

Other factors also served to impede the establishment of a career pattern: The capability of local commands to conduct aircraft transition training; the lack of a clear policy within the Aviation Warrant Officer Branch itself for granting branch clearances for local unit training; an inability in many cases to identify previously trained assets; and the lack of a firm branch policy on utilization subsequent to graduate flight training. Many of these problems developed because of the growing pains associated with the Vietnam buildup.

The current aviation warrant career program, as outlined in DA Pamphlet 600-11, provides outdated and limited guidance to the new aviator entering an aviation career as to what patterns of development are available, what ancillary skills he can expect to acquire or what type utilization assignments are available to him. The pamphlet merely shows entry sources from either rotary wing or fixed wing or from the aircraft maintenance field and generalized utilization assignments.

Because of this lack of specific guidelines, up to now an aviation career pattern for most warrant officers has meant simply the acquisition of as many aircraft qualifications and ancillary skills as possible. Many warrant officers appear to feel that a successful career has been attained if an individual is qualified to fly every aircraft in the Army inventory as well as being

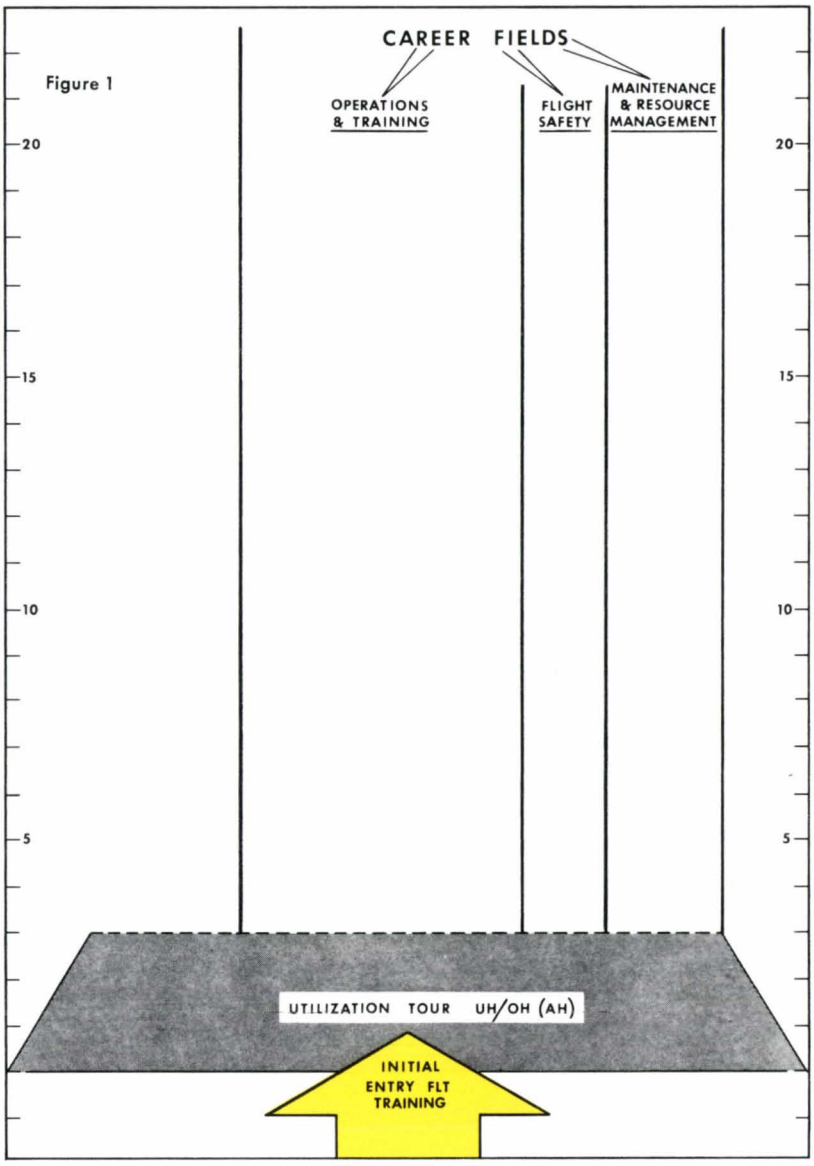


Figure 1

an aircraft maintenance officer, safety officer and an instrument flight examiner. It must be recognized, however, that as the size of the aviation warrant officer force decreases and tends to stabilize, the present career force will represent the great bulk of aviation warrant officer assets for the next several years. A large percentage of this force has already received graduate and transition training in excess of actual requirements. This situation, coupled with a severely reduced initial entry input into future flight training, will significantly reduce the necessity to conduct extensive graduate/transition training. In view of this it is imperative that the selection of individuals to receive additional training is made with even greater care. With these thoughts in mind four principle requirements face aviation personnel managers in the immediate future:

- The necessity to reduce training costs to the bare minimum.
- The need for maximum effective utilization of the current career force.
- The need to provide adequate service attractions to enhance the retention on active duty of currently trained aviation warrant officers.
- The establishment of a more meaningful aviation career development pattern which has visibility both to the individual and personnel managers at every level.

Paced by these requirements a revision to the current aviation warrant officer career pattern has recently been approved by the chief of personnel operations, Major General Sidney B. Berry, and by Lieutenant General W. T. Kerwin Jr., the Deputy Chief of Staff for Personnel, Department of the Army.

The first step in formulating a new pattern was to analyze the many and varied jobs now being filled by aviation warrant officers. It was found that aviation warrant officers are employed essentially in one of three major functional areas: operations and training; maintenance and resource management; and flight safety. All activities in which aviation warrant officers are used can be included in one of these three functional career fields.

Proportionately about 80 percent of the warrant officer requirements are in the operations and training field, 15 percent are in maintenance and resource management areas and 5 percent are involved with flight safety functions. Using the three functional career fields as a framework, career patterns within each were developed.

Figure 1 is a chart aligning the three functional fields into a vertical pattern showing at least a 20 year program of career development. The entry arrow at the base of the chart depicts the varying number of newly appointed warrant officers acquired each year into the force base. These new aviators will serve their initial utilization tour

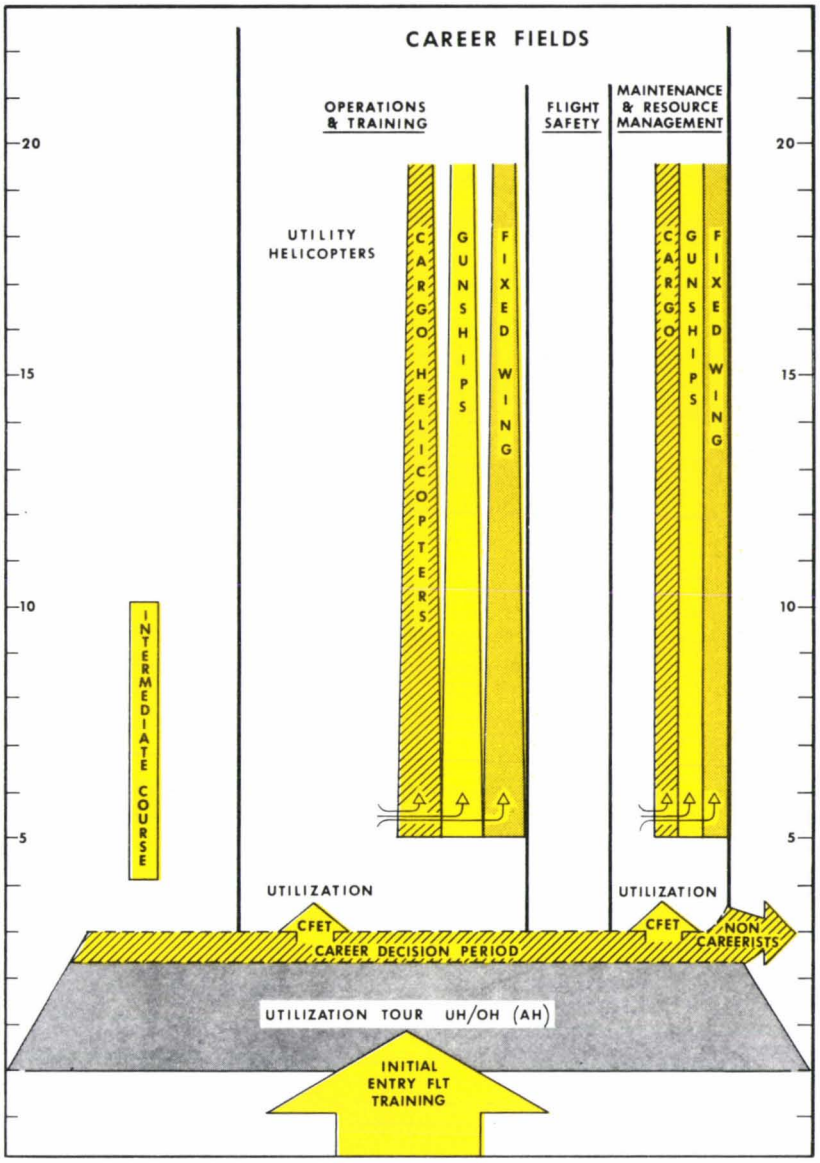


Figure 2

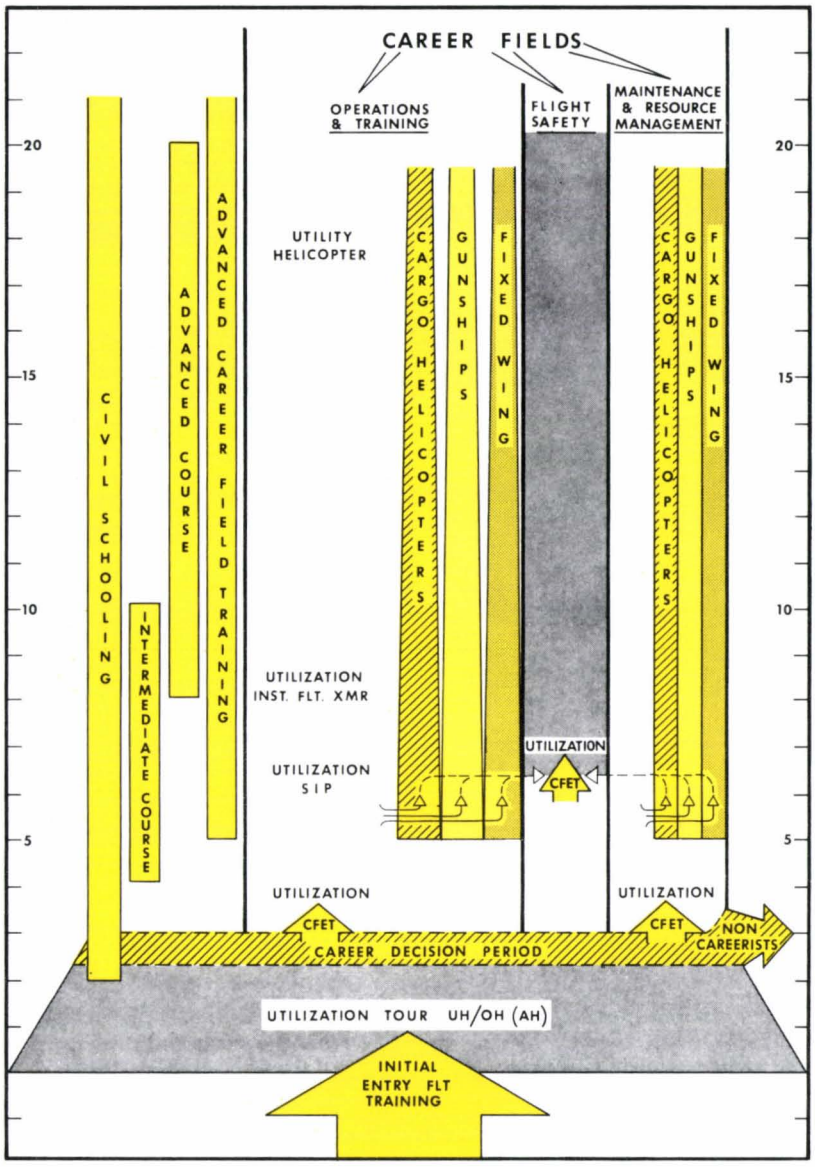


Figure 3

flying only the basic helicopter aircraft in the inventory . . . at present the UH or OH type aircraft. While some may be selected for basic gunship training, most will not receive any significant advanced training in either aircraft or skills. They should dedicate this initial utilization tour toward establishing not only a base of flying experience but also the attainment of a solid manner of performance record on which selection for further training can be based.

Toward the end of his initial utilization tour the young aviator arrives at a career decision point . . . to stay in or to leave active duty service. Once he makes this decision, he will then *choose* one of the three career fields in which he is most interested. His choice will be made known to the Aviation Warrant Officer Branch, Officer Personnel Directorate, Department of the Army, and subject to the numerical constraints of the career field itself, his past performance record and the needs of the service. He then will be tentatively programed into one of the three major career fields. The most promising individuals will then be *selected* by the Aviation Warrant Officer Branch for basic career field entry training (CFET) somewhere between the third and fourth year of warrant officer service.

The individual who chooses the operations and training field and is selected for further training can expect to receive his CFET as an instructor pilot (IP) in the UH or OH type helicopter. He then will serve a full utilization tour as an IP at the U. S. Army Aviation School, Ft. Rucker, AL, or in a helicopter unit.

Those who opt for, and are selected for, the maintenance and resource management career field will receive their CFET at the basic Aviation Maintenance Officers Course (AMOC), Ft. Eustis, VA, and will then serve a full utilization tour at the unit level in UH or OH type aircraft.

Because the number of aviators available for selection into CFET each year is considerably greater than the annual requirements of the various career fields, only those with the best manner of performance and future potential will be selected for additional training and entry into CFET. All others will be continuously evaluated through a career branch screening process and will be reconsidered at the appropriate time.

After the fourth year of warrant officer service all aviation warrant officers enter the zone of consideration for attendance at the Aviation Warrant Officer Intermediate Course. At about this same time they will be considered for training in an advanced aircraft system, either cargo helicopters, aerial fire support systems or fixed wing (figure 2).

Those selected for advanced training will again be offered a

choice of the category of advanced aircraft system in which they desire to be trained. This *choice* and *selection* feature is one of the keys to the program in that once an individual is trained in either cargo helicopters, gunships or fixed wing that is the aircraft system in which he will generally serve the remainder of his career. Those not selected or choosing to be trained in an advanced aircraft system will remain in their basic career field to progress into more advanced skill levels.

The percentages of aircraft system requirements in the maintenance and resource management field are roughly the same as in the operations and training (O&T) field, and the selection process for such training will be similar.

Looking at the flight safety field, years of experience reveal that the best qualified aviation safety officers have backgrounds in either the flight operations and training field or in the maintenance field. Thus, the primary selection route for entry into the flight safety career field will be from those who have acquired a thorough background in one of the other two fields. Note that the entry arrows for the flight safety CFET (figure 3) are shown past the point of advanced aircraft system training to ensure that only well qualified people are selected for entry into this critical field.

The Army's current emphasis on civil education for all personnel sets a minimum goal of an associate degree for warrant officers. Two programs, the Officer Undergraduate Degree Program and the Degree Completion Program, are available from the second year of warrant officer service. Civil education for qualified aviation warrant officers will be used in conjunction with advanced career field training in the development of individuals in each of the career patterns.

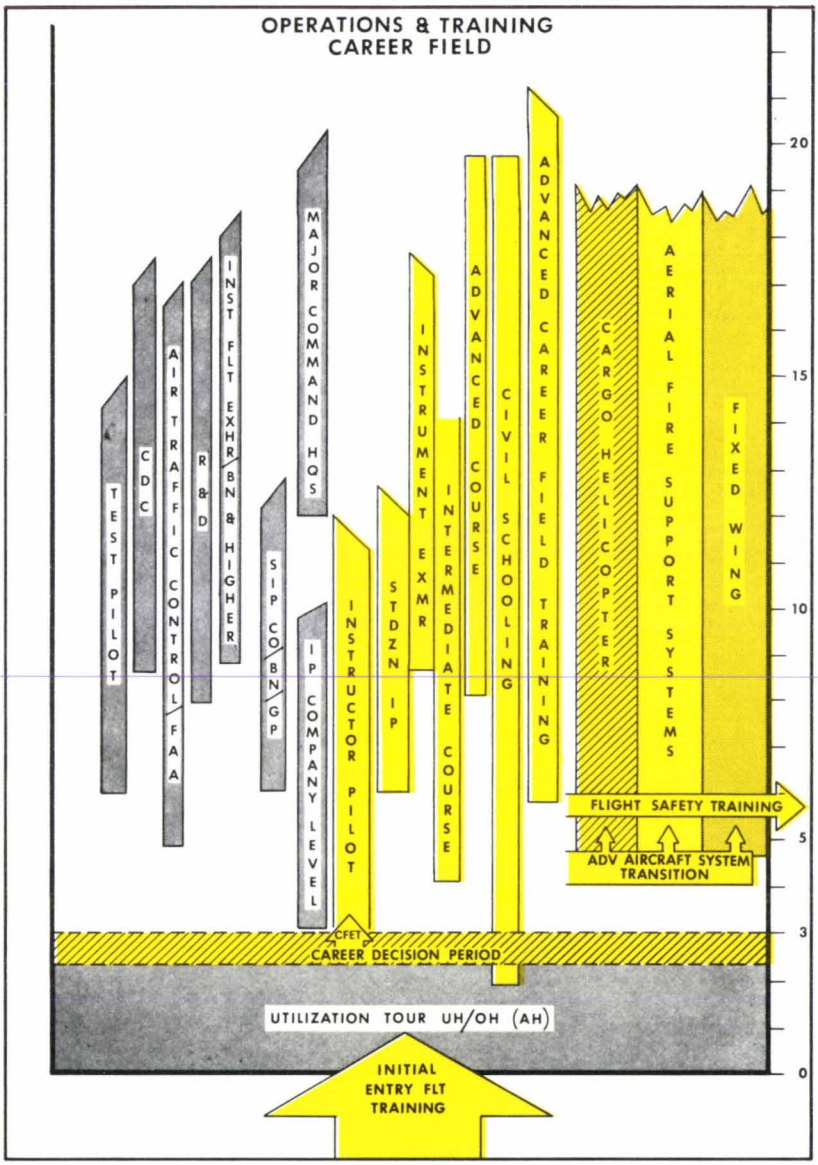
Additionally, individuals enter the zone of consideration for selection to attend the Aviation Warrant Officer Advanced Course after their eighth year, with attendance normally at about the twelfth year of warrant officer service.

Regardless of which career field an individual enters, the overall objective of the career development patterns is to ultimately provide the Army with a highly skilled, aviation *technician* who can provide maximum professional contributions during the latter portions of his career.

Inherent to progression into this period is a continual expansion of both utilization potential and level of responsibility. Exemplary performance and demonstrated potential during all phases of an individual's career, regardless of his specific career field, will qualify him for advanced career field training within his field. Those whose records indicate they should not be considered for additional graduate flight training will remain in the utilization sustaining base.

What this all adds up to is the

Figure 4



cold, hard fact that from an economic, operational and safety standpoint the Army can no longer continue to train aviation warrant officers to fly every aircraft in the inventory and be a generalist with a broad background of aviation skills.

Figure 4 outlines the key features of the operations and training field. As stated, those entering the field will receive their CFET as an IP in one or more of the several basic helicopters in the inventory. This training will be followed immediately with a utilization tour, either at the Aviation School or in a field aviation unit. Following this utilization tour several options are available to those whose records support further training. If the individual chooses to remain in the utility helicopter field he will be programed through a succession of advanced professional skills. This field is where the bulk requirement exists and also where in recent years there has been a notable absence of experienced, senior warrant officers, especially in Vietnam.

Following a utilization tour as an IP, a logical progression is standardization pilot training with subsequent assignment as an aviation company, battalion or group standardization instructor pilot (SIP).

With the experience gained during previous tours as a pilot, instructor pilot and standardization instructor pilot, this senior aviator will then be extremely well qualified to be trained and utilized as an instrument flight examiner as the next step in his skill development pattern.

Those individuals selected for advanced aircraft system training also will progress through basic pilot, IP, SIP and instrument examiner skills after transition training in the respective system. For example, within the cargo helicopter field an individual may be qualified in either CH-47 Chinooks

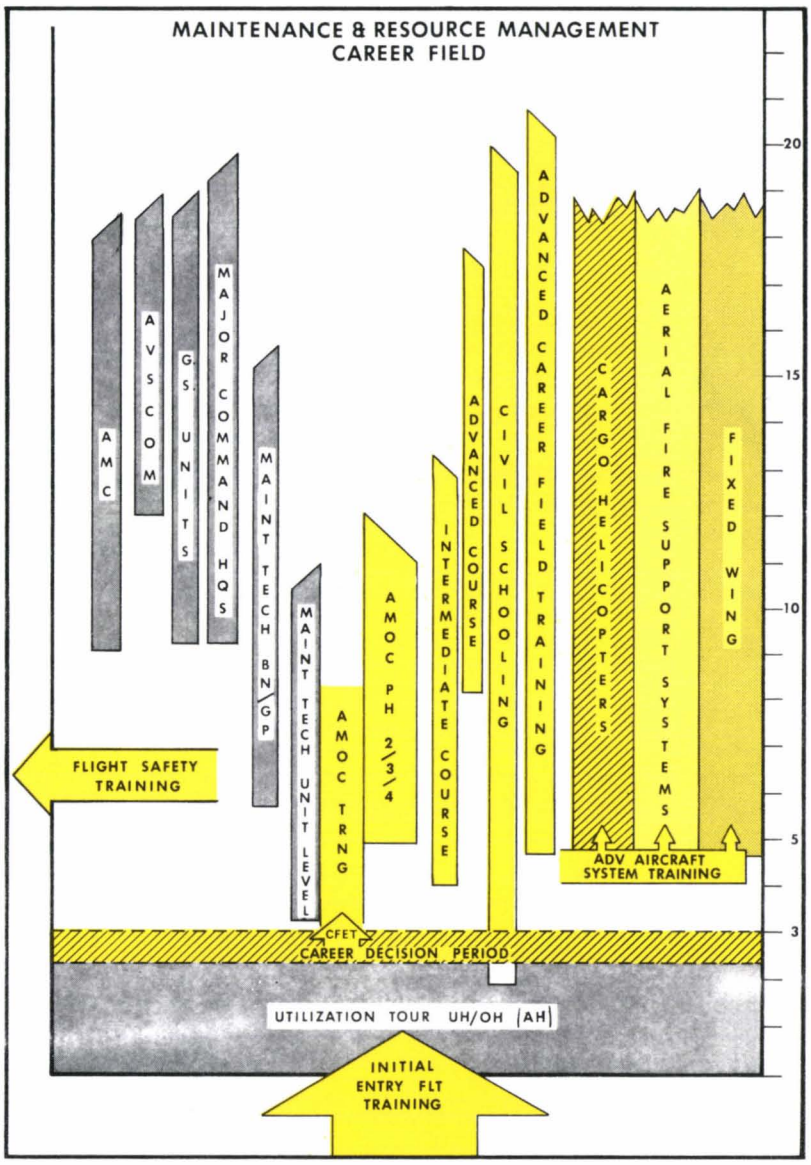


Figure 5

or CH-54 Flying Cranes (or some other follow-on aircraft) and continue his professional and technical development within that specific field. Those opting for the gunship field will likely be AH-1G HueyCobra and AH-56A Cheyenne type people for the bulk of their careers and will be the real experts in the use and development of tactics, concepts and doctrine in this area. Those entering the fixed wing field will ultimately be the only dual rated aviation warrant officers and will remain with OV-1 Mohawk or U-21 Ute type aircraft in repetitive assignments and acquire increased skills and technical proficiency through their career progression.

Within the operations and training field a variety of advanced career field training is available at appropriate levels. The Army test pilot program, air traffic control with assignment to Federal Aviation Administration positions, research and development, and combat developments are all inherent portions of the O&T field. Also, a

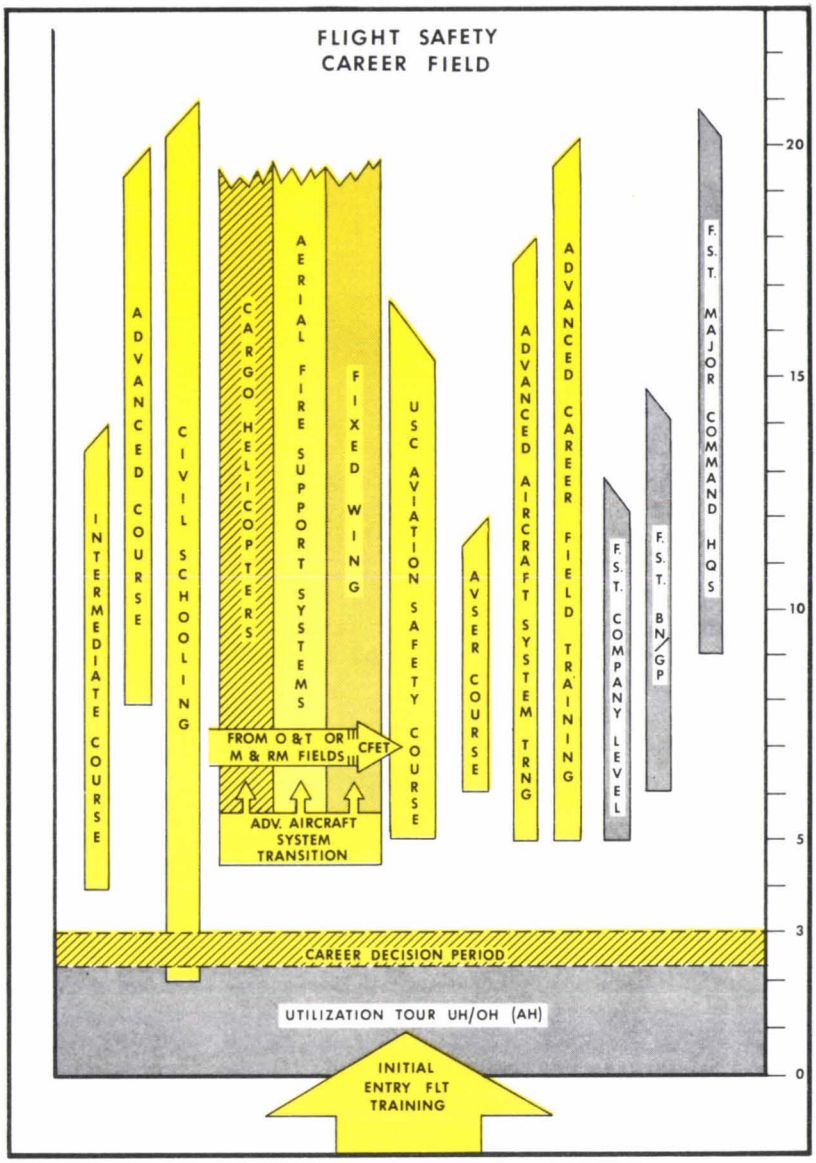


Figure 6

wide range of additional military training and civil schooling is available to further the professional potential of those in the field.

In the maintenance and resource management (M&RM) field, (figure 5) individuals will receive CFET at the basic AMOC course followed by a direct support utilization tour at the company or detachment level. Selection for advanced aircraft system training will be made using similar criteria as for those in the O&T field.

Advanced career field training (ACFT) in the maintenance and resource management field incorporates a multitude of training and utilization possibilities. For example, promising individuals will first attend the appropriate follow-on AMOC course oriented toward their specific aircraft system. In addition, training courses in aircraft armament maintenance, avionics maintenance, the logistics supply course and maintenance management are all available to qualified individuals during their early utilization years.

Following service at unit and direct support level, experienced maintenance technicians will have the opportunity to serve in depot and general support facilities. As an example, the U. S. Army Aviation Systems Command has identified requirements for over 20 procurement positions for aviation warrant officers. These positions require training courses in defense procurement management, defense contract administration, configuration management, defense contract law and a host of other related military and civil training.

In the flight safety field (figure 6) the majority of the flight safety technicians will be acquired from the O&T or M&RM fields and will attend the University of Southern California Aviation Safety Course as their CFET. This selection process will ensure that only the most technically qualified individuals will be offered training and assignments in the critical field of aviation safety. Regardless of entry source, however, the newly trained flight safety technician will serve a full utilization tour as an aviation company safety officer in the specific aircraft system in which he has been previously trained. The Aviation Crash Survival Course is one of several which may be offered to participants in the flight safety field as preparation for assuming more responsible duties at headquarters above the basic unit level.

One of the primary considerations which paced the development of the new career pattern was the recognition that the program must be flexible enough to accommodate both the previously acquired *skills* of our aviators as well as their future *aspirations* for a career in Army aviation. While it was recognized that many aviation warrant officers now in the career force have not been trained in accordance with this career pattern, the basic philosophy underlining the

Continued on page 29

Rotary Wing Instrument Flight Examiners:

Help Us Help You!

Graduate Instrument Division

Department of Graduate Flight Training

U. S. Army Aviation School, Ft. Rucker, AL

UNLESS YOU'VE been stationed on a subarctic glacier for the past few months, you know by now that the Department of the Army is going to require all of us to have at least a standard instrument rating no later than 31 December 1972. And since you have a keenly analytical mind (you're an aviator, aren't you?), you can perceive that this generates a requirement for more—and better—rotary wing instrument flight examiners. The word "better" is emphasized because you examiners are key figures in assuring that Army aviation gets what it needs: *better* examiners.

How? Read this excerpt from the Rotary Wing Instrument Flight Examiner Course (RWIFEC) prerequisites: *". . . (the RWIFEC student) must have a certificate of proficiency signed by an examiner. Prior to the issuance of the certificate of proficiency, the examiner will conduct an initial type instrument flight examination and an extensive oral examination . . ."* (DA Pamphlet 350-10).

Since we've quoted and italicized this gem of information, you can probably guess what the sales pitch is. To put it bluntly there are just too many aviators arriving at the U. S. Army Aviation School at Ft. Rucker, AL, who do not meet all prerequisites for the RWIFEC. Oh, there are the usual bugaboos of lack of total time or instrument time specified by 350-10. But, topping the charts is a discrepancy that's downright hard to believe: Many student flight examiners are not proficient enough to learn to be instrument examiners. They have the certificate but not the proficiency. Sorry 'bout that, examiners, but there doesn't seem to be any nicer way to say it. It's a little foolish to start an instrument rated pilot from scratch on basic instrument work ("Okay, Mr. Jones, this is an attitude gyro . . .") and, in

fact, more people flunk out of RWIFEC for lack of initial proficiency than for any other reason. And here's the clincher: Many certificates of proficiency given to would-be examiner students as their ticket to the course are just that—gifts. They have not been earned. (Some people don't even *have* a certificate when they get to Ft. Rucker, and that must be corrected.)

Sad, isn't it?

The point is this: RWIFEC is a course that cranks out super-pros, and if the student is to stand an even chance of completing it, he has to start out as a competent instrument pilot. We at the Aviation School want to help you in the field by training the best possible instrument examiners to add to your elite corps. But we need your help.

Knuckle down, buckle down and tighten up on these proficiency checks! No one is suggesting that you beat a man to death on a checkride, but you can sure as heck give him a few firm love-pats. Scrutinize his basic instrument work with a vengeance—full *and* partial panel. Make sure he can fly straight and level, do turns (level, climbing and descending) and recover from unusual attitudes. Use the old ± 100 feet and ± 10 knots as a standard. And watch his control touch; one major gripe from RWIFEC instructors is students who are control-jerky.

Work on navigation with your man, and make sure you give him at least one of each type instrument approach, depending on what kind of facilities you have available. (If you can't do them all, state what you couldn't do and why.)

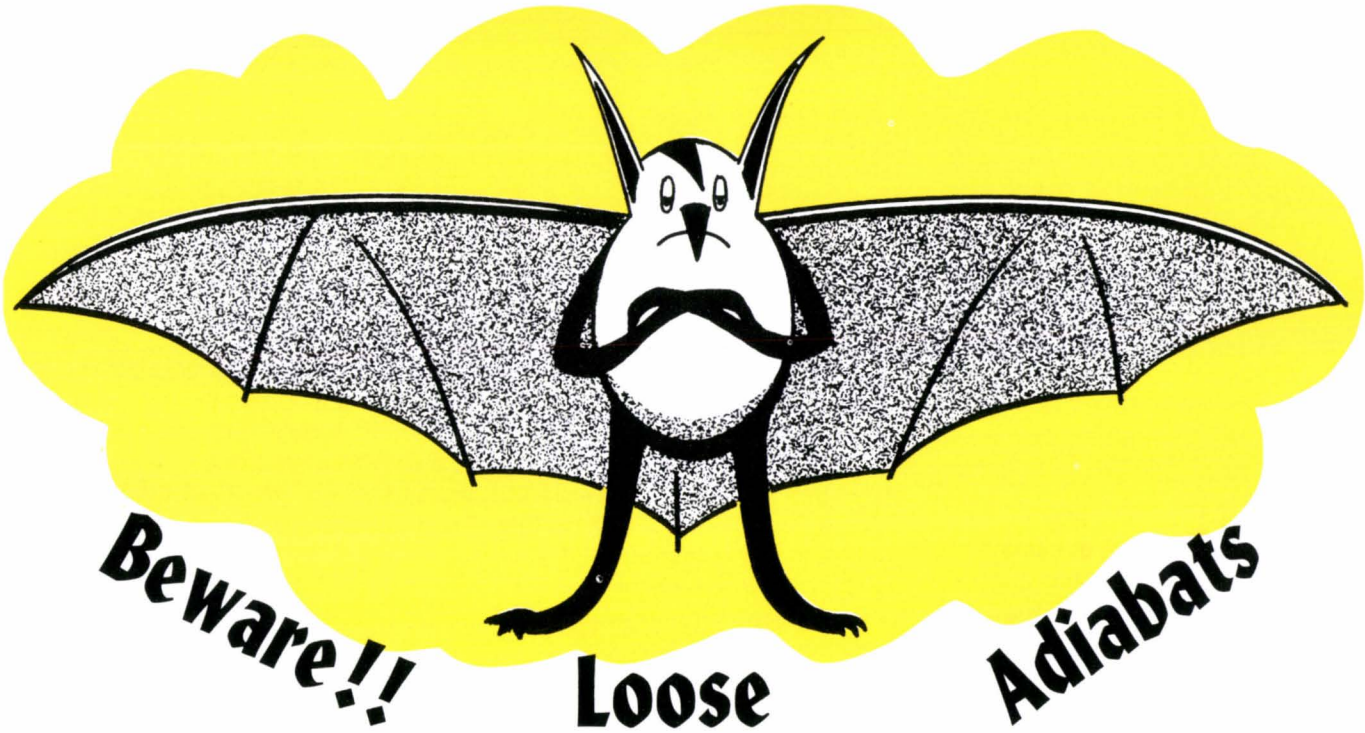
Make sure he knows FLIPs, AR 95-1 & 2 (Sections I & II) and FAR 91 inside-out. In fact, these should be the basis for your oral examinations. Lack of knowledge on this material has been another cause of clenched teeth among RWIFEC instructors, and there's really no good excuse for an instrument pilot not knowing them anyway. Agreed?

There's no intent to insult you examiners by rehashing all this basic information. You know and we know, and we know you know, and all that. But the fact remains that there have been far too many prospective flight examiner students who were unable to hack it because they didn't have the minimum level of proficiency to begin with. Before you affix your signature and your reputation to a certificate of proficiency, *make sure the man is proficient.* That's a simple enough requirement, and one you've probably been observing all along. But the nonproficient people are coming from somewhere, so if the shoe fits . . . well, you know.

We're even offering a checklist for you to use as a guide when conducting proficiency checks. The boys in blue who instruct in Ft. Rucker's Rotary Wing Instrument Flight Examiner Course swear by it, so you can bet it's a tried-and-true checklist. If your man is up to snuff on all 15 items, you can issue his certificate of proficiency without any qualms . . . *and* you'll help us to help you.

The following is a checklist of items that should be evaluated on a certificate of proficiency ride:

1. Knowledge
2. Flight planning
3. Equipment check
4. Instrument takeoff
5. Flight fundamentals
6. Servo failure
7. Autorotations
8. Unusual attitude recovery
9. Lost communications procedures
10. Holding
11. Radio voice communication
12. Air traffic control
13. Enroute navigation
14. Four different types of approaches including:
    - Tuning radio
    - Orientation
    - Track interception
    - Track following
    - Radio fix identification
    - Approach
    - Missed approach
15. Control touch



Some of these little monsters are brown, others are green . . . some friendly but most aren't. Many are frisky and unruly; how they howl and jump! And yet others are sedate. They can be killers though, when they congregate and get rambunctious

William B. Wells, Department of the Army Civilian

"AN 'ADIABAT,'" said one aviator "is something we were taught to circumnavigate"; and another, "It's the little gremlins in the atmosphere that are sometimes friendly and sometimes unfriendly." Whether they are friendly, unfriendly or regardless of the necessity of circumnavigation, they usually spell trouble.

Adiabats are occasionally hard to locate. Some are dry and brown as a Georgia cornstalk in August, while others are wet and green as April leaves after a rain. The dry, brown ones will often turn wet and green as fast as a chameleon changes color as he scurries from the brown leaves that have fallen to the ground to the green leaves of an overhanging bush. It's the wet, green ones that are mean and dangerous.

While the ground is cold these little adiabats lie close to the ground and create no flight problems; however, when the ground is heated they begin to jump and howl. This is when all aviators should beware and interpret the weather reports like TWRG CU ALQDS, T+RW+A+ or LTG-CCCG ALQDS. This is when we start circumnavigating all these loose adiabats that are jumping up from the ground and rising several thousand feet before stopping.

Many of these small adiabats are capable of rising at the rate of 6,000 feet per minute and the tired ones will sink at a more moderate rate of 3,000 feet per minute.

Why are some adiabats tired and friendly while others are frisky and unfriendly? The answer is easy when we understand a few basic facts concerning the atmosphere.

When the ground is cold the air at the surface is cooled by contact. This results in the air becoming heavier or more dense and thus it remains on the surface. When this condition exists the adiabats, green or brown, remain on the ground in a state of hibernation. As the earth turns and the inclination of the sun becomes greater, the surface temperature increases and the air near the surface is heated by contact. As the air becomes warmer or less dense it begins to rise and awakens the sleeping adiabats.

If this rising air remains dry the adiabats will cool 3 degrees centigrade per 1,000 feet. While the rising air remains warmer than the air it is passing through, the conditions will be clear and turbulent with gusty surface winds. As the air continues to rise and cool it might become saturated. At this point the

mean, green adiabats take control and, being meaner, will cool only 1.5 degrees centigrade per 1,000 feet. This reduced rate of cooling is the result of two processes working simultaneously. First, the air cools by expansion, and then condensation adds heat energy to the rising parcel of air or wet adiabats. Now that the rising adiabats are cooling slower, they will become warmer than the air they are rising through and they really begin to jump because they can continue to rise without any outside help. As these freely rising adiabats continue to rise, they will push the cloud top upward to 30, 40 or 60 thousand feet. Some of these little green adiabats become so excited they will rise at the rate of 60 feet per second and are capable of twisting the tail of a U-1A, popping the rivets from an OV-1 or tightly wrapping the wings around the fuselage of the U-8.

How then can these ripsnorting, wet, green adiabats be located? Easily enough, they all congregate in those vertical clouds called cumulus and cumulo-nimbus.

In the beginning the wet adiabats are not too troublesome. The cloud is relatively small with no precipitation and all the frisky, wet adiabats are freely rising. After a period of time the cloud top is pushed to a more dangerous altitude and the large water droplets begin to fall. As the rain falls the exhausted adiabats hitch a ride on the droplets back to the surface. While some adiabats are rising others are sinking at a fairly rapid rate, therefore, this doesn't provide an area in which the aviator can maintain easy control of the aircraft.

When billions of adiabats assemble for a reunion we begin to see TWRG CU ALQDS, RWU, LTGCCCG, RW+ and A+ in the teletype reports. As the descending adiabats reach the surface and spread out we find SQUALLS and GUSTY SURFACE WINDS.

The towering cumulus in all quadrants, rainshowers or gusty surface winds are not the only problems created by all these loose adiabats. Many of the falling raindrops are lifted above the freezing level by the rising adiabats and freeze into ice pellets. Again these (now pellets) begin to fall, they accumulate a new coating of water, are lifted again and refrozen. This process, repeated several times, can produce a hailstone weighing as much as 2 pounds. Another problem created by loose adiabats that occurs just prior to the maximum rainfall is lightning. For a 10,000 foot stroke of lightning these busy, wet adiabats have to generate at least 20 to 30 million volts with a current that may vary from 60,000 to 100,000 amperes. Other problems such as restricted visibilities, inaccurate readings from pressure instruments, icing conditions and loss of communications may also exist.

As the rainshowers gradually spread throughout the cloud, all the adiabats begin a return to the surface. This is the beginning of the dissipating stage and a characteristic feature of this cell is the familiar anvil on top of the cumulonimbus cloud.

Whether the wet adiabats are rising or sinking, the cloud they develop spells trouble. They produce an area that all aviators should avoid. How then can all these wet and dry adiabats be kept in hibernation? If we could accomplish this, it would certainly simplify flight conditions; however, this would be a tremendous job. For example, the thunderstorm project that originated in 1945 found that at least 1,800 thunderstorms occur over the earth's surface every minute and during every second there are at least 100 flashes of lightning. The lightning alone represents a continuous transfer of energy equalling 268,000,000 horsepower. A tropical hurricane, during a 10 day period, will expend enough energy to supply the entire U. S. with all its electrical needs for the next million years.

One pilot flying at 26,000 feet in a thunderstorm reported, "Radio static kept building in intensity until it was so severe that I couldn't keep the earphones close to my ears. I heard what sounded like the sharp burst of a German 88 mm. A sheet of flame simultaneously enveloped the entire cockpit. My air speed indicator jumped from 190 to 500 and stayed there. Everything looked a bit fuzzy. The air was so turbulent and the instruments jumped around so much that I couldn't tell for a moment what was going on. I just let the airplane buck through. After what seemed like hours the air speed came back to normal." (Film records showed that the air speed indicator maintained an erroneous 500 mph reading for approximately 30 seconds.)

With these facts in mind it's unlikely that any attempt to eradicate all the frisky, wet adiabats will be successful. So let's fly with the problem and follow the recommended flight procedures. Avoid, if possible, those areas where the wet adiabats are assembled. If you can't do a 180 degree turn and you must fly through, the recommended altitude is 4,000 to 6,000 feet above the surface over level terrain.

There are no "soft" thunderstorms. One pilot reported, "The jolt was so severe that I thought I had collided with another plane. I was unable to keep my hands on the controls; they banged around so much."

The problem can be solved in only one way. We have to admit that these wet, green adiabats, even though very small, are dangerous. They look for trouble; they'll split your airplane in pieces and then go looking for another.

Enlisted Aviation MOS Tests

Captain Robert Dorgan

WITH TROOP STRENGTH declining in today's Army, such things as pro-pay promotions, the best assignments and even reenlistment eligibility will be the reward of the man best qualified to do the job.

If you have been in the Army more than 30 days, you already know that how well you do your military occupational specialty (MOS) "thing" determines whether you fit into that "best qualified" bunch and how quickly you advance in your career field. The key to your future among the best or (we prefer) "Above The Best" is the enlisted evaluation system (EES).

As you old pros know, the elements of the EES are the enlisted efficiency reports (EERs), MOS evaluation tests and evaluation data reports (EDRs). For up-to-the-minute changes in format and usage and interpretation of EERs and EDRs, we refer you to the appropriate regulations, Army Personnel Letters and TIPS, the Army personnel magazine. In this article, however, we want to tell you about innovations that may be expected from the U. S. Army Aviation School (USAAVNS), Ft. Rucker, AL, to the EES: the evaluation tests for aviation related MOS codes. To ensure that the MOS tests for aviation MOSs accurately reflect and identify the best qualified men in the field, several innovations will be implemented in the USAAVNS MOS test program.

There are very few aviation personnel who have not been at installations where publications were way out of date. If you are like the average guy in this respect, you will appreciate the first of our innovations: One-Stop Study References. The objective of this instrument is the same as the EES Evaluation Test Study Guide—to prepare you for your annual MOS test—but it will be more usable. The One-Stop Study Reference will be a special text that will contain all the information required on your job and on the MOS test. So, it will be both an aid in preparing for the test and a tool on the job.

For aviation related MOS codes these publications will initially be printed, stocked and distributed by USAAVNS. Distribution will be accomplished in a manner similar to the method used in distribution of the EES Study Guide. About 4 months before the test administration month for an MOS, these texts will be sent directly to each installation test control officer (TCO) who requests EES materials. He will then distribute the texts to the individuals to be tested in that MOS.

The entire One-Stop Study Reference will be reprinted about every 2 years. Changes to the basic text will be published and distributed annually in a time frame suitable for distribution to the field 4 months prior to test administration.

The first One-Stop Study Reference (for the 71P20 MOS code) should be in the field next January.

Selection of the 71P series MOS for the first One-Stop Study Reference and the ranking of the sequence of development listed below was based on the population densities of all aviation MOS codes.

Sequence of Development of USAAVNS' One-Stop MOS Study References

71P20,40,50	Flight Operations Specialist
67B20,30,40	O-1/U-6 Airplane Repairman
67V20,30,40	OH-6/OH-58 Helicopter Repairman
93H20,40	ATC Tower Operator
67M20,30,40	OH-13/OH-23 Helicepter Repairman
93J20,40	ATC GCA Operator
93D20,40	Flight Simulator Specialist
93K20,40	ATC Approach Control/Enroute Specialist
93L50	ATC Chief

Refreshing changes are near for aviation enlisted men... new One-Stop Study References—a single study guide, current, handy, useful, prior to MOS tests... completely new tests to more accurately measure essential functional skills ... career grouping by career management fields to enable the soldier to see where he is and where he's going

Since the worldwide density of a particular MOS varies from year to year, the actual order of development of each study reference may vary as the program progresses. We expect, however, that the first edition of One-Stop Study References for all MOS codes produced by USAAVNS will be in the field by approximately mid-1975.

To the man in the field another new thing in MOS testing will be less obvious than the new study guide. In order to more accurately align the MOS test with what you actually perform on your job, aviation MOS tests will be developed "from scratch" by a systematic approach similar to the method used in systems engineering of school training. The specifics of applying these procedures are important only to the USAAVNS MOS test-writing people. But for you, the job holder, the significance is that your MOS test will more accurately measure essential functional skills.

The last two "coming attractions" we want to tell you about deal with innovations in the enlisted MOS structure itself. The first of these is in the initial stages of implementation. The other innovative idea is just that—an idea; it is in the "think" stage, as high up as OPO.

The one anticipated innovation of the enlisted MOS classification system which has progressed beyond the think stage is the planned regrouping of all Army skills into new career groups: career management fields (CMFs). These new fields are primarily a regrouping of MOS listings in AR 611-201. No MOSs are added, deleted or revised. All 470 MOS descriptions remain the same. But, instead of grouping the jobs by aptitudes and skills necessary to do them, they're grouped into organizationally related work areas.

Why? Basically to make "people-management" work better in the Army. And for the individual soldier, CMFs show his career pattern and tell him how to climb the ladder, no matter what his current MOS.

DA Pamphlet 611-7 spells out the specifics of this program; and as that directive states in its introduction, "Career Groups in the current MOS structure and Career Management Fields will exist concurrently until 1 July 1972."

A study is being conducted at the Department of the Army which is actively considering the worth of the CMF grouping concept. It is expected that this study will extend the date for this concurrent existence and determine by late 1972 the feasibility of merging the CMFs with the basic MOS structure. Indications are that the people making this study feel that the CMF approach is feasible. So you can probably expect to see a complete rehash of AR 611-201 and a renumbering of the MOS system in line with the new groupings. However, publication and distribution will probably be about a 2 year job; so it will be some time before you see it in the field. For a more comprehensive explanation of what CMFs mean, see "New Fields to Conquer," TIPS, Fall 1970.

The second expected innovation within the MOS structure itself—the one in the think stage—is a planned movement to reduce the frequency of MOS proliferation. It is really an evolutionary development of the CMF structure we described above.

Under the CMF structure formulated in DA Pamphlet 611-7, the jobs grouped into one CMF would retain their identity as MOSs. In order to reduce overspecialization of MOS codes, the proposed plan would identify all jobs within the CMF by the same MOS code number; specific jobs within the CMF would be identified by additional skill identifiers (ASIs). For example, in order to enhance the enlisted man's mobility within the air traffic control (ATC) career group, all ATC related MOS codes would be consolidated into one CMF (let's call it ATC coordinator) with specific jobs identified by ASIs (say, for example, flight operations specialist, tower specialist, etc.).

As today's Army gears itself toward the modern volunteer Army, there is a rapidly growing need for meaningful data which can readily be used to identify the best qualified soldiers. The EES is a major contributor to this effort and to many other aspects of enlisted personnel management.

Those at USAAVNS who prepare evaluation tests for aviation MOS codes want to ensure that the tests do, in fact, contribute to the EES and to the qualitative management of enlisted personnel by helping to identify the best qualified people in the field.

Aeromedic

Provided by the Society of U. S. Army Flight Surgeons

Major Robert R. McMeekin

Captain Clifford C. Hudson

While this article is directed at the flight surgeon's participation in aircraft accident investigation, it should be of interest to all individuals whose potential duty may include membership on an aircraft accident investigation board. The president of the board and all its members should facilitate the flight surgeon's participation in aircraft and accident pathologic investigation by ensuring that his interests are secured at the accident site pending his arrival. Photographic support is essential and care must be taken to schedule board meetings around the flight surgeon's requirement to consult and participate with the pathologist at the autopsy examinations. Only in this way can the full potential of an aircraft accident investigation be realized.

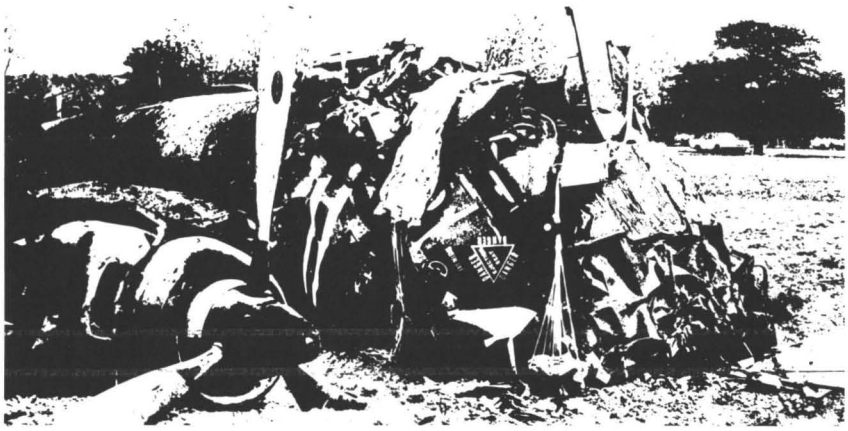
The Flight Surgeon's "MEDICAL TEAM" In Aircraft Accident Investigation

The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of the Army or the Department of Defense

THE SOLE PURPOSE of aircraft accident investigation is to prevent future accidents (AR 95-5, paragraph 6-2). An aviation accident board must gather as much information as possible from an aviation accident in order to reach valid conclusions regarding the cause of the accident. Based on their findings, members of the accident board make suggestions for changes in equipment or procedures that may prevent a similar accident or increase survivability from such an accident in the future. In order that their recommendations may be pertinent, it is mandatory that their information be as complete and thorough as possible. No possible source of relevant information can be ignored or an important clue to the entire disaster may be missed. This can lead to completely erroneous conclusions by the board.

The flight surgeon, as a member of the accident investigation board, is charged with analyzing the hu-

The Flight Surgeon's "MEDICAL TEAM"



man component in the man-machine-environment complex. In the investigation of a fatal accident, this can be a most difficult undertaking. Fortunately, he has a valuable ally in the pathologist. Unfortunately, the capabilities of the pathologist often are not employed to the best advantage. This occurs most often because the flight surgeon is unaware of the areas in which the pathologist can be of assistance and, consequently, how to make optimal use of his services.

The pathologist is the flight surgeon's consultant in a fatal aircraft accident. Just as a physician must supply an internist or surgeon with as many particulars of a patient's case as possible in order for him to offer the best advice in patient management, the flight surgeon must supply the pathologist with sufficient information to enable him to reach valid conclusions. As an aside, it should be mentioned that a hospital pathologist who is accustomed to performing autopsies on patients who met a less violent end is often not too enthusiastic when first confronted with a badly mutilated, dirty and perhaps burned body of which the cause of death should be apparent to anyone: injuries, multiple, extreme. The enthusiasm and interest of the flight surgeon on the case is often essential to arouse the necessary investigative spirit within the pathologist. In addition, affording the pathologist a better idea of the reason for the autopsy beforehand as well as the type of information being sought will ensure a more meaningful investigation.

The pathologist must perform a unique type of autopsy representing an amalgamation of the routine hospital autopsy, the forensic autopsy and pure detective work. In addition to the usual goal of a person performing an autopsy, i.e., determination of the cause and manner of death, the pathologist must conduct a meticulous search for evidence that could explain the cause of the aircraft accident. He attempts to relate injury patterns with the configuration of the duty station of each crew member and thus to determine the possible cause for each injury and, if possible, to correlate them with various factors in aircraft and equipment design. Finally, he attempts to achieve an accurate analysis of the sequence of events surrounding the accident from the pathologic evidence.

What information must the pathologist possess to accomplish these aims? Of course, all information regarding the general health and physical status of the casualty is important, so that clues to possible sudden incapacitating illness may be pursued. In addition, a detailed description of the circumstances of the accident and the actual crash scene are vital, augmented whenever possible with photographs that show the relationship of the body to the wreckage. Diagrams of the cockpit or duty area of the casualty indicating dimensions and prominent design features are mandatory to illustrate possible objects responsible for certain injuries. Ideally the flight surgeon should accompany the pathologist to the scene of the accident, then examine an intact aircraft of the same type with him, then assist with the autopsy. Unfortunately, the ideal is often not possible, especially under combat conditions. In such situations pictures and diagrams assume much greater significance, along with a detailed description of the exact circumstances encountered during the preliminary investigation by the flight surgeon, preferably delivered in person before the autopsy. At the very least a detailed conversation with the pathologist via telephone is required to augment the written report, pictures and diagrams. The point must be stressed that the standard information on the "Aircraft Accident Autopsy Report" (DD Form 1322) was never meant to be a definitive source of information to the pathologist, nor was this form intended to be the complete autopsy report.

A specific example of the type of information that the pathologist, thus consulted, might be able to supply the flight surgeon would be the determination of whether burns were incurred before or after death; that is, whether the victim died as a result of impact or of the postcrash fire. The presence of carbonaceous particles in the airway and an elevated carbon monoxide level in the blood would help to determine this. Or was the pilot incapacitated before impact by organic disease, toxic fumes or

drugs, or G forces? Histopathologic and toxicologic studies may answer these questions. Patterns of skeletal injury may indicate who was flying the aircraft at the time of impact and what control forces he was exerting. Also, the pathologist can relate "mysterious" patterns of injury to pecularities of cockpit design or restraint systems.

The investigating flight surgeon, armed with the information supplied by the pathologist, can provide important information to the accident board that may lead to an overall understanding of the cause of the accident. With the definite evidence that specific injuries were caused by certain design characteristics, he may be able to point out significant safety hazards resulting from weaknesses or misconceptions in basic design and thus help implement changes that would significantly reduce morbidity and mortality in future accidents.

The investigating flight surgeon and the pathologist who is performing an aviation accident autopsy have a valuable consultation service that not only is available for their use but also *should* be used in all fatal accidents. This is the Joint Committee on Aviation Pathology (JCAP). Its official agency, the Aerospace Pathology Branch of the Armed Forces Institute of Pathology (AFIP), maintains a team of experts consisting of aviation pathologists, forensic pathologists, flight surgeons, physiologists, dentists and toxicologists with completely equipped laboratories whose chief function is to evaluate aircraft accident fatalities in depth. They maintain a large repository of information collected from both military and civilian aviation accidents throughout the world. Because of this they are in an excellent position to see the broad picture of aviation accidents and can detect similarities between isolated occurrences. Occasionally causative factors of accidents are recognized in this way that are not readily apparent from the study of the isolated case.

Consultation with this team of experts is readily available via telephone if information is needed quickly (AUTOVON 346-3232 or commercial 202-723-1388). Physicians are encouraged to utilize this service whenever they feel it may be of assistance. Ideally the pathologist and the flight surgeon investigator should call the Aerospace Pathology Branch as early as possible in an investigation, notify its staff of the accident and discuss with them whatever particulars of the accident they may have. The consultants may be able to give the investigators some excellent pointers on how to proceed that will greatly enhance their investigation, thus making their task easier and increasing the amount of information obtained. If nothing else is achieved it will help dispel the feeling of being "totally on one's own" with a difficult job.

As outlined in AR 95-5, chapter 12-4, representative gross autopsy materials on all fatal accidents are to be forwarded to the Director, Armed Forces Institute of Pathology, Washington, D. C. 20305, within 96 hours. The original and two copies of the DD Form 1322 should accompany the specimens. Specific instructions on how to prepare and ship the specimens may be found in the regulation. To expedite consultations and toxicologic determinations and to be in accordance with directives in the regulations, this material and all inquiries should be directed to the AFIP, bypassing the area laboratories.

Another service is available to aid the aviation accident board and help implement its recommendations. This is the U. S. Army Agency for Aviation Safety (USAAAVS, previously USABAAR) at Ft. Rucker, AL. This agency consists of a team of highly qualified experts in all areas of aviation operations and hardware (airframes, engines, instruments, restraints, etc.) who are concerned with every aspect of flight safety. They review all Army aviation accidents and incidents and exchange information with the other services pertinent to aircraft common to their inventories. The Life Sciences Division is particularly concerned with the crew member's interaction with the aircraft and its various components. USAAAVS can furnish a wealth of technical information to the board, as well as valuable suggestions to enhance the investigation of the accident. Further, this agency can help "grease the skids" on achieving consideration and implementation of needed changes in aircraft design or operating procedures when these are thought to be significant factors affecting aviation safety. Direct telephonic communication from the field is encouraged (AUTOVON 558-4806).

In summary, the flight surgeon in the field who is charged with investigating a fatal aircraft accident is supported by a number of highly specialized and proficient consultative persons and services. Their job is to assist him in obtaining the most information possible from an accident so that he may make the most valid and meaningful analysis of the accident and, therefore, pertinent recommendations. He should consider it his obligation to understand the capabilities of these services and to utilize them optimally. Not every investigation can be expected to yield significant medical findings, but he must be ever alert to their possible existence in even the most "clear cut" and obvious case because of their importance to aviation safety. Aircraft safety and accident prevention is one of the most solemn obligations the flight surgeon has to his men.

Charlie and Danny's Write-In

Dear Charlie: My question concerns the autofeathering procedures as listed in TM 55-1510-204-10/5, C7.

I cannot find any references in the dash 10 or CL where this feature is turned on and used, but in the before takeoff check we check the autofeather system to see if it is operational. To save time and space why not delete this check until such time the autofeather system can be used again in the OV-1D.

CPT O.W.H.

Charlie's answer: On the surface this sounds like a good suggestion, CPT H., however, in the near future the autofeather system will be used to assist the pilot if he happens to lose an engine during takeoff (takeoff continued). A DA Form 2028 has been submitted to the U. S. Army Aviation Systems Command, and has been approved, to use the autofeather system under certain circumstances. The requirement to make an operational check of the autofeather system is still valid.

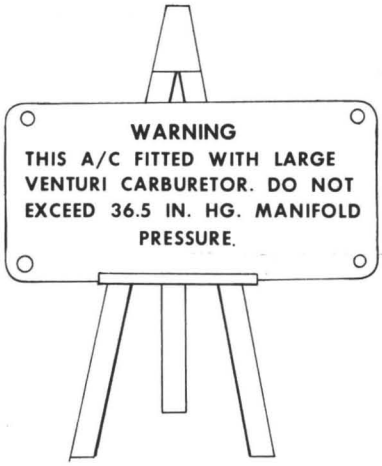
Dear Charlie: A note inside the cover sheet of TM 55-1510-203 CL (U-6A Pilot's Checklist) refers to small and large venturi carburetors. Also the TM for the engine indicates one carburetor by FSN.

My question is, How does the crew determine what type of carburetor is installed on a particular aircraft?

B.A.G.

Charlie's answer: The pilot of a U-6 can determine the type of carburetor installed on any particular engine by looking for a placard on the instrument panel as noted in TM 55-1510-203-10, paragraph 7-7.

Instructions for installing the placard can be found in paragraph 5-14, TM 55-2810-224-24, dated 29 Oct 70 as follows: "When installing a carburetor of the A17809 (large venturi) series be sure to install placard part number 1560-L-20-188 which is inclosed in the carburetor shipping container. The placard should be located in the upper left corner of the instrument panel.



"If a carburetor of the A30258 (small venturi) series is installed the placard is no longer required and should be removed."

After determining the type of carburetor installed one would then refer to page 7-3 in the dash 10 for manifold pressure limitations for takeoff.

The number A17809 is a Federal stock number, however, A30258 is the only number listed in TM 55-2810-224-34P.

Dear Danny: After using the OH-23 dash 10 and checklist hundreds of times I have found something that I have continuously overlooked. On page 3-5 of TM 55-1520-206-10, paragraph 3-19, it indicates that the master switch should be off for APU starts.

Danny, it will not start that way. Could you elaborate?

R.L.S. Jr.

Danny's answer: Sure thing, Eagle Eye. Since we do not utilize an APU very often when starting the OH-23 overlooking the master switch was very easy. Get your TM 55-1520-206-10 out and follow me if you like. On page 2-26 we find the following under paragraph 2-66:

"When moved to the OFF position, the switch cuts off all power to the electrical systems by opening the battery relay and interrupting the generator reverse-current relay circuit."

Now, looking at figure 2-17 on page 2-24, we can see that with the master switch in the OFF position, the starter won't work. Also, on page 2-26, paragraph 2-67, the NOTE reads:

"The MASTER SWITCH must be in the ON position whenever external power is in use."

So, that's the story. If the master switch is in the OFF position the power from the APU is stopped short of all electrical systems. Thanks for looking closer. Your DA Form 2028 has been concurred with and a future change to TM 55-1520-206-10, page 3-5, paragraph 3-19, will read *MASTER SWITCH-ON.

VIEWS FROM READERS

Continued from page 1

that he will reassess his ideas and view more closely the aviation program as a whole.

We in aviation realize that our very reason for being is the support of the ground commander, and we desire to do so to the best of our ability. We welcome constructive criticism and our commanders will normally take action on suggestions of merit. Army aviation heartily intends to provide the best support available anywhere in the world. Let us all become the epitome of professionalism.

CW2 Charles D. Hunt
Aviation Detachment
Berlin Brigade
APO New York 09742

Sir:

The story of Army aviation in the Republic of Vietnam has been vividly documented by the largest composite force of aviation assets ever assembled since the days of the Army Air Forces in the 1940s. It is an account of the 1st Aviation Brigade's "Golden Hawks" which marked its sixth anniversary of service on 25 May 1972 in ceremonies at its headquarters at Long Binh.

From its inception on that date in 1966, the brigade grew as the challenges of a war having ill-defined boundaries increased. At its apex in 1970 the brigade claimed a force of 23,000 men and 2,000 aircraft, larger than most Army divisions. In the skies from the Mekong Delta to the DMZ, from Cambodia northward to Laos, the 1st Aviation Brigade has provided tactical support for all Free World forces engaged in the conflict.

Although the brigade itself is but 6 years old, its origins date back to 1961 when the 8th and 57th Transportation Companies arrived in Vietnam with their CH-21 "flying banana" helicopters. Later redesignated the 117th and 120th Assault Helicopter Companies, respectively, they were incorporated into the brigade at its formation and are the oldest Golden Hawk units.

In the short span of a half dozen years the 1st Aviation Brigade has compiled some very impressive statistics. Its aircraft crews have flown over 17 million sorties, carried more than 37 million men into battle and logged nearly 8 million hours of flight time—enough hours to keep one pilot flying continuously for over 900 years. The brigade has twice received the Vietnamese Cross of Gallantry with Palm, and in 1967 was named aviation unit of the year by the Army Aviation Association of America. This year it will receive the Meritorious Unit Citation for a second time.

But the achievements of the Golden Hawks extend beyond the landing zones, pickup zones and area of operations of everyday military operations . . . when torrential rains flooded large sections of Malaysia in January 1971 1st Aviation Brigade units were dispatched to that disaster-stricken nation with food and medical supplies for more than 100,000 homeless persons. Flying hundreds of sorties, Golden Hawk helicopter crews delivered 153 tons of supplies and transported countless numbers of flood victims to relief stations.

The 1st Aviation Brigade now is making significant contributions to the training and equipping of the Vietnamese Air Force. Several Golden Hawk units have turned over their entire aircraft assets to the VNAF in conjunction with the improvement and modernization phase of overall Vietnamization. Each transfer has followed periods of intense on-the-job training of VNAF flight and maintenance crews by highly qualified brigade personnel.

Also of note is the increased emphasis of brigade units throughout Vietnam upon civic actions programs. In their concern for the welfare of the Vietnamese people, teams of doctors provide regular medical and dental care to the local civilian population.

Within the framework of war the 1st Aviation Brigade has again and again proved worthy of its motto "Nguy Hiem" which means "danger" to all foes. In anticipation of peace, Golden Hawks have contributed to the rebuilding of a nation and have earned the respect and admiration of the people they have helped.

Information Officer
1st Aviation Brigade

INSTRUMENT CORNER

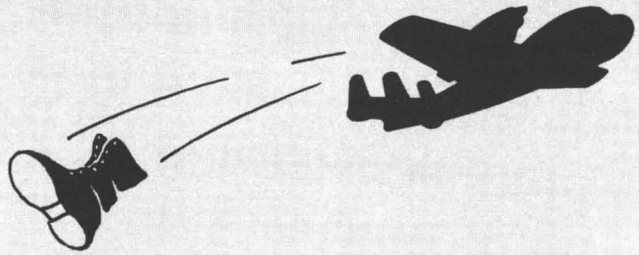
Q. If a pilot receives a "CRUISE" clearance to a destination airport and experiences lost communications while enroute, may he commence his approach upon arrival even though he arrives prior to his last ETA given ATC or flight plan ETA?

A. Yes. Cruise—a word used in an ATC clearance to indicate to a pilot that climb to and descent from the assigned altitude may be made at his discretion. Further, it is approval for the pilot to proceed to and make an approach at destination airport and can be used in conjunction with: (a) An airport clearance limit at locations within an approved/prescribed instrument approach procedure. The FARs require that if an instrument letdown to an airport is necessary the pilot shall make the letdown in accordance with an approved/prescribed instrument approach procedure for that airport; or (b) An airport clearance limit at locations that are within/below/outside controlled airspace and without an approved/prescribed instrument approach procedure. Such a clearance is NOT AUTHORIZATION for the pilot to descend under IFR conditions below applicable MEA/MOCA nor does it imply that ATC is exercising control over aircraft in uncontrolled airspace; however, it provides a means for the aircraft to proceed to destination airport, descend and land in accordance with applicable FARs governing VFR flight operations. Also this provides search and rescue protection until such time as the IFR flight plan is closed.

Reference: TM 11-2557-29, change 5, page 8, dated 1 Apr 71.

Maintenance

WITH DEICING BOOTS



Lost An OV-1 Deicer Boot Lately? Check the OV-1 deicing boot ejector periodically to make sure air is coming from the ejector pump discharge and not the boot dump valve. Failure of the boot dump valve to seat will result in a loss of vacuum to hold the boots snug to the wing. This could result in a loss of boots in flight. TM 55-1510-204-20, chapter 11, page 103. Also see paragraph 11-138, page 11-100A of change 3 to this dash 20 for the operational check of the pneumatic deicing system.

Hot T-42 Tip: Beechcraft TM 55-1510-208-10, page 1-13, gives the procedure for raising the cabin temperature when the outside air temperature (OAT) is very low. Prolonged operation in this manner could cause the ducstat points to stick closed because of the reduced air flow and the longer period of time the ducstat points remain closed. If this happens the heater discharge plenum temperature will reach 300 degrees F. and the overheat thermostat will short circuit to ground causing the safety fuse to flow and render the heater inoperative. Therefore, use extreme caution if you use this procedure. If you notice the temperature in the cabin starting to rise for no apparent reason, immediately shut off the heater and open the cabin air or "T" handle full open (pushed in) to get cooling air into the heater. If the heater is rendered inoperative, close the cabin air source by pulling out the "T" handle completely and closing the stale air exhaust.

Sluggish U-6A Prop? Occasional sluggish propeller operation on the U-6A Beaver has been caused by the use of high temperature grease on the propeller counterweight bearings. Counterweights on the U-6A should be lubricated in accordance with chapter 2, section II of TM 55-1510-203-20. Figure 2-2 in this section clearly indicates the type of grease to be used.

UH-1 Bleed Airdriven Fuel Boost Pump: The bleed airdriven fuel boost pump used in the left forward cell of UH-1D/H helicopters serial number prior to 69-15292 has a failure mode that under certain conditions could induce engine fuel starvation. If the carbon bearing becomes excessively worn, bleed air might be driven past the seal and induce cavitation in the engine-driven fuel pumps. This would only happen if the right fuel boost pump (electric) was also failing to produce pressure.

As a precaution against this problem the following practices should be observed on all UH-1s equipped with a bleed airdriven fuel boost pump:

- Do not take off with bleed air applied to a failed or failing (chatter or pressure erratic) bleed airdriven pump.
- Do not take off with a failed right (electric) fuel boost pump.
- Do not turn off the right (electric) fuel boost pump in flight, especially if any malfunction of the bleed airdriven pump is known or suspected.

If a bleed airdriven pump fails in

Matters...

flight, land as soon as practical and have the pump replaced. Flight can continue to the nearest maintenance facility or refueling point but should not be prolonged beyond. Reference: Safety of Flight Priority Message 2016302 Jan 72.

Hydraulic Fluid Servicing Tips: Do not overfill any reservoir or spill fluid in surrounding areas. If fluid is spilled, absorb it with clean rags.

When filling reservoirs, extreme care should be taken to ensure that no dirt or foreign matter enters the system.

Refer to applicable aircraft maintenance manual for additional servicing and maintenance instructions. Use only specified hydraulic fluid. Reference: TM 55-1500-204-25/1, paragraph 1-61.

Torquing Of Self-Locking Nuts: Did you know that self-locking nuts contain an internal friction element? The torque of this friction, called tare torque, must be measured on the torque wrench as the nut is being turned but before the nut touches the washer. The properly tightened torque is the sum of the standard torque plus the tare torque. Check TM 55-1500-204-25/1, paragraph 6-352-K, General Aircraft Maintenance Manual, dated April 1970, with changes 1, 2 and 3.

Bleed Band Adjustment (Closing Rate): When making bleed band closure adjustments rotate the adjustment screw a maximum of one-half turn, either clockwise for closure at a higher rpm or counterclockwise for closure at lower rpm. One-eighth turn equals approximately 2 percent of N_1 speed. The TM 55-2840-229-24/1 C1 states one-eighth turn equals 1 percent of N_1 speed. This is incorrect.

Dash 13 Writeups: Did you know that you may carry uncorrected faults forward from day to day on your DA Form 2408-13? But, you are required to accompany this entry with a valid requisition number from the unit tech supply. These entries may also be transcribed to the DA Form 2408-14. This entry also requires a valid requisition number plus a signature of the person authorizing the transcribing. Reference: TM 38-750, page 4-21, paragraph Y-1-A.

T-42 PILOTS

The Department of Maintenance Training, Ft. Rucker, AL, has recently completed a set of programed texts covering all T-42 ground school maintenance subjects (6). Any unit desiring such texts should write to:

COMMANDANT
U. S. ARMY AVIATION SCHOOL
ATTN: ATSAV-NRI
FT. RUCKER, AL 36360

Please include number of sets needed.

FERRY

CW3 G. J. Barton

HOW DID WE feel about a "once in a career" flight to Turkey? We were indeed excited and impressed, but apprehensive. The apprehension came from realizing the largest body of water ever crossed by either of us was Possum Kingdom Lake. Now we would be flying one of two brand new T-42s across hundreds of miles of open ocean. The other T-42 was to be flown by Captain John Tykowski and WO1 Robert Wimpy.

Many questions had to be answered and much interservice coordination arranged, for the 2nd Aircraft Delivery Group (USAF), Langley AFB, VA, was to handle the flight routing, navigational briefings and flight following.

The first question was, How do we get to Ankara? Were we to use the southern route—South America across to Africa? Or were we to use the northern route—Labrador to Lajes in the Azores? Or finally the Arctic—Greenland to Iceland, then to England? The answer to this was provided by the 2nd Aircraft Delivery Group. We were to start our trip from Langley and proceed as follows: Loring AFB, Maine; Goose Bay AFB, Labrador; Sondre Strom Fjord, Greenland; Keflavik NAS, Iceland; Lossiemouth, Scotland; Weisbaden AFB, Germany; Naples, Italy; and finally Ankara, Turkey.

Several other questions also needed to be answered. For example, how were the aircraft equipped for an extended overwater flight to include fuel range, radio gear, survival equipment, etc.? Most of the answers were provided by the Beech Aircraft Corporation. The aircraft had internal auxiliary fuel cells with 120-gallon capacities. This provided a 10-hour plus fuel endurance. Radio equipment on each aircraft consisted of dual VHF navigation receivers, dual VHF communication radios, 64-code transponder, ADF receiver and a 10-channel preset high frequency (HF) radio. At that time all looked well with the exception of survival equipment. All major questions were answered and any further information or guidance required would come from the 2nd Aircraft Delivery Group in Virginia.

Armed with the knowledge provided by Beech Aircraft and the 2nd Aircraft Delivery Group, we kissed the little woman, threw the white scarf over the shoulder and proceeded to Wichita, KS, to pick up our aircraft from Beech.

FLIGHT

CW2 P. R. Lefebvre

At Wichita we received a thorough briefing on the internal auxiliary fuel system. In addition, we were informed of an overgross condition of 700 pounds. When fully serviced the aircraft center of gravity was on the aft limits. A test flight/currency ride followed and then we were off to Langley AFB and a briefing for the next two legs to Loring AFB and Goose Bay AFB. We picked up our survival gear, overwater and arctic equipment, then attended the briefing. We were informed that our 10-channel preset HF radio would not net with the flight following facilities to be used.

A search of the supply system with the help of the U. S. Army Aviation Systems Command (AVSCOM) at St. Louis, MO, indicated the earliest we could possibly receive any new crystals would be 3 weeks. However, we were fortunate enough to locate a company that would provide us with the proper crystals in 2 days and arrangements were made to purchase them.

The men of the 2nd Aircraft Delivery Group at Langley were very helpful in helping to clear up other problems and getting us on our way. However, they gave us a feeling that we wouldn't make it to Turkey. Everywhere we went they would shake their heads and say, "A two engine airplane on a four engine ocean!"

The trip to Loring AFB was uneventful because we were still in the States and VOR navigation was excellent. Weather kept us in Maine an extra day, then we went on to Goose Bay AFB. This flight was routine except for the fact while at the minimum enroute altitude (MEA) we were not in radio contact with anyone nor could we pick up the navigational facilities. Back to pilotage. While enroute we were VFR under the cloud deck and we saw some of the most beautiful countryside either of us had ever encountered. We flew over a mountainous area that hosted thousands of lakes with no visible habitation. The one single most impressive thing was the visibility. The only restriction was our own eyesight.

At Goose Bay we were met by a 2nd Aircraft Delivery Group representative. The next morning we received our briefing on the next two legs of our flight. These would take us across the North Atlantic to Sondre Strom Fjord, Greenland, and then on to Keflavik, Ice-

FERRY FLIGHT

land. The flight to Sondre Strom Fjord would require 5 hours with 600 miles of our trip over water—*very cold water,* for this was iceberg country. We were more apprehensive about the successful completion of our mission than at any other time. Things looked even worse when we were informed our high frequency radios could not be fixed to net with the North Atlantic flight following service, however, we *might* be able to pick up New York Airways on its secondary frequency.

During our briefing at Goose Bay we were told we could pick up Kook Island radio beacon at Char. (Char is an oceanic reporting point approximately 100 miles off the coast of Labrador.) The straight line distance between Char and Kook Island is 500 miles. We were somewhat concerned about the navigational portion of the briefing at Goose Bay; after all, who ever heard of picking up an NDB at that distance?

Once again we were ready for liftoff. The weather was forecast to be clear at our altitude. Our alternate Frobisher Bay, Baffin Island, was forecast clear, so we took off. About 45 minutes prior to Char, you guessed it—we went IFR. We arrived at Char on time and turned toward our next checkpoint. At Char we tuned in Kook Island beacon not really believing we would pick it up. Much to our surprise Kook Island came in loud and clear at a range of 500 miles.

We were then assured of making it: our ADF was tuned, our clock was in working order and our mag compass full of fluid. But then our internal auxiliary fuel system started to leak inside the cockpit. Shortly after finding the leak our high frequency started to smoke and it burned up. With the fuel fumes we weren't about to try the radio again because we thought the lack of air circulation caused the high frequency to overheat. We had radio contact with the other aircraft so all was well.

About 200 miles out of Char the layers started to break up and we would break out only to see buildups in front of us. But there was no turning back now. We secured all the loose gear and readied the aircraft for turbulence penetration. All this was in vain for the clouds were as smooth as glass—not a bump.

We continued our flight, reporting our position to our friends in the other aircraft via VHF and they relayed our position to New York Airways. We broke out of the clouds about 100 to 200 miles off the coast of Greenland and we could see the island.

Visibility was so clear we took a visual wingtip bearing and this further assured our position. We also were very interested in the icebergs we saw floating below; they looked quite large even though we were cruising at 11,000 feet. They reminded us of the 1 hour and 30 minute survival period should we be forced down in the water.

Suddenly we got an urgent call from the other aircraft that it lost both engines, was still AI and was going in. There was a USAF Duckbutt on strip alert at Goose Bay but its flight time to our position would have exceeded the survivability time.

We tried unsuccessfully to establish some sort of radio contact. After about 3 minutes they called to tell us they got both engines back and were continuing with the

Preparing for the flight

The airport at Sondre Strom Fjord

flight. By this time we were beyond the point of no return. It was quite a scare and unexplainable. A check of the internal auxiliary fuel system to see if the fuel had been turned off revealed it hadn't. When it was switched back on it worked fine.

The rest of the flight was uneventful except for the approach and landing at Sondre Strom Fjord which was unusual in several ways. VFR minimums at Sondre Strom Fjord are 4000-3, due to the fact that the terrain around the airfield elevation is 165 feet with peaks from 2,000 to 8,000 feet surrounding it on two sides. The icecap which is 2,000 to 9,000 feet was on the third side.

The view of the surrounding area from the airfield is spectacular. You can stand on the parking ramp, look to the east and see the icecap of the world; a fjord to the west with a water temperature of 32 degrees; and looking in all directions see nothing but treeless, barren rock cliffs. For you fishermen the fjord at Sondre Strom Fjord is a fisherman's paradise where a 10-pound Arctic char is a baby and is thrown back.

The next day it was off to Keflavik NAS, Iceland . . . mostly a routine flight. While flying over the icecap our single engine zero climb altitude was 1,000 feet below ground level—and that would be some heavy flying if we lost an engine.

We had to cross 300 miles of solid ice with only two very small radar sites where humans could be found; one was in our flight path and the other was 100 miles to the south. After takeoff we climbed to 13,000 feet and proceeded to Iceland. On climbout the heater became inoperative. At 13,000 feet the outside air temperature (OAT) was minus 16 degrees F.—and for a 5-hour flight that is *cold!*

Two events remain outstanding in our minds. First, the visibility—you could actually see the curvature of the earth with no obstructions and no haze. Just fantastic! The second was an optical illusion that one encounters when dealing strictly with one color; depth perception is nil. We saw nothing but pure white. Even though we at times were 4,000 feet above the icecap, it would appear that we were contour flying.

We arrived at Big Gun ADF on the eastern coast of Greenland and proceeded on course. Thirty minutes out of Iceland we encountered a strange icing condition. We entered a light fleecy cloud and exited less than 5 seconds later and the whole airplane was covered with clear ice . . . not just the leading edges but the whole airplane, every square inch.

Our descent was uneventful but the landing was of great concern in both our minds. Flying at 13,000 feet with an OAT of minus 16 degrees F. and no heater for almost 5 hours, your feet become ineffective except for them being a shoetree. Luckily the wind was down the runway and a crosswind landing was not necessary at Keflavik.

Due to bad weather in England our takeoff for Lossiemouth, Scotland, was delayed 6 days. On climbout we again noted fuel fumes

in the cockpit, only this time it was worse . . . almost nauseating . . . so we returned to the airfield. Our companions were 30 minutes ahead of us and elected to continue.

We waited 2 more days in Iceland and conferred with the Beech Aircraft Corporation and AVSCOM about our problem. There was no explanation.

During our 8-day stay we had a chance to really see Iceland. The name "Iceland" implies a wasteland, barren and ice-coated, but we found the island extremely green and beautiful. The people are friendly and—believe it or not—the average temperature at Keflavik is higher than Chicago's.

When the weather improved we took off. All went well until we were halfway to Scotland. We had a dual instantaneous engine failure, no cough, no sputter, no fuel pressure drop—just immediate silence.

Knowing all the serious problems we were having with the internal auxiliary system, the only thing we could think of was to get off that system. We hit the boost pumps and switched to the aircraft's main tanks. Both engines started without a problem, although I can't say the same for my heart . . . and that poor seat cushion was never seen again. The rest of the flight was good IFR time and a GCA was made into Lossiemouth to 100 feet scattered, 200 feet overcast and 1 mile visibility conditions.

The Scottish countryside is a beautiful place. The rolling hills were covered with foliage as if made of velvet, and imaginary leprechauns were popping up from behind every rock, tree and underpass. It was truly a paradise.

The next day began as usual with a weather briefing and it was forecast, according to the Royal British Navy, as a "cup of tea" along our routing to Weisbaden. All went as briefed until we were halfway across the English Channel. Instead of the stable status and fair conditions forecast, we ran into a line of heavy thunderstorms. We were told to turn eastward for a vector through the line. We did and were vectored into a fairly large cell which gave us several bad moments. The rest of the flight to Weisbaden was a series of dodging thunderstorms that weren't supposed to be there. Our arrival at Weisbaden surprised the 2nd Aircraft Delivery Group representatives for they couldn't believe we took off with such bad enroute weather.

Because of the serious problems encountered with the internal auxiliary fuel tanks, we had the system defueled and scheduled additional fuel stops in Pisa, Italy, and Athens, Greece. We received our final flight briefing at Weisbaden for the trip into Turkey and the additional diplomatic clearances needed for our extra stops.

The flight to Naples was routine and impressive since neither of us had ever seen the Alps. Roughly we followed the eastern French border to St. Tropez, then to Corsica and finally into Pisa. Throughout our flight in France we were never out of sight of an airfield. While on approach to Pisa there was quite a bit of neck stretching to see the leaning tower, however, the duties of landing the aircraft came first. The job of refueling was accomplished with hand signals because neither us nor the Italians could speak the other's language. This language barrier presented an additional problem in reading back our IFR clearance.

When all of this was behind us, we departed for Naples only to arrive there with thoughts that Mt. Vesuvius had erupted; the visibility was terrible! After an exciting night in "Old Napoli" we caught a cab for the airfield and unexpectedly experienced 45 minutes of bumper-to-bumper cars at 60 miles an hour. Goodby to Naples!

Our flight path followed the coast of Italy southward to the toe of the boot then across to Athens. The major portion of this leg was routine until the sky filled with thunderstorms. After our experience over Amsterdam we decided to go VFR underneath. The last 100 miles from Araxas to Athens was low level along the water to our destination. Ah—beautiful Athens . . . it left us a little older, wiser and poorer when we departed for Ankara, our final leg.

All things went well until we arrived at the Turkish coast at Izmir; we went IFR and at the same time the whole world stopped talking to us. The next words spoken to us were from Ankara approach control. After a successful approach and landing we were met by a representative from the Joint U. S. Military Mission for Aid to Turkey plus a swarm of Turkish customs officials. We landed at Esenboga Airport and the final flight was to the Turkish Army Flight Training Center.

Well, that's the end of our story. We left R21054 in the hands of the Turkish government. In all we spent 49 hours and 50 minutes in the air from Kansas to Turkey. We met some fine people and saw some beautiful countrysides. Our last look at that proud bird was over our shoulders; she indeed was beautiful, but her appearance was somewhat marred by the fact that we spent many uncomfortable hours getting her to Turkey. Still, the trip home was nice as we sat back and relaxed on a 747 while someone else worried about getting us across all that water.

A New Career Pattern

Continued from page 9

career pattern requirements can be summarized as follows:

First, all newly rated aviators will serve an initial utilization tour in UH or OH type aircraft units only. This utilization tour coincides with the 3 year term of obligated service after graduation from flight training during which time the Army must insist that the new aviator acquire a good background in flying prior to investing additional training costs in an unknown career asset.

Second, career field entry training will be provided only to those who are in a confirmed career status and have exhibited an outstanding manner of performance and potential for continued service. All others will remain in competition for later selection into their chosen career field.

Third, graduate flight training will be conducted only to meet clearly identified requirements. An already trained asset will be assigned to fill a vacancy before sending another individual to training.

Fourth, a full utilization tour will follow all graduate flight training.

Fifth, selection for advanced career field training will be on a competitive basis, with selections made by the assignment and professional development sections of the Aviation Warrant Officer Branch.

The advantages in this approach to career planning are characterized by several key features. First, the management approach is similar to those of the Navy and Air Force. Both of these services have long recognized the better effectiveness derived from keeping aviators in the same aircraft system for extended utilization periods following training. Second, the program provides visibility to a definitive pattern which can be used by the individual, his supervisors in the chain of command and by personnel managers at all levels—all of whom have an impact on the career development of an individual aviator. Third, this approach to career planning will provide a readily available pool of highly qualified aviators within each aircraft system to accommodate new aircraft systems as they are phased into the inventory. Lastly, this method of stabilizing aviators not only into functional career fields but also into specific aircraft systems is in consonance with recent changes to Combat Developments Command (CDC) branch proponency for concept, doctrine and tactics. In general terms, utility helicopter proponency rests with the Infantry CDC Agency; heavy cargo helicopters with the Transportation Agency; and attack helicopters with the Armor CDC Agency. The advantages accruing from long term, repetitive utilization of warrant officers in a specific aircraft system complements the experience base of his commissioned counterpart who provides the command, management and supervisory leadership in the similar system.

In summary, the revision to career development planning for aviation warrant officers is recognition of the requirement to provide a definitive pattern of logical progression through a complete 20-to-30 year aviation career. It recognizes the economic realities of increasingly close Congressional scrutiny of the defense budget and provides a system of building skill on skill with a firm provision for utilization of these skills following training. Above all, it allows the individual a choice in selecting his career field. However, only those with the best demonstrated manner of performance and potential for future service will progress to the highest levels of responsibility within the aviation warrant officer structure. The program is now being actively implemented by the Aviation Warrant Officer Career Branch. Necessary revisions to DA Pamphlet 600-11 have been submitted and will be published in the near future.

Twenty years of Army aviation history have firmly established the role of the aviation warrant officer in the Army structure. The future will see his role continue to increase. He will fill a broad spectrum of aviation functions which cannot be served by the commissioned aviator whose career patterns are directed toward development as leaders and executive managers. Warrant officers will be trained, within the career patterns described above, to fill every technical and professional aviation position other than command and executive staff positions.

The future of the aviation warrant officer in the Army of the 1970s shows even greater promise than during the two decades of Army aviation growth in the 1950s and 1960s.

Where To From Here?

Continued from page 2

intended to be the counterpart in training to the Command and General Staff College.

These have been the theoretical goals of WOCAR. Two or more years of subject revision and systems engineering may be required to produce two separate courses that would qualify as either a "Warrant Career Course" or a "Warrant Command and General Staff College."

To reach this stage the Army is resolving the critical question: What is an aviation warrant officer and how does he differ from an aviation commissioned officer?

Before the Aviation Warrant Officer Career Course can meet the needs of the warrant officer, the Aviation School and the Army must know what is to be expected from a WOCAR graduate. In short, what should the finished product be trained to do? Prior to determining this, one must first define a warrant officer. Several definitions have been suggested, ranging from a specialized technician to an officer capable of filling any commissioned officer's job short of combat command and courts-martial functions.

Historically and traditionally the warrant officer has been a highly specialized technician. But, since World War II the Army has been in the throes of a technological revolution. For example, advances in lasers, atomic weapons, microminiaturization, computers, missiles, jet turbine powered hover craft, rotary and fixed wing aircraft have made hundreds of warrant and commissioned officers highly specialized technicians not only in materiel but also in related fields of theory and application.

In aviation and aviation related areas, training for junior warrant and commissioned officers is being equalized to keep pace with these accelerating advancements. With such an overlap in specialization and supervisory skills, particularly in the field of aviation, it is no longer safe to assume that the warrant officer maintains a technical expertise separate from the commissioned officer. Furthermore, it would be an error to assume that the commissioned officer's role is traditionally in leadership and staff positions and not connected with the technological specialties of a modern Army—particularly in light of the Army's objective of ultimately having all commissioned officers possess bachelor degrees. This objective in itself is a trend toward specializing the officer corps before the candidate is even offered his commission.

As a result it becomes difficult to determine the role of a warant officer. Warrant officer functions that overlap the commissioned areas and commissioned functions that overlap the warrant areas, particularly at aviation company grade levels, are creating a situation whereby the difference between the warrant and commissioned officer is becoming indefinable. Complicating this situation is the trend of the Aviation Warrant Officer Career Course toward training technical specialists for positions of a more general nature. In the course emphasis is placed on tactics, leadership, management and assistant staff duties rather than technical proficiency. With this trend toward staff and management, it appears that the warrant officer's existence as a separate entity in the traditional sense may be in jeopardy. Numerous solutions to the problem of indefinability have been studied.

One solution would maintain the status quo: continued career schooling of the warrant officer with a *trend* toward raising his knowledge level up to that of the commissioned officer, and continued specialization of the commissioned officer with a *trend* toward raising his skill level up to that of the warrant officer. This may eventually result in little delineation between duties and functions of warrant and commissioned officers with the exception of key command, staff and courts-martial duties.

Another solution would do away with the warrant officer corps by promoting all warrant officers to commissioned officer grades: producing rank commensurate with advancing responsibility. This would entail a massive change in organizational requirements, budgeting for implementation and pay purposes, reevaluation of the traditional role of the commissioned officer and complete deletion of the U. S. Army warrant officer.

A third alternative would increase the role and scope of the warrant officer to include entire units (up to battalion in size) manned, commanded and controlled by warrant officers in all areas of technical specialization and reduce the role of the commissioned officer to ground combat units: do away with commissioned officer specialization (including aviation) and restrict them to staff

and leadership only. The result would be a drastic delineation of duties between the warrant and commissioned officer. Outrageous as the concept appears, the seeds for its implementation already exist. Warrant officers could command units made up entirely of enlisted specialists, while present line units could return to the traditional command rank system under commissioned officers and non-commissioned officers. We would return to a situation similar to that which existed before the introduction of the specialist ranks in the enlisted structure and the influx of warrant officers trained in the arts of the generalist.

A fourth solution would expand present TOE and TDA requirements to include warrant officers placed in technical administration and staff positions to handle the specialized aspects of aviation in units at all levels. With appropriate changes in regulations and personnel assignment policies, areas of indefinability would be rectified. For example, positions in aircraft maintenance, supply, operations, safety, administration, logistics—and at higher echelons, aircraft procurement, design, testing and employment—could be established to allow field commanders to benefit from the talents of diversified staff warrant officers. Planning involved would not entail the massive revisions inherent in the second and third alternatives, but must be explicit and thorough to the degree that it does not appear to be a face lifting of the present status quo resulting in empty lip service to the proposal.

To accomplish this planning, qualifications such as pay grades, associate degree prerequisites, career course credentials and military experience to include combat duty would have to be evaluated and established for each position. Present technical MOS structure may have to be enlarged, revamped and streamlined for applicable job placement.

In analyzing the four solutions mentioned, only the third and fourth appear to justify the policy of providing the warrant officer with career training that will be cogent and necessary for the needs of his job. The other two solutions either negate or relegate the academic significance of WOCAR to merely an aviation course of nebulous value. The third alternative contains interesting possibilities in providing a direct support element to the line commander that would utilize the full capabilities of specialist enlisted men and warrant officers.

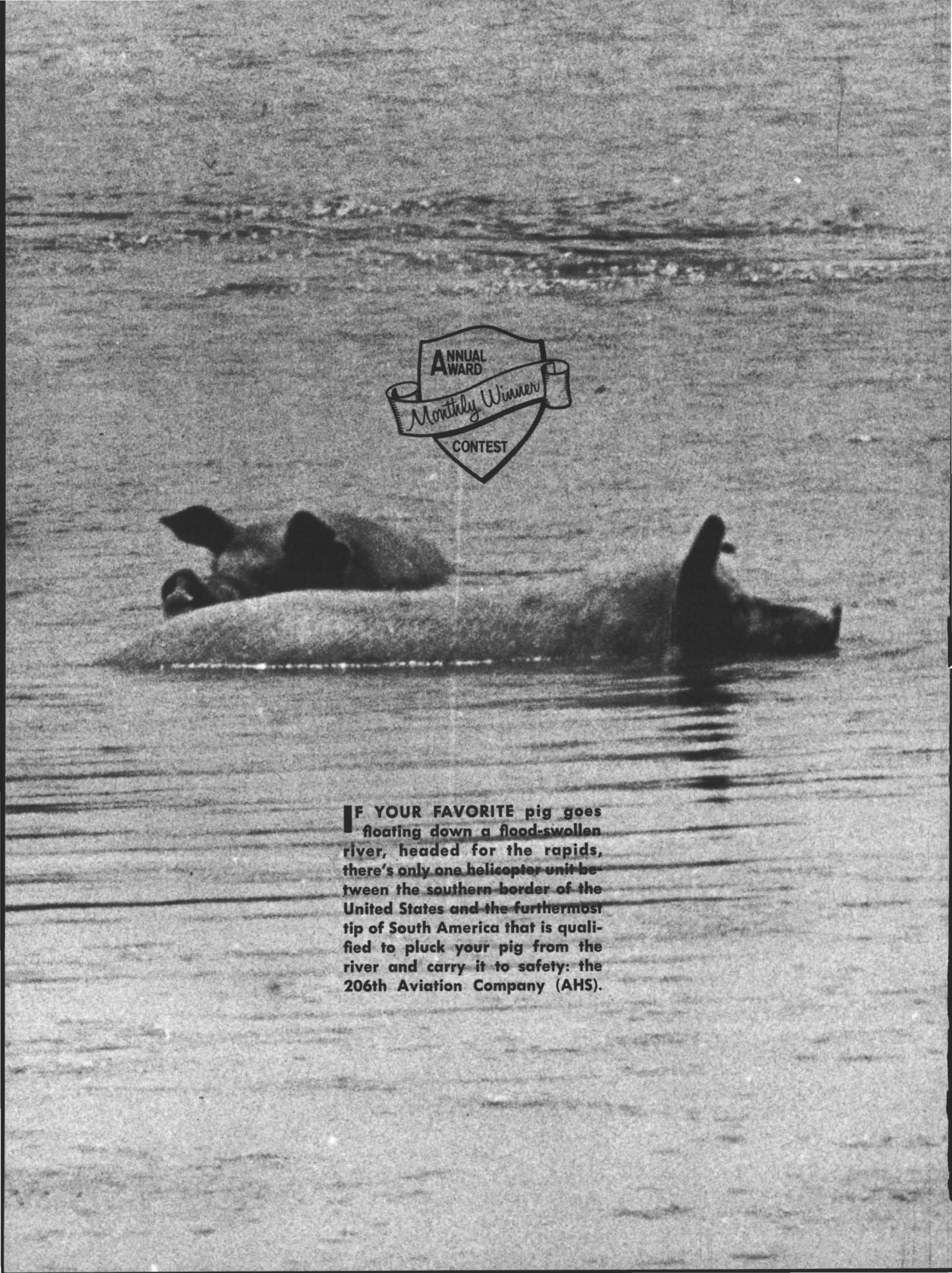
The fourth alternative, however, clearly establishes the need to define the role and function the aviation warrant officer should play in the Army's overall picture. The creation of the new career patterns by DA will require the career school to establish military academic requisites that will enable the WOCAR graduate to meet his new career requirements.

The establishment of new positions would be the realization of a goal or objective of aviation warrant officers and WOCAR. If instituted, however, a top level effort would have to be made to dispel any thoughts of warrant officers pre-empting present commissioned officer positions. The idea of warrant officers competing with commissioned officers in any of the present TOE and TDA structures would have to be squelched at the outset. The intent of WOCAR must be to supplement present staffs, not replace commissioned officers.

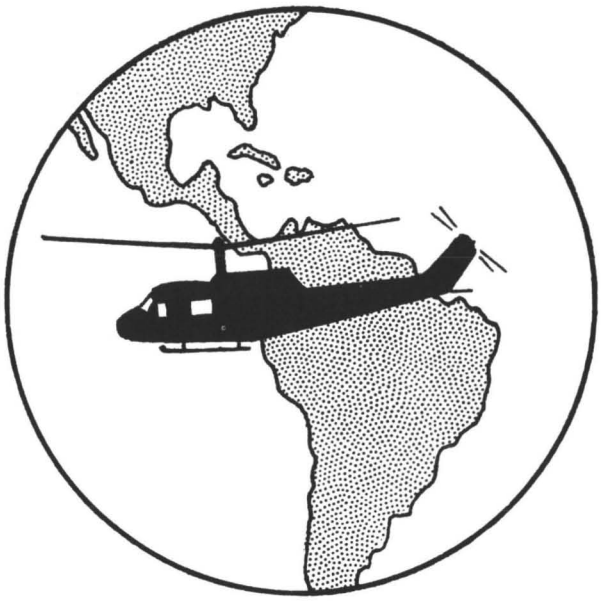
The warrant officer corps is a vast reservoir of experience and talent with a potential that is inhibited only by the imagination. The thoughts discussed here have triggered serious thought and contemplation while the career course is still in the developmental stage.

The men and women of the warrant officer corps deserve the best the Army has to offer. Proper and serious planning is anticipated. Under present DA guidance, the Aviation Warrant Officer Career Course is the best that can be offered. With earnest thought, planning and guidance in the most constructive and concrete way, what is now offered can be made better —not only for the students and the career course but also for the warrant officer corps itself.

The newest special purpose aircraft delivered by Beech Aircraft Corporation to the U. S. Army is the RU-21E. Deliveries of 16 aircraft were scheduled through May under a $12.3 million contract. Beech had previously delivered 30 RU-21 models of similar design. The Army has in operation and on order from Beech a total of 170 of the U-21 series twin-engine, turboprop aircraft, including utility, training and special mission versions.



IF YOUR FAVORITE pig goes floating down a flood-swollen river, headed for the rapids, there's only one helicopter unit between the southern border of the United States and the furthermost tip of South America that is qualified to pluck your pig from the river and carry it to safety: the 206th Aviation Company (AHS).

We  Cover The Americas

Crewmen of the 206th agree that theirs is one of the most unusual and interesting assignments in Army aviation. One day may find them flying a troop lift in the Canal Zone . . . 2 days later they may be hovering over the Peruvian or Ecuadorian Andes where the use of oxygen is mandatory. They may spend most of their free time at the beaches, racing cars or visiting casinos and night clubs in the city of Panama

Lieutenant Colonel Gary V. Dennison

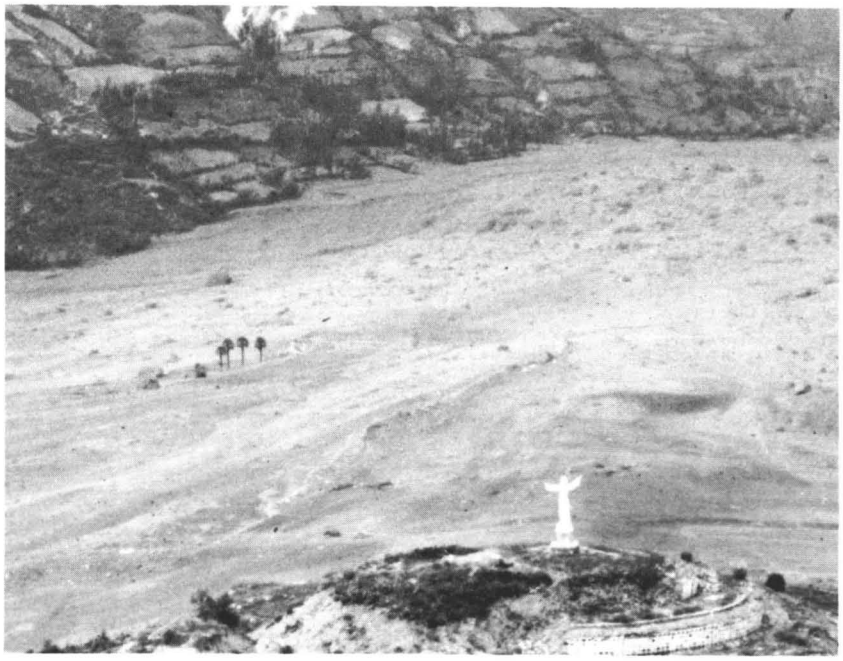
The 206th is the only helicopter company assigned to the U. S. Army Southern Command and it operates from Albrook Air Force Base in the Canal Zone.

Since the unit was formed on 30 December 1969 it has been in constant motion, performing literally countless missions. There has never been a day when the company has not been involved in some task in Central or South America.

To recite the number of countries visited by the 206th would be a geography lesson, but recently in response to requests it has flown in Costa Rica, Honduras, El Salvador, Columbia, Ecuador, Peru and Panama.

A pilot in the 206th may fly a troop lift in the Canal Zone at sea level on 1 day and 2 days later find himself hovering over the Peruvian or Ecuadoran Andes where the use of oxygen and heavy clothing is mandatory for survival. Or he may be sent on a rappelling mission, slingload a pump to an oil tanker breaking up on a reef or spend a day walking through a Cuna Indian village in the exotic San Blas Islands while a civil affairs team dispenses instant medicine from a dirt-floored hut in the village square.

Pilots agree that it is one of the most unusual and interesting assignments in Army aviation. They are impressed with the natural beauty of Panama, marvel at the engineering skill required to build the canal, and enjoy transporting the colorful leaders of various foreign powers transiting the Canal Zone. They work well with the Panama Canal officials and are able to observe the politics of international diplomacy.



The town of Yungay, Peru, was buried by mud within minutes following an earthquake in June 1970. Only the trees remain . . . population was 2,800

★ ★ ★

★ ★ ★

Training of Latin American crews is one of many missions conducted by the 206th Aviation Company. Some 30 officers and men in the unit are bi-lingual

Inasmuch as 125 members of the unit (156 total) are under the age of 25, they spend much of their free time at the beaches, racing cars at Rio Hato or visiting casinos and night clubs in the city of Panama.

Literally all of the pilots and the majority of the crewchiefs are Vietnam veterans, so rapid action is a way of life. Often a crew must decide whether to carry maritime, jungle or desert survival kits—and they may need all three.

Even during the time the crews are in the Canal Zone there is no way to know what the next night or day may bring since search and rescue missions and medevacs are always a possibility. A midnight medevac from Taboga Island to Santo Tomas hospital in the city is typical.

A typical "out-of-country" mission starts with an alert notice that a certain area has had a natural disaster (flood or earthquake) and is requesting assistance. A decision is made to fly a number of the 25 UH-1s assigned to the unit to the affected area or to prepare them for shipment via C-130s stationed at nearby Howard Air Force Base. Crews are assembled, equipment is packaged and within hours men and helicopters are flying into the host country.

The first flight is usually a look-see so that an exact measurement of what is needed can be radioed back to local officials and, if necessary, to the Canal Zone where large stockpiles of supplies are maintained.

From that point on crews may be directed to perform any operation from evacuating entire villages to delivering cooking utensils, food or tents.

Recently in Costa Rica the 206th had a small two-ship commitment and, as might be expected in a flood area, the weather was marginal. Still 62,000 pounds of

supplies were carried and 417 natives were moved from the flooded area in a few days.

Considering that the unit flies from sea level to the top of the Andes and is on the go day and night, the fact that it has survived an entire year without a chargeable accident is a testimony to the proficiency of the crewchiefs and mechanics. Their commanding officer, in a recently televised program, called them "the best in Army aviation."

An example of the 206th's worth is perhaps best illustrated by the actions they took in Peru during June and July 1970. The Peruvian earthquake, probably the most devastating natural disaster in the history of the hemisphere, was a source of headlines the world over.

Four UH-1s from the 206th were sent to survey the damage. In a matter of days they evacuated over 400 seriously injured natives, carried 190,000 pounds of supplies and went to hundreds of villages so that survey personnel could assess the damage.

For this work the company was presented the Peruvian Meritorious Service Award. The citation read, in part: ". . . the 206th Aviation Company (AHS) flew in some of the most hazardous conditions found anywhere in the world. Their helicopters were the mainstay and lifeline of those pueblos isolated in the mountains and provided a new dimension in service to those suffering from the disaster.

"The men of the 206th evidenced at all times a great spirit of sacrifice, endangering their own lives and equipment in their effort to bring relief to the disaster victims. They were an example of human fraternity, as well as a testament to their own personal and professional qualities."

All in all, to pluck a pig from a pugnacious river isn't all that difficult—for an outfit that *covers the Americas.*

Transportation of VIPs from Central and South American countries is a common 206th mission . . . here a passenger, of four star rank, is being helped to strap in

★ ★ ★

Children are always anxious to help . . . helicopters are painted white/red since OD/black might never be seen by rescue if downed in the jungles

★ ★ ★

Although the board could not determine an established cause factor, its members proved once again the value of thorough investigative efforts through their analysis and recommendations which constitute major contributions to the prevention program

280 FEET TOO LOW!

After striking trees which severed right wing and started fire, U-8 came to rest among pines and hardwood trees of ridge and burned.

THE ACCIDENT: A U-8F crew of two was on a round robin IFR service mission, additionally scheduled as a currency flight for the copilot. The copilot flew the first leg to their destination where four passengers boarded for the return trip. Takeoff for the return trip, with the pilot flying, was at 1331. Nearing home base, the airplane was turned over to approach control and radar vectored to the final approach course for a VOR approach. At 1543, 2.4 NM west of the airport, the U-8F impacted trees at approximately 1,200 feet msl. It traveled 737 feet and came to rest at an elevation of 1,137 feet. Fire ignited as the outboard portion of the right wing separated 124 feet from the crash site and the airplane burned.

The pilot and two passengers were killed. The copilot and one passenger sustained major injuries. The other passenger escaped with minor injuries. All fatalities occurred at impact. The passenger with minor injuries attempted to open the cabin door, but was unable to because of a tree lodged against it. He got out through the area of the cockpit windshield and helped the copilot through the same opening. The other surviving passenger got out through the ruptured fuselage between the two passenger seats on the left side. Residents of the vicinity helped the survivors get away from the burning wreckage.

Investigation: The crash site was on a heavily wooded ridge line covered with pine and hardwood trees. The elevation of the first ridge line where the airplane initially contacted treetops, evidenced by paint flecks, was 1,131 feet msl, with the treetops at 1,200 feet. The flight path appeared generally level at 1,200 feet, with the U-8F contacting treetops throughout, until the first major tree impact, 268 feet from the crash site. At this point, the elevation of the ground was 1,137 feet msl. The tallest trees on the ridge line were measured to be 65 feet. The highest obstacle in the approach zone was a 1,219-foot (msl) water tower, .5 NM north of the approach course.

Altitudes specified on the approach plate used by the crew were 3,000 feet at the first navigational fix, 2,600 feet at the final approach fix, 1,480 feet to the fan marker 1.2 miles from the end of the runway and 1,380 feet after the fan marker. At the time of initial impact with the treetops, the airplane was 280 feet below its prescribed altitude of 1,490 feet and directly on the centerline of the 095-degree approach course.

The home airfield was an FAA-controlled airport served by three instrument approaches, the VOR approach being flown by this crew, an ADF approach along the same course and an ASR radar approach. The crew was in contact with approach control until approximately 35 seconds prior to the accident. At that time, they were instructed to contact the tower. Contact was made and tower tapes recorded a 25-second transmission. The crew was cleared to land on runway 08 right. This approach involved a 15-degree left turn to final alignment and circling minimums.

Witnesses in the area of the crash site stated the treetops on the ridge line were in fog and the airplane was lower than those they were used to hearing on the approach. A housewife was probably the last to see the airplane passing her house within 1 mile of the crash site, but she could not make positive identification.

Copilot interview: Note: The copilot was interviewed on three separate occasions. This was the final interview.

Question: Let's go through from where they brought you in to the first fix through the approach until the accident and reconstruct it once again.

Answer: I hope I can get all the steps in. However, having retold it so many times, there's a possibility of getting out of sequence, but I'll cover every act that was made from the time we were on base for the approach. At that time, we were advised we were on an extended base for a VOR approach to the airport. I had read off the prelanding checklist to the pilot and he had accomplished it all, except for the

gear and flaps. He had set up his fuel panel, got all the checks that were required, and he said, "I'll call for the gear at the fix and flaps as desired."

Maybe one of the passengers can check this out, but I think my next act after completing the prelanding check was to turn around and advise our passengers that the weather was good enough to land at the airport and we were going in there. When I turned back around and got the headset on, we were on final and slightly south of course. Not a whole lot, but we had just slightly overshot. The pilot said something to approach control during the time I had my headset off, but they came back and said, "We're sorry about having overshot," or something to this effect, and the pilot said, "No problem at all, we're getting it lined up nicely," or words to that effect.

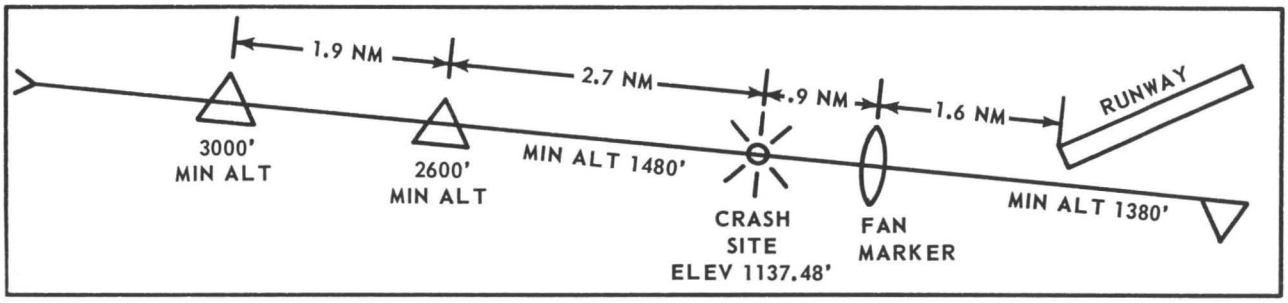
of us doublechecked the other. We were sitting on exactly 3,000. He was carrying a plus 3 in his altimeter and I was carrying a 0 in mine.

Question: His indicated a plus 3?

Answer: Plus 3 and that was different from our previous leg. But our latest information on our K factors was what we had picked up at our passenger stop, plus 3 for the pilot's and 0 for mine. This is what we were using.

As we hit the fix, I called "Gear coming down," and he started the descent. I switched over No. 2 VOR to the approach fix and reached down and changed the radio frequency. While I was changing frequency the pilot asked, "Have you got the approach fix set up?" and I said, "Roger, it's in, as soon as she's centered, that's it." He didn't say anything, but gave me a thumbs-up.

I reached down and wheeled in the tower frequency and, as I recall, made two attempts to call the tower.

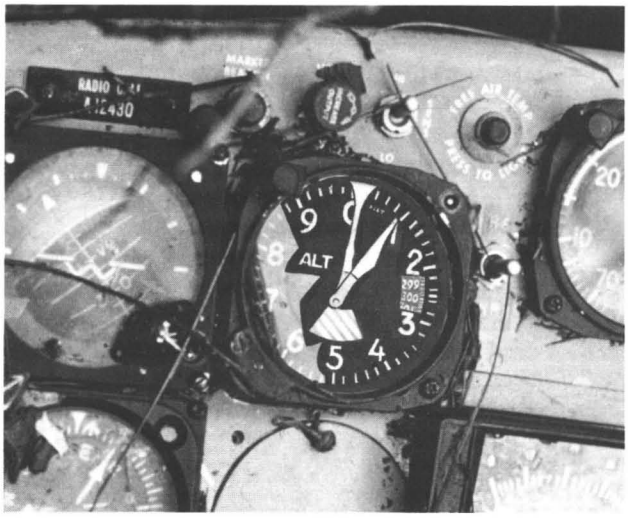


The next words were, "You're now 4 miles west of the fix. You have been cleared for a VOR approach." They gave us the weather which was 600 and 1½, I believe. I don't recall exactly what it was, but it was good enough for the approach.

Approach control told us to contact the tower and gave us the frequency. I rogered their transmission and made a fast glance at the approach plate, noting that particular frequency was the same one published for the tower.

The pilot said, "You all set up for the fix?" and I said I was. I told him we were coming up on the fix and the deviation was a little swingy. We weren't getting a good firm fix, like you desire, but one which was very characteristic of that approach. Additionally, when we were on base, I had tuned in the ADF to another facility just for a double check, but our primary means for identifying the fix was the VOR.

As we had come around, during the prelanding check, approach control had given us an altimeter setting of 29.92 and we had applied that and each



TOP: Chart shows approach course, navigational fixes, crash site, runway, minimum altitudes and distances.
LOWER: Instrument panel with pilot's altimeter showing 1,100 feet, with a Kollsman setting of 29.97

However, they did not answer, so I wheeled back in the approach control frequency and requested an alternate frequency. They came back with an alternate frequency and I can't remember what it was, but they said, "Attempt to contact the tower on such and such a frequency, be advised the tower has cleared you to land." They gave all the sequence right on through, as they had before our approach began, the ceiling, visibility, wind direction and velocity. As I jotted all this down, I flipped on the intercom and asked, "Did you monitor that?" and the pilot said, "Roger, got it." As I was looking at my chart where I had written the information, I glanced at my altimeter. I glanced across the board and rechecked the gear. I rechecked gear down and went across to his VOR and his altimeter and, at that time, we were leveling at 1,500 feet. He had 26 inches of power, 2600 rpm and his deviation needle was centered. The heading indication for the VOR was maybe 1 or 2 degrees, I think, to the right.

As I started down to change the frequency to put in the new frequency for the tower, I recall getting it in and seeing the pilot's right hand come down, as if he were trimming . . . I don't know whether he made an adjustment or not, but then the hand went right back to the throttles and, after that, the only thing I recall is looking up and going in the trees. I screeched, "Pull up, pull up."

Question: You checked 1,500 feet before you went down to tune the tower frequency?

Answer: Yes.

Question: Do you recall anything during the final parts of your approach that bothered you? For example, when you told the pilot you could see straight down, but couldn't see forward, did he happen to leave the gauges and look out?

Answer: He did not.

Question: Did you notice him at any time during the last part of the approach looking up away from the gauges, or spending too much time adjusting the throttles?

Answer: I did not.

Question: When you said you looked up and noticed you were at 1,500, did you get a positive indication from your altimeter and your rate of descent indicator that he had actually stopped going down?

Answer: Yes. That's when he applied power. He may have added more than 26 inches, but the rate of descent had been stopped. It was just as steady at 1,500 feet as it could be.

Question: Are you positive of your altitude over the approach fix?

Answer: Yes.

Question: You did not begin your descent below the published minimums?

Answer: We did not. In fact, we got to 2,600 feet prior to the fix and he leveled out and added power, so that we crossed the fix at 2,600, but we were not below it when we crossed. At no time during the terminal portion of the flight did I see either altimeter moving below an indicated 1,500 feet.

Question: Were the altimeters parallel at this time?

Answer: They were. We had doublechecked on base, making sure we got the K factor in and they were both reading exactly 3,000 feet downwind, crosswind and on final when we hit the initial fix. That's when I hit the gear and we left 3,000.

Question: Was it raining at the time you were making your approach?

Answer: Yes.

Question: Was it hard?

Answer: No, it was light to medium.

Question: How about turbulence?

Answer: Occasional and light.

Question: Nothing that would make your instruments shake so badly you couldn't see them?

Answer: No. We had some on letdown from 8,000, an occasional moderate shake, but when we got down with approach control, we had nothing more than occasional light turbulence.

Question: Do you recall any downdrafts?

Answer: No.

Question: Updrafts on the approach?

Answer: I did not notice any.

Question: How about heading correction to stay on track? Do you recall what he was having to hold?

Answer: After initial turn, as I recall, approach control overshot him on the turn to final and he turned to something like a heading of 060 and immediately came back on course. But the correction that was held throughout the approach was no more than 2 or 3 degrees.

The approach control and tower tape recording transcriptions offered an accurate accounting of the flight to a point just prior to impact. The pilot's altimeter at the time of the investigation read 1,100 feet and the Kollsman setting was 29.97. The copilot's altimeter was internally damaged and displaced, with a Kollsman setting of 29.93. The marker beacon switch was broken and the board was unable to determine the volume setting for the marker beacon.

TOO LOW

The sensitivity switch was set on high.

The debris pattern substantiated the flight path and the in-flight breakup. The wing tips, aileron panel from the right wing and various other pieces of the wing followed the flight path exactly. The postcrash fire significantly affected a number of items which the board could possibly have used to determine the cause of the accident. Also, there were significant changes in the debris pattern due to the escape of the survivors, firefighting and recovery of the bodies.

The fuel control selector handles were recovered and indicated both engines had been operating from the main tanks. Based on the quantity of fuel remaining in the main and auxiliary tanks of the left wing, it was computed that the airplane had approximately 70 gallons of fuel remaining at the time of the crash. This was enough to fly approximately 1:45 and there was an alternate airfield about 15 minutes flying time from the crash site.

The pilot was well qualified in fixed wing aircraft, having a total of 1,787 hours in U-8s and 338 hours in U-8Fs. Additionally, he had 132 hours of actual instrument flight in U-8s and held a current fixed wing special instrument ticket. The copilot was also well qualified, having a total of 1,058 hours in U-8s and 110 hours in U-8Fs. He had a total of 117 hours of actual instrument flight in U-8s and also held a current fixed wing special instrument ticket.

The logbook was destroyed by fire. However, previous copies of the DA Form 2408-14, Uncorrected Fault Record, were reviewed, as well as all associated records. There was nothing noteworthy that may have contributed to the accident. The weight and balance record, DD Form 365F, for the type load carried during this flight was dated 10 months prior to the accident. The actual weight and balance form for this flight was computed on the day of the accident. The board found it noteworthy that the airplane was over maximum allowable gross weight at takeoff for the return flight and at the time of the accident.

Both engines, the propeller assemblies and the instrument panel were shipped for analysis. The laboratory facility reported no defects that would contribute to a malfunction in either the engines or propellers. The pilot's altimeter was checked in a vacuum chamber and found to be within calibrated limits. However, the barometric pressure was adjusted 0.27 inches high. This would result in a plus 230-foot altitude above the indicated altitude on the instrument. The copilot's altimeter was damaged beyond analysis. Laboratory analysis of fuel and oil samples indicated normal conditions.

There were no indications of pending personnel actions for either the pilot or copilot which would have caused adverse psychological effects. There appeared to be no personal family problems in the case of either crew member. Both aviators had performed normal duties in the days prior to the accident and both had adequate rest.

A topographical survey team measured the elevations of the terrain where the accident occurred. This survey proved that indicated map elevations were basically correct. Analysis of the weather during the day of the accident showed the barometric pressure was falling rapidly in the area. From an observation taken at 1531, the home airport tower had reported an altimeter setting of 29.92. Five minutes after the accident, at a nearby airfield, the altimeter setting was reported to be 29.87. This significant drop in barometric pressure would affect altimeter readings throughout the area if they were not corrected to proper Kollsman settings. There was a possibility the pressure at the crash site was somewhat lower at the time of the accident than had been reported by the home airport tower. There were two low pressure patterns affecting the area. These patterns were moving rapidly to the east.

The fan marker criteria were examined closely. Actual fan marker passage is indicated by visual indication on the marker beacon light when the signal strength is in excess of 2 milliwatts. Proper instrument flight procedure dictates that descent will not be initiated on the aural signal, but rather upon receipt of the visual marker indication. The propagation pattern of the visual marker is considerably smaller than the pattern within which the aural signal can be received. Indications were that the fan marker met the criteria outlined in FAA publications.

The VOR approach was flight checked on the day of the accident and initial reports verified no gross malfunction of the VOR. On the day after the accident, the approach was again flight tested and the facility was found to be out of tolerance in scalloping. A NOTAM was then issued that the VOR approach was unusable until further notice.

The installation of an ILS course for the airport was in progress at the time of the accident. However, neither the localizer course, glide path, outer marker, nor middle marker were operational. In anticipation of the ILS course being operational, the airport VOR approach had been changed to indicate use of the ILS

middle marker. Interviews with the copilot and other pilots of the unit indicated this was common knowledge and they were well aware that the ILS middle marker was not in operation.

The pilot's altimeter was the subject of greatest concern for the board. On their departure from the home airport the morning of the accident, the pilot's altimeter indicated a K factor of plus .07 while the copilot's altimeter indicated a plus .03. The copilot's statement indicated the altimeters generally agreed in altitude en route. Prior to takeoff for the return trip, the altimeters were rechecked and, at that time, the pilot's K factor was a plus .03 while the copilot's indicated 0. There was some confusion initially as to what K factor was used on the approach. It was resolved that the pilot had used a plus .03. But the pilot's altimeter at the accident site indicated 29.97. This would have been a plus .05 from the given altimeter setting of 29.92. A representative of the laboratory which analyzed the pilot's altimeter said that the 230-foot error which existed in it was an "adjusted error" that could only have been set by manipulating an adjustment screw. This adjusted error did not logically allow for the airplane to have been at the altitude where it impacted the hill.

Analysis: Impact with a hardwood tree 37 feet prior to final impact proved significant in that it caused the fatal injuries of the leftside occupants. The base of the tree came upward through the bottom of the fuselage, resulting in crushing injuries, and the top of the tree, falling backward across the left side of the fuselage and left horizontal stabilizer, contributed to crushing injuries to the leftside occupants.

The main question that confronted the investigation board in this accident was why the airplane descended below minimum descent altitude to a point where it could impact the trees at 1,200 feet. The board concluded there was a barometric pressure differential at the scene of the accident which was lower than the altimeter setting given the crew 12 minutes prior to the crash. The board agreed this barometric pressure drop could logically account for a 50-foot error in the actual altitude of the airplane versus indicated altitude, and that because of this pressure drop, the airplane was 50 feet below all indicated altitudes during the approach.

The board also agreed that with the inherent errors of the aneroid barometric altimeter and associated correction factor (K factor), an error did exist in the application of this factor to the altimeter. It was concluded by the board that this error could have been zero or a maximum of 70 feet. In combination with the barometric pressure error, this could logically place the airplane anywhere from 50 to 120 feet below the indicated altitude.

There was a strong possibility the pilot received an aural indication from the fan marker and proceeded, incorrectly, to descend from 1,480 feet indicated to 1,380 feet, the minimum descent altitude after passing the fan marker. This possibility could not be substantiated by the copilot. However, the normal aural propagation pattern of a fan marker suggests this may have occurred.

Assuming the maximum errors in barometric pressure, altimeter K factor, and the distinct possibility of reception of the fan marker aural signal, the pilot could have been 220 feet below his actual minimum altitude prior to reaching the crash site. This would have put him at an actual msl altitude of 1,260 feet, or 60 feet above the point where initial impact was made. Several possibilities existed that could account for the remaining 60 feet prior to impact with the trees. These were summarized as distraction, fixation, vertigo, complacency, or a combination of two or more.

It was considered that the pilot, having received the aural signal of the fan marker, then having arrived at 1,380 feet, possibly saw the ground below him and, assuming he had passed the fan marker, continued his descent, knowing the terrain was lower all the way to the airport after the fan marker. Conversely, he may not have seen the ground or broken out of the clouds at all, but may have assumed that having passed the fan marker, he could continue his descent, knowing the ceiling was reported as 600 feet and he would break out momentarily on the downslope portion of the ridge line and have the airport in sight.

The position of the control head for the VHF communications radio and the problem the copilot had previously experienced in tuning and receiving the tower may have caused the pilot to turn his head and look to the right and down to ensure the radio was tuned to the proper frequency. In doing so, he could have induced vestibular disturbances, causing vertigo, or he could have naturally relaxed back pressure on the yoke or added forward pressure, causing the airplane to descend.

It was noted by the copilot that the pilot added power to 26 inches of manifold pressure at 2600 rpm with the gear down during the level-out at 1,500 feet. A power setting of 26 inches manifold pressure will not hold the airplane at 120 knots in level flight with

the gear extended. Therefore, in attempting to maintain altitude, the air speed would naturally decrease as the pilot decelerated. Conversely, if he maintained an air speed of 120 knots, a descent of approximately 500 feet per minute would ensue. The possibility exists there was a trade-off, that in attempting to maintain altitude, the air speed dissipated and, as the air speed dissipated, the pilot released a slight amount of control pressure and descended at an air speed of less than 120 knots at a rate of descent less than 500 feet per minute. Familiarity with the approach, complacency and the possibility he had received the aural portion of the fan marker may have caused him to be unconcerned about a slow rate of descent at that point. In view of these possibilities, the board could not conclusively find an established cause factor for this accident.

Findings:

Established cause factor: Unknown.

Suspected cause factor: The pilot descended below the authorized minimum descent altitude in instrument meteorological conditions.

Suspected contributing cause factors: Rapidly falling barometric pressure in the area of the crash site.

The inaccuracy of the aircraft altimeter and K factor corrections to altimeter settings.

Erroneous pilot response to aural reception of actual or spurious transmissions from the fan marker.

Pilot distraction and/or spatial or illusory disorientation while crosschecking the copilot's attempt to tune the communications radio.

Nonrelated factors:

The aircraft was over maximum allowable gross weight at departure for the return flight and over allowable landing weight at the time of impact.

The VOR approach plate for this base lists a nearby VOR as being used to fix two intersections, although the VOR is listed in the IFR Supplement as unusable below 15,000 feet.

The approach plate for the VOR approach to this base was published with the middle marker of the ILS course as the final fix for descent to minimum descent altitude, although the ILS course and the middle marker were not in operation.

The placement of the VHF communications radio control head between the pilot and copilot seats on the floor requires a turn on the part of the pilot or the copilot and a movement of the head toward the floor to change frequencies.

Recommendations:

That the findings of this board be published in the USAAAVS Weekly Summary with a brief discussion as to the possibilities of the suspected causes and suspected contributing causes.

That the use of altimeter K factors be discontinued, wherein a correction is applied to the Kollsman window reading to broadcast altimeter settings, and that the K factor only be used on the ground prior to flight to determine if the altimeter is accurate within .07 inches of mercury.

That the interpretation and application of fan, bone, or marker beacons with aural and visual indications receive emphasis in appropriate USAAAVS publications.

That the unit involved recompute type load weight and balance forms and assure that fuel loads are commensurate with passenger loads.

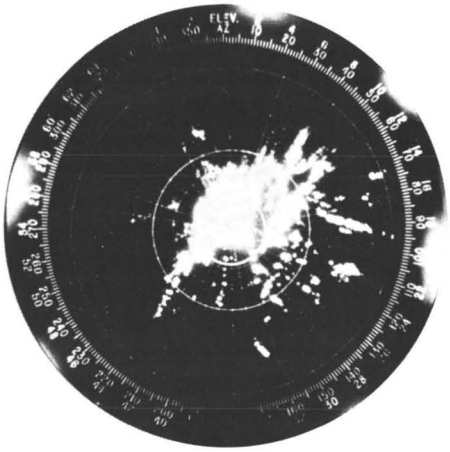
That approach plates published in the Flight Information Publication be current, accurate and not contain information which may tend to degrade the accuracy of an instrument approach.

Flight surgeon: Both the pilot and copilot sustained head injuries. Both of these injuries could have either been minimized or eliminated if flight helmets and available shoulder harnesses had been worn. Deceleration forces caused the copilot to strike his left forehead and eyebrow on the lateral aspect of the instrument panel molding, resulting in two moderately large (5-6 cm) lacerations. The resulting bleeding temporarily obscured the copilot's vision such that, with his other injuries considered, he was unable to exit the airplane without aid from another survivor.

One passenger sustained an injury to his lower abdomen which probably resulted from improper adjustment of his seatbelt. This passenger recalled on interview that his seatbelt was fastened, but was only loosely applied to the lower abdomen.

The VHF communications radio in the U-8F is positioned on the lower portion of the pedestal between the seats of the pilot and copilot. To operate the radio, the copilot must reach, bend slightly toward the floor and glance down. This position significantly impairs his ability to visually back up the pilot by doublechecking instruments and scanning the horizon. An instrument panel mounting of the radio is recommended.

Note: *The report of this accident evidenced a most complete and thorough investigation. Although the board could not determine an established cause factor, its members proved once again the value of such investigative efforts through their analysis and the recommendations which constitute major contributions to the prevention program. In addition to the board's recommendations, the reviewing official recommended development of an accurate system to determine the fuel quantity of U-8s by external means.*



RAWF

ADVISORY: FLGT PRECAUTION IS RECOMMENDED OVER ALL RTS DUE TO TURBC, ICG, AND LOW CIGS AND VSBYS

WEATHER accidents are usually severe and almost always fatal.

Forecast: Low ceilings, fog and reduced visibility. Zero-zero in the hills.

Accident: A UH-1 pilot flew toward rising terrain and visibility dropped. He started a 180, thought he saw a lighter area, turned back to his original heading, flew into a thick cloud, lost sight of the ground and started to climb. Seconds later, he crashed into a hillside. A master Army aviator, this pilot had several thousand flying hours. He held a special fixed wing instrument rating and a standard rotary wing instrument rating.

Forecast: Severe thunderstorms, with extreme turbulence. Tornado warning in effect.

Accident: A twin-engine airplane disappeared from a radar tracking scope in an area between two large thunderstorm cells. It crashed in a wooded area. This pilot also had several thousand flying hours and a special instrument rating.

Weather: Fog and low clouds.

Accident: A UH-1 took off at night, climbed to 500 feet on course and was seen to go into a steep rate of descent to avoid a cloud. It crashed and disintegrated. The aircraft commander had 1,500 flying hours and held a standard rotary wing instrument rating.

Weather: Fog and low clouds.

Accident: A UH-1 apparently flew into the ground at night while both pilots were suffering vertigo. It exploded and burned at impact. The last transmissions heard were: "I have vertigo!" "Look out!" "We're going in!" Neither of the two pilots aboard was rotary wing instrument rated.

From these and similar accidents, it is clear that weather has no respect for experience or ratings. Nor does it show any sympathy for the inexperienced and noninstrument rated. Like the sea, weather is very unforgiving for those who venture into it and commit the errors of trying to get through or under its most severe forms; trying to maintain VFR in instrument weather; or trying to fly instruments without training and qualification.

Some who survive use the term "inadvertent" to describe how and why they entered weather without adequate preparation or qualification. If you accept this explanation, the word will make an excellent epitaph.

Based on Crashworthy Fuel System Mishap Data
USAAAVS Technical Report 72-6,
by LTC Marco Torres, Jr., and Mr. Milan Buchan

Gene Berta

Evolution— Helicopter Crashworthy Fuel System

IT WAS SOON after Zeus and his family tied Prometheus to a rock as punishment for giving fire to man that man found fires not only cooked food, but also cooked him if he got careless with them. For eons, about all he had to worry about was fire in the forest, for his cave was relatively fireproof. But then his wife realized her fellow primates, hairy and not nearly so pretty as she, lived in and among those nice trees and in all that pretty sunlight. Why couldn't she? So she nagged him into figuring out a way to put tree leaves and limbs together to keep the rain and cold off their hairless skins. At this point, man gained a safety worry—getting caught in a burning house.

More eons passed. Man's wife now came to the conclusion that surely there must be a better way to get all this spinning and weaving done. Besides, she needed a dress to wear to Lady Cobblestone's cotillion and needed it in a hurry. Man was once more bedeviled into solving one of his wife's problems. This time, he did it with machines. From the first machine, it was only a short while until he invented something for himself—a great big self-propelled toy he could fly at unbelievable speeds. (Cynics insist he invented it solely as a speedy means to answer his wife's common plaint, "I'm going home to mother.")

Aircraft brought new dimensions to the fire safety problem. Man learned about the force of gravity the

hard way. If the aircraft was overcome by gravity and crashed, as it sometimes did, it just might explode and burn. It sometimes did that, too. Man got busy. This time he needed no urging from his wife. He developed what he hoped would be a fuel system that would retard, if not prevent, postcrash fires. The U.S. Army, owner and operator of many aircraft, has bought such a system for its UH-1D/H helicopters.

This brings us to the main question: Is the UH-1D/H crashworthy fuel system (CWFS) successful?

In search of an answer, USAAAVS studied UH-1D/H mishaps occurring from 1 June 1970 through 31 August 1971. During this period, 2,544 UH-1D/H mishaps of all classifications were reported. Of these, 327 involved CWFS-equipped aircraft. Only those in which the CWFS was challenged—major accidents (including total losses), minor accidents and incidents—were compared to mishaps of the same classifications involving aircraft not equipped with the CWFS. Precautionary and forced landings were omitted from the study and no attempt was made to distinguish between survivable and nonsurvivable accidents.

Mishaps Compared By Category

MISHAP CATEGORY	UH-1D/H WITHOUT CWFS	UH-1D/H WITH CWFS
Major accidents	240	52
Minor accidents	18	2
Incidents	473	74
TOTAL	731	128

Postcrash Fires Involving The Two Types of Fuel Systems

	UH-1D/H WITHOUT CWFS	UH-1D/H WITH CWFS
Total No. Mishaps	731	128
Postcrash Fires	38	6

Casualties Sustained in the 859 Mishaps Studied

	UH-1D/H WITHOUT CWFS (731 mishaps)	UH-1D/H WITH CWFS (128 mishaps)
Thermal Casualties:		
Fatalities	37	0
Injuries	12	0
Nonthermal Casualties:		
Fatalities	142	6
Injuries	321	54

Dollar Costs of These Mishaps

	Number of Mishaps	Total Cost of Mishaps	Average Cost Per Mishap
UH-1D/H w/o CWFS	731*	$93,396,809	$127,733
UH-1D/H with CWFS	128**	$ 7,334,420	$ 57,300

*38 postcrash fires
**6 postcrash fires

Seven fires in helicopters equipped with CWFS were reported during the study period. Six were classified as postcrash fires. That these fires were not of a cataclysmic nature was attributed to the containment feature of the fuel system.

The average cost per accident for a CWFS-equipped UH-1 was found to be substantially less than for one without the CWFS. Despite this favorable showing, the incidence of postcrash fires in mishaps involving CWFS-equipped helicopters was only slightly less than it was for helicopters without crashworthy fuel systems.

But dollar costs and the probability of postcrash fires do not tell the whole story. Let's look at what the CWFS was designed to do—provide increased strength for fuel containment, a self-sealing capability and improved plumbing to minimize fuel cell rupture or failure resulting from a crash. The ultimate goal of the CWFS is to protect the crew as well as the aircraft from fuel fires caused by combat or crash damage. Postcrash fires occurring on CWFS-equipped aircraft during the study period were of the progressive type. That is, *the CWFS allowed crews and passengers sufficient time to escape from crash-damaged helicopters without sustaining injuries associated with cataclysmic fires.*

The most recent of the six CWFS-equipped helicopter fires, following the crash of a CWFS-equipped UH-1D, illustrates this point. Six persons were on board. The pilot apparently suffered spatial disorientation under instrument meteorological conditions. The helicopter hit the ground with no apparent forward motion. After impact, the engine continued to run with flames emitting from the tailpipe section. Initially stunned, the occupants escaped in ample time to avoid thermal injuries and the pilot had time to return to shut the engine down.

This study has shown that the average damage cost is much less for CWFS-equipped helicopters and the probability of postcrash fire is somewhat less. But of far greater significance is a third factor—*no thermal fatalities or injuries were sustained in mishaps involving CWFS-equipped UH-1D/H helicopters during the study period.* On the basis of these findings, we believe we can answer our original question with a definite "Yes!" The crashworthy fuel system installed in UH-1D/H helicopters is successful.

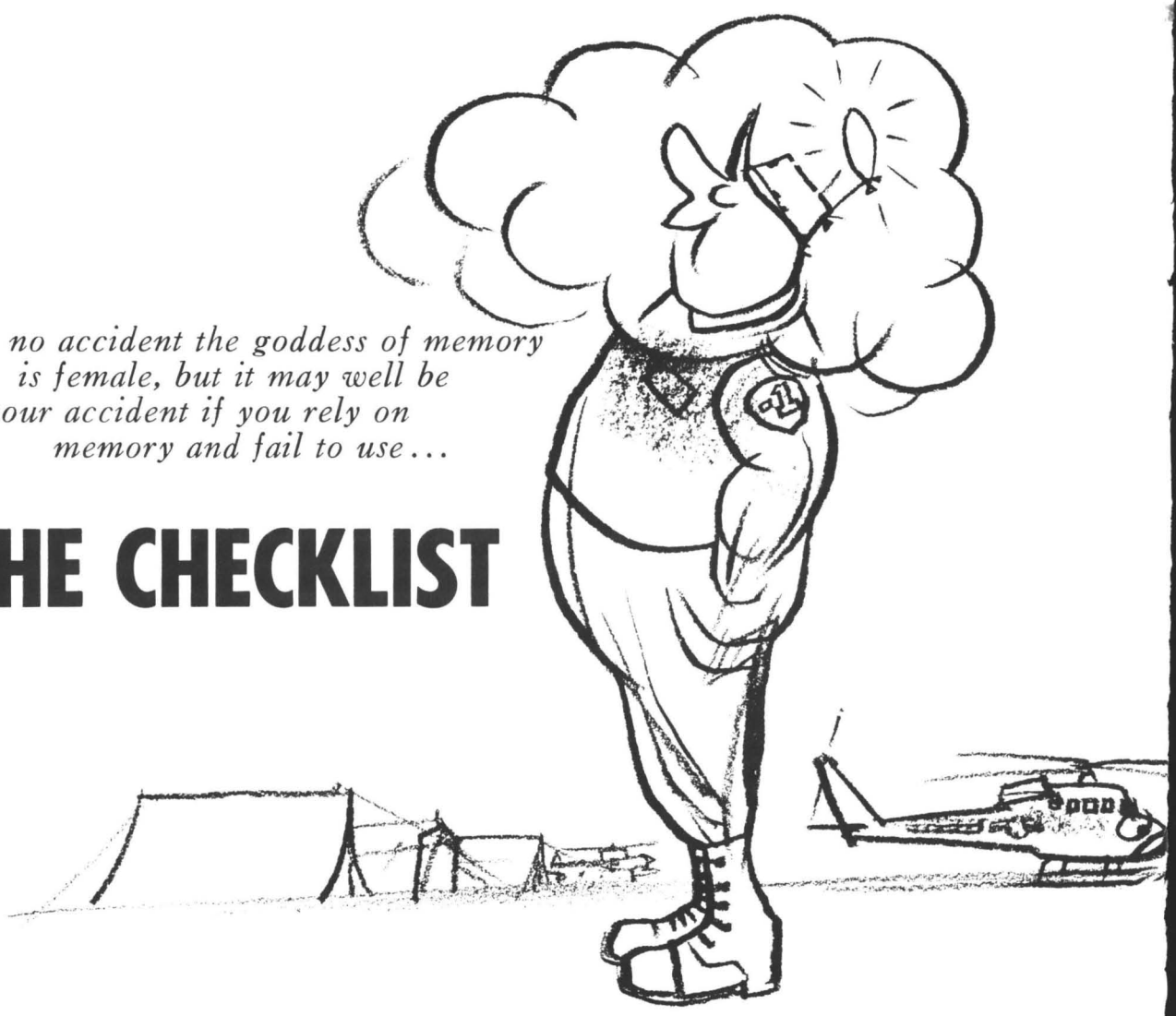
Once again, man makes progress, this time toward making flying safer for him, and even for his wife who may decide to fly back from mother's. We hope she'll select a CWFS-equipped aircraft.

I NEVER forget a name. I've known old what's-his-face for a dog's age." So it is with the aviator who never uses a checklist because he knows it all by heart. You see, his memory is so "good" that he has forgotten AR 95-1 requires (1) checklists be placed in all Army aircraft and (2) that crew members call out and confirm each item.

True to her femininity, the goddess of memory, Mnemosyne (pronounced *nee-mossiny*), often proves fickle. "I didn't have time to check everything. It was a rush-rush mission." Twenty minutes after takeoff into that rush-rush 2-hour mission, this aviator is on the ground. By the time he can call operations and they can muster another pilot and aircraft or get fuel out to him . . . Oh well, you get the picture.

Every pilot who does not use a checklist has a reason. Reliance on good old Mnemosyne and lack of time are often cited. Maybe the pilot makes up these reasons to rationalize his mistakes, but he knows it's unprofessional to ignore the checklist. He also knows

CW3 James R. Callen
Data Center
USAAAVS



It's no accident the goddess of memory is female, but it may well be your accident if you rely on memory and fail to use . . .

THE CHECKLIST

the two basic characteristics of a professional—as distinguished from an amateur—are his *awareness* that he can make mistakes and his *willingness* to take necessary steps to prevent them. The professional uses his checklist as if his life depends on it—and it often does.

Not only is the checklist a necessity for safety, but it's also useful in other ways. All routine checks and procedures are listed, as well as those that come in so handy when an emergency arises. The pilot who habitually fails to use the checklist may not even know where to find it. In the event of an emergency, he will probably find himself relying on our not-so-reliable goddess to recall vital procedures. Since most mistakes are made by people under stress, a pilot who relies on his memory is more apt to make mistakes. With one emergency in progress, he shouldn't want to complicate the situation by creating another.

Let's look at the professional aviator. He's performed all inspections and cockpit checks by the "book," and he's ready for takeoff. As he pulls pitch and begins to lift off, he knows he's not taking off with some defect that by-the-book procedures would have exposed. He knows there will be no self-induced mishap because he failed to check some item, such as a fuel line quick-disconnect. He can concentrate on flying and be ready to detect and cope with a genuine emergency, should one arise. He may occasionally enjoy flirting with Mnemosyne, but he never bets his life on her.

Let's look at the other side. What happens when a crew in a hurry depends on our fickle goddess? One tragic example involved a C-47 with a crew of three. The AC was a highly qualified IP with approximately 27 years aviation experience and more than 17,000 flight hours. The pilot was a master Army aviator with more than 4,000 flight hours. The crewchief was a mature, industrious individual with varied experience in the aviation field.

After a shorter than normal takeoff roll of approximately 400 feet, the airplane broke ground and climbed at a steep angle of about 70 degrees to 75 degrees. It was then seen to roll to the left and nose over. It appeared that power was reduced at the apex of the climb, then reapplied after the nose started down. Maximum power was being developed by both engines when the aircraft crashed in a nearly level attitude, burst into flames and burned. All three occupants were killed on impact.

Investigation revealed the takeoff was attempted with the left elevator control lock in place. It can only be surmised that either the crewchief forgot to remove it or the IP directed him to leave it in place while they were taxiing because of the gusty surface wind (15 knots, gusting to 19 knots). The end result was loss of three lives and one airplane. Ironically, the checklist was found in the wreckage.

Obviously, the checklist is more than just another piece of printed matter. Simple as it may appear, it plays a definite and vital role in your safety. It's easy to read and use. To put it bluntly, failure to use a checklist denotes rank and dangerous amateurism.

Join the elite and be a pro! Use your checklist every time, every flight!

Survival

I am writing to you as a result of increasing concern about survival after a crash incident primarily involving aircraft.

Having served in the Republic of Vietnam and other areas, I am very much interested in any assistance you may be able to offer.

AVIATION ACCIDENT PREVENTION FORUM

an interchange of ideas between readers and USAAAVS on subjects of aviation accident prevention

The following is a list of problems and questions you may be able to answer, solve or clarify.

(1) Send us pictures and illustrations on survival kits that are issued, as well as ones we can design on our own.

(2) Send us books or listings that contain tips on survival.

(3) What research if any is being done on what implements can be made or used out of aircraft remnants?

(4) What training films can be used about the organization of survival equipment and crash survivability?

Presently I am assigned to an aviation company in the South Carolina National Guard. South Carolina has some very rugged swamps and marshlands as well as dense woodlands. On several occasions, it has taken a considerable amount of time to locate downed aircraft.

With the factors mentioned in mind, we would like to know all we can in order to prepare ourselves and others to cope with possibility of survival after a crash. We await your able assistance.—CWO, National Guard Aviator.

We have sent you the TMs that describe survival kits for individual aircrew members and are authorized by CTA 50-901/2. Since you have served in Vietnam, you are probably familiar with the survival vest also authorized by CTA 50-901/2. It is listed in the stock catalogue under FSN 7465-177-4819, Survival Kit, Individual, Vest Type.

Publications dealing solely with survival are limited. You should, however, be able to get a copy of FM 21-76, Survival, *through normal publication channels. The Air Force, Navy and Coast Guard have monthly safety publications containing good articles on survival. (FORUM in the January and February issues of AVIATION DIGEST contained details on how to obtain publications as well as information concerning survival publications.) Most of the outdoor magazines periodically publish helpful articles on survival, and a magazine entitled* Field and Stream Guide to Survival *has been on the newstands.*

Because of the variety of crash impact damage that may be sustained by an aircraft, it would be almost impossible to do any research on implements that can be used out of crashed aircraft. This is left, as it must be, to the imagination and ingenuity of crash survivors.

Training films on survival are listed in DA Pam 108-1. Limited in number, most of those available are copies of Air Force and Navy films and will be listed in the MF1 series.

We hope this information will be of help to you.

Cloth Patches

I wish to bring up a question which may cause a lot of disagreement. The question is, should cloth name tapes and patches be worn on flight clothing? It is my opinion that cloth is flammable and a fire hazard to personnel. I personally know of one accident in RVN where a doorgunner's right arm received second-degree burns after his CAV patch caught fire. I have been told by a pilot friend of mine that his doorgunner received burns to his left upper chest after his CIB, wings and U. S. Army tapes caught fire.

My suggestion is a small leather patch with wings, name, rank and USA on it, and attached to the left breast by the same material used to close the cuffs on the Nomex sleeves. This patch plus wings and rank worn on the baseball type cap outside the aircraft could be easily distinguished for military courtesy purposes. I feel my suggestion is

good and should become regulation. I am waiting to hear how others feel about this question.—SSG, Unit TI

You are absolutely right about your question bringing up a lot of arguments and disagreements among the aviation family. At the present, many organizations including USAARL, USAAVSCOM and USAAAVS are discussing this very problem to which there is apparently no solution that suits everyone. The wearing of the various organizational badges and accouterments, rank and branch insignias, and awards and decorations such as combat infantry badge, combat medics badge, etc., on the flight uniform creates much disagreement. The problem arises because there is no definitive Army regulation concerning the proper wear of these items on the Nomex flight uniform. We suggest that you submit a DA Form 2028, "Recommended Changes to Regulations," recommending that AR 670-5 be changed. Be sure to include complete justification for your recommendation.

If we can be of further assistance, please let us know. Thank you for expressing your opinion.

Well Done

In review of the past weekly accident summaries, I have noticed that a front page "Well Done" has been given to several units because of their safety records. The record of the 350th Aviation Company speaks for itself and I believe the officers and men of the 350th Aviation Company deserve a "Well Done."

On the 14th of January 1972, the 350th Aviation Company completed its fifth year of accident-free flying. The 350th Aviation Company was organized as the 350th on the 14th of January 1967. However, the history of the 350th Aviation Company extends back to Fort Sill, OK, where the 36th Transportation Company was organized on the 30th of March 1956. On 13 November 1957, the 36th Transportation Company departed Fort Sill en route to Europe to join the 54th Transportation Battalion in Hanau, Germany. The unit was redesignated "A" Company, 503rd Aviation Battalion, on 1 September 1963. Its primary mission was to provide an airmobile capability to the 3rd Armored Division. On 14 January 1967, the unit was once again redesignated and became the 350th Aviation Company.

Records available to the 350th Aviation Company indicate that throughout its history, it has flown in excess of 60,000 hours of accident-free flying time. However, this can be verified only through unofficial battalion and company historical records. Since its designation as the 350th Aviation Company, on 14 January 1967 until 1 May 1972, the Company has flown 23,709 hours of accident-free flying time.

The mission of the 350th Aviation Company is to provide tactical air movement of combat troops in airmobile operations. The current mission is general support of all V Corps units for airmobile operations, resupply, medevac service and VIP. The Army Aviation Association of America recognized the 350th Aviation Company as the outstanding company-size unit in USAREUR for 1970 and 1971. This marks the first time any unit has won the award for two consecutive years.

A comprehensive and aggressive training program is in effect in the 350th Aviation Company. The company has initiated a semiannual standardization ride in both contact and instrument phases of flight. Airmobile training is extensive throughout the summer months to maintain a high degree of skill in both the aviation and ground elements, thereby increasing the combat effectiveness of the United States Army in Europe. The instrument school, established and operated by the 350th Aviation Company, has been responsible for 16 initial issues of standard tickets, five yearly renewals of standard tickets and four tactical ticket renewals. The high standards of training are carried on by the aviators in the company safety program. The safety program enjoys full participation by all aviators as well as strong support by the commanding officer, Major Jack R. Watkins. The wealth of experience in the 350th is greatly depended on by all involved in daily operation of the company. The safety record compiled by the 350th Aviation Company provides ample evidence that accident-free flying can be a reality and that it should be the goal of every aviation unit. The officers and men of the 350th Aviation Company are to be commended for their achievement. The unit, by its superior performance, has earned itself a position among the vanguard of those organizations working for the furtherance of Army aviation safety.—CW2, Aviation Safety Officer.

Thank you for writing. Proponents of aviation safety are always pleased to hear of units such as yours that have maintained outstanding safety records over a period of years. We heartily commend the 350th Aviation Company for a job well done.

Readers are invited to participate in this forum. Send your ideas, comments and recommendations to Commanding Officer, USAAAVS, ATTN: E&P Department, Ft. Rucker, AL 36360

A retired master Army aviator searches mythology, history and accident records. With tongue in cheek, he gives an entertaining lesson in...

no new causes

THE PROBABLE causes of modern aircraft accidents are not likely to be new or unique. A session with the inner circle of accident investigators will reveal many believe it difficult, if not impossible, to find a new cause. Modern day causes have parallels in mythology and history. While the incompleteness of early reports makes it necessary to speculate, it quickly becomes apparent there is little new in the origins of aviation accidents. Then, as now, the margin between success and failure was often narrow and sometimes the risks involved were all for naught.

Consider the case of the first reported flight, that of a shepherd named Etana who lived near Babylon. He was from a small village where no children had been born for several years because the wrath of the gods had been incurred. In his quest for a plan that would restore the power of birth he found an eagle that had been hurt and nursed it back to health. For his kind action, the eagle flew him to the goddess of birth, Ishtar. Incensed at his audacity, the goddess had him hurled from her palace and he was killed in the fall. Although his flight was successful, the fact that his mission failed brings to mind one of the problems that exist today. Should the mission have been flown in the first place? Proper evaluation of the risks would have revealed his chances of success with Ishtar were so small that Etana's resources should not have been gambled on the flight.

An early recorded flight which ended in a hard landing involved Emperor Shun of China. While still a boy, he was imprisoned atop a tall granary which was then set afire. The young man survived by jumping and using two reed hats as parachutes. These were the same type of coolie hats still seen in the fields of Asia today and we can only conclude that he was either a very small boy, or the hats were exceptionally large. Since he escaped serious injury and the hats were apparently undamaged, Shun left it to others to write about his flight. This initial failure to write up a hard landing set in motion centuries of similar failures. Laced with pride, it is no doubt the origin of our troubles in getting proper write-ups today.

Lieutenant Colonel Ted Ferry (Ret.)
Institute of Aerospace Safety and Management
University of Southern California

The flight of Daedalus and Icarus stands as an epic example of accident causes and was the first recognized fatal accident. As the story goes, Daedalus was a brilliant man, credited with many innovations and inventions, among them the saw and ax. His successes produced much jealousy and he and his son were imprisoned in a tower on the Isle of Crete. They fashioned wings of feathers and wax and succeeded in escaping from the tower. Their success was short-lived when they flew too near the sun. The hot rays melted the wax in Icarus's wings, the feathers came out and he fell to his death. Monday morning quarterbacking of this event brings out several items. Supervisory error was evident in that the senior man present did not plan the flight to avoid high temperatures, nor did he brief his wingman on the necessity to maintain formation and avoid the sun. Further review reveals quality control and design were involved, since ordinary candle wax with a low melting point was used.

Not too many years ago, an Englishman, no doubt a descendant of Icarus, demanded the case be reopened and subsequent investigation, involving a thorough review of witness statements and other testimony, revealed the accident may have resulted because the wax used to fasten the feathers together hardened at Icarus's higher altitude and cracked with the flexing of the wings. Thus, the true cause involved failure to use low-temperature wax. This was probably the basis for the current use of the term *probable cause,* which allows cases to be reopened, in view of subsequent events. The use of

this term does not indicate final action and leaves the way open for changes of heart, mind and facts.

Bladud, the tenth King of England and father of King Lear, was one of the early tower-jumpers. While on a trip to Greece, he picked up some wild ideas about flying and, as was the fashion in those days, tried to prove his theory by jumping from a tower. He used a pair of homemade wings in his attempt to fly over London and crashed to his death. In the

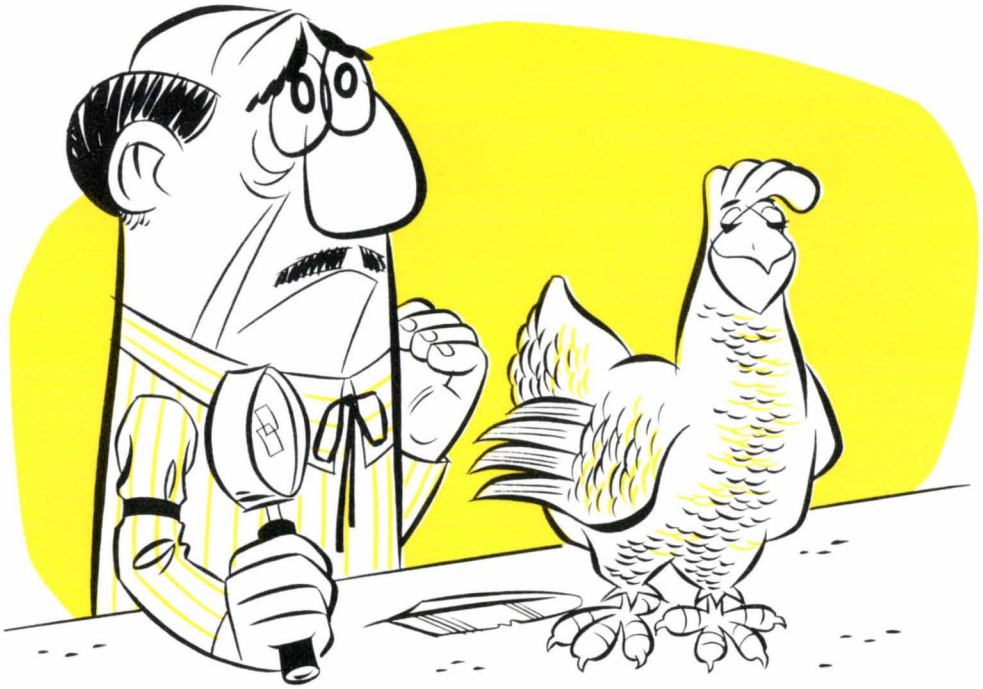
no new causes

absence of a good accident report, we must conclude the cause was unknown, though speculation leads us to believe design error played a key role. Since he was the father of King Lear, there is also speculation that the pilot selection process was not what it should have been.

One of the early-day giants in flight was Simon Magus who was grievously hurt when he put on a show near the hippodrome in Constantinople. Lacking a public information officer, he loudly announced his intention to jump from a tower and fly. A large crowd gathered to watch him—"in a garment stiffened with willow reeds"—lean into the wind for an extended period before jumping into what should have been a slide. The maneuver was unsuccessful, but he gained everlasting fame, since the cause of his accident was well recorded: "The weight of his body having more power to drag him down than his wings had to sustain him, he broke his bones." Obviously, there is a case here for poor design, lack of quality control, crew error in flight technique and, possibly, a lack of self-discipline for being goaded into jumping by the impatient crowd. The latter is known today as an unusual sense of urgency about mission accomplishment.

Simon also gets a historical note by being one of the first antiaircraft victims. His early success at flying around Rome enraged a certain gentleman of the city known as Peter. There are two versions of what happened. One claims that Peter, sick with jealousy, shot Simon down with an arrow. The assumption is that this happened before Peter became a saint. The other version indicates that Peter shot him down with a few well directed prayers, which may be one of the reasons he became a saint.

Next came a man of all trades, Oliver of Malmesbury, who fashioned some wings and, according to reports, flew more than a furlong before crashing and breaking his legs. While recuperating, he wrote up his accident report, claiming he crashed because he "forgot to fasten a tail to his hinder parts." Obviously, his failure to use a checklist played an important role in the crash. We can't help but be impressed with his hindsight.



Another sportsman of the day was an Italian adventurer named John Damian. While in Scotland, he fashioned homemade wings and tried to glide from a high wall. While recovering from his injuries, he showed great insight into investigative techniques. He found the reason for his fall was the use of chicken feathers which had a greater affinity for the barnyard than for the sky. Once again, poor quality control and design error contributed heavily to an accident.

The era of tower-jumping ended about the middle of the 18th century and the balloon came into prominence. The first successful free flight by a man in a balloon is of interest because of hazardous events on the trip. A young Frenchman named Pilatre had made several captive balloon flights, but it was his first free flight in November of 1783 that marks the military entrance into aviation. As a passenger, Pilatre took an infantry major named d'Arlandes. Their journey was a great event, lasting 25 minutes and covering 5 miles across Paris. The balloon was of the hot air type which, in the style of those days, had a fire in an open grate and sparks were continually flying up and onto the varnished cloth used for the balloon covering. It was Major d'Arlandes's job to keep dipping a sponge into a bucket of water and apply it to the smoking cloth so it would not burst into flame. Today, his contribution would likely be recognized with a *Well Done* for saving the aircraft.

George Biggin is unknown in the Aviation Hall of Fame, except for a flight he made in 1785 with Mrs. Sage, a beauty of her day who weighed 200 pounds plus. It was the first flight of a woman in England and applies to our study because of the disaster which resulted when she accidentally planted her size 10 shoe on the barometer. Certainly, there were cause factors present we recognize today: Poor design in that the instrument was placed where it could be stepped on by robust women; and the fragility of the barometer made it obvious it had not been tested to withstand prospective wear and tear. If fault tree analysis had been applied, the possibility of this event could have been forecast and avoided. Other more imaginative investigators might conclude there was an element of environmental design error in that the cramped quarters of a balloon basket was no place for amorous pursuits. There was absolutely no evidence to support this conclusion.

Earlier, the flight of Pilatre and d'Arlandes was mentioned. This same Pilatre decided he would be the first to fly the English Channel from east to west. He set out with the balloon's manufacturer, Romain, in June of 1785. Half an hour after takeoff, at 3,000 feet, something went wrong. Watchers on the coast below heard a muffled explosion and saw the passenger basket and balloon fall to the earth trailing fire and smoke. Their deaths were the beginning of the end for hot air balloons. In reviewing this accident, we find Pilatre used a combination of hot air and hydrogen. A more explosive mixture could hardly be found, particularly since there was a fire to generate the hot air. It was later learned that Pilatre did not think the flight could succeed, but goaded by the west to east channel crossings of others and handicapped by pride and jealousy, he talked himself into a flight from which he could not retreat. The cause factors for Pilatre's fatal accident have been repeated in many later accidents. There was design error in that the volatile mixture was known to be explosive. Elements of true pilot error were present in that Pilatre knew in his own mind that he should not attempt the flight under the circumstances.

Although there were other balloon accidents of interest, the accent in flying shifted to gliders and early attempts at powered flight. Between 1891 and 1896, near Berlin, Lilienthal made over 2,000 flights in gliders. While on his last flight, in blustery weather, a gust of wind pitched his glider sharply upward. It stalled and fell to earth. The great experimenter died the next day. The cause of his accident was lack of self-discipline. He flew when he knew the weather was blustery, with a gusty wind that was probably beyond his and his equipment's capabilities. The ugly head of complacency reared, as it so often does to those who gain great experience and fly what are considered proven machines.

Langley, the distinguished and respected secretary of the Smithsonian Institute, was well into his fifties when he decided that powered flight was for someone other than the birds. He invented a series of flying devices and built several successful flying models. Congress granted him $50,000 to build a flying machine and he ended up with a gasoline-powered monoplane to be launched from a houseboat on the Potomac River. A scale model worked very well. On

no new causes

October 7, 1903, his assistant, Manley, tried a takeoff which ended with a plunge into the river. The machine was repaired and, on December 8, Manley tried again. This time the tail structure struck part of the launching platform and another plunge into the river resulted.

All agreed at the time that Langley's plane could probably fly. They were proven right when it was rebuilt years later and made a successful flight. Review of the two Langley accidents points to design error in the catapult mechanism on the first flight. On the second, ground support equipment appears to have been placed too close to the aircraft for takeoff. Some investigators will point out that Langley tried to use too short a runway and that the craft should have been placed on wheels for a more conventional takeoff. Later experiments brought out the truth of these observations.

While everyone realizes the Wright Brothers made their first powered flight in 1903, few realize their problems. They arrived at Kitty Hawk several weeks before the first successful flight. When the machine was assembled, the motor missed so badly that the resulting vibration twisted one of the propeller shafts and jerked the assembly apart. Both shafts were made over, then another mechanical problem arose. The magneto would not make a strong enough spark. Next, they had a problem with the sprockets to the propeller shafts. It seemed as if there were no end of mechanical failures. Finally, on December 14, Wilbur won the coin toss and took off. He went only a few feet into the air, then flew into the ground, breaking one of the skids and several other parts. By his own admission, an error in judgment was the cause.

Finally, came the great day of Thursday, December 17. The first successful powered flight was a mere 120 feet. The aircraft was slightly damaged on landing, but the cause was not recorded in the excitement. Three more flights were made, with the last being the longest. After flying about 800 feet, the aircraft began pitching. On one of its downward darts, it struck the ground. The cause was diagnosed as flying too close to the ground in gusty air. Pilot technique and weather are apparent factors. When the aircraft was carried back to the starting point, a sudden gust of wind struck it and turned it over several times, damaging it badly. It was never flown again. While not strictly an aviation accident, this ended powered flight for the year.

The accident rate for 1903 was fantastic! Considering the Wright Brothers' 4 minutes and 38 seconds of flying and their four accidents, the rate was around 5,200,000 accidents per 100,000 flying hours —a clear warning to those to follow. But the fatality rate was extremely good during those early years. Although flying activities mushroomed, there were no fatalities until 1908, when Orville Wright was flying with LT Thomas Selfridge of the Army Signal Corps as a passenger. During a demonstration at Fort Meyer, a propeller broke, severing a support wire and allowing the aircraft to plunge to earth. LT Selfridge was killed. This materiel failure gained an infamous place in history, since it involved the first fatality in powered flight.

This brings us to the realm of modern aviation and an era of accidents so numerous they're almost commonplace. Most of the causes of air accidents became known prior to this era. Current and future accidents will, for the most part, only point to probable causes established by prior accidents.

Before we close this saga of early accidents, one man should be mentioned. A hero of his time and champion motorcycle racer, Cal Rodgers tried to fly across the United States within 30 days to capture the Hearst prize of $50,000. He didn't make it in 30 days. But, from an accident viewpoint, his 49-day flight from New York to Pasadena was epic. He made 69 stops, 23 in Texas alone. According to his flight the country was 19 crashes wide. Only the rudder and a single strut remained of the original aircraft when he arrived in Pasadena. A review of his flight and accidents revealed no new accident causes were involved. There were many—supervisory error; crew error; materiel failure; maintenance deficiencies; inadequate inspections; poor planning; weather; etc. At this early date, a new cause for an aircraft accident had become difficult to find. The probable causes of most aviation accidents were already written into history by 1911.

Pearl's

personal equipment
and rescue/survival lowdown

You say Nomex is hot and it itches?
In your helmet, you feel like a turtle,
And you sweat in boots and gloves?
I say wear your fire-retardant britches!
Imagine how you'd feel in the girdle
She wears for your looks and love!

From Business Pilots Safety Bulletin 72-203, April 1972, Flight Safety Foundation, Inc., by permission

It Ain't Necessarily So

LANDING approach accidents continue to be a problem in all aviation—including corporate. The more FSF examines the problem, the more we are convinced that vertical guidance in some form is a *must* for jet operations. More VASIs are needed, more ILS and airborne computed glide slopes.

In the meantime, hundreds of thousands of approaches will be made to short runways without the benefit of vertical guidance of any type—except the eyeball. Unfortunately, the eye is subject to being fooled (ask any magician—that's how he makes his living), but illusions can be overcome if one knows when they are likely to occur.

Despite knowledge of visual illusions being with us for many years, experienced pilots still land short or overshoot because of illusions. Twenty years ago, Captain Coquyt of Sabena Airlines won the coveted FSF/Aviation Week Distinguished Service Award for work in this field. Therefore, what we have to say is not new—but it is worth reviewing again.

The best approach angle for most corporate aircraft is 3 degrees. Light twins can use 4 degrees comfortably, but jets and turboprops like 3 degrees. ILS glide slopes and VASIs are in the 2¾- to 3-degree range and we are accustomed to a 3-degree view of the runway. However, that 3-degree angle is measured from the true horizontal and either sloping terrain or sloping runways play havoc with our visual assessment of a correct approach path.

One of the best checklists on this subject was published by the then USAF Military Air Transport Service (now USAF Military Airlift Command) which formed the basis for the following current checklist:

Anti-Illusion Checklist

Illusions may be caused by any one or a combination of the following conditions:

1. *Sloping Threshold Terrain*
2. *Visibility Restrictions*

Lack of approach zone lighting. Intensity of lights as compared to surrounding terrain.

3. *Runway Lighting*

Haze, precipitation, smoke, glare. Moisture or precipitation on the windshield.

4. *Runway Characteristics*

Width compared to "normal." Length in contrast to width. Humps or dips.

5. *Runway Contrast*

Color compared to surrounding terrain. Precipitation on runway. Visibility restrictions.

This checklist was devised to alert pilots to the visual illusions they may encounter under various environmental and runway conditions. Many times the pilot affected will not realize he is experiencing an illusion, particularly if he isn't aware of the pos-

sibility of existing illusory conditions. Also, all pilots will not experience the same illusion under given conditions. The presence of any one or combination of factors listed in the checklist should signal the pilot to exercise greater caution during his landing approach. Pertinent to the anti-illusion checklist, the following appeared in a publication of the Military Airlift Command.

Sloping Threshold Terrain

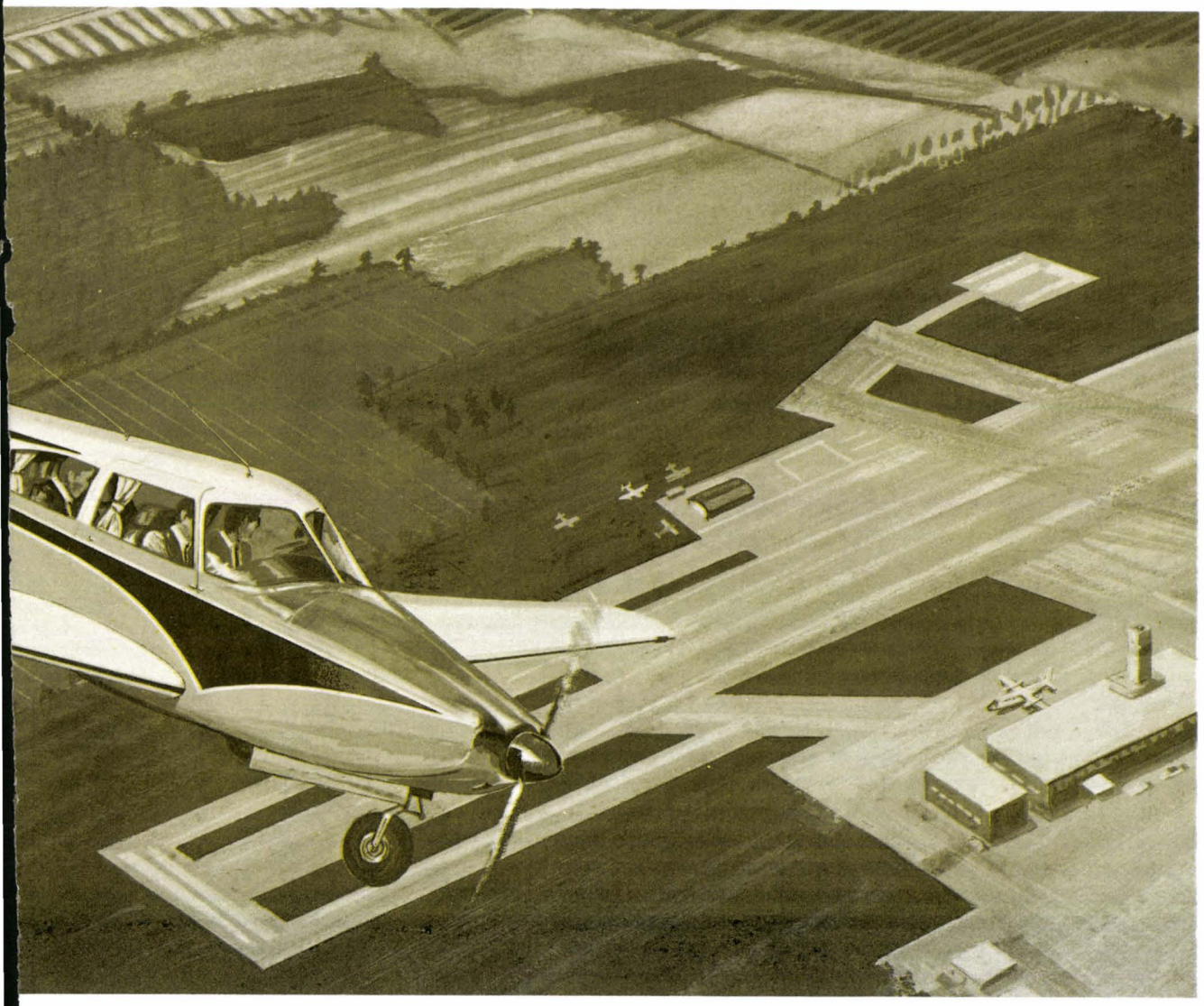
1. When there is an upslope in either the runway or the approach zone, expect an "above glide path" illusion. You will be lower than you appear to be.

2. When there is a downslope, expect a "below glide path" illusion. You will be higher than you appear to be.

In the first case, correcting for the illusion on the apparently high approach will result in landing short of the runway. In the second, it will result in an overshoot unless the pilot maintains power and airspeed control. In the latter case, merely "pulling the nose up" could result in flight on the backside of the power curve and a premature touchdown.

Normally, when a pilot makes a visual approach he subconsciously judges his approach path from a combination of his apparent distance from the runway and his apparent height above the terrain. Through continuous exposure to precision glide paths, and now VASI, the pilot becomes "tuned" to a 2½- to 3-degree glide path. Or, put another way, to seeing a 177-degree relationship between the runway and himself. This is shown in figure 1. The angular relationships in this, and subsequent figures, are exaggerated for clarity.

When there is an upslope, as shown in figure 2, the normal glide path appears to be too steep and there is a tendency to fly a low, flat approach.



IT AIN'T NECESSARILY SO

When there is a downslope, as shown in figure 3, the normal glide path appears to be too low and there is a tendency to fly a steep approach.

When the approach zone terrain slopes upward, as shown in figure 4, the aircraft will seem to be higher than it actually is. This effect can be more or less than the sloping runway effect, depending on the pilot. Conversely, if the approach zone terrain slopes downward toward the threshold, the normal glide path will seem too flat, as in figure 5.

Combinations of slopes may amplify or nullify the illusion. Also, the length of the runway or hazardous terrain at the far end of the runway may add psychological effects. A desire to touch down near the approach end could increase the hazard.

To prevent: Check the approach plates for runway slope. Follow the precision glide path to touchdown or evaluate the approach zone while on downwind and base legs of a visual traffic pattern. If in doubt, ask the tower.

Visibility Restrictions

Under conditions of haze, smoke, dust, glare, or darkness, expect to appear higher than you actually are.

Shadows are one of the key factors in depth perception. Their absence, when due to visibility restrictions, unknowingly confuses the pilot. Since he can't discern the shadows he normally sees at a given height, he interprets his altitude as being higher than it actually is. This effect also is encountered during dark night landings. Another serious case is encountered in a smoke or dust layer lying low across the threshold. The effect varies with individuals and is modified by the intensity and clarity of runway lighting. It is best exemplified by the tendency, when on a precision approach, to reduce power and drop below the glide path as soon as the runway is seen.

Moisture on the windshield often interferes with visibility and may cause any type of "off glide path" illusion. Light rays will refract—or bend—as they pass through the layer of moisture on the windshield. Depending on the particular aircraft and pattern of ripples across the windshield, the aircraft can appear to the pilot to be above or below the glide path or left or right of centerline. This can be as much as a 200-foot error at 1 mile from the runway which, when combined with the effect mentioned above,

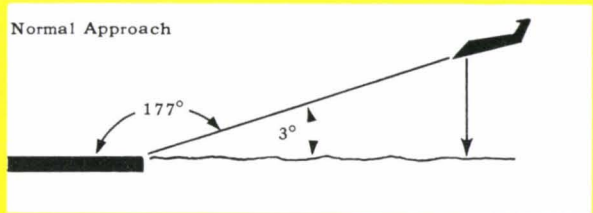


Figure 1.
Normal approach glide path

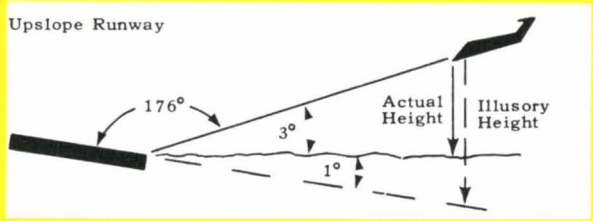


Figure 2.
Illusion of steep approach to runway with a 1-degree upslope. Tendency to fly a low, flat approach

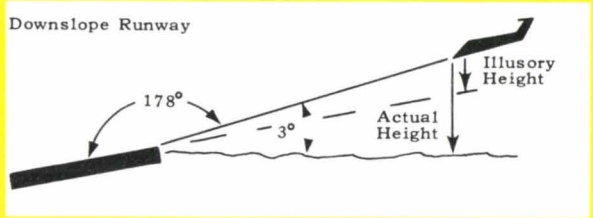


Figure 3.
Illusion of flat approach to runway with a 1-degree downslope. Tendency to fly a steep approach

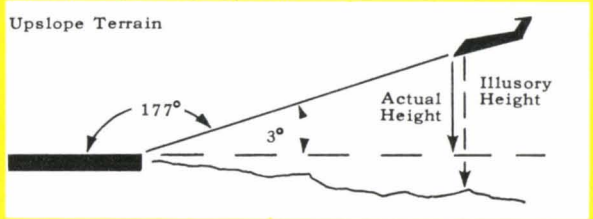


Figure 4.
Illusion of steep approach to runway with an upslope in threshold terrain. Tendency to fly a low, flat approach

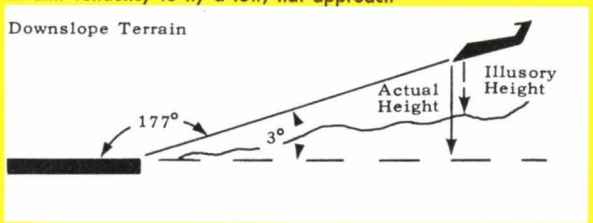


Figure 5
Illusion of flat approach to runway with a downslope in threshold terrain. Tendency to fly a steep approach

Illusions and their effects can be minimized by the pilot who is aware of factors which produce them

could result in touchdown 3,000 to 5,000 feet short of the runway.

To prevent: Maintain the precision glide path rate of descent from minimums to touchdown during conditions of rain, haze or darkness. Avoid straight-in VFR approaches under these conditions. Make a close-in pattern if VFR. Cross-check altimeters with the ILS outer marker or the controller's report on minimums to make certain the approach isn't too low.

Runway Lighting

1. Expect to appear higher than actual and further from the runway when the lights are dim.

2. On a straight-in, clear night approach, the aircraft will be farther from the runway than it appears to be to the pilot.

Turn a light up bright and it will appear to be closer to you. Dim it and it will seem farther away. Or, more simply, bold colors advance, dull colors recede. An approach to a brightly lighted runway on a dark, clear night often has resulted in a touchdown far short of the runway. The effect is greatly increased in clear cold air or when approaching over an unlighted desert or water surface. An approach over an area where there are houses or other surface lights will decrease the contrast of the high intensity runway lights. The absence of approach zone lighting greatly increases the hazard.

To prevent: Check the approach plate for type of threshold lighting. Follow published instrument or visual approach procedures, and the precision glide path when available. Avoid straight-in night landings.

Runway Characteristics

1. When approaching a wide runway, the pilot can expect to be higher than he appears to be, and closer if approaching a short, narrow runway.

A pilot bases part of his judgment on a mental comparison of the runway before him with the "normal" view of the runway to which he is accustomed. If he's accustomed to landing on a 12,000- by 300-foot runway, he may touch down well short of a 4,800- by 120-foot strip which has the same relative proportions. Out on the final approach he will judge himself farther out and therefore higher above the ground than he really is.

Irregularities in runway surfaces also can cause a runway to appear much shorter when the pilot loses sight of the end after touchdown due to a hump between the aircraft and the far end. This sudden "shortening" of the runway could result in blown tires or hurried thrust reversal with a resultant loss of engines, both of which end in a problem of keeping the aircraft on the runway.

To prevent: Check the runway dimensions on the approach plate. Look *down* the runway, rather than to the side, to judge height for touchdown. Cross-check the runway slope as this will give a clue to dips or humps. A pilot who is sure of his touchdown point will know if he has sufficient runway remaining for his computed landing roll.

Runway Contrast.

1. Be alert for problems in depth perception when runway color approximates that of surrounding terrain.

A snow-covered runway, water landing on a glassy sea, and night landing on a dimly lit runway are extreme examples. But even lesser conditions present severe problems in depth perception, resulting in over and undershoots. The concrete runway on a sand surface in bright sunlight or the macadam strip surrounded by dark foliage will give similar difficulties. Water on the runway in either of the latter two examples will heighten the effect. Haze or other visibility restrictions also will serve to further reduce runway-terrain color contrast.

To prevent: Be exceptionally cautious under these conditions. Again, follow the precision approach, if available, to touchdown. Be prepared to make a go-around.

Illusions and their effects can be minimized by the pilot who is aware of factors which produce them. For safety sake, the pilot thinks about these things before each flight and during each approach. He also will make "illusions evaluation" a part of his personal procedure, and apply the checklist as he executes the approach. If it doesn't look right, take it around!

A prime rule of safety in the air or on the ground is to have activities that are . . .

HAZARD-FREE

If you were the first sergeant or NCOIC of this detail, how would you explain this terrible accident to the parents of the five men . . .

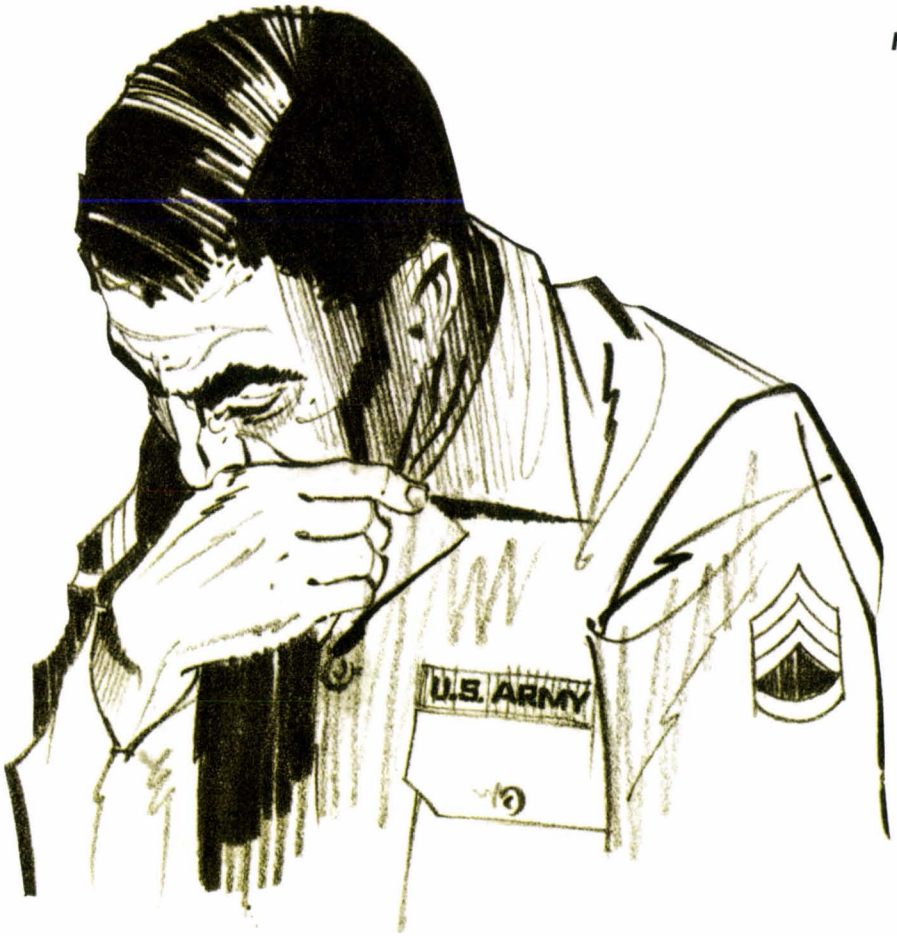
THERE WAS A loud bang, screams and the wailing of sirens. When the confusion cleared, three people were dead and two badly burned. If you were the commanding officer, first sergeant or NCOIC of this detail, how would you explain this terrible accident to the parents of the five young men who died or were badly burned?

The unit had been ordered to active duty. A special meeting was called for preparing equipment. The five men and an NCOIC were assigned to weapons cleaning. Instructions given to the men are not clear. It probably went something like this: "Men, we have all these weapons to clean. Get the cleaning equipment and get with it!"

One part of the cleaning equipment was a pail of gasoline. Since it was night and cold, the area selected to perform the detail was the latrine. There was a butane heater burning in the back room. After several minutes, vapor from the open gasoline reached the burning heater. When the vapor ignited, there was so much force against the door, which opened inward, it was impossible for personnel outside the room to open it and rescue the men.

The windows were covered with heavy gauge wire mesh, making rescue through them impossible. One of the survivors happened to be in the area of the shower and turned on one of the shower heads. He didn't know whether the water was hot or cold. That was the last thing he remembered. The other survivor did not remember how he got in the shower. After the pressure against the door subsided enough, it was forced open. Flames extended from the top of the room downward to approximately 18 inches from the floor. The rescue party crawled under the flames, reached the first man, caught him by the arm and pulled him out. The fire department arrived, extinguished the fire and the other survivor was rescued.

You say this couldn't happen? Well, it did. You



Master Sergeant Hassell Miller
Aircraft Accident Analysis and Investigation Dept.
USAAAVS

say it couldn't happen in your unit? Maybe. But are you absolutely sure no one in your unit cleans with gasoline? Cleaning with gasoline is only one of the ways you can become a human torch. What about the POL man who happens to spill gasoline on himself and, on his way to change clothes, has someone throw a lighted match or cigarette near him?

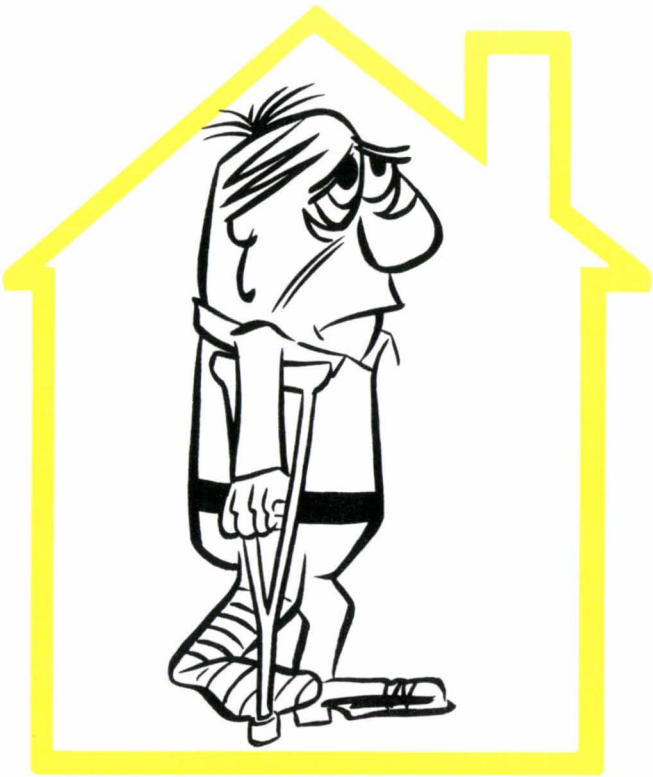
Some of the other ground safety rules that are frequently violated are:

Ramp speed with tow trucks: How many times have you seen speeders on the ramp? How many times have you corrected them? Speed on ramps should not exceed 5 miles per hour. While towing an aircraft it should not exceed a normal walk, 3 to 4 miles per hour. Speeds above 3 to 4 miles per hour with an aircraft in tow can be very dangerous if one side of the tow bar becomes disconnected.

Crewchief stands: Many times maintenance personnel use crewchief stands without the guard rails installed or the up-lock secured. This can be very dangerous to personnel and aircraft. If the guard rails are not installed, personnel may fall off the stand. If the up-lock is not in place and the hydraulics fail, the stand can damage the aircraft.

Hangar cleanliness: How often have you walked into a hangar where maintenance is going on and, after only a short look around, formed a definite opinion, good or bad, of the type of maintenance? Other people do the same in your hangar. What opinions do they form? Do you have loose tools, spilled oil or other fluids, waste materials or sweeping compound near open engines?

All of these unsafe acts beg for accidents to happen. Perhaps they don't apply to you. If so, you have a good operation. If not, it's high time you and those you work with and around resolve to make your activities hazard-free.



HOME SAFETY HINTS

WHAT CAN happen in your home? Military quarters and family housing have proven to be the greatest source of minor injuries in all the military services. You can't expect to become a complete safety expert at one session, nor can one person eliminate all the hazards in a home. However, by applying a little thought and forming a few new habits, we can eliminate many of the small mishaps that lead to injuries.

One of the most repeated mishaps in the kitchen comes from placing pots and pans on the stove to heat with handles protruding over the edge. It's just the right height for little toddlers to reach up and pull them down. The corrective measure in this case is to be sure no parts of pots or pans extend over the edge for little ones to get hold of or big ones to bump into.

The same type of mishap can also occur in barracks. Look in the cleaning equipment locker and see how many open containers of powder cleaner you find on the top shelf. How would you like to turn this over in your face? The corrective action is to put it in a box, then put it on the top shelf *only* if there is no other place for it. Be sure to label the box.

In family quarters you find bottles of insecticide, weed killer and any number of blinding chemicals stored on shelves high enough to be out of reach of children. But what if a bottle of one of these chemicals should slip off and shatter while you are reaching for something and a child is within the splash area? These items should be placed in a strong box with an attached top that is plainly labeled with its contents.

A little item found in both barracks and family quarters that can give you a nasty cut is the familiar nut can. Try a little experiment. Take an empty can of any size, place it on a hard surface with the top

Clarence J. Carter
Aircraft Accident Analysis & Investigation Dept.
USAAAVS

removed and hit it with a piece of wood. Look at the wood and think what could happen if you should step on a similar can in the dark. What if one of your kids should fall on one? The ring placed in the top of the can to prevent you from cutting your fingers after the can is open is just strong enough to allow you to place a great amount of weight on it before it collapses into the can, at which time the part of the body doing the pushing descends on the sharp edge of the can with blinding speed and enough force to ensure a cut to the bone.

In this day and time, more and more mess halls and homes are equipped with automatic dishwashers. These are well engineered machines and they are basically safe. Here again the human element is the unsafe element. The basket type container in the lower portion of this machine was designed to wash silverware. Very few are properly equipped for washing carving or paring knives. The common mistake is to load and unload this basket while it is in the machine. The removable baskets should be taken out and set at waist level to load and unload. This will prevent impaling yourself on an unseen knife blade when you reach into the basket. It's also a good idea to place a bowl upside down over the basket to prevent being stabbed by a fork or knife while arranging the rest of the load. If you find that knives placed point down in the basket are cutting out the bottom, replace it by wiring a piece of ¼-inch hardware cloth to the bottom of the basket.

Another source of nicks and cuts is the sewing basket. There are so many different kinds and shapes it's impossible to cover all the cases, but the best way to be safe is to buy a ball of yarn, rewind it fairly loose and stick all scissors, cutters, large needles, etc., into it point first. And a regular pincushion can't be beat for small sharp-pointed objects.

Back to the kitchen. Some of the older kitchen appliances, such as toasters or coffee pots, will give you a nasty shock if you touch them while turning on the water. The cure here is not to plug them in within reaching distance of the sink. This is also a good idea with mixers, blenders and similar appliances. If one should inadvertently fall into the sink, be sure it's unplugged before you go after it. For some reason, every house has three-wire 110 volt plugs in the kitchen and the only country that has three-wire appliances is Germany. The third wire is for internal grounding—a positive means of preventing electrical shocks.

One other precaution is be sure to have the world's oldest fire extinguisher handy—a large box of bicarbonate of soda. This is still one of the most widely used firefighting chemicals and the best for a flaming pan of grease. Sprinkle it at the base of the flame. As the soda breaks down from the heat, it gives off a heavy gas that cuts off the oxygen and starves the flame. Soda will work on just about any type fire, so keep a big box in a handy place. This is also a good point for mess sergeants to remember when out in the field cooking on gasoline field stoves. Soda will also put out the fire on a burning emersion heater.

One other tip about burns. If you should spill hot grease or other hot liquid on some area of your body, cool the area by the handiest means—water, ice, Coke, etc.—within a few seconds and no burn will result.

The best advice for home safety is for each family member to think things out, avoid rushing and know in advance what he will do for each type emergency. This kind of thinking and planning will prevent many hazards from becoming mishaps and better equip you to cope with those which do.

USAASO Sez

The U. S. Army Aeronautical Services Office discusses

On Frequency Discipline: How many times have you been frustrated when trying to contact air traffic control (ATC) for a change in clearance or to obtain some form of advisory information? Was it because some "clown" had the frequency tied up with a long-winded transmission, or the controller was too busy to answer, or were you actually on the wrong frequency and had to be advised to shift to the right one? There are several things that you can do to help, along with helping other pilots and at the same time assisting the air traffic controller in doing a better job. What can be done? Simply, practice "frequency discipline."

The steady and significant increase in air traffic is being accompanied by an associated increase in voice communications between controllers and pilots. Most ATC frequencies are simplex, meaning that both the facility and the pilot transmit and receive on the same frequency. This often is referred to as a "party-line telephone" system; when one party is transmitting on a frequency it cannot be used by anyone else.

Long-winded and unnecessary transmissions by pilots interfere not only with normal routine but also create hazards by potentially blocking emergency transmissions from the facility or other pilots. This can be particularly critical where radar vectors are provided to separate and sequency aircraft and airspace for vectoring is limited. Unnecessary use of a frequency is just not good operating practice and is a disservice to other pilots as well as to the ATC facility.

ATC is constantly reviewing means for reducing and refining phraseologies and transmissions. Much has been accomplished in cooperation with the entire aviation community. For example, position reports have been virtually eliminated when aircraft are under radar control; instrument departures and arrival procedures have been standardized at many locations. Although these and other actions have significantly reduced frequency congestion, much more can be accomplished if pilots using ATC frequencies will recognize and act on factors under their control.

As a pilot you should—

- Check your frequency and listen before transmitting. There could be emergency transmissions on the frequency you intend to use.
- Say what needs to be said to the extent that it is clear to both you and the controller as to what you want or need.
- Check your speech rate and enunciation. Are you regularly being requested to repeat a transmission? If so, you may be talking too fast or not clearly.
- Remember in using a simplex frequency when you talk you cannot hear on that frequency.
- Assure your microphone button releases when you complete a transmission. Frequencies are often jammed by stuck mike buttons and even if an offender can be identified there is no way to inform him of the situation.
- As a cardinal rule keep frequencies available for use by everyone to the maximum extent possible.
- If you are not declaring an emergency don't use guard. USAASO Sez—train yourself on "frequency discipline" and avoid idle chatter on the airwaves; somebody's "whole day" may be at stake.

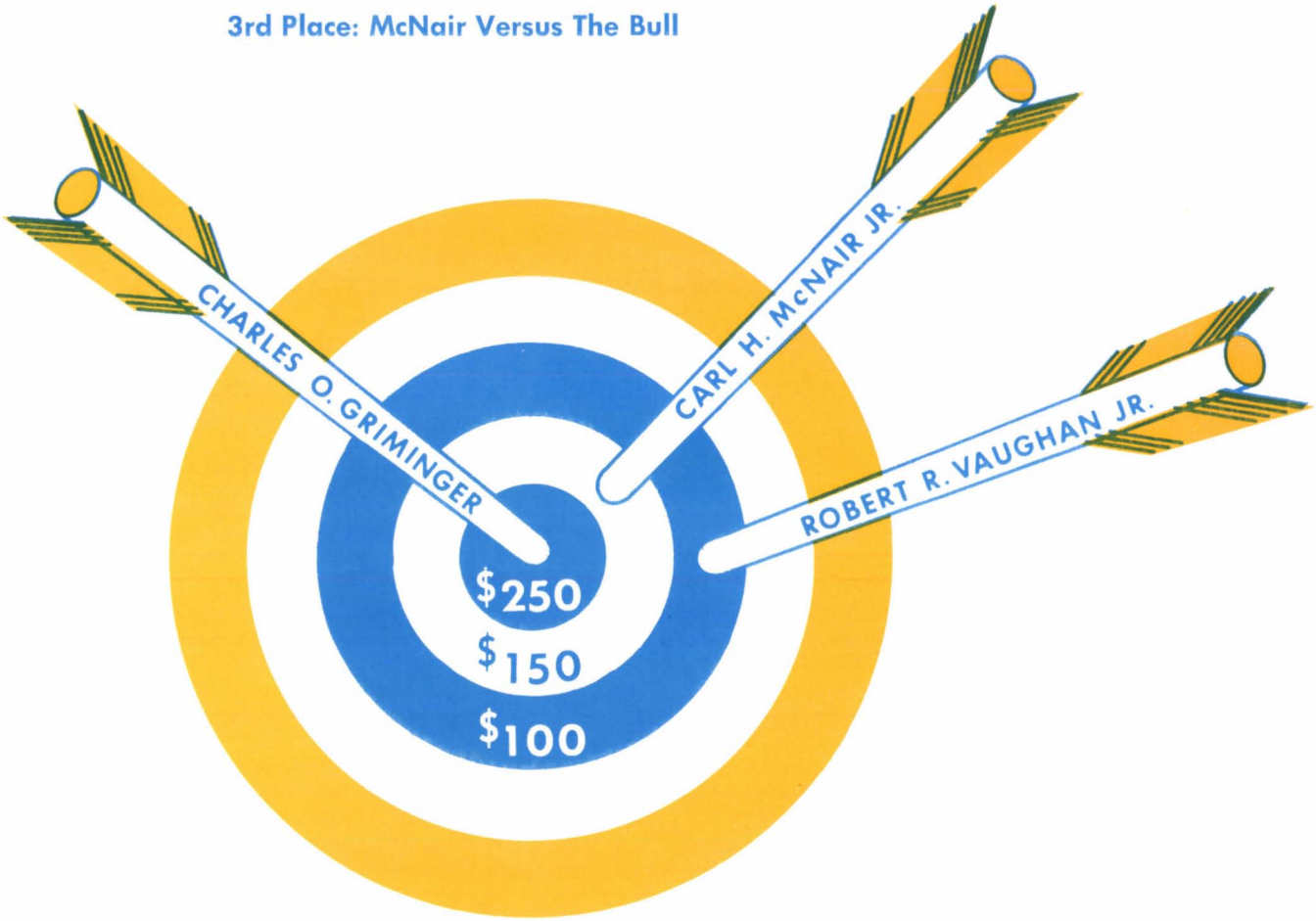
Aircraft Save: Congratulations to Staff Sergeant Richard N. Henderson, an air traffic controller stationed at Cairns Army Airfield, Ft. Rucker, AL. His timely warning to an Army aviator flying an Army U-8 Seminole on 3 April 1972 prevented the aircraft from landing with the gear up. The alert manner in which he operated in this most demanding local control position prevented possible serious injuries to personnel and thousands of dollars damage to an expensive and complex aircraft. His high degree of dedicated professionalism, initiative and knowledge has brought credit upon himself and the U. S. Army.

Annual Writing Awards

1st Place: The Armed Helicopter Story—Part I: The Origins

2nd Place: Horizontal Enrichment

3rd Place: McNair Versus The Bull



Jul—LTC Charles O. Griminger
Aug—CPT Richard B. Carey
Sep—LTC Joe B. Myers
Oct—Frank H. Duke
Nov—CW2 Jules F. Mier Jr.
Dec—CPT Thomas P. Petullo

Jan—Bob Kuenstler
Feb—LTC Carl H. McNair Jr.
Mar—MAJ Frederic H. Stubbs
Apr—CPT Carl A. Meyer
May—CPT Frederick D. Hatton
Jun—CW3 Robert R. Vaughan Jr.

YOUR NAME COULD be among those listed in the winner's circle if you submit an article for the AVIATION DIGEST's twelfth annual writing contest beginning this month. Each month the author of the article selected as the best of that issue receives an engraved plaque and a $25.00 U. S. Savings Bond. From these monthly winners, the three best articles of the year are selected for U. S. Savings Bond worth $250, $150 and $100 respectively. Last year's monthly winners are listed above with the top three prize winners.

To be eligible an article must be original and concern Army aviation or related subjects. Dual authored articles are not eligible for the contest, but this rule does not prevent their selection for publication. Authors of published articles will also receive credit in their 201 file.

Winning articles are selected by judges who review the manuscripts without bylines. Selection is based on accuracy, completeness, originality, readability, soundness, substance and overall merit.

DASG-HES

Coming Attraction:

CHECKLIST SENSE

Watch for it in the September issue!