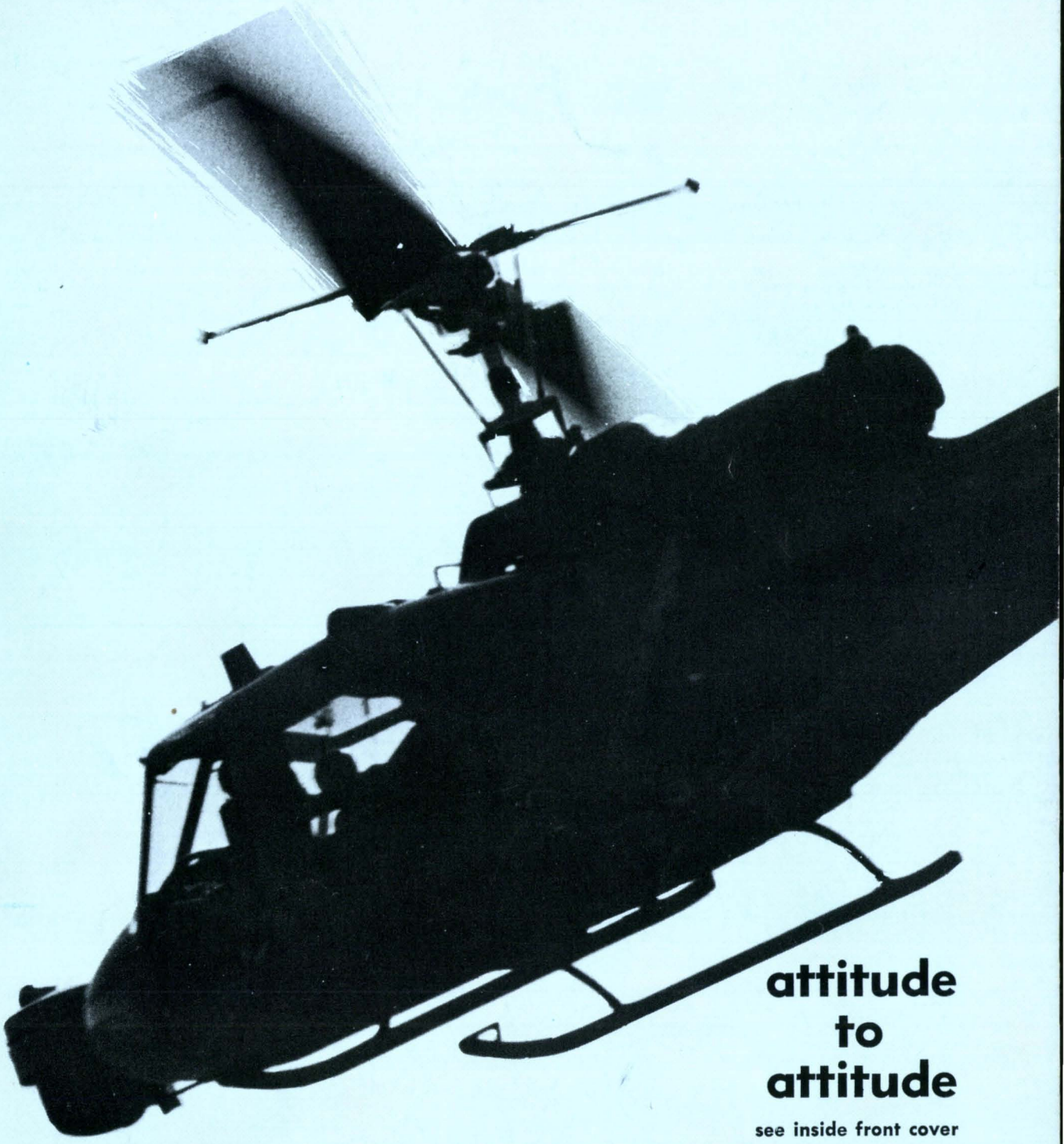
USAARL
SCI SUPPORT CENTER
P.O. BOX 620577
FORT RUCKER, AL 36362-0577

UNITED STATES ARMY MARCH 1973

# AVIATION DIGEST



**attitude to attitude**

see inside front cover

# UNITED STATES ARMY AVIATION DIGEST

MARCH 1973 VOLUME 19 NUMBER 3

Views From Readers 1

Nightmare, LTC Norman E. Scott 2

"Hey Tower . . . Haven't You Got My Clearance Yet?" 6
COL Robert E. Darlington, USAF

Aeromedic, LTC Nicholas E. Barreca, M.D. 8

Charlie And Danny's Write-In 13

True Or False? CPT James W. Isbell Jr. 14

Attitude + Attitude + Attitude, CW3 Stanley E. Whitman 19

A Hole In The Floor, CW3 Dwayne L. Petersen 20

Asbestos-Suited Medics Practice Aircraft Rescue, 24
SP4 James Eakins

Writing For The DIGEST 26

Write To Right 30

Warning Signs 32

Full-Stall Landings Are Foolish 34

Let's Stop Building Mountains 38

Pearl's 40

System Safety In Army Aviation: A Coming Of Age 42

Need For A Small Firefighting Vehicle 45

USAASO Sez Inside Back



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 Earl W. Fletcher

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


## ABOUT THE COVER

The UH-1 on the cover was "editorially" placed so that it would appear to be flying in a somewhat abnormal attitude. Such attitudes often are caused by poor attitudes among people. CW3 Stanley Whitman considers attitudes on page 19, and on page 38 SFC Bill Bailey discusses poor attitudes found during a visit to an aviation unit


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, AL 36360.

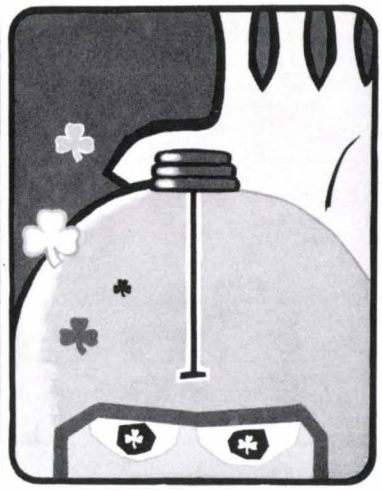
This publication has been approved by Headquarters Department of the Army, 1 September 1972.

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.

Those not eligible for official distribution or who desire personal copies of the DIGEST can order the magazine from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Annual subscription rates are $8.00 domestic and $10.00 overseas. Single copies are 75 cents each.

# VIEWS FROM READERS



Sir:

We are limited here in Germany on VOT stations. I was informed that it is not correct to use the test position of the VORs in the aircraft for this purpose. Is it in fact wrong to use the VOR test position for checking the VOR? If it is then why do we have them?

Please clear this up for me.

CW3 Archee Harrell
D Trp, 3rd Sqdn, 8th Cav
APO New York 09185

• **The FAA states that the use of the test position of the AN/ARN-82 does not meet the intent of FAR 91-25. Furthermore, the radiated signal must be controlled by the FAA.**

**The U. S. Army Electronics Command states that the purpose of the test position is to check for malfunctions in the course indicator, the 30 Hertz amplifier, and the phase comparator circuits.**

Sir:

The article "Autorotations—Cause & Effect" by H. E. Roland, Jr., which appeared in the October 1967 issue of AVIATION DIGEST, has considerable significance for the Canadian Forces. I would appreciate your assistance in securing from the author permission to reprint the article in Canadian Forces FLIGHT COMMENT.

CPT P. J. Barrett
National Defense Headquarters
Ottawa, Ont
K1A OK2

• **The DIGEST is happy to grant permission for you to reprint Mr. Roland's fine article.**

---

The following revisions failed to be incorporated into the February 1973 "Maintenance Matters":

**Rigging Of The Tail Rotor:** The chain and sprocket are no longer changed as a matched set. Replacement of the chain and sprocket is necessary only if it fails the inspection procedure outlined in paragraph 9-15.g.(3), change 2, TM 55-1520-210-20, dated 29 March 1972. Change 2 deleted the NOTE which required that chain and sprocket should be replaced as matched sets.

**Battery Relay:** The fast, easy method described to determine if the battery relay is the cause of complete electrical failure is incorrect. The transmission oil level light is independent of the battery relay. Refer to figure 13-19, TM 55-1520-210-20, page 13-91. In the forward battery system, the jumper wire P24B18, between contact points A2 and X1, and the jumper wire P44B20, between contact points A1 and X1 of the aft battery system, provide this independence from either battery relay. There may be enough residual voltage in the battery to illuminate the transmission light but not enough to close the battery relay.

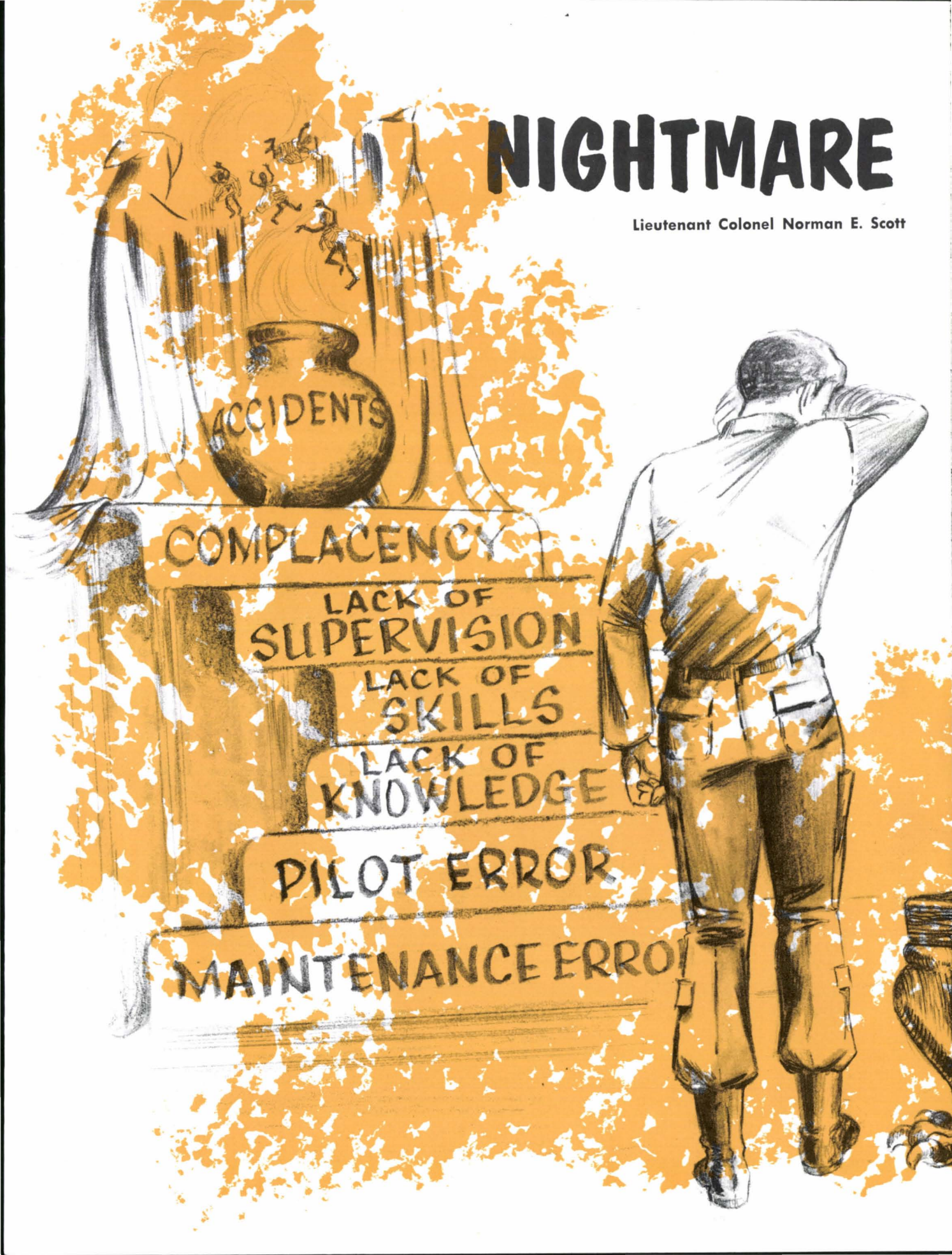
**Start Fuel Solenoid:** When removing the start fuel solenoid valve assembly, be sure all electrical power is disconnected. The correct reference is paragraph 5-15, TM 55-2840-229-24, dated 23 April 1971.

**UH-1 Battery Voltmeter Circuit Breakers:** When installing a battery at either the front or rear location, the voltmeter circuit breakers at the opposite location should not be opened. The reference should read TM 55-1520-210-*20* (not-10).

**U-21 Temperature Control Circuit Breaker:** When maintenance is being performed on the U-21 that requires electrical power, the temperature control circuit breaker is frequently pulled. This circuit breaker controls the combustion air blower which is designed to *help* keep the avionics compartment cool. If any of the avionics equipment is turned on, this breaker should not be pulled so as to prevent serious damage to the avionics equipment due to overheating. (Reference TM 55-1510-209-10/1, page 6-1, paragraph 6-6.) The following related information should have been included: In addition, the ventilation blower circuit breaker should be closed. This blower will automatically operate when the temperature reaches 49 degrees C. in the avionics compartment while the aircraft is on the ground and power is on. (Reference TM 55-1510-209-10/1, paragraph 6-7.) Neither of the above circuit breakers should be pulled when avionics equipment is on.

# NIGHTMARE

Lieutenant Colonel Norman E. Scott



**. . . It had to be a bad dream—a nightmare! . . . but I couldn't seem to wake up! He was going to take me on a guided tour . . .**

IN THE FIRST chamber they had what I believed to be miniature replicas of Army aviation accidents. Not all, understand, just an example of each . . . only they weren't miniature replicas . . . they were miniaturized! To my horror, the real remains of past accidents. I knew then it had to be a nightmare, because I had just remembered seeing that flick based on Dickens' story of ghosts of Christ-

**Down here we maintain files on those who have or will have ...accidents.**

mas past and Scrooge and Tiny Tim.

Now, getting the little mirror out I've checked those sore places on my leg and rear portions. I remember saying pretty frequently last night, "Pinch me—I'm dreaming?" Somehow . . . I wasn't dreaming . . . I really saw those miniaturized accident scenes! (Must remember to put lower wattage bulbs here in the bath . . . tomorrow . . . stark white . . . very bad for the eyes. Damnit, that was some party . . . my eyes are playing tricks on me

**"...this, though not an early one, is an example from 1963, of the extensive use of helicopters in the place known as S E A.**

**you know the story...**

**three crewmen and twelve A R V N...DEAD!"**

. . . can't see but just a few feet this morning . . . hangover, yeah, that's got to be what caused such a wild dream, too . . . nightmare, it was, not just a dream . . . I'd better call flight ops to check on takeoff time.)

"This is 'TORMENT OPERATIONS,' may I help you?"

Unreal, fantastic! I'm still dreaming! (Got to go wake Betty, she'll help me get out of this.) "Betty! . . . Betty! . . . Betty!" (She sat straight up in bed . . . but she's not looking at me. She's looking as if she *thought* she heard me but wasn't sure. Oh, now she's getting up and coming over here. No! She walked past the bathroom door and out the hall. Why is she going to the front door?

Major Leich, my CO! Dear God, the doorbell woke her and she thought I was already gone. He must've come to see why I missed the flight . . . Betty's falling! What did he say to her? I could kick him in the . . . here, let me help, get away from her.

The sounds and tremendous pain I experienced when I touched her was nothing compared to the horror of my hands passing through her arms!

Suddenly, I was very cold. The horror movie ghostie I dreamed of earlier was back and put his hand on my shoulder. He didn't say it, but I knew as if my mind communicated with his. "Come, George . . . it is time. You'll get to see Betty tomorrow at this time . . . but first things first! What did you think Hades was, just simple fire and brimstone? Oh, no, your personal hell is to have the party, then everything leading up to the crash, and finally to go through the crash in very slow motion. You'll have to feel it every day, George. Then, you'll 'relive' that final experience there as Major Leich tells Betty how you were burned in the crash . . . see George? If you had used the checklist it would've prevented this. But, now, it's time for your permanent duty. Come, now, we goeth now. You'll never get used to it, but I'll always be here to be sure you experience it forever and ever at the same time every day. Come, George. . . ."

# "Hey Tower . . .

# Haven't You Got My Clearance Yet?"

**Colonel Robert E. Darlington, USAF**
**Hq TAC/SE**

**There seems to be a natural law which demands that the growth of air traffic shall always outspace the supply of modern equipment and controllers. The best thing a pilot can do is to help ease the adverse situation with some plain everyday old-fashioned radio discipline—well tempered with courtesy, consideration and composure**

NOT TOO MANY years ago, there were a few outfits which required a cross-training program for air traffic controllers and aviators. The idea was to strap a young tower or GCA controller into the back seat of a jet and let him enjoy the thrill of a dwindling fuel supply while trying to work into the landing sequence. The pilots, on the other hand, were required to visit tower, GCA or RAPCON on a recurring basis so they could see how much fun it was to handle a mix of fast airplanes, slow airplanes, IFR traffic and VFR traffic with only one or two runways to play with and no less than a "million" people talking at the same time.

The result of the program was a healthy respect for the other fellow's problems. Unfortunately, the decrease in available cockpit/flying hours and the increase in recurring ground training duties make it tough to keep that kind of program alive.

But the need for mutual respect within the air traffic control/aviator team, however, hasn't decreased at all.

There seems to be a natural law which demands that the growth of air traffic shall always outpace the supply of modern equipment and experienced controllers. Given this fact, the best thing the pilot can do is to help ease the situation with some plain, old-fashioned radio discipline—well tempered with courtesy, consideration and composure.

When I hear a pilot arguing with an air traffic controller, it always prints out in my mind as *adolescent aviator*. If an airborne pilot has a valid reason for not accepting a clearance or lack of same, there are procedures, such as declaring an emergency, for seeking resolution.

If safety considerations are not involved, the only place to pursue an air traffic disagreement is ON THE GROUND, not over the radio.

There are two major reasons for this. First, the pilot is usually tuned in on only one frequency. Thus, he may not have as great an awareness of the total traffic situation as the controller who is listening in on UHF and VHF frequencies plus a couple of landlines. Lacking this appreciation, the wrong chatter, argument or delay at the wrong time could very well be putting another aviator in a bigger pinch than the first pilot thinks *he's* in.

Secondly, if a situation is getting so sporty that a crusty old aviator of 5 or 6 (or more) years experience blows his cool with a blast at the controller, consider this: If the *pilot* is that *rattled,* how will his blast affect the rattle-factor of the first term controller who possesses limited experience in aviation?

Good radio discipline is not entirely a matter of composure and minimum verbiage. It also includes waiting until you're sure the frequency is clear before transmitting after a channel change, and it includes letting the arrival controller know your complete intentions without making him play "20 Questions."

The courtesy and consideration part of the formula doesn't necessarily pertain to the use of "yes, sir," "thank you" and "good evening." These are good phrases

***Continued on page 29***

## Tips To Healthful Living: Part I

# The Health Consequences Of Smoking

*Aeromedic*

LTC Nicholas E. Barreca, M.D.

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

HOW INDIFFERENT we have become to the risks of that foul abuse of smoking. The smoker fingers the often colorful and spellbinding commercial pages of the many popular news media, carefully overlooking and unconsciously denying the warning: *The Surgeon General Has Determined That Cigarette Smoking Is Dangerous To Your Health.* He or she fleetingly, but nervously ascribes such chance disaster to "them, not I, me or thee." It never happens to us, always them, certainly not now, perhaps conceivably, though remotely, in the distant future . . . when we certainly won't care. Or will we?

The smoker even turns to his fellow man for security. He casually, seldom apologetically pronounces, "You don't mind if I smoke?" And most of us blithely, yet witlessly respond, "Not at all!" or "Go right ahead" or "Think nothing of it." Would our reply be as spontaneous if the same person announced, "You don't mind if I kill myself . . . but slowly?" or "Do permit me to continue in my personal contribution to research in cancer and heart disease!"

Flight surgeons, being concerned with health and fitness, have as their goal the reduction of both the immediate and long-term risks or consequences of even our seemingly most trivial bad health habits. As thoughtful physicians, they are interested in extending our useful and vigorous existence and maximizing our performance capabilities. However,

their least satisfying experience must often be the treatment of disorders beyond the reach of present day curative medicine . . . those conditions that are best prevented.

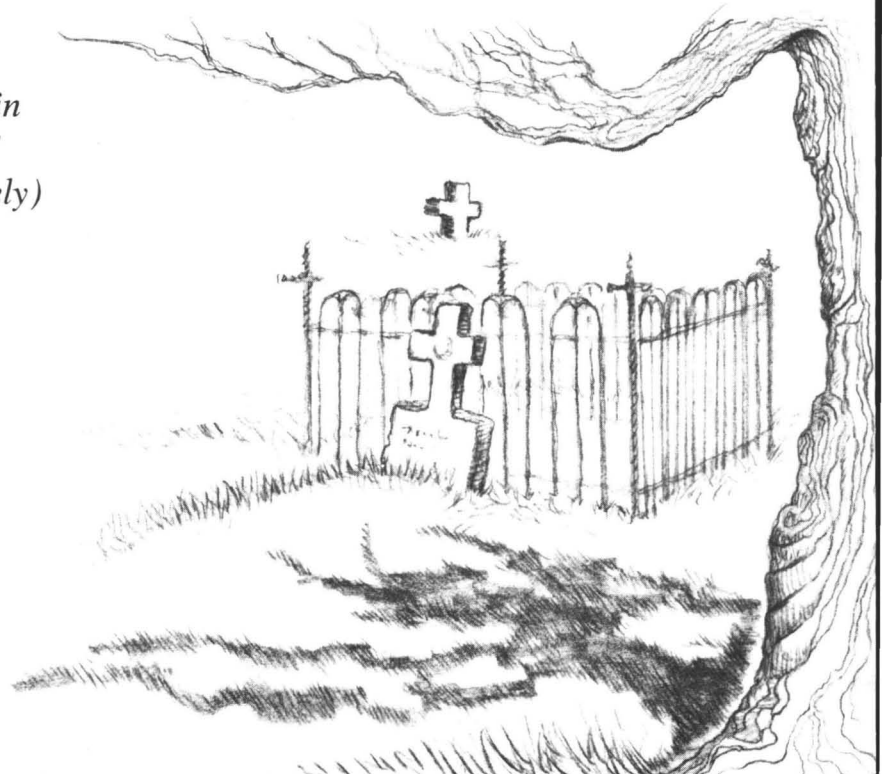
Today each of us, smokers and nonsmokers, can play a role in preventing serious disease and disability. The smoker can quit smoking. The nonsmoker can set the example, particularly for the youthful, developing minds of our offspring. Why quit or prevent smoking? Because there is incontrovertible evidence amassed that implicates smoking as a causative or contributing factor in the development of serious, usually life-threatening and often fatal disease. Diseases that strike just about the time when most people need and appreciate healthful, comfortable living most.

Just why is smoking so harmful? There are several reasons. First of all, smoke is irritating to the tissues with which it comes into contact. It ultimately causes damage and deterioration of these tissues. Then smoking permits the bloodstream to become partially saturated with carbon monoxide (CO). CO produces a form of hypoxia, like being at 12,000 feet of altitude before leaving the ground. This insult by itself or in combination with environmental pollution may produce some of the systemic or distant effects of smoking. Finally, many of the particulate and gaseous components of tobacco smoke will produce untoward effects throughout the body by interference with the chemical systems or by chemical alteration of specific body tissues and surfaces. Look at the constituents found in tobacco smoke (see box, page 11). The first *three* are likely to be those that contribute to the health hazards of smoking. The next six (*) are thought to probably contribute to health hazards. The remainder of the list are *only* suspected contributors. If someone prepared you a drink with each of these foul constituents added before your very eyes, would you drink such a poisonous cocktail . . . and drink it and drink it and drink it twenty, thirty, forty times a day? The sophisticated analysts among you will say, "But these ingredients are only present in microgram and milligram quantities." The human body functions biochemically on as little as a micro-microgram of matter, sometimes less. Do you not think that malfunction can occur any less easily? Why is smoking so potentially harmful to your health? Because its assault is invisible and insidious . . . you can't see the name of your poison, it's obscured in smoke and haze.

Let's take a look at some of the more serious health consequences of smoking. Each is a serious threat in and of itself. Granted, each of us is somewhat resistant to some of these diseases because of our genetic inheritance. By the same token, each of us is likely to be susceptible to one or more given the right poison. The list of consequences (see back cover) is long enough that few of us are so well endowed that we can ignore the threat from some of these corridors of suffering.

**CORONARY HEART DISEASE** - Smoking is one of the major risk factors contributing to the development of coronary heart disease (CHD) or "hardening of the coronary arteries" as many recognize it. Cigarette smoking can act independently or together with other known risk factors in leading to heart attacks or myocardial infarcts as your flight surgeon might say. Autopsy studies show that cigarette smoking is also associated with the increased development of arteriosclerosis of the aorta (hardening of the body's largest artery). For people with already existing CHD, smoking leads to the likelihood of more serious disease and increased complications. It also increases the chances of death from these complications. Several U. S. Presidents have survived heart attacks for more than a decade by careful, nonsmoking living. Once a smoker stops smoking, the risk of death from CHD is decreased. When one compares cigarette smokers with nonsmokers, the risk of developing CHD is 2-3 times greater depending on the

*"Rest in pieces" (securely)*



*"Say friend, got a light? I'm about to die for a cigarette!"*

survey studied. Pipe and cigar smokers have increased risk lying between that of cigarette smokers and nonsmokers.

**CEREBROVASCULAR DISEASE** - Cigarette smokers have higher death rates from cerebrovascular disease than nonsmokers. This catastrophic condition is more commonly referred to as a stroke, but the stroke in this instance is probably due to hardening of the arteries to the brain. This ultimately leads to thrombosis and occlusion of an artery with infarction (death) of brain tissue in much the same way as in myocardial infarction.

**BULGING OF THE AORTIC ARTERY** - This condition, known as aortic aneurysm, is most commonly caused by syphilis or lues. Here we are concerned only with aneurysm from non-syphilitic causes. An aneurysm is a bulging or ballooning of the artery wall due to deterioration and weakening of its tissues. Cigarette smokers have higher death rates from non-syphilitic aortic aneurysm than nonsmokers.

**PERIPHERAL BLOOD VESSEL DISEASE** - This is medically referred to as peripheral *vascular* disease. It usually means arteriosclerotic disease in arteries besides those to the brain and heart or the aorta. Cigarette smoking is a likely risk factor in the development of peripheral vascular disease. It also appears to aggravate preexisting peripheral vascular disease. Smoking has also been implicated as a possible causative agent in a specific peripheral vascular disease, known as Buerger's disease.

**EMPHYSEMA AND CHRONIC BRONCHITIS** - Medically these diseases are commonly lumped together as chronic obstructive pulmonary disease (COPD). Cigarette smoking is considered the most important cause of these conditions. Death rates from COPD are also higher among cigarette smokers, although pipe and cigar smokers are also at some increased risk. Smoking also acts together with air pollution and occupational exposure in the production of increased risk of COPD. Emphysema can be one of the most disabling diseases. It produces what's loosely termed a respiratory cripple . . . an individual who gets short a breath just standing up. Respiratory symptoms and infection are also more prevalent and severe among cigarette smokers. If smokers undergo surgery, they are more likely to develop post operative pulmonary (lung) complications. How about that. . . . Smoking gets you coming and going, mostly going! What if you quit smoking? Then the risk decreases progressively with time. The result is fewer symptoms and decreased risk of the development of COPD and respiratory infections.

**GASTROINTESTINAL DISORDERS** - Cigarette smoking men have an increased prevalence of peptic ulcer disease as compared to nonsmoking males and a greater peptic ulcer mortality ratio. Since there is evidence to suggest that the lower esophageal valve to the stomach is less effective among smokers and results in regurgitation of stomach juices, the prevalence of heartburn or esophagitis is likely to be increased among smokers.

**LUNG CANCER** - No matter how you slice it, cigarette smoking eventually leads to lung cancer . . . if you live long enough. The risk is closely related . . . the greater the number smoked, the longer the duration of smoking, the earlier you started smoking, the more and deeper you inhale, and the more tar per cigarette . . . the greater the risk. Cigarette smokers have a greater risk than pipe and cigar smokers, but the two are greater than normal risk. Men have a greater risk than women. Combine these risks with urban living and the old wheel of fortune slows down toward your number.

**MOUTH CANCER** - Cigarette smoking is a significant factor in the development of the oral cancers. This includes both leukoplakia (white plaques on the mucous membranes) and actual squamous carcinomas (malignant tumors). Cancer of the lip has long been associated with pipe smoking although recently a stronger association has been found with exposure to sunlight. This is because these

tumors always occur on the lower lip (perhaps one should worship other than the sun).

**THROAT CANCER** - Cigarette smoking is a significant factor in the causation of cancer of the larynx (vocal cords and voice box). Pipe and cigar smokers have about the same risk, maybe slightly lower. Alcohol is a minor risk factor in the development of the disease. Think of those who use both in excess.

**ESOPHAGEAL CANCER** - Cigarette smoking is significantly associated with the development of cancer of the esophagus (tube leading to the stomach). This risk is as great for cigar and pipe smokers, perhaps slightly lower. Studies have also shown a significant association between alcohol consumption and cancer of the esophagus. Further, the combination of exposures, smoking and alcohol, is associated with especially high rates of this cancer.

**BLADDER CANCER** - Name your cancer, smokers. That's what its getting to be the more medical science studies the associations of disease with smoking. There is a significant association between the incidence of bladder carcinoma and cigarette smoking for both men and women. Bladder cancer is also associated with certain occupations in the aniline dye industry but the association with smoking is separate and distinct. This association is not apparent for pipe and cigar smokers. However, they aren't completely off the hook. There is a correlation between the use of chewing tobacco and cigar smoking with adenoma and adenocarcinoma of the kidney.

**PANCREATIC CANCER** - There is a significant association between cigarette smoking and cancer of the pancreas (the ole beef bread where insulin and digestive juices are produced and stored). This association applies to both men and women.

**ORAL DISEASE** - A whole barrel of minor irritations and disorder of the mouth are associated with smoking. Smoker's tongue is one of them. Certain dental problems are another. General oral health is simply much better among nonsmokers.

**ALLERGY** - Tobacco smoke can contribute to discomfort in many individuals, which is a complex of irritative and allergic responses. Exposure to tobacco may produce recurrences of allergic symptoms in nonsmokers who suffer with allergies from diverse causes. How many non-asthmatic smokers have from time to time experienced a sensation of wheezing or chest constriction? Tell the truth now smokers!

**TOBACCO BLINDNESS** - There is a rare disorder known as tobacco amblyopia, a blindness which evidence suggests is related to the cyanide component of tobacco smoke when certain other deficiencies are operative.

**AIR POLLUTION** - Think of the smoke filled room of a cocktail party. Recently a medical investigation showed that individuals with angina pectoris (chest pain from CHD) had increased symptoms when they drove in urban traffic due to carbon monoxide (CO) levels. Think of how such individuals might fare at a cocktail party or in the smoky cabin of a modern jetliner. In these respects smoking is merely inconsideration and irresponsibility. The levels of CO in smoke-filled rooms have been shown to equal and at times exceed the occupational threshold limit valves that are applied industrially to determine safe limits of exposure for a normal work day. The extent to which these exposures bear on general health or the incidence of illnesses is presently indistinct.

**INFANT DEATH** - Very recently it has been established that pregnant female smokers run nearly twice the risk of delivering a low-birth weight child and run a higher risk of stillbirth. This is especially so if she smokes beyond the fourth month of gestation.

**EXERCISE INTOLERANCE** - Certainly of importance to the military is man's ability to perform physically. A review of a number of fitness tests, comparing smokers and nonsmokers, indicates that cigarette smoking impairs exercise performance for many types of athletic events and activities involving many types of work capacities.

Had enough? Are you convinced that smoking is generally undesirable no matter how you look at it?

**COMPOUNDS IN CIGARETTE SMOKE**

| | |
|---|---|
| Carbon Monoxide | Butylamine |
| Nicotine | Carbon Dioxide |
| "Tar" | Crotononitrile |
| *Acrolein | Dimethylamine |
| *Cresol | DDT |
| *Hydrocyanic Acid | Endrin |
| *Nitric Oxide | Ethylamine |
| *Nitrogen Dioxide | Formaldehyde |
| *Phenol | Furfural |
| Acetaldehyde | Hydrogen Disulphide |
| Acetone | Hydroquinone |
| Acetonitrile | Methacrolein |
| Acrylonitrile | Methyl Alcohol |
| Ammonia | Methylamine |
| Benzene | Nickel Compounds |
| 2,3-Butadione | Pyridine |

How do you feel when you wake up in the morning, if you wake up? Drugged? Mouth shaggy and foul tasting? How's your concentration without a cigarette in your hand? Ever spend an hour and one-half trying to find or buy cigarettes?

What about the mere compatibility of smoking with the aviation environment? Not too long ago a serious study was completed to determine carbon monoxide (CO) levels on the flight decks of commercial aircraft. The concern was for the buildup of exhaust fumes containing CO on taxiways while aircraft await takeoff clearances. The results were borderline. Would they have been so if the crew were permitted to smoke? Several years ago on the flight deck of a USAF C-141 this author observed six of six flight deck air crewmen smoking simultaneously. The weather report? . . . Obscured in fog and haze in the cockpit.

Most heavy smokers can develop CO levels in their bloodstreams that take up to 8 to 10 percent of the oxygen carrying capacity of hemoglobin. This effect, independently and in combination with decreasing barometric pressure, causes hypoxia. The most noticeable effect is diminished night vision . . . a 25 percent decrease even at sea level. Is vision important in aviation? . . . Still airframe manufacturers install ashtrays in all militray aircraft.

What about the fire and explosion hazard? Refueling operations, fuel transfer . . . oxygen systems? Consider the jet jockey who smokes in between breaths from his oxygen mask. It's possible to survive such tom foolery but the risk is high.

At least AR 95-1 has something to say about smoking:

- Smoking within 50 feet of an aircraft on the ground is prohibited.
- Smoking is prohibited in aircraft under the following conditions:

a. During all ground operations
b. During and immediately after takeoff
c. During fuel transfers operations
d. Immediately before and during landing
e. At any time an occupant detects gas fumes
f. When oxygen is being used

Not only is smoking incompatible with health and often life, it is incompatible with the flying environment. So when are you going to quit smoking? Impossible you say? It's an addiction? Boulderdash and bull feathers! Smoking is as much an addiction as you want to make it.

Some people advocate decreasing the number of cigarettes smoked, the length of cigarettes smoked, the depth of inhalation, the frequency of inhalation and the gaseous and particulate contaminants of smoke. The first four are like eating one potato chip . . . like telling the gay lothario to stop at the kiss of a hand. The last hasn't been developed yet to the extent that would be necessary . . . and when it is, smokers probably won't like it anyway.

The solution is to stop cold! Throw away the pack. But, and that is an important but, you must be convinced that stopping is worthwhile before hand. How does that happen? Well, smoking must become a personal problem for you. Not a threat to your life necessarily, but a similar feeling. This will only happen when you start looking realistically at the effects of smoking around you. The people sick and dying around you, your own disability and the mounting evidence revealed above. Try running around the block just once. If you feel like a 90-year-old, you have the makings of a personal problem. You should feel like many of us . . . remember 16.

Think of your family, those dependent upon you for support. It's unfair to your wife, your children and your grandchildren that they should be denied the pleasure of your vigorous and healthy attentions. Think of the generous retirement from the Army, the one you've always bragged about as a fringe benefit. You have to be alive and well to enjoy it. Finally, think of the peace of mind that will prevail when you quit smoking. No longer will there be a need to worry about that pain or tightness in your chest, that lump or hoarseness in your throat, that cough and phlegm, the shortness of breath . . . the terrible threat of cancer.

Do some people need help to stop smoking? Certainly! To some extent all do. Smoking is a habit that is encouraged by man's social convictions and engagement. It is natural then to seek and ultilize social reenforcement to discourage smoking. Make it a group affair. Find two or three others in your predicament. Quit together with mutual reenforcement, concern and encouragement.

Some individuals may also respond to the help of physicians or psychologists. Drugs may be used in conjunction with various behavioral therapy. One way or the other find your way a discouraging or quitting this costly ugly, morbid, suicidal habituation. Let's face it, "smoking stinks." The next time someone asks "Do you mind if I smoke?", remember the recent haunting TV melody and sing, "Yes, I mind very much if you smoke . . . yeh, yeh, yeh . . . I mind very much if you smoke... yeh, yeh, yeh... I mind very much if you smoke! . . ."

**HEALTH CONSEQUENCES OF SMOKING, A Report of The Surgeon General: 1972, Department of Health, Education and Welfare, Public Health Services, Health Services and Mental Health Administration. Available for sale from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Price 70¢, Stock No. 1723-005.**

# Charlie and Danny's Write-In

Dear Danny: There were numerous cases of overheated batteries in UH-1 helicopters in our unit during hot weather, apparently caused by voltage regulators being set too high. According to TM 55-1520-210-10, paragraph 3-21, step 10 and step 14, the voltage regulator should read: Main generator 28 to 28.5 volts and standby generator 27 to 27.5 volts. TM 55-1520-210-10 states the main generator should be set to the following values according to the average ambient temperatures:

27 volts—90°F (and above)
27.5 volts—32°F to 90°F
28.8 volts—32°F (and above)

The standby generator voltage should always be adjusted 1.0 volt below the main generator. What should we do?

Mr. I.A.B.

**Danny's answer: You have a problem and here is the answer.**

**This information was obtained from the U. S. Army Electronics Command (ECOM) and action has been initiated to change the manuals accordingly.**

**The information in TM 55-1520-210-20 should be the same as shown in paragraph 3-4c of TM 11-6140-203-15-2 as given below:**

**VOLTAGE REGULATOR: Check to see that the voltage-regulating device on the aircraft is set as shown in chart below. The optimum voltage setting for the voltage regulator is determined by the voltage requirements of the associated equipment, temperature, type of battery, frequency and depth of discharges, and recharging rates. Undercharging will result in poor performance, while overcharging and high temperatures may cause excessive gassing, spewage of the electrolyte, and damage to the battery. Compensate for temperature changes by checking the generator voltage regulator setting on the aircraft at least every 25 flight-hours or weekly (whichever occurs first). Use the chart below for adjusting the generator voltage regulator setting for various temperatures:**

| Ambient ground level temperature (°F) | Voltage regulator setting (volts) |
|---|---|
| Above 80° | Between 26.5 and 27.5 |
| Between 32° and 80° | Between 27.5 and 28.5 |
| Less than 32° | Between 28.5 and 29.5 |

Dear Charlie: Our unit operates and is responsible for the maintenance of two T-42s. Needless to say, guidance in the form of TMs is sadly lacking at our level, specifically operator's manuals.

The present operator's manual, TM 55-1510-208-10, appears to be a rehash of the civilian version and is sadly lacking in detail. In addition, it does not always agree with the DA published checklist.

Is there any relief in sight for us poor lost souls out in the "boonies"?

CW4 C.B.F.

**Charlie's answer: Have heart my friends, relief to your problem is on the way.**

**We are told that the U. S. Army Aviation Systems Command is presently compiling a DA approved operator's manual for the T-42, which we hope will be far superior to the present publication.**

**At this time there has been no definite time table established for this document to hit the newsstands —but be patient, it's on its way.**

Dear Charlie: In reference to the tail rotor blade bearing of the OH-58A, is this bearing prefabricated on the tail rotor blade? TM 55-1520-228-34P shows that it is removable (page 236, item 11, figure 65). TM 55-1520-228-20 does not show or state the clearance or the proper maintenance measures that should be taken to correct it. Your help will be greatly appreciated.

SP4 J.T.

**Charlie's answer: The SMR code listed in TM 55-1520-228-34P for bearing P/N 206-010-765-1 is P—F. This code indicates the subject bearing may be replaced at direct support. TM 55-1520-228-35, the direct support, general support and depot maintenance manual, has complete instructions for tail rotor blade bearing replacements in chapter 8. TM 55-1520-228-20, the organizational maintenance manual, contains only those instructions which are applicable to organizational maintenance.**

## Autorotational descent performance is a function of indicated air speed and is essentially unaffected by density altitude and gross weight

# True or False?

**The author reviews, in a nontechnical manner, some important factors about autoratations in order to give operational aviators more insight and knowledge of what forces are at work during this emergency maneuver**

**Captain James W. Isbell Jr.**

AUTOROTATIONS are probably the most controversial subject discussed among rotary wing pilots. Their conversations usually cover topics like glide distance, rates of descent, zero ground speed touchdowns and the techniques to accomplish the maneuver.

Most rotary wing pilots achieve a high degree of stagefield proficiency when it comes to autorotations. Peak proficiency is attained normally about the time the aviator becomes an instructor pilot (IP), since the IP not only has to cope with the aircraft and other outside factors but also the pilot he is instructing. The odds are though that most pilots feel truly comfortable performing autorotations after a few practice laps around the traffic pattern. Then if this is true, how do operational pilots hope to have first-time success when an actual emergency occurs requiring an autorotation? In most instances there isn't much pilots can do except mentally prepare themselves so that when the sudden rotor decay does occur,

**NOTE**

**The material used to develop this article was taken from actual test data and individual experiences may not be explained fully by what has been presented. References:**

**NAVAIR 00-80T-80** — **AH-1G Operator's Manual**
**AFFTS Tech Document Rpt No. 64-27** — **NH-1D/H Operator's Manual**
**Test Pilots, Test Flight Center, Army Activity, Edwards AFB**

they will have all the necessary information at hand to make a correct and safe decision.

One obvious approach is to study the dash 10 and understand the recommended procedures. Since the dash 10 is broad in scope this may not answer all your questions. This is especially true when some dash 10 statements seem to be contradictory. For example, chapter 4 in a few rotary wing dash 10s states that autorotational performance is a function of indicated air speed and is essentially unaffected by gross weight and density altitude. On the surface this statement appears to be incorrect; if the aircraft weighs more it should fall at a faster rate and not glide as far. To understand why the statement is in fact true, first the pilot needs to realize that both rotor rpm and calibrated air speed are constants. To help the pilot understand what is actually occurring during an autorotation, a little investigation into the aerodynamics of an autorotation may help answer the question.

Keep in mind that an autorotation is classified as an emergency maneuver and it's not the intent of the author to dictate procedures or teach a course in aerodynamics, but rather to give the operational pilot a little more insight and knowledge of what happens during an autorotation.

**Blade Section Elements (Vector Quantities)**

Figures 1 and 2 show typical vector quantities of two rotor blade section elements. If you were to view the regions from above a

**Figure 1**

**Forces In The Propeller Region**

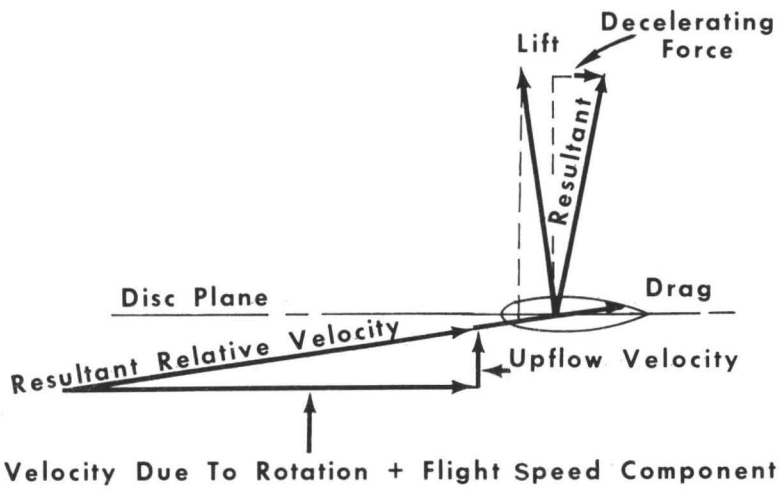
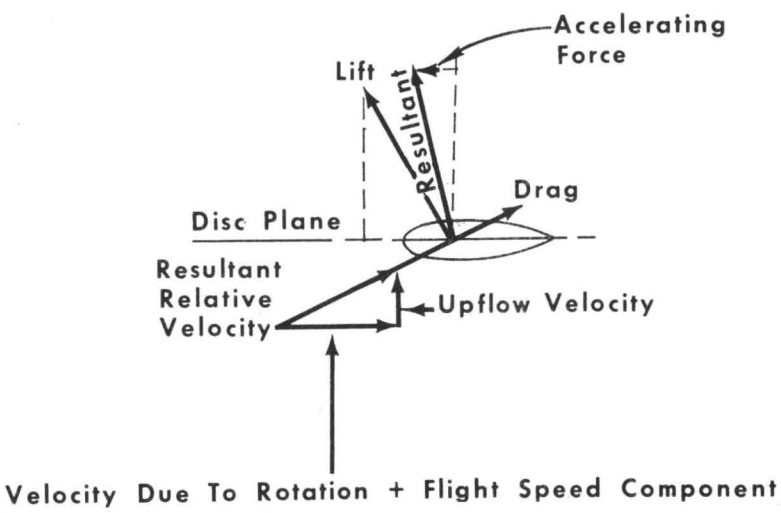
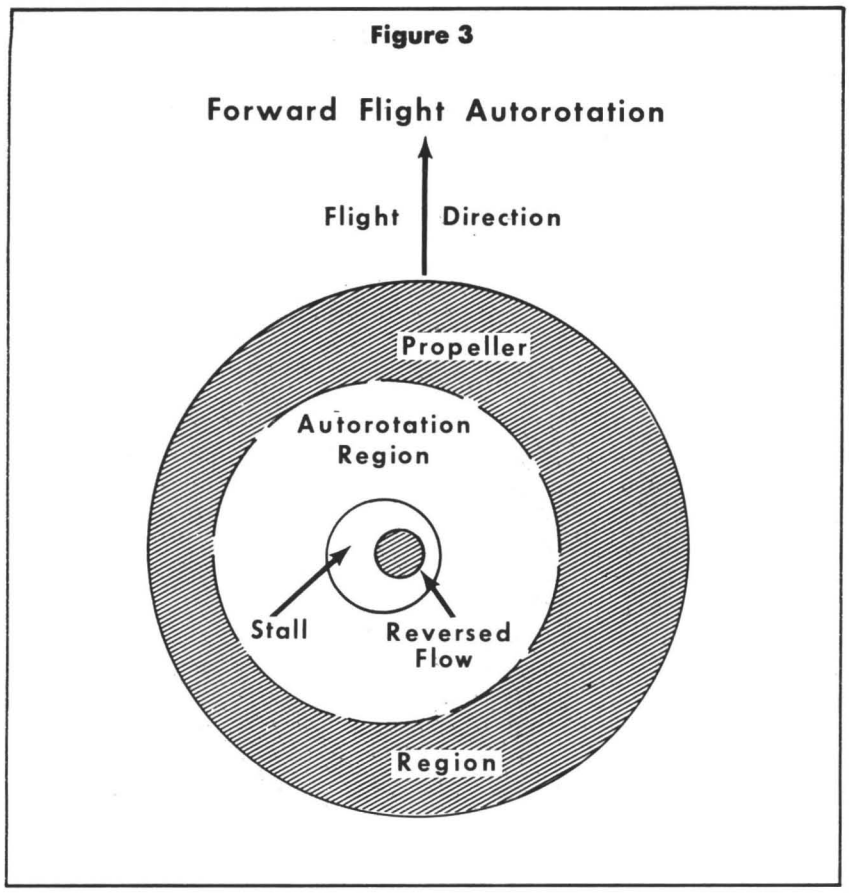



**Figure 2**

**Forces In The Autoration Region**






rotating blade with forward air speed, the autorotation and propeller regions would be similar to figure 3 on page 14. The propeller region provides the majority of the lifting forces that retard excessive rates of descent during autorotation. The autorotative region provides the driving forces needed to maintain a desirable rpm. Angle of attack and velocity due to rotation are the factors that allow a rotary wing aircraft to autorotate. Due to the differences in velocities of air flowing over the blade, a twist is given to the rotor blade to help equalize lifting forces. This twist is also necessary for autorotation and accounts for the magnitude of the forces acting on the blade during the autorotation.

The second and the most important factor governing autorotative performance is the relative velocity of air that flows across the rotor blade at various points along the blade. The velocity of air (or the velocity of the blade due to rotation) at a point decreases as that point is moved from the tip of the blade toward the hub. The inner 25 percent of the blade produces little lift and high drag thus tending to slow up the blade. In forward flight the aerodynamic force perpendicular to the axis of rotation changes to thrust (+) or drag (—) at each 180 degrees of rotation, thereby providing an autorotative force (thrust) and an antiautorotative force (drag). Rotor rpm stabilizes (zero net torque) when these two forces are equal: Assuming collective pitch remains constant, a greater angle of attack of the rotor disc increases rotor rpm, as during deceleration, while a decrease in the angle of attack, as in descent, will reduce rotor rpm. The resultant vectors are depicted in figures 1 and 2 as lift vectors.

**Gross Weight Consideration**

If figures 1, 2 and 3 are representative of an aircraft at some gross weight within the normal usage range of that aircraft, what happens if a higher gross weight is used? An aircraft that weighs more should fall faster than the lighter one. This greater rate of descent changes the angle and magnitude of the input forces acting on the rotor blade and corresponding changes occur with the resultant lift forces.

In the propeller region the upflow velocity due to the greater rate of descent does not change the resultant lift forces significantly. (Check figure 1 and note the difference between upflow vector and rotational vector.) As we move in toward the hub a different set of input forces are acting on the blade and the corresponding resultant lift vector changes significantly to cause rotor rpm to increase. (Figure 2—a change in upflow vector with reference to the rotation vector should have a significant effect on the lift vector.)

This increase in rpm is the key to the aforementioned statement concerning autorotational performance. Unlike our fixed wing counterparts who change forward velocity (indicated air speed) in a glide to compensate for a greater gross weight with the formula $\frac{V_2}{V_1}=\sqrt{\frac{W_2}{W_1}}$ rotary wing pilots control rotor rpm to accomplish essentially the same thing by adjusting collective. The equilibrium rotor rpm is obtained when the deceleration torque (drag) generated in the propeller region exactly balances the accelerating torque (thrust) generated in the autorotative region, as discussed earlier. $V_1$ equals glide indicated air speed for a gross weight $W_1$. $V_2$ equals glide indicated air speed for a new gross weight $W_2$.

As this rotor rpm is decreased to safe limits by application of collective pitch, the angle of attack of the entire rotor blade is changed and the dimensions of the propeller and autorotation regions correspondingly change. Figure 3 shows those regions for some gross weight lighter than the gross weight that causes rotor overspeed. When the collective pitch is changed, the propeller and autorotation regions change. The autorotative region becomes smaller in diameter and the propeller region larger. This change not only increases lift for flight and decreases lift for driving the blade but also changes a third factor, induced velocity.

Induced velocity is derived from air being deflected downward by the airfoil and may be considered as producing a force that helps retard descent. This force increases as angle of attack is increased.

The summation of these forces closely approaches that of the lower gross weight aircraft and in terms of glide distance and rate of descent tend to be almost the same.

If the theoretical autorotation is correct, then the actual autorotation should closely correspond to these results.

**Test Flight Data**

Figure 4 depicts test flight data that verified the preceding discussion. The points plotted are results from closely and exactly monitored autorotational performance. (Note: The plots for the curve are taken at different density altitudes.) A curve is formed after the points are plotted and this curve is then used to derive figure 5. Figure 5 is what we see in the dash 10 and is normally accompanied with air speeds and the rotor rpm to be used. (Note: Control of the rotor rpm is an important factor governing autorotational performance. This factor becomes more evident when air speed is compared to the velocity of the blade due to rotation.)

**Figure 4**

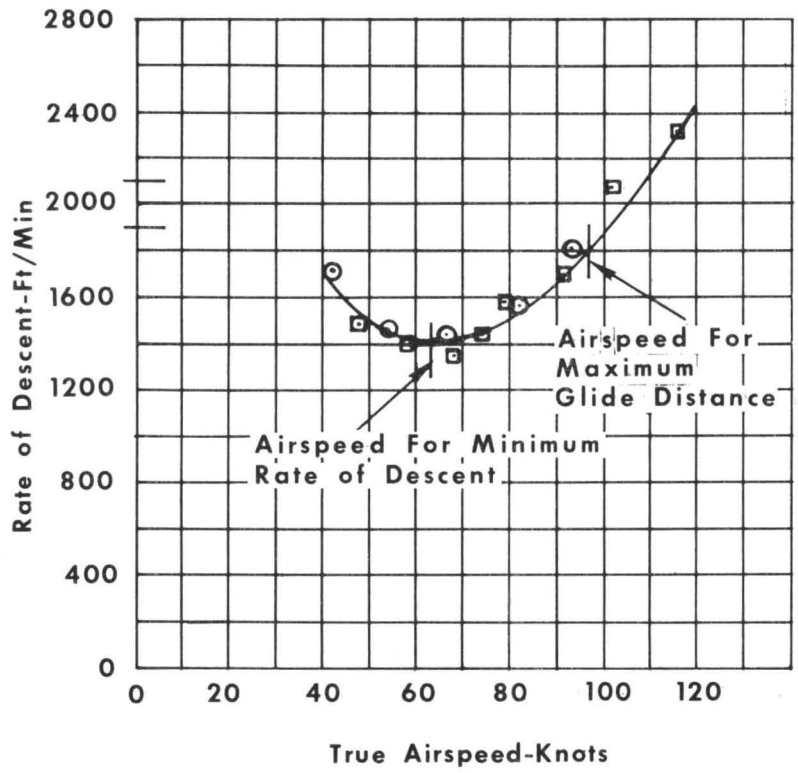
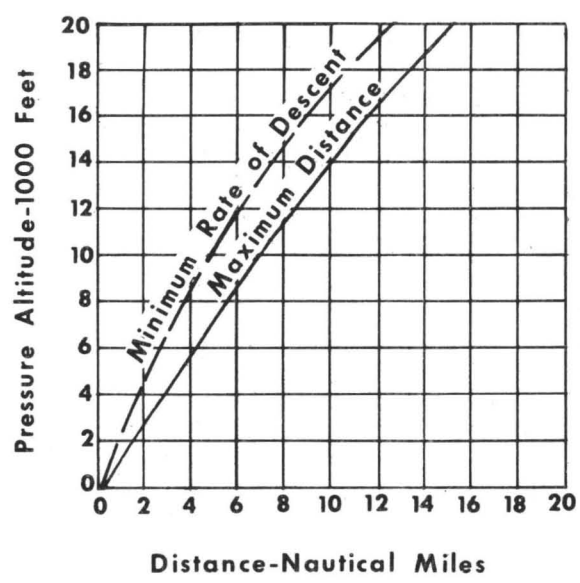



**Figure 5**



To obtain minimum rate of descent certain parameters must be satisfied to obtain a lift versus drag relationship to enable us to slow our descent as much as aerodynamically possible. This is, if the greatest amount of lift can be derived with the least amount of airfoil drag, then we should be able to slow our rate of descent to some minimum. During flight testing many different rotor rpm's are tried and the most favorable rpm is presented in the dash 10 chart.

Maximum glide distance is found similarly; however, distance traveled across the ground is a consideration and an air speed is chosen when the rate of descent and air speed attain the best ratio for maximum glide (distance flown in a zero wind condition).

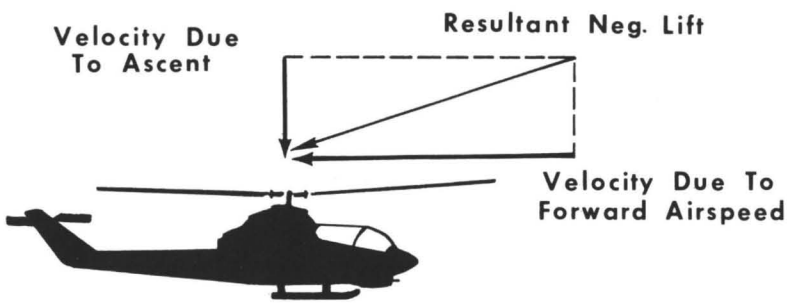
Now the statement "Autorotation descent performance is a function of indicated air speed and is essentially unaffected by density altitude and gross weight" tends to make sense. The two points to remember are: (1) "essentially" means that the difference under normal flight envelope conditions does not warrant a change in air speed to offset density altitude or gross weight changes to attain maximum glide; and (2) if parameters are taken to extremes, changes in performance can be expected; i.e., a very light aircraft at 1,500 feet density altitude or max gross aircraft at 13,000 feet (need oxygen there!).

Another controlling and important consideration during the autorotation is the air speed to be used. Minimum rate of descent autorotations are nice if our proficiency is above average, but if we look at figure 4, we see that regardless of the way we go an increase or decrease of air speed always increases minimum rate of descent. This becomes more pronounced as the aircraft gross weight approaches the maximum and rotor rpm is not closely monitored.

Maximum glide air speed is accompanied with a higher rate of descent, however, the higher air speed affords the pilot the advantage of trading air speed for higher rotor rpm during deceleration which is advantageous. The deceleration is less effective if the aircraft is below minimum rate of descent air speed. The effectiveness of the deceleration may also be considered a function of air speed.

The facts favor max glide air speed for those of us that are not as proficient as we would like to be.

**Figure 6**




**The aircraft tends to continue to climb after the rotor system is suddenly unloaded by rapid reduction of collective pitch. Movement of the cyclic control forward, during the air flow reversal, tends to aggravate the condition and cause further pitch up of the aircraft**

### Autorotational Entry

Successful autorotations begin with a smooth entry. It takes 300 to 500 feet to completely stabilize the autorotation after the initial entry. The changes in pitch, roll or yaw moments are a result of rotor inflow changes and may occur with the cyclic control in a fixed position. Therefore, any rapid control movement in response to these changes will only aggravate the situation. In fact, flight tests have shown that an aircraft at max gross weight in a climb at a slow air speed will encounter air flow reversal if the collective is moved too quickly. This can be understood if you consider the law of inertia. The aircraft is moving at some rate upward. If the collective pitch is moved to such an extent that the rotor system is completely unloaded, an air flow reversal takes place and negative lift is developed. Since the aircraft also has forward speed, two vector quantities are applied to the rotor system and a resultant lift force is derived, *but it is in the wrong direction.* Figure 6 shows the resultant vector.

The dash 10 is written to inform the pilot of the characteristics, capabilities and limitations of his aircraft and offer him guidelines for emergency situations.

The book cannot offer all the answers in all cases but a *professional* pilot should be capable of studying and analyzing those situations that he finds in day-to-day flying, regardless of the mission, and be able to outline a course of action that will enable him to get his aircraft back down safely.

# Attitude + Attitude + Attitude

**CW3 Stanley E. Whitman**

HAVE YOU EVER given thought to how much your attitude means to the people you contact each and every day of your life? *Each day* in every way our lives entwine with others and our attitude has a great bearing on the individuals we meet.

I can remember a number of occasions when my day had a bright and shiny start, life was really worthwhile, and given the proper incentive nothing could deter me from giving Uncle Sam his dollars' worth of effort. That is until I encountered the surly operations clerk who changed my entire outlook for the day with only a word or two in the wrong tone of voice.

Why does this have to happen? What could have given this man such an attitlude and why did it affect me so? Could it be his attitude was more powerful than mine? Why didn't the situation reverse itself? Instead of spoiling my day why didn't I brighten up his day? Frederich Buechner compares humanity to a spider web. "As we move around in this world," he wrote in *The Hungering Dark,* "and as we act with kindness, perhaps, or with indifference or with hostility toward the people we meet, we are setting the great spider web atremble. The life that I touch for good or ill will touch another life, and that in turn another, until who knows where the trembling stops or in what far place the touch will be felt."

As an aviation safety officer I can't help but wonder how many accidents occur when the trembling stops or the touch is felt. For in our daily lives we are committed to use the finest, most expensive and sophisticated equipment the Army has ever known. As aviators, regardless of age or experience, we are handed the responsibility of flying aircraft that we could not afford to buy in a lifetime. Yet, how often have you heard, "Heck, the factory produces them in bunches like bananas, and if this one is broken they will always get another"? Surely when a statement like this is made it is not made to a brick wall, and most certainly the trembling will start and before it stops this very attitude will rub off on many people.

In the *Transparent Self,* Psychotherapist Sidney Jourard claims that this process goes on all the time, that we all constantly issue unique and powerful invitations to each other to live or die, to triumph or surrender.

Clearly our individual influence can be profound. How do we use it? "Some people," writes Jourard, "have a proven flair for transmitting powerful invitations to others to regard life as pointless and hopeless. They are gifted at getting others to 'give up, yield, give in.' "

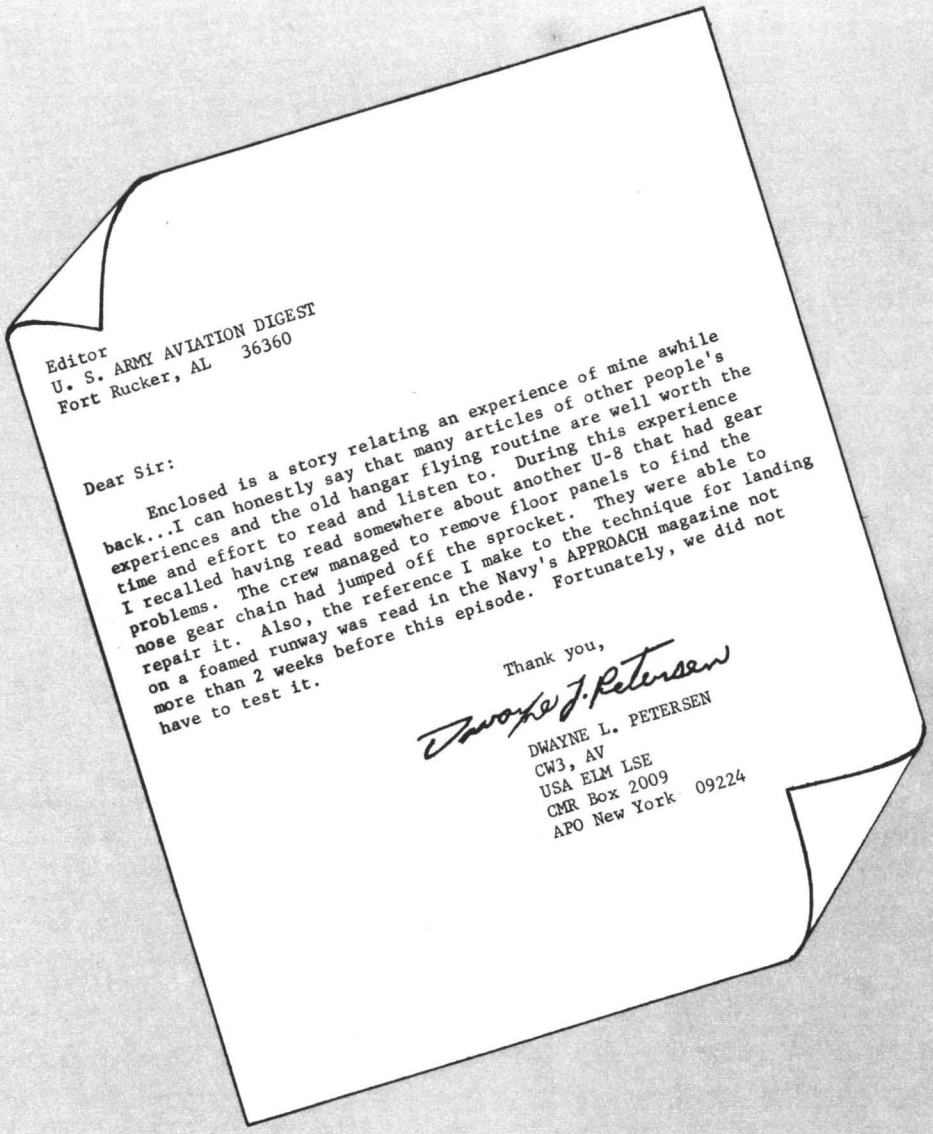
We all know people like this. They have the "who cares, what difference does it make?" attitude and seem to make a special effort in spreading their gospel at every opportunity. In fact, these people seem to have a special gift of preaching negativism. When one comes under the influence of these people our life becomes inadequate. We seem to be pushed into belligerence and stupidity, a day, week or perhaps even the rest of our lives becomes a wasted thing. We become a continuation of this original contact and again the web begins to tremble . . . cockpit errors, errors of omission, judgment, careless and unsafe acts become the order of the day. Who knows where the trembling will stop, whose life will cease to be, whose career will be ruined, whose soul will be scarred because directly or indirectly you have contributed to an accident that a kind word, a smile, a word of encouragement could have prevented?

As a student pilot I can clearly remember the instructors and check pilots that encouraged me on my way but for the life of me the gruff, unbending bearer of negativism is blocked from my memory. Their names no longer exist and their faces are lost, shoved aside by a strong desire to forget. This has taken years to overcome because nagativism has a magnetic force that takes a real effort to eliminate. Hard work and an unyielding desire to succeed along with a positive approach to my fellow man has been the formula necessary to develop a feeling of positivism.

Let us, each and every one, make an honest effort to reflect the positive attitude, start the web to trembling with a smile or kind word. Let the touch be felt in far places and live proudly with the results of positivism.

Once again I ask, "What's your attitude? Positivism or negativism?" Take a good look in the mirror tomorrow morning and ask yourself, "How do I want the spider web to tremble? Whose life do I want to touch today?"

**Based in part on "The Invitation To Live" by Ardis Whitman. *The Reader's Digest,* April 1972.**



Editor
U. S. ARMY AVIATION DIGEST
Fort Rucker, AL 36360

Dear Sir:

Enclosed is a story relating an experience of mine awhile back...I can honestly say that many articles of other people's experiences and the old hangar flying routine are well worth the time and effort to read and listen to. During this experience I recalled having read somewhere about another U-8 that had gear problems. The crew managed to remove floor panels to find the nose gear chain had jumped off the sprocket. They were able to repair it. Also, the reference I make to the technique for landing on a foamed runway was read in the Navy's APPROACH magazine not more than 2 weeks before this episode. Fortunately, we did not have to test it.

Thank you,

Dwayne L. Petersen

DWAYNE L. PETERSEN
CW3, AV
USA ELM LSE
CMR Box 2009
APO New York 09224

ANNUAL AWARD
Monthly Winner
CONTEST

ON A BRIGHT clear day I and another pilot departed in a U-8F for a functional maintenance test flight. During the landing gear check our day turned out to be other than routine.

The landing gear was activated for extension in the electrical or normal mode. To our surprise the indicators and light in the handle showed all three gear in the transient position. After some discussion we decided to try and retract the gear. First, we went to the manual gear extension procedure. Much to our surprise the gear again stopped somewhere in the transient position, evidenced by an impossible-to-move manual gear extension handle. We notified our home base tower of the situation and requested a flyby for a visual check by the tower. Our request was approved and after completion we were advised by the tower that all landing gear appeared to be extended halfway. This information was not too comforting but at least we knew our situation.

Proceeding to a clear airspace area we discussed the problem and decided that we were in no hurry to land in this condition. We had a full fuel load at takeoff which gave us time to avoid hasty action, and we did not want to land under the circumstances with all that fuel aboard. We decided that we would again try to retract the gear since this had worked before. It also was felt that a landing with the gear up was preferable to one with the gear halfway down. So we deactivated the manual extension system and activated the electrical system. You're right, nothing happened except the gear motor told us in no uncertain terms that it could not

**We certainly agree with CW3 Petersen about the value of exchanging personal flying experiences that have a teaching point. In his reference to having recalled reading about a similar U-8 gear problem, the DIGEST feels that CW3 Petersen was thinking about the Weekly Summary of 25 November 1963 (see the end of this article). Although this occurred almost 10 years ago, we find that many Army aviation people who were around then still recall the particulars of this U-8 incident. It paid off for CW3 Petersen . . . and his story may pay off for you as well. If you have had a similar experience as this in either fixed or rotary wing aircraft, we'd like to hear from you. If you are not adept at writing, don't worry about it. Just put your thoughts down on paper and send them to Editor, U.S. ARMY AVIATION DIGEST, Department of Nonresident Instruction, U. S. Army Aviation School, Ft. Rucker, AL 36360. But first, take time to read . . .**

**CW3 Dwayne L. Petersen**

# A Hole In The Floor

raise the landing gear. Disappointment abounded. Since for better or for worse both of us smoke this was the time . . . sit back, relax, light up and start exploring all possible courses of action.

The first item was emergency procedures for landing this aircraft in its present configuration . . . what I would do, what my partner would do, when we would do it. We considered things such as at what point prior to touchdown we would shut down the engines; would there be enough time to use the starter to position the props for least damage; and how much of the runway would we request to be foamed. There was 9,000 feet of it. Didn't we recently read an article that said to plan the touchdown just prior to the approach edge of the foam? At what point on the approach would we unlock the airstair door, of course leaving the safety chain hooked, etc.?

After all of these items had been discussed and verbally rehearsed, we continued to investigate the possible causes for our predicament. We decided that if the problem was not in a wheel well we might be able to get to it.

An inventory of tools abroard turned up one screwdriver with a blade of the size used to adjust vertical speed indicators and a ½ inch socket set handle. Our plan was to remove the floor panels to expose the gear mechanism. Things again looked grim because these tools were not adequate. Then, another brainstorm! Onboard were four water survival kits which contained survival knives that had screwdriver blades. My partner started to open one of these and at that moment I reminded him

that the inflation lanyard for the one man raft is connected to the case zipper. We really did not need a cabin full of inflated rubber raft. After some effort the survival kit was opened without raft inflation and we had an additional tool with which to work.

Have you ever tried to remove Phillips head screws with a regular screwdriver blade that is also a little large? Patience is the name of the game. By alternating the job of flying and removing screws we finally managed to expose the gear cross shaft, clutch, emergency extension mechanism, motor, nose gear chain and one area with nothing of interest. During this process we also had to remove the right front passenger seat. It along with the floor panels were stowed in the rear of the cabin. At this time I would like to emphasize that I am in complete agreement with having the minimum required number of people aboard during test flights. We were not crowded for working space and did not have other concerned people to worry about.

Next, we began a visual inspection of the gear mechanism. After a few minutes a strange object was spotted. Care to guess what it was? If you guessed a wrench you were right. It was a nice ½ x 9/16 inch open end wrench. To be honest we really did not need it but it did give us an additional tool.

The problem was the place where this wrench was located. Coming out of the left side of the landing gear retract gear box which is driven by the gear motor is a threaded shaft. On this shaft is a nut assembly which travels back and forth across the shaft. On top of the nut assembly is a small finger. Its sole purpose in life is to contact and activate the up and down landing gear motor solenoid stop switches. The wrench was positioned with one end against the bottom skin of the fuselage and one side against the cross beam, tilted to the left at about a 10 degree angle, with the upper end snugly engaged by the nut assembly. Believe me, this condition allows nothing to move.

After removing the wayward wrench with the assistance of the socket wrench handle I proceeded to lower the gear the rest of the way manually . . . and with much jubilation. Wait a second! The whole thing is just as it was. I cannot move anything. The wrench is out, right? All else looks fine, right? Then what's wrong now? Talk about frustration.

After more discussion we decided to again try the electrical gear system. Nothing moved. Suddenly my partner shouted out that he knew what was wrong. During the activation of the electrical system he'd noticed the cross shaft try to turn. However, instead of the nut assembly moving to the right it tried to turn with the shaft. As mentioned earlier, there is a landing gear limit switch actuator on this nut assembly which contacts the landing gear motor up or down limit switches. There is a metal bracket with a slot in it which is above the shaft. This acts as a guide for the landing gear limit switch actuator. The actuator actually extends through the top of the slot about one-eighth of an inch.

Evidently when the wrench jammed the nut assembly the threads inside it and those on the shaft fouled, creating a binding condition. As the shaft and nut tried to turn, the landing gear limit switch actuator was stopped by the side of the slot in the metal bracket. We knew what our new problem was but what do we do about it? We had no tools with which to remove the bracket so we decided to use our trusty ratchet wrench handle to break off the actuator. We proceeded to beat the devil out of it and it broke off flush with the slot in the bracket. The system still would not work.

Ingenuity is really a great thing. By one of us using the socket handle to pry the bracket up and the other working the manual extension system we slowly but surely saw the welcome sign of three flags showing the gear in the down position. Being good guys, the pumping of the extension handle was stopped when the flags said *"down."* After going through all this it was decided that we would really like to know if the light in the gear handle was also out. This may have been a little foolish or unnecessary but this was checked by my partner activating the down limit switch by hand while I placed the gear handle selector in the down position (or rather making sure it was in that position) and resetting the circuit breaker. The gear handle light was out and a press to test the light showed that it did work.

The next steps were to again deactivate the gear electrical system and make another flyby for a visual check of the gear position. This resulted in a very nice sound in the headset of "appears down and locked." All of this was climaxed by a very uneventful landing. Elapsed time from takeoff to parked on the ramp was 03+45.

There are I believe several good points to come from this experience and I list them here for your consideration:

- Learn the aircraft systems and their locations. (My compliments to the ground school personnel at the U. S. Army Aviation School, Ft. Rucker, AL.)
- Know and constantly review all procedures.
- Analyze your situation and do it as slowly and thoroughly as possible, depending on time available.
- If there is someone with you discuss your thoughts and ideas. Let them do the same.
- If space and weight permit always have a small flyaway tool kit onboard where you can get to it.

(You can be assured we do . . . it is even an add-on item in our preflight checklists.)

• Practice and enforce tool control and accountability anyway you can.

• Work hard at being professionals regardless of your job, position, location or circumstances.

The following was published in USAAAVS' (then USABAAR's) Weekly Summary in November 1963:

This one strikes close to home. On the 22nd of November, two local pilots borrowed USABAAR's U-8D for a proficiency flight. The flight plan called for a two hour local flight. Four takeoffs and landings were made. After the fifth takeoff, an attempt was made to lower the landing gear for the next landing. The right main gear light came on, but the other two did not, and the nose gear indicator on the floor showed half down. The gear handle light remained on.

A call was made to the tower and the gear problem explained. At this time, the gear handle was raised to the up position and all three wheels indicated up. Two more attempts to lower the gear were made. The results were the same. The gear handle was then placed in the up position and emergency procedures for lowering the gear were attempted. The landing gear relay circuit breaker was pulled and the gear handle was left in the up position. The clutch lever was moved to the right and the emergency gear handle pumped. There was no resistance to the movement of the emergency gear handle. After about 40 fast strokes, the left main gear light came on and resistance to movement of the emergency gear handle increased rapidly. The nose gear indicator again showed the nose gear halfway down.

An attempt was made to bring the gear up electrically. The clutch was re-engaged, the gear handle moved to the up position, and the relay circuit breaker closed. The gear did not come up and the circuit breaker was again pulled. At this point, maintenance assistance was requested through the tower and a low pass was made for a visual check. The main gear appeared to be down and the nose gear partly down.

After being advised of the action taken thus far, it was recommended that another attempt to lower the gear manually be made. With circuit breaker out, gear handle down, and clutch lever right, the emergency gear handle was pumped. After several strokes, it broke at the base.

By this time, USABAAR representatives and maintenance personnel were in the tower to lend a hand. The next suggestion was to attempt to remove the panel under the right front seat. Fortunately, one of the pilots had a GI can opener. Using the can opener as a screw driver, and the emergency gear handle as a pry bar, he was able to obtain limited access to the nose gear drive chain.

In the meantime, a call was made to the factory and the situation was explained. The factory representative asked for the crew to check the nose gear chain sprocket where it attaches to the torque tube for a missing bolt. Sure enough, the bolt was missing. He then advised that the airspeed be slowed to 65-70 knots, and the top chain be rotated forward, or the lower chain be rotated aft.

The initial attempt to move the drive chain resulted in approximately one foot of movement. There were definite hard spots beyond this travel. At just above stall speed, the chain was rocked back and forth and finally passed the hard spot. Movement of the chain was extremely difficult. The limited space and the angle to the chain in which his arm and wrist had to operate made the operation very tiring. Maps were used to line the access area and prevent injuries to his arm and wrist as he pulled the lower chain. A piece of foam rubber from the seat cushion was used to hold the lower chain while pulling. Resistance to the last few inches of chain travel reduced and the nose gear light came on.

The tower then advised that the clutch be engaged, the landing gear handle be placed in the down position, and the circuit breaker be closed. When this was done, the load meters showed an increase in generator power, and the main gear lights came on. Another low pass was made by the tower and a visual check showed the gear down. A successful landing was made. Thanks to some heads-up flying and a team effort, the aircraft sustained no damage, except for a bent floor panel and ruined cushion.

Inspection showed the cause to be the loss of a bolt (FSN 5306-182-2005) from the sprocket assembly (FSN 1560-217-5721) which drives the nose gear chain from the torque tube. From the dirt and grease in the threads of the bolt, it was determined that the safety nut had not been on the bolt for some time.

USABAAR has several recommendations to make as a result of this experience:

1. Recommend one time inspection of all bolts in the entire torque tube assembly.

2. Recommend inspection of these bolts at every periodic.

3. Recommend all units equip their aircraft with a small tool kit. This kit should contain a minimum of one Phillips head screw driver, one regular screw driver, a pair of diagonal pliers, a pair of regular pliers, and a small adjustable wrench.

4. Recommend all aircraft with retractable landing gear be placarded with emergency landing gear procedures.

# Asbestos-Suited Medics

**Story by Specialist 4 James Eakins**

EACH WEDNESDAY at Ft. Bragg's (NC) Fire Pit No. 1 a group of daring specialists from the 132d Medical Detachment rappels from a hovering UH-1H helicopter into a hellish sea of flames.

The asbestos-suited medics and crash rescue specialists are practicing an aircraft rescue operation. In a real situation their job is to reach and evacuate occupants of a downed aircraft. Meanwhile, a specially equipped UH-1H crash rescue helicopter hovers overhead spraying a fire suppressant onto the flames.

Because fire is a major hazard in any aircraft accident, each of the 132d's two UH-1H helicopters carries two 25-gallon cans of a fire retardant known as "light water." In a crash situation the UH-1H flies near the fire and, using a nozzle extension, sprays a path through the flames to allow the specialists to reach the crewmen. The entire op-

**Upper left: Rescue helicopter arrives at mock crash site. Upper right: A medic rappels. Lower left: A light water solution is sprayed on the fire. Lower right: Specialists enter fire area**

# Practice Aircraft Rescue

**Photographs by Specialist 4 Earl Dawson**

eration takes only 30 to 45 seconds.

In August the 132d marked its first year of crash rescue service to Ft. Bragg's Simmons Army Airfield. Captain Glenn W. Flint, commanding officer, said: "Since our activation it has been left up to us to work out specifics in performing our mission. In our first year we have tested out many procedures and I am convinced this is one that works."

The 132d services a 20-mile radius of the airfield. If an aircraft puts in a distress call, the team goes into immediate action, flying directly to the aircraft and escorting it to the airfield. Should the craft go down, an immediate rescue of the personnel can be accomplished.

The 132d is one of four such units in the Army that stays on constant alert for the sake of Army aviation safety.

**Upper left: Specialists practice searching for casualties. Upper right: Aircraft continues to spray light water. Lower left: Preparing casualty for stretcher. Lower right: Evacuating casualty**

# Writing For The DIGEST

**O.K., so you're not Hemmingway. Not everyone can be a professional writer, but everyone should be able to express himself in writing, regardless of his profession. Here's the shove you needed to get started on your DIGEST article**

SAVED ANYONE'S life lately? This question might be more significant than you think. It's just possible that you may possess some knowledge or have benefited from some experience that could save somebody's life—if they knew about it. You can tell them in the U. S. ARMY AVIATION DIGEST.

No matter what your job is, there is something about it or something that you have experienced that is of interest to the professional people who read the DIGEST each month. You *know* what is happening and where it is happening and we invite you to share your experiences with others interested in Army aviation. While it may not necessarily save a life, it could easily save time and money.

The DIGEST continually seeks to keep those involved in Army aviation informed about the most recent advances in aviation safety, operations, maintenance and technology. The magazine also serves as a sounding board for new ideas which further the cause of Army aviation and it promotes esprit de corps by noting significant accomplishments.

You, the reader, can do your share to help make this goal a reality by sharing your knowledge, experiences and ideas through the DIGEST.

This is how to do it. Anyone can submit an article to the DIGEST. When your manuscript is received several things happen. First, you get a letter of acknowledgement; then if the DIGEST prints the article, a letter crediting you with having had an article published is placed in your 201 file at your branch at Department of the Army. Third, your published article is entered in the monthly award competition. If you win, you receive an engraved plaque plus a $25 U. S. Savings Bond. Also the article becomes eligible along with other monthly winners for the annual awards contest. The three best of the year are selected and the winners receive engraved plaques and a U. S. Savings Bond of $250 for the first place article, $150 for second and $100 for third.

You don't have to be a profes-

sional writer to contribute to the DIGEST. Our authors come from all walks of life. Don't worry if your article is not perfect grammatically or does not conform to DIGEST style. The staff will edit the manuscript and correct such errors.

Material submitted to the DIGEST varies from pictures, letters, ideas and suggestions to full articles. Any material that falls within our mission is welcome. However, as an official Department of the Army publication, the DIGEST follows guidelines which limit the publication of certain types of articles. For instance, material which tends to publicize units or individuals for the mere sake of publicity is not printed. If you have any doubt about the acceptability of the item, either send it and let us be the judge or query the DIGEST prior to writing the story.

Whenever possible an author should contact the DIGEST before beginning his article to be sure he is on the right track. This can be done in person, by telephone or by mail. All military personnel are authorized to deal directly with the DIGEST. To ensure technical accuracy, manuscripts are reviewed by experts in the particular field with which they deal. For example, a story on helicopters normally would be reviewed by the U. S. Army Aviation School at Ft. Rucker, AL, and an article dealing with aircraft design or modification can be sent to the U. S. Army Aviation Systems Command at St. Louis, MO. Many articles are reviewed by the Department of the Army to ensure compatibility with official government policy and to ensure that they do not contain classified information.

The author has the option of clearing his story through the Office of the Chief of Information, Headquarters, Department of the Army, prior to submission, or he may send the manuscript and let the DIGEST handle the clearance. These safeguards protect not only the author but also the DIGEST and the government against printing misleading, false or even libelous information. Also, reviewing agencies often improve an article by adding current information that may not be readily available to the author.

What would we like for you to write about? Anything covered in our mission is suitable. The following topics are offered as suggestions (a more detailed list of suggested topics can be yours upon request):

- Army aviation subjects of timely interest.
- Maintenance, operations, safety, etc., practices that save time, money and material.
- New uses for Army aviation or its equipment.
- War stories or personal flight experiences that bring out new or unique tactics, techniques or safety procedures.
- All phases of professionalism in the aviation program.
- Research and development projects.
- Humor, with a teaching point.
- Historical aspects that tend to establish an Army aviation heritage or to build esprit de corps.
- Anything expressing original constructive thought on Army aviation.

In selecting a topic it is generally best to choose one with which you're familiar. If you or someone in your unit has found a new, better or safer way of doing something or has had a personal experience of value to others in the program, write about it.

Once you have made your selection, make an outline of what you want to say. At this point, a visit or call to the DIGEST could make the difference between failure or success. A member of the staff will be able to tell you whether or not such a story would be of value to the DIGEST and how best to proceed from there. With a firm outline you will find that you won't ramble or omit important points. Keep the average reader in mind.

Don't assume that all the readers will understand terms that you use every day in your job. Identify all such terms in your article. By having an interesting and attention-getting lead paragraph you will be able to catch the reader's attention and then focus it on what is to follow.

Illustrations are important sup-

plements to the written word and will be helpful in holding reader attention throughout the article.

The continuity of the story must be developed from the very beginning and should not be overlooked when the concluding paragraphs are written. If the story doesn't have a surprise ending or a natural conclusion you might try tying the ending back to something mentioned in the lead paragraphs.

Another important item to be aware of, especially when writing about technical subjects, is the accuracy of facts and figures. Although we will check them for accuracy, this detail is really your responsibility. If you are unable to verify statistics, call this to our attention.

Permission must be obtained from copyright owners to reprint quotes of more than 200 words. Plagiarism—an ugly word for stealing another author's original work—could make you, the DIGEST and the government subject to legal action. Be sure to credit your sources if the idea is not solely your own.

Whenever possible include appropriate, captioned photographs, artwork, charts or diagrams to illustrate material. The readability of any article is enhanced by good illustrations. If you are not sure what is needed, send what you have and let us decide what to use. Below are some general guidelines concerning supporting material:

• Use protective cardboard for illustrations during mailing and do not use staples or paper clips on pictures. Use cellophane tape or masking tape to attach captions to the back of the photo.

• We prefer black and white glossy prints or their negatives. We can use color photos but they do not reproduce as well.

• Get a professional photographer if possible to take the pictures.

• Captions should include the full name and rank of each individual, if known, and a description of what is taking place in the photo.

• Be sure to credit proper sources for illustrations. Obtain written permission to use photos from outside sources, or advise us of ownership so that we may obtain this permission.

**• Get something down on paper as soon as possible; it gives you a tool to work with. Tell the story to yourself and write it down as you do, using your outline to keep you from wandering too far off. At this point don't worry about such things as grammar, sentence structure and spelling.**
**• Read what you have written and add any detail or little thing you may have forgotten. As you rewrite, correct your grammar and spelling.**
**• Now look at your article objectively. If you have said anything not directly connected to the story, or if there is anything in it that does not carry the story forward, cut it out.**
**• Put the story away for a few days "to sleep." Then take it out and reread it. After this rest, you will be able to see many flaws you let pass.**

We prefer that manuscripts be typed on standard size bond paper—double-spaced. Do not send carbon copies unless you verify that the DIGEST is the only recipient of the article. If you do not have access to a typewriter, we will be happy to receive your handwritten material.

Manuscripts should run from 2,000 to 3,000 words, but we realize that many subjects require a greater or shorter length. The best guidance we can offer is to make the article long enough to tell the story without omitting meaningful information or adding excess wordage that adds little to the effectiveness of the story.

It is important that you send a short biographical sketch to include your rank, Social Security number, branch, a permanent address, current assignment and other information you feel is appropriate. We are especially interested in any significant facts in your background that tend to lend credence to the subject matter about which you write. If you change assignments, address or are promoted before we have printed your article, send the new information to us.

While style and composition are definitely important, our main concern is what the author is saying rather than how he says it. We can correct grammar and smooth out an article, but it is solely the task of the author to convey the meaning and thought that he is trying to get across.

Although there is not a monetary reward for authors who do not win the monthly award, the satisfaction gained by writing for the DIGEST will help you in your future military career. The ability to express yourself clearly and concisely in writing, as well as in speech, is a requisite of any profession. And you will be credited in your 201 file for your article if the DIGEST prints it.

Begin writing your article today. Send your manuscript to the U. S. ARMY AVIATION DIGEST, Ft. Rucker, AL 36360. For those who would like to visit or call, the DIGEST office is in building 5703 at Ft. Rucker and the telephone number is—commercial: (205) 255-3619; AUTOVON: 558-3619.

# "...Haven't You Got My Clearance Yet?"

*Continued from page 7*

if you happen to be calling Salt Lake Center around midnight, but definitely out of order at 1100 hours local in the Washington Terminal Control area.

The increase in air traffic and corresponding radio traffic, as you know, has resulted in reduced mandatory reporting and clearance readback requirements. But occasionally, radio discipline means talking a bit more than required by the rules.

Now, I realize that a simple "Roger" will suffice to acknowledge understanding of a new altitude clearance under the new rules. However, when it's obvious that a center controller is straining to sandwich other traffic into airspace I'm vacating, it's just good common courtesy to read back the altitude clearance. It's also a good idea to put yourself in the shoes of the tower controller who, in an effort to expedite traffic, clears an aircraft to "Taxi into position and hold." While a simple "Wilco" will do, a "position and hold" acknowledgement is better. Instructions to "hold short" should also be clearly acknowledged.

One more pet peeve: There is no control tower in existence that can manufacture an ATC flight clearance, and probably darn few that would intentionally conceal or withhold a valid clearance. When a pilot is strapped into a 115 degree Fahrenheit cockpit, waiting to start engines, he can be excused for

**There's no control tower in existence today that can manufacture an ATC flight clearance**

making an occasional query on the status of a clearance delay. On the other hand, I've heard aircraft commanders translate their embarrassment for late takeoffs by getting tough with ground control. The reaction simply means that the tower supervisor has to discontinue supervision of the younger controllers while he tries to reduce the noise from the irate aircraft commander. If a real problem is developing in the traffic pattern, cross off one pair of experienced eyes that could be helping to resolve it.

To this point, I've been painting the aviator as the villian of the radio discipline team, but it works the other way, too. Someday, I'd like to disabuse that fellow in RAPCON of the idea that I possess a photographic memory. I refer to the scene where I'm in the soup, in a descending turn, and I'm handed off from center to approach control. Initial contact is made, and in one mouthful, I'm given a new altitude clearance, a new vector, altimeter setting, active runway, ceiling, visibility, winds, remarks and missed approach procedures. It would be nice to claim that I'm smart enough to consistently assimilate all that. But to be honest, 8.4 flying hours per month just doesn't equip some people with that ability. WHEN THE TIME PERMITS, friend controller, please give me all those numbers, a few at a time.

*Reprint courtesy TAC ATTACK*

**Publications**

*How can I make sure I get the ARs, other DA publications and DA blank forms I need?—ASO*

AR 310-2, August 1971, supported by change 1, 20 June 1972, and DA Pamphlet 310-10, 14 February 1969, is the bible for distribution and requisition of Department of the Army publications and blank forms. According to this regulation, an organization in the field should be able to get the publications and blank forms it needs if the procedure described in the following paragraphs is followed.

In order to get publications to the people who need them, the U. S. Army Adjutant General Publication Centers (USAAGPCs) distribute and resupply publications directly to organizations and units, using the pinpoint distribution method. A commander of a brigade, group, regiment, battalion, company, battery or comparable command may establish an account for the publications required by his headquarters at either or both of the USAAGPCs listed below:

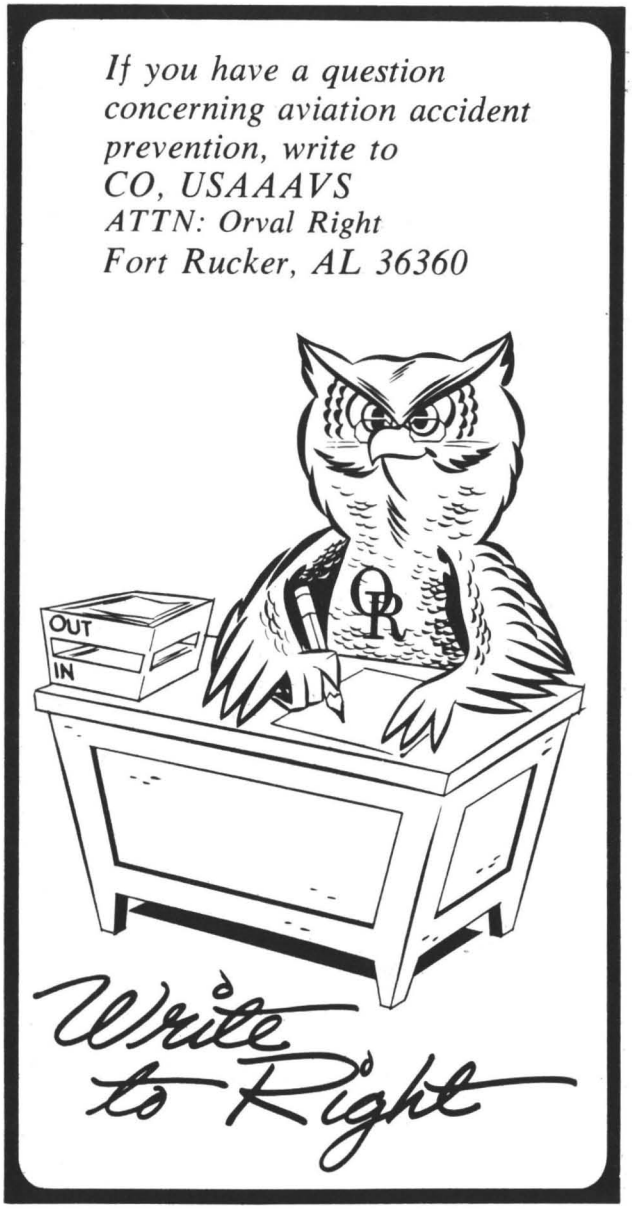
USAAGPC
1655 Woodson Road
St. Louis, MO 63114

(Some types of publications stocked: All technical and supply publications such as technical manuals, technical bulletins, lubrication orders, supply bulletins and supply catalogues.)

USAAGPC
2800 Eastern Boulevard
Baltimore. MD 21220

(Some types of publications stocked: Army regulations; DA circulars, general orders, pamphlets and posters; certificates for awards and decorations; doctrinal, training, organization and miscellaneous publications.)

To establish an account with a USAAGPC, a commander submits a "Request for Establishment of a Publications Account" (DA Form 12), when he sends in any one of the DA Form 12-series, a pinpoint subscription form. The subscription form is used to establish the organization's publication needs at the USAAGPC. When a commander submits these completed forms, he has "subscribed" to the publications he needs for his headquarters. The USAAGPC will then assign that unit an account number. The subscription forms are preaddressed to the appropriate USAAGPC to make the subscription process easier. Two pinpoint subscription forms, "Requirements for Army Aviation and Army Avionic Configuration Publications" (DA Form No. 12-31) and "Requirements for Army Avionics Publications" (DA Form No. 12-36), will be of interest to many aviation subscribers.




A word of warning: The next higher headquarters must approve requests for accounts from companies, batteries and detachments.

A commander's responsibilities are not limited to establishing the account and submitting the initial requisition. He must ensure that both the type and number of publications subscribed for are actually needed. In this regard, a commander should request only those publications applicable to his headquarters. He should review his subscription forms at least twice a year to confirm that his unit is receiving

needed publications, but is not getting unnecessary ones. The same subscription form (DA Form 12 series) is used to submit changes. The "change" box should be checked and changes indicated in those blocks on the form for which additions, deletions or changes are required. Instructions are found on the back of the form.

For the convenience of the subscriber, USAAGPC allows "write-in" subscriptions for new publications not listed on subscription forms. When new issues are announced either in a DA circular or in a USAAGPC letter, they may be ordered by the "write-in" method.

In any correspondence with a USAAGPC regarding an account, the account number assigned the organization by that particular USAAGPC must be referenced. And a last suggestion concerning publications: If the designation of an organization is changed, a change showing the new designation and referencing the account number should be submitted to the USAAGPCs as soon as possible.

Bulk quantities of blank forms, including the 2397 series, are provided to the publications centers in overseas commands and to installation publication stockrooms in the Continental United States (CONUS) to supply using units. However, some overseas commands, organizations and activities that are not satellited on a command with a publication center receive blank forms directly from USAAGPC as do CONUS installations and off-post activities which neither operate stockrooms nor are satellited on organizations with stockrooms. These groups establish an account with USAAGPC by submitting the DA Form 12-series. Then blank forms can be ordered on the DA Form 17 and 17-1.

However, most using units requisition blank forms from installation publication stockrooms or from overseas command publication centers, as appropriate. DA Forms 17 and 17-1 are used. Units are allowed to keep 60-day supplies on hand.

To obtain distribution of the U. S. ARMY AVIATION DIGEST and DA aviation safety posters, submit DA Form 12-4 in accordance with instructions on the form.

To obtain distribution of U. S. Army Agency for Aviation Safety publications, submit your request to Commander, USAAAVS, ATTN: FDAR-EP, Ft. Rucker, AL 36360.

### Crashworthy Fuel Tanks

*Are crashworthy fuel tanks scheduled for retrofit on Army aircraft now in the inventory that don't have them installed?—Aviator*

Yes. The completion date for installation of these tanks in Army aircraft is as follows:

UH-1D/H—June 1973
AH-1G—December 1973
UH-1B/C—July 1974
CH-47C—July 1974
OH-58A—September 1974
CH-47A—July 1975
OH-6A—December 1975
CH-54A/B—September 1976

### Aircraft Displays

*Is there a regulation governing static display of aircraft at civil air shows?—Commander*

AR 360-61 covers static displays and states, among other things: "Static display is a ground display of any aircraft, and its related equipment not involving flight, taxiing, or starting of engines. The aircraft must be in place with power off prior to assembly of spectators unless the aircraft can be towed or otherwise transported into the area with safety to spectators observed, and may not be moved until spectators have departed." Supervisory personnel of any unit that may be called upon to furnish an aircraft for display at a civilian function should familiarize themselves with the particulars of this regulation and ensure that the aircraft is put in place and moved in accordance with outlined procedures. You would be interested in an article appearing in the December 1972 AVIATION DIGEST entitled "Static Displays and AR 360-61."

### Safety Meetings

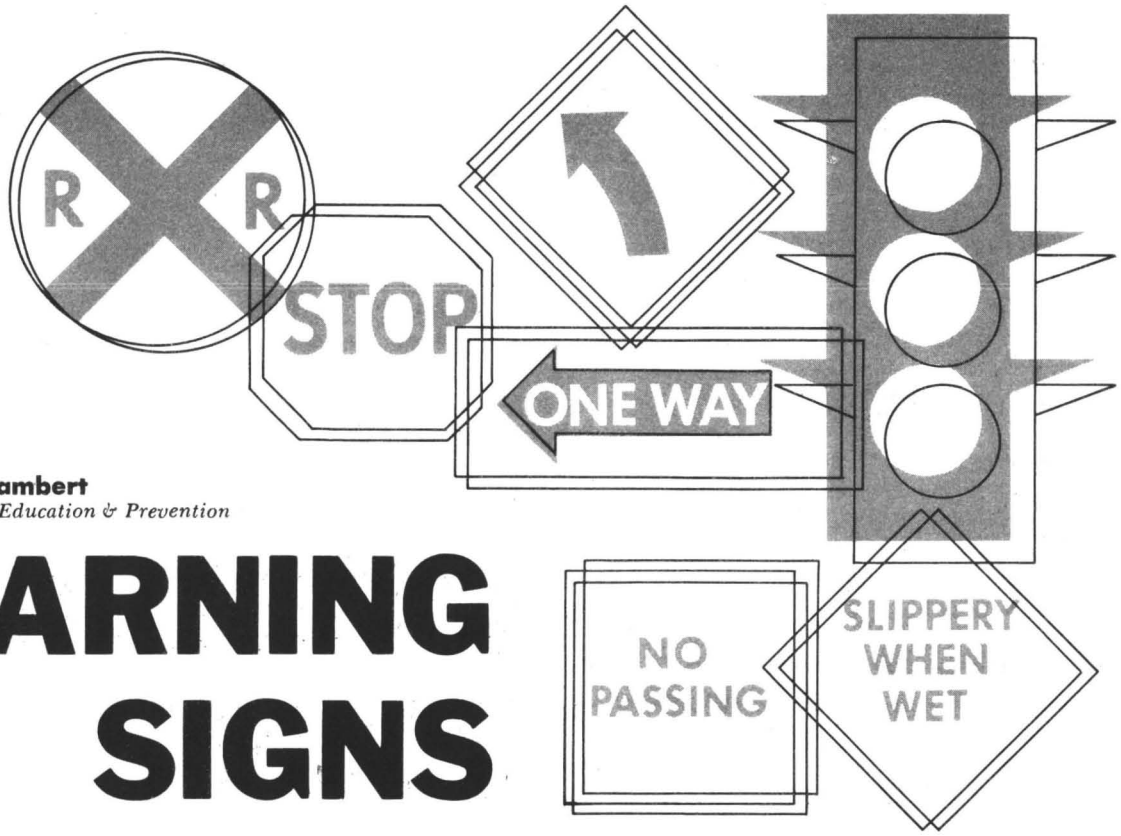
*Are monthly flight safety meetings required by AR?—ASO*

Paragraph 5 of appendix 6 to AR 95-5 states that informal aviation safety meetings should be scheduled periodically (at least one per month) for all aviation personnel. Most Army supplements to this AR state how long a safety meeting should last and often suggest subjects to be covered.

### Flight Jackets

*Is there a regulation that says that aviators must wear flight jackets?—Nonaviator*

No. AR 95-1 says that flame retardant clothing, leather boots and flight gloves will be worn by the flight crew on combat, tactical training, test or similar flights that involve unusual hazards and at other times as prescribed by unit commanders. The flight jacket is not flame retardant, and Nomex flight jackets are still in the service test stage, with field issue expected in FY 1975.




**Arnold R. Lambert**
*Directorate for Education & Prevention*
*USAAAVS*

# WARNING SIGNS

MR. WILSON played golf as often as he could, which wasn't nearly often enough to suit him. His hardware store took up most of his time and business came before pleasure.

Seven pars and three birdies in a single round was well above average for Mr. Wilson and on this day he stayed at the 19th hole longer than usual. He enjoyed several beers with friends while giving a stroke by stroke description of the three birdies and two of the pars that could have been birdies had it not been for the long putts he missed by inches.

Leaving the clubhouse, he threw his clubs in the back seat of his car and drove by the high school to pick up his son. It was one of those days that looked as though the predicted early evening thunderstorms would materialize. Black clouds started billowing like smoke from an oil fire and the early evening was suddenly pitch-black.

Mr. Wilson told his son, "Let's get home before the storm starts. You drive, but be careful." They were on a two-lane asphalt paved road and in a matter of minutes the heavy downpour started.

As young Wilson approached a busy intersection, he applied the brake and the rear of the car started skidding to the right. He steered the car sharply to the left which intensified the skidding. The car spun through the intersection and was hit from the right rear by another car approaching from the right. The impact was in the opposite direction of spin and was so great that the right door was torn from the Wilson car. Mr. Wilson was thrown from the car and killed instantly. Both cars overturned and the driver of the other car was pronounced dead upon arrival at the hospital. Young Wilson was wearing his seat belt but received serious head injuries caused by flying golf clubs.

A road sign with the words "SLIPPERY WHEN WET" was found among the twisted wreckage in the intersection. A witness, following the Wilson car, stated that young Wilson was not exceeding the speed limit but did not start braking soon enough considering road conditions.

Investigating officers attributed the cause of the accident to the fact that the car was being driven by an unlicensed, inexperienced 15-year-old boy. In addition to not allowing adequate stopping distance for existing road conditions, the boy turned the steering wheel in the opposite direction of the skid.

A contributing cause factor was cumulative deposits of oil on the pavement from cars stopping at

the intersection. Oil on the asphalt pavement, together with the rain, made driving conditions hazardous even for experienced drivers.

Mr. Wilson was right in not attempting to drive considering the number of beers he had consumed, but used poor judgment in allowing his inexperienced and unqualified son to drive.

SAME SONG, SECOND VERSE

A UH-1H, with a pilot, copilot and two passengers aboard, was on an authorized support mission to perform a demonstration parachute jump for a group of high school students in connection with a recruiting program. As the aircraft arrived at the drop zone, the demonstration was cancelled because of high winds. The commander of the pathfinder detachment (one of the passengers) gave the students a briefing on parachute jumping and showed them how the aircraft was rigged for jumping missions.

Another passenger climbed aboard and the detachment commander remained with the students. The pilot took off and performed a short flight demonstration for the students, as previously requested by the commander. After the demonstration, the aircraft was landed several hundred meters away from the students and remained on the ground less than a minute.

The pilot took off to the west for the return flight to the airfield. About 1½ miles from the point of takeoff, at an estimated altitude of 500 feet agl, the aircraft was seen rolling from right to left. The nose pitched up, the main rotor mast separated, and the aircraft rolled to the right and crashed on its right side in a nose-low attitude. There was no postcrash fire. All four occupants were killed on impact. Three were thrown from the aircraft and the only occupant found in the wreckage was strapped in the right front seat.

Diagnostic teardown of the engine and aircraft components failed to disclose any cause for malfunction. The crash-resistant fuel system was effective and functioned as designed. Fuel contamination was not a factor. Analysis of engine oil revealed normal engine wear. The hydraulics-out warning light was on during the entire flight. This was recorded on the dash 13 and was attributed to a malfunction in the warning system. The hydraulics system was functioning normally. Aircraft controls and electrical system revealed no discrepancies that would have contributed to the accident. Several MWOs were still outstanding, but had no bearing on the accident.

Witness testimony produced some information which assisted the accident investigation board in determining the cause of the accident. One witness saw the aircraft through a telephoto lens on his camera just prior to final takeoff. He stated that the aviator in the right front seat exchanged places with one of the passengers. Another witness told about a conversation he had with one of the passengers in which the passenger expressed a desire to get in some "stick time."

Crash scene investigation substantiated witness testimony. One of the passengers (a nonrated officer) was found strapped in the right front (pilot's) seat. Further investigation of the wreckage revealed that the main rotor blade struck the copilot's left antitorque pedal. The pilot was sitting in the left (copilot's) seat prior to impact. Absence of injury to the ankle or the left foot of the pilot indicated that his feet were probably not on the pedals at the time of the accident.

Laboratory analysis revealed that the main rotor mast fracture was typical of the type occurring when severe mast bumping is encountered. The board determined that this severe main rotor mast bumping was probably induced by erratic control movements by the nonrated officer in the pilot's seat. This caused a fracture of the main rotor mast and loss of the main rotor hub and blades.

Pilot error was a major cause factor. The pilot in command permitted a nonrated passenger to occupy the designated pilot's seat (TM 55-1520-210-10, par. 7-3) while he, the pilot in command, was in the copilot's seat and did not physically remain on the flight controls. This was a violation of AR 95-1.

Lack of strong command supervision was a contributing factor as evidenced by lack of pilot discipline and judgment in allowing a nonrated officer to occupy his seat during flight operations.

The investigation board recommended that no nonrated personnel be permitted to occupy the designated pilot's seat unless undergoing a formal course of instruction as prescribed by AR 95-1.

Neither of these accidents should have happened. Both were caused by abrupt control movements by unqualified operators who were allowed to attempt tasks beyond their ability.

Safety rules and regulations originate from accident-producing actions. These actions and the resulting accidents become a matter of record. This experience, if passed on to others, can prevent similar mishaps. All aviation personnel are constantly warned of the consequences of compromising established aircraft operating procedures. If you heed these warnings, you gain judgment and knowledge from the experience of others. If not, you get your experience the hard way. But all too often, lessons learned the hard way are learned too late.

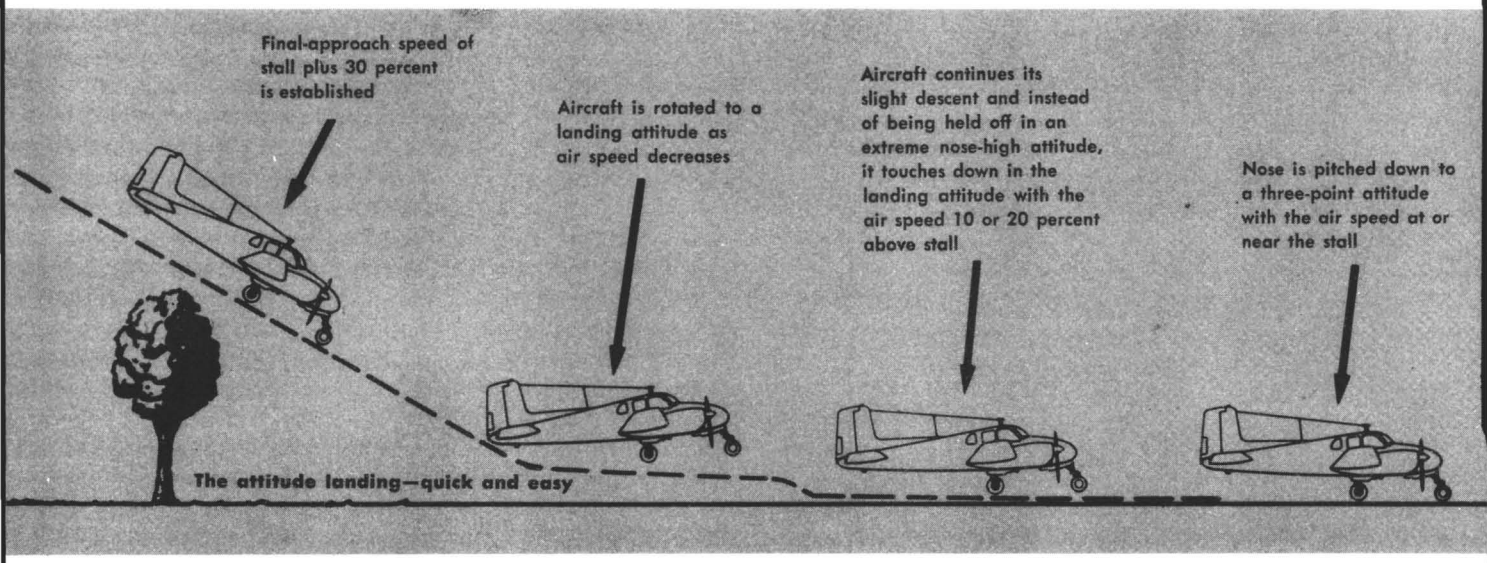
*This article has been adapted for reprinting because it contains an exceptionally fine discussion of fixed wing landing techniques. However, it should be noted that the U. S. Army's position on full-stall landings is that they must be taught at the Aviation School to help ensure that Army aviators are fully proficient and capable of flying in tactical as well as other environments*

# FULL-STALL LANDINGS ARE FOOLISH

SHOWING OFF would have been the wrong description. It was more like an enterprising salesman's display of wares. En route, the man in the left seat had exhibited most of his inventory, and I, the visiting pilot in the right seat, was now to watch as he whipped out the stainless-steel top-of-the-line. He pulled both throttles back, dropped the gear and turned downwind for a landing.

Would I buy the supposition that he was a competent and qualified aviator? He knew his performance so far rated an enthusiastic "good job"—yet his eyes said he intended to dazzle me with the touchdown. At a reasonable air speed, the *piĕce de rĕsistance* was to come in a quarter of a mile.

After crossing the threshold, he retarded the throttles and pulled on the wheel. He had started the flare, and was advancing confidently toward a perfect full-stall landing—except that he overcompensated for our rate of descent by adding 1 foot of flare-out altitude for the wife, 2 feet for the kids and 5 feet for my presence haunting his peripheral vision. The realities of field elevation would drive home each of these errors; we were in a condition of semiflight that was taking us down faster than a descent through the circles of hell. Milliseconds before touchdown we both tried to rise in our seats, a futile attempt to



The attitude landing—quick and easy

*Adapted from an article by*
*Thomas H. Block in FLIGHT SAFETY FACTS AND ANALYSIS*
*July 1972*

help the oleos. Contact with the runway was firm.

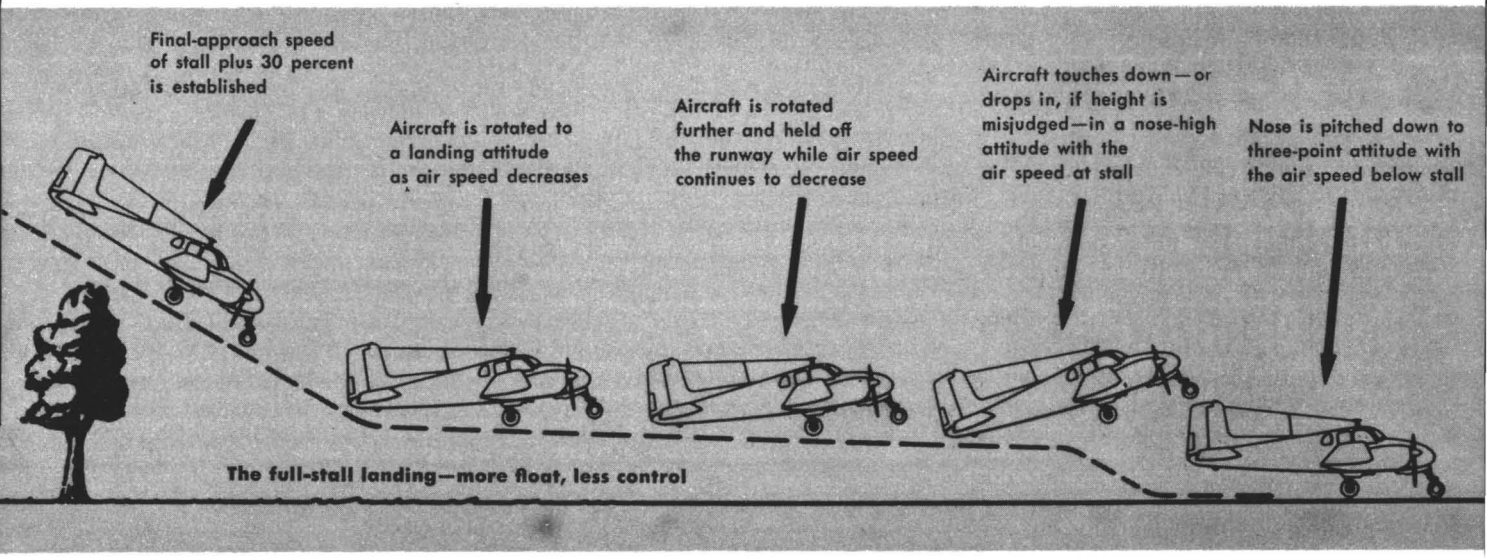
"#$&#&!!," he snarled as the dust settled. "I knew I should've driven the thing on," was his embarrassed explanation, "but I wanted to do it right. I tried to make a full-stall landing."

Although we are now well into the age of the tricycle landing gear, many pilots mistakenly believe that full-fledged landings are still full-stall landings. They also believe any other manner of placing tires on concrete should be considered unsound—a coward's way out of the complexities involved in running out of air speed and altitude simultaneously. While no one will argue that the techniques required for the perfect full-stall are difficult to acquire and retain, the whole affair is nothing more than a five-finger exercise in nonsense, particularly in airplanes with nosewheels. Those who have thought about it, however, often admit that except for rare and unusual circumstances, such as in soft- and rough-field landings, the full stall is not the best available manner of touchdown for tricycle-gear airplanes.

The men who establish operating criteria for transport-category aircraft have agreed on two points: that the hazards and complexities of the full-stall touchdown far outweigh their advantages; and that substituting a maneuver called "attitude touchdown" is a solution that results in good performance and large safety factors.

The transport pilot performs his approach just like any other pilot to put the aircraft into a "landing attitude" (enough nose-up to clear the nose tire, but not enough to drag the tail). From here on, however, his order of priorities differs from that of the full-stall advocate. The transport pilot will trade knots for a decrease in the rate of descent, but he will only trade a few knots while spending a couple of seconds hunting for the ground. His paramount concern is touching down above stall speed, in a landing attitude, and if he hasn't located the top of the runway as air speed continues to dribble, he'll plop down while the aircraft is still flying—and still in complete control.

Smooth touchdowns are *not* a product of air speed, but rather a direct result of *rate of descent reaching zero exactly when the wheels rub the runway.* The air speed or ground speed of the aircraft is unrelated



The full-stall landing—more float, less control

to its touching force, and equally smooth landings can be accomplished at any speed from stall to cruise. Although extra tire wear results from touchdown at faster speeds, the cost is more than compensated for by better touchdowns that result in far less airframe and landing gear deterioration and far more passenger confidence.

What are the dangers that compel large aircraft to touch at speeds greater than stall? They come from unnecessary exposure to flight at or near operating limits. When an aircraft stalls, whether it be a 150 or a DC-8, "up" control is lost and cannot be regained until power or altitude is traded for air speed. In addition, ability to steer in the other two axes in most airplanes is reduced from somewhat to substantially. Finally, touchdowns at stall speed are often the result of hauling the airplane's nose into an unusually high attitude during flare—a maneuver that, because of its unfamiliarity and semi-aerobatic proportions, is hard to get down pat.

If a pilot is aiming for touchdown at exactly stall speed, chances are he's going to miss his mark occasionally. When he does, he will find himself several feet above the runway, in a falling aircraft. Throw in a crosswind and he will simultaneously drift sideways—a condition he must counteract by using the now less-than-normal rudder and aileron response caused by the very slow air speed. Make the situation occur at night, and his landing light will be pointed toward the heavens while he sinks into a runway that seems a bottomless pit. Add gusty winds or turbulence and the whole operation becomes even more difficult.

In contrast, the pilot who is aiming at a touchdown speed greater than stall finds the runway easier because the airplane is flying in a familiar, preselected attitude. A pilot stands a greater chance of successfully feeling for the ground when the airplane-to-horizon relationship matches the one he has seen many times during takeoffs and cruise. Control response is firmer and nearer to what is expected.

An over-the-fence speed of 30 percent above stall is recognized as a reasonable figure for most airplanes in most situations. Accepted touchdown speeds are in the 10- to 20-percent range, allowing the airplane a sufficient margin above stall without unnecessary padding. An aircraft with a gear-and-flaps stall of 60 should therefore attempt an over-the-fence speed of 78, with touchdown occurring between 66 and 72. These air speed parameters allow enough excess for arresting the rate of descent and creating the perfect grease-job.

Short-field landings in a tricycle airplane require a minimum over-the-fence speed, coupled with a quick rotation sufficient to place the aircraft in the properly pitched "landing attitude." Touchdown occurs while the aircraft is still a few knots above stall. Priority is not placed on air speed, but rather on establishing the proper landing attitude. "Dropping the airplane on" results in consistent spot landings under full control—the optimum condition for a short field, since airplanes decelerate three times faster during rollout than during flare. Flying the airplane at a preselected slow speed and flaring just enough to raise the nosewheel enables the pilot to drop right on his spot.

The selection of touchdown speed is directed by the selection of over-the-threshold speed, since threshold minus the few knots used to raise the nose slightly during flare equals touchdown. Air speed on approach takes on renewed significance. If the field is short, a low touchdown speed results from a low threshold speed—which should be a direct result of a lower-than-normal approach speed. In the other extreme, touchdown on a windy, turbulent day should be made faster than normal—a result of an increase in both threshold and approach speeds. To increase air speed on approach and across the fence, yet then flare to a full-stall landing, combines the worst of both techniques.

Then what are the disadvantages of utilizing the landing-attitude rather than full-stall technique? For one thing, since an attitude-landed aircraft is still capable of flight even though its wheels are on the runway, any use of flight controls will get an immediate response. If a pilot decides that the sound of tires touching concrete is the signal for pushing full forward on the control column, he will push himself into the area known as "wheelbarrow."

The pilot who touches down in a nose-high attitude can apply down elevator to settle the aircraft on all three landing gears, thus reducing the wing's angle of attack and lift. By pushing too much forward

elevator, however, he can quickly defeat his purpose by lifting the aircraft off the mains and onto only its nosewheel. This ability to transform a tricycle-gear airplane into a unicycle requires a flagrant misuse of flight controls that even the inexperienced pilot can avoid if he remembers to "keep *flying* the aircraft until it's in the hangar." Certainly no pilot would try lowering the nose by firewalking the control column if he were still on downwind leg; to do that just because his wheels are on the runway is sheer madness. A pilot must continue to fly whenever the airplane is capable of flight-control response.

Full-stall-landing purists are often divided on the question of crosswind landings. Since a pilot could full-stall land any aircraft in any situation, the question is not whether it *can* be done but whether the increase in difficulty and decrease in safety factor are worth the results. During crosswinds, a pilot is seeking firm control response, ability to place the aircraft on the runway at a given moment, and quick yet controllable loss of lift.

Attitude landings offer control response that is firmer because of the aircraft's greater speed; placement on the runway becomes easier with an only slightly nose-high touchdown; and a unique trait of tricycle airplanes is that they can produce a decrease in lift during rollout by lowering the nose. When an aircraft is settled on its nosewheel, the decreasing angle of attack results in a positive ability to stay on the ground—unless, of course, the pilot pushes a disproportionate amount of forward elevator, thus lifting the airplane off its mains.

Once airborne, there is no difference between tricycle- and conventional-gear aircraft, whether being airborne involves flight at cruise altitude or gliding a few inches above the ground. For the landing, tricycle aircraft can execute two types of touchdowns: full-stall and attitude. Tailwheel airplanes can make three: full-stall, attitude (tail slightly low, touching down on the main gear while still above stall speed) and wheel landings (pushing the airplane on its mains while flying inches above the runway). Wheel landings are ill-advised in tricycle-gear airplanes because pushing forward on the control column while inches off the ground will result in nosewheel contact and high-speed wheelbarrows.

Full-stall landings are best in both tricycle and conventional aircraft only when a pilot is confronted with a situation requiring the slowest possible ground contact. For instance, in both soft- and rough-field landings, the overwhelming requirement is for wheels to touch as slowly as possible, since the runway environment is hostile.

While short fields are best handled by tricycle gear, conventional-gear aircraft require full-stall touchdowns for operation into the shortest airports. The lack of a nose tire prevents tailwheel aircraft from dumping their lift by settling nose-down to a lesser angle of attack. Lift created by a conventional-gear airplane is most quickly eliminated by increasing the angle of attack beyond the stall, and the aircraft can more safely use its wheel brakes after being firmly planted on its tail.

Normal landings in a tri-gear airplane should be accomplished in a nose-up attitude with pre-stall touchdown speeds; there is little justification (except for practicing soft- or rough-field work) to do otherwise. The selection of normal landing style for conventional-gear aircraft is open, since soft-, rough- and short-field touchdowns should all be executed full-stall. The tailwheel pilot has a much greater need for the full stall than does the man with a nosewheel.

Selection of air speed for approach, threshold and touchdown is a matter of working backward. Evaluating runway length, surface and wind conditions to produce an optimum touchdown speed (normal situations call for 10 to 20 percent above stall) will in turn dictate threshold and approach speeds. Carelessly picking a speed that is either too fast or too slow is like choosing between freezing or roasting to death: Either extreme seems like a bad deal. Touchdowns with excess speed are unwarranted because they introduce control factors that needlessly complicate the landing. The consequence of landing too slow can be premature stall, hard landing. touchdown short of threshold or stall/spin.

Using all the parts of the aircraft to their full extent while keeping some of the aircraft's flying ability in reserve is not an act of dishonor. A little air speed tucked away may come in handy if the flight inadvertently stumbles near the hairy edge. Honor is not earned exclusively by walking on the rim of the cliff; it sometimes comes from knowing just how far to stay away.

# LET'S STOP BUILDING MOUNTAINS

**Sergeant First Class Bill R. Bailey**
*Directorate for Aircraft Accident Analysis and Investigation*
*USAAAVS*

DURING A recent technical and safety assistance visit to one aviation unit, team members found mechanics using torque wrenches that were overdue for calibration. On the surface, this appears to be a rather trite or "mole hill" type of situation. Certainly not one worthy of much emphasis since things like this can be corrected on the spot. But let's take a closer look.

An inspection of all the torque wrenches assigned this unit revealed that most were overdue for calibration. Yet none were tagged and all were available for use. When a further check showed that this unit calibrated their own torque wrenches, the torque tester was inspected and found to be 350 days overdue for calibration. Nor did the problem end there.

When two mechanics working on the rotor head of an OH-23 were questioned and their torque wrench inspected, the following was revealed: Like the tester, their torque wrench was also 350 days overdue for calibration; it was not tagged; and neither mechanic knew that the DA Label 80 (U. S. Army Calibration System) on the wrench provided the date of last calibration along with the next due date. Further, when shown the label and explained its purpose, neither mechanic knew how to interpret the Julian dates inscribed. The "mole hill" had grown.

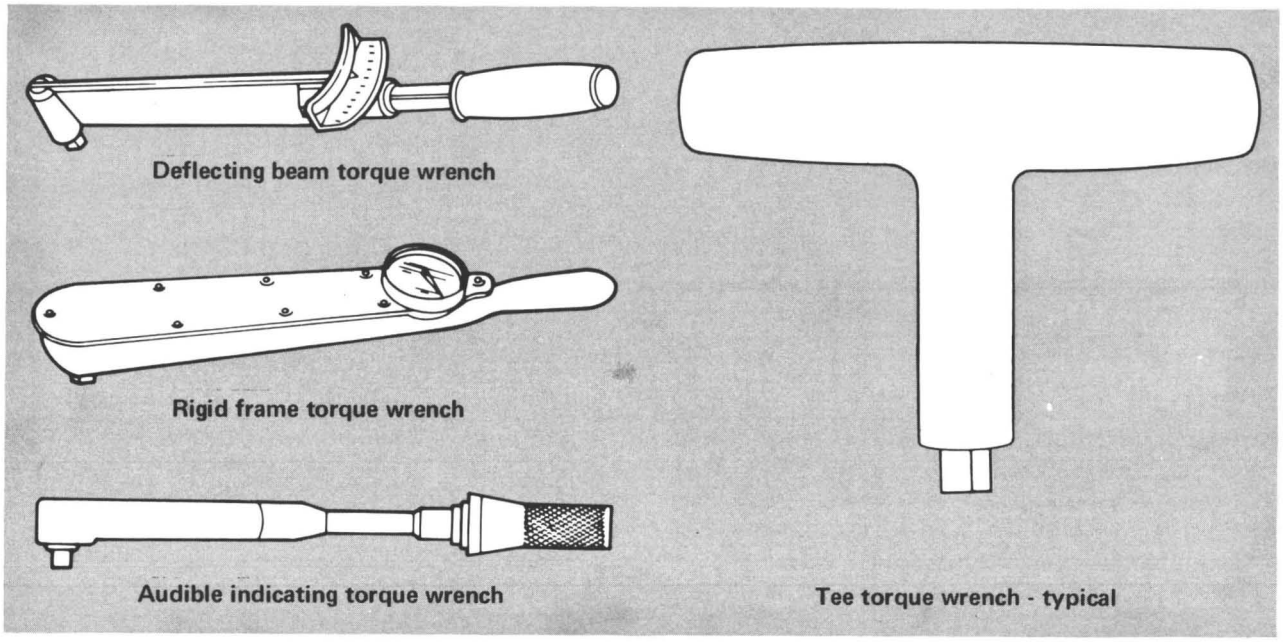
The mechanics were then asked the torque value for the nuts they were torquing. Neither was certain of the correct value, but they "thought" . . . Asked if they were using the dash 20, they replied that the unit had only one dash 20 for the OH-23 and someone else was using it. There you have it—a "mole-hill" transformed into a formidable mountain. How formidable? More than one precautionary and forced landing has been caused by improper torquing of hardware. And many a forced landing has terminated in an incident or accident. Unfortunately, some of these accidents have resulted in fatalities and destroyed aircraft. In-flight failures of UH-1 trunnion supports, for example, have caused some of these fatal accidents. Overtorquing of the trunnion attachment bolts caused trunnion supports to crack and fail.

Overtorqued engine and transmission filter hous-

**U.S. ARMY CALIBRATION SYSTEM (TM 38-750)**

| | |
|---|---|
| 1. JAN TYPE/MFR & MODEL | 2. CALBR DUE |
| 3. SERIAL NUMBER | 4. DATE CALBR |
| 5. NAME/REPORT NUMBER | 6. SUPPORT UIC |

DA LABEL 80 1 JAN 70 — REPLACES EDITION OF 1 JAN 64 WHICH IS OBSOLETE




ings have caused studs to strip and the lubricant to be lost. Tail rotors have failed because retaining nuts were either undertorqued or overtorqued. Rocker box covers have allowed engine oil to drain overboard, and engine cylinders have failed from improperly torqued hold-down nuts. The list of failures from this cause is a long and expensive one in terms of time, dollars and lives.

Where does the responsibility lie? With the mechanics? With the instructors who instructed them? Maybe so, but the individual who must bear the brunt of the responsibility is the supervisor. He is the one who must ensure that personnel are knowledgeable in their fields and are performing their duties by the book, remembering that personnel are constantly being transferred and the experience level of their replacements varies.

Now is a good time to make certain that problems similar to those described do not exist in your unit. This may also be a good time to make sure mechanics are familiar with the different types of torque wrenches available and that they know how to use each. They should also know how to compute correct torque values when using extension attachments and should thoroughly understand correct procedures to follow when retorquing hardware as opposed to those used for establishing initial torque values. In addition, they must also know what *not* to do. They should *not,* for example, use the torque wrench to loosen nuts and bolts—only to tighten (torque) them. They should *not* store the torque wrench loosely among other tools, but in its own case. If dropped or otherwise mishandled, the torque wrench must *not* be used until it has been recalibrated—regardless of the calibration due date shown on the DA Label 80.

While the discrepancies discussed have dealt solely with a single problem area involving a single unit, they are significant in that they are representative of a variety of "small" problems which exist in Army aviation units scattered all over the globe. Like the uncalibrated torque wrench, most of these seemingly insignificant problems can be easily overlooked. In time, these "mole hills" grow and cause mishaps.

What can we do? We can start by surveying our resources and our management procedures to pinpoint problem areas for correction. And we can support our safety officers by heeding their recommendations. Above all, we can provide ample supervision in all areas of aviation. Let's unite now in a concerted effort to spot and eliminate "small" problems before they can grow into big ones. In short, let's stop building mountains.

**If you have a question about personal equipment or rescue/survival gear, write Pearl, USAAAVS, Ft. Rucker, AL 36360**

# PEARL'S

## Personal Equipment & Rescue/Survival Lowdown

### SURVIVAL EQUIPMENT

*Why is it the Army does not have an MOS in its inventory to cover the inspection and maintenance of survival equipment? The only MOS that I can find that even is slightly applicable is 76V20 Equipment Storage Specialist.*

*Also I would like to know why the Army TMs concerning survival are so inadequate compared to the Air Force TOs, which give complete illustrations on how to fold LPUs, one-man life rafts, and also seven-man rafts. Your July 1971 issue of the* AVIATION DIGEST *has almost become a bible in our section. If you ever decide to print this listing again it would be very helpful if you would put the service life for the items listed.—Crewchief*

You are absolutely correct; the Army does not have a military occupational specialty in the field of inspection and maintenance of survival equipment. However, the suggestion that such a career field be developed has been made. The Life Support Equipment Management Office of the U. S. Army Aviation Systems Command is attempting to obtain authority to hold a worldwide symposium on life support equipment. One of the major topics of discussion is to be the feasibility of the development of a career field in life support equipment. Whether or not such a career field is established remains to be seen.

Your attention is directed to the following Technical Manual: TM 55-8465-206-23, Organizational and DS Maintenance Manual Including Repair Parts and Special Tools List for Army Aircraft Survival Kits, dated 26 September 1972. This manual supersedes TM 55-8465-206-13, 19 December 1966, including all changes, and contains detailed descriptions, including illustrations for Army aircraft survival kits. Recommend you take immediate action to obtain this TM. It is an absolute necessity if you are to have a functional inspection and maintenance operation for life support equipment.

### Snap, Crackle, Pop

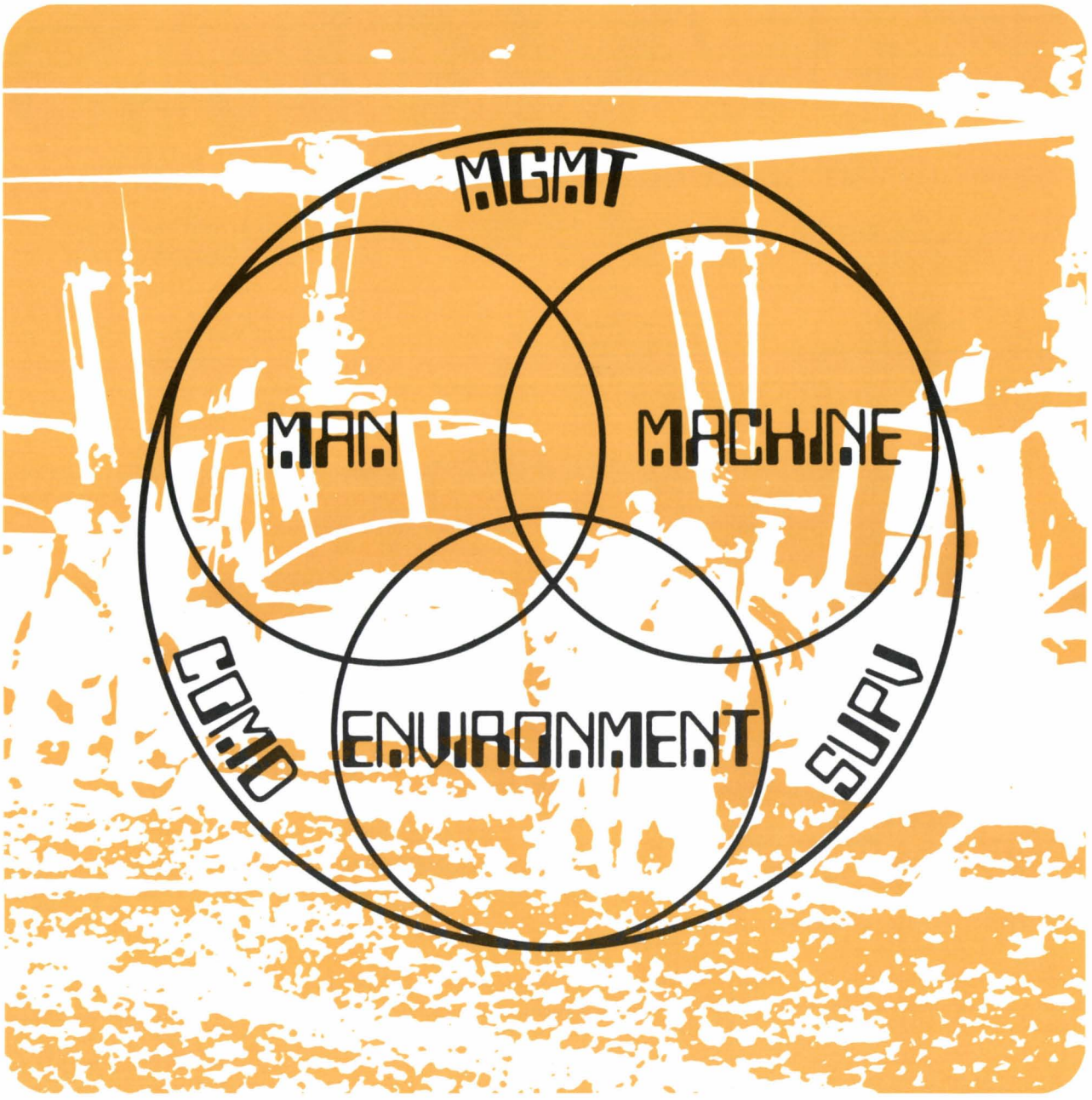
Have you experienced a buildup of static electricity on your CWU-21P fire-resistant Nomex flying coveralls? If so, you are not alone. Complaints from users have been received and the problem investigated.

During manufacture, Nomex is given an antistatic treatment to reduce the static problem common with many nylon materials. However, the best treatment is not sufficiently permanent, and after repeated laundering, the antistatic properties are measurably reduced. It has been found that certain commercial fabric softeners by their fiber lubrication and moisture retention characteristics significantly reduce static charges and do not affect the fabric's fire resistance.

The U. S. Army considers static charges from any source a potential hazard around aircraft fuel and munitions. So, if your flying garments are subject to static buildup, it is recommended that a fabric softener be used in the final rinse each time the suit is laundered.

*(Editor's note: In the December 1972 Pearl article pertaining to the underarm life preserver, there was a misprint in the referenced TMs for procedures for various tests and inspections. TM 55-4220-201-12 should have been TM 5-4220-201-12.*

# SYSTEM SAFETY IN ARMY



**Major William F. Gabella**
*Directorate for Technical Research and Applications*
*USAAAVS*

# AVIATION: A COMING OF AGE

AFTER A DELICATE infancy and sometimes painful adolescence, the new scientific discipline of "system safety" is rapidly approaching maturity in its application to U. S. Army aviation systems as a management tool.

To say that system safety as applied to aviation systems is "new" is understating the case. The 1971 edition of *Books in Print,* for example, does not list a single volume devoted to system safety. And, while there are at least two universities offering short courses on the subject, the still-evolving philosophy and not the practical application of system safety is the basis for study.

By definition, system safety is the optimum degree of hazard elimination achieved through the specific application of management, scientific and engineering principles to an aviation system throughout all phases of its life cycle. As such, system safety represents the newest of the "assurance sciences."

The importance of system safety can be gauged by the fact that it will offer the U.S. Army a means to ensure the conservation of combat resources—in terms of men and materiel—to the highest degree it has been possible for humans to devise. In some cases, the projected results are nothing short of dramatic.

For example, the application of system safety to the heavy lift helicopter advanced technology and components program (HLH-ATC) is conservatively projected to reduce the mishap loss-rate of the HLH to nearly half that of the CH-47 series aircraft—despite the fact that the HLH will incorporate materials, construction techniques and operating procedures never before tried by the aerospace industry.

The agency that pioneered the translation of system safety philosophy into a practical methodology that can be applied to any new Army aviation system or subsystem was the U.S. Army Agency for Aviation Safety at Ft. Rucker, AL.

Three years ago the agency had one officer tentatively exploring system safety. Today, the agency's Systems Research and Technology Division, composed of five officers and two civilians, is devoting full-time effort to applying system safety management to the utility tactical transport aircraft system (UTTAS), the advanced attack helicopter (AAH), the aerial armored reconnaissance system (AARS), the HLH-ATC and HLH prototype program, as well as other projects.

A monumental task, translating the sometimes visionary philosophy of system safety into a practical methodology that could be applied to Army aviation systems and subsystems throughout their life cycle from concept to inventory phase-out demanded not only imagination but also innovation and invention.

Keying on Army Regulation 385-16, "Safety for Systems, Associated Subsystems and Equipment," and DOD Military Standard 882, "System Safety Program for Systems and Associated Subsystems and Equipment," USAAAVS has developed a unique three-phase system safety management procedure (SSMP) which applies not only to aviation systems but to other items of military hardware as well.

Phase one of the SSMP consists of another USAAAVS innovation: the system safety process (SSP)—an iterative management procedure that consists of the following elements:

- Known precedent.
- System delineation.
- System hazard analysis.
- Hazard identification.
- Hazard identification and evaluation.
- Action(s) to eliminate or control hazards.
- Modification of system element(s) (within program restraints).
- Effectiveness evaluation of action taken.
- Increased safety assurance.

At the heart of the SSP is hazard identification, analysis, evaluation and elimination. It is infinitely better to spend a few thousand dollars to "design out" hazards while an aviation system is on the drawing boards than to allow these hazards to creep into the operational inventory, at which point modifications can be accounted for only in terms of human life,

millions of dollars and an overall degradation of operational readiness.

Phase two of the SSMP is the contractually required development by the aviation systems contractor of a system safety program plan (SSPP). The purpose of the SSPP is to provide an integrated, logical and, most importantly, *manageable* method for obtaining the safety goals desired for any aviation system.

With respect to the SSPP, both the HLH-ATC and the UTTAS programs represent major historical "firsts" in the history of Army aviation systems development and procurement. The HLH-ATC contract was the first procurement document to require the contractor to devise an SSPP for an Army aviation system, but it did not specify that the SSPP would be made available to the Army for review. However, the SSPP is undergoing comprehensive review at both informal and formal engineering reviews.

The UTTAS, on the other hand, represents a major breakthrough in Army aviation procurement, as its contract requires the manufacturer to develop SSPPs and furnish them to the Army. Because the engines and airframes were subject to separate yet integrated procurement actions, two separate, but integrated, SSPPs—one for the engine and the other for the airframe—were furnished to the Army for review and approval.

The hard, cold realities of aviation system procurement dictate that "lip service" and "paper plans" are no guarantee toward achieving desired levels of safety assurance.

At this point, phase three of the system safety management procedure—the system safety group (SSG)—enters the management process.

To prevent various aspects of the SSPP from falling through the proverbial crack, the U.S. Army Aviation Systems Command and USAAAVS jointly originated the concept of organizing a special technical advisory group, under Department of the Army charter, to assist project managers of the various aviation systems in achieving desired safety goals.

The first SSG to be chartered by DA was that for the advanced aerial weapons system (AAWS) AH-56A Cheyenne. Requirements for the creation of similar SSGs for the UTTAS and the HLH, during an appropriate period in their development, are presently being studied.

While the U.S. Army's trailblazing in system safety management is gratifying, is proving most rewarding and, in fact, places it in the forefront of such efforts worldwide, the near-term goal of this management process only just recently became an attainable reality. This goal is the refinement of system safety management requirements so that they will mesh smoothly within the cogs of the development and procurement machinery as *contractual* requirements applicable to the entire life-cycle of the system. When this goal is reached, the entire system safety management process will become a viable and self-sustaining program.

One of the last major obstacles remaining in the path to this goal was removed with the publication of a USAAAVS landmark technical report, TR 72-8, "Preparation of a System Safety Program Plan for Aviation Systems Development." USAAAVS prepared this system safety management "bible after experience with the civilian aerospace community indicated the Army had a clear responsibility to inform prospective contractors of the Army's approach to system safety management—not to mention the system safety discipline itself. That this publication filled an information void is attested to by the fact that nearly 2,000 copies have been requested by interested agencies to date. Copies may be obtained from the Commander, USAAAVS, ATTN: FDAR-T, Ft. Rucker, AL 36360.

By exploiting fully the newly developed system safety management procedures, Army aviation can assure itself a hitherto undreamed-of conservation of both men and materiel, regardless of the scope and nature of future missions it is required to perform.

In an era of changing national defense requirements, shifting budgetary considerations and increasing complexity in aviation systems, system safety management has come of age in Army aviation.

**Clarence J. Carter**
*Directorate for Aircraft Accident Analysis and Investigation*
*USAAAVS*

# NEED FOR A SMALL FIREFIGHTING VEHICLE

THE RAPID evolution and versatility of rotary wing aircraft have brought about new concepts in transporting military and civilian manpower and equipment. These concepts have required that industry develop new means to support helicopter operations under the most demanding conditions.

An excellent example of this endeavor is the airmobile concept. An entire airmobile division, including its heavy construction equipment for building airfields, is transported by helicopters. One must realize, however, that this equipment is not the same as that found in the ground division. The many generators that supply the electrical power for the division are air cooled, a feature that reduces their individual weight to about one-half that of the usual water-cooled generator. Specially designed dump trucks and bulldozers can be transported easily inside the CH-47. The larger dirt movers for constructing runways can be dismantled into two parts, allowing one part at a time to be transported by the CH-54. The concept of complete airmobility has been applied to vehicle maintenance shops, hospital equipment, aircraft maintenance equipment and even the cook stove. As you can see, application of this concept allows the establishment of camps or worksites that are completely supported by helicopters.

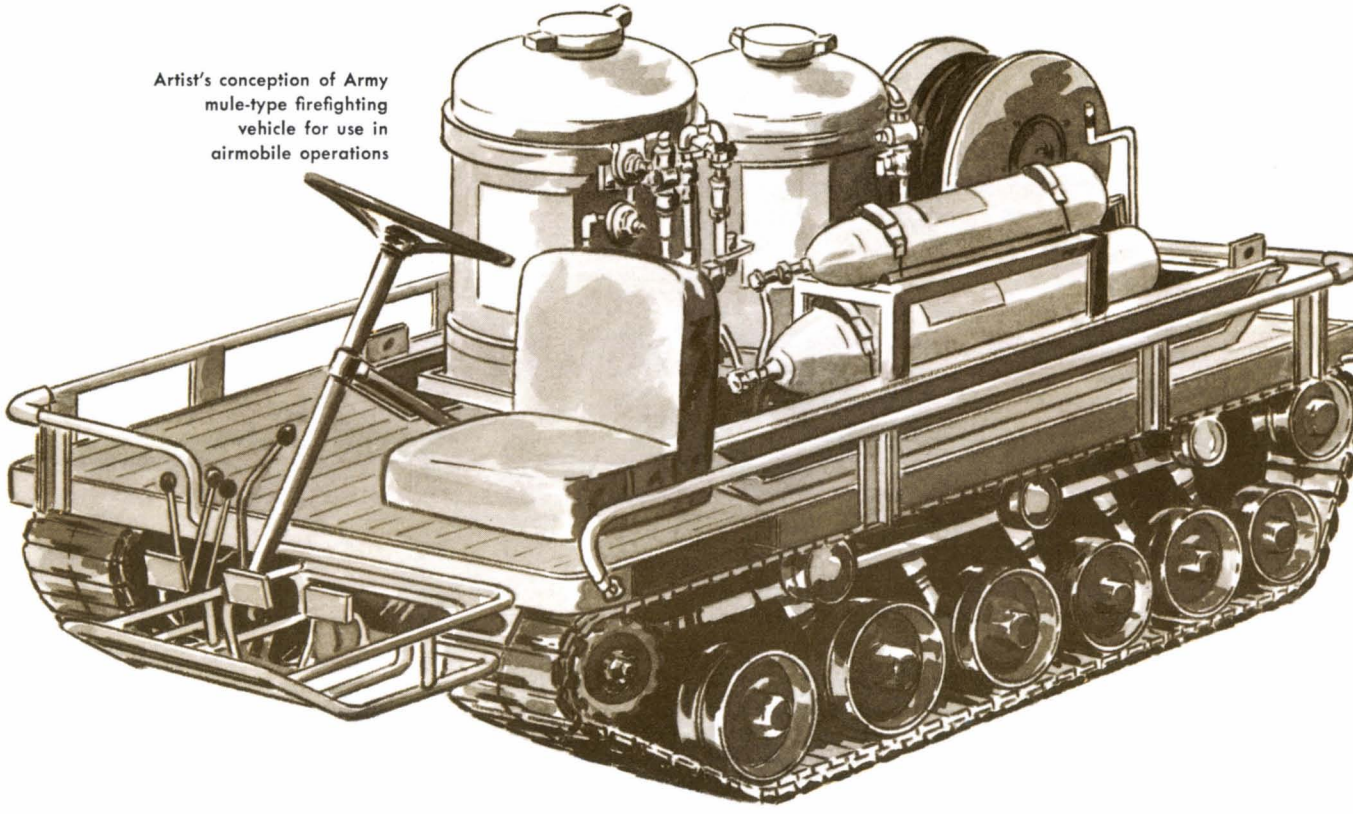
The crash rescue firefighting vehicle is a must for all airfields and helipads, but at the present time, a suitable vehicle is not available that can be transported by air. The handheld or wheel-mounted fire extinguishers are the only fire protection equipment available at helicopter-supported sites. There are helicopter fire-suppression kits available, but as the name implies, they are designed only to control the flame long enough for rescue, not to extinguish it. In civil operations, there are air-supported mining and oil drilling operations that must have more than just fire-suppression equipment, as has been demonstrated by fires on offshore drilling rigs. One point that must be remembered about the civil operation

**NEED FOR A SMALL FIREFIGHTING VEHICLE** is that some air-supported sites are so completely inaccessible that it costs less to operate a helicopter or airplane at $50 to $300 an hour than to build a road.

In the military, we have forward area rearming and refueling sites which, at times, contain as much as 20,000 gallons of jet fuel and 10,000 to 20,000 pounds of ordnance. In some cases, these sites are inaccessible to the point that they cannot be approached over the surface. This condition makes for very rough terrain around the sites and, since extensive clearing of rock, timber and sand, or reinforcing of swamp is required for any type operation, they generally have small landing areas. The takeoff and approach paths in any direction are not always the best.

Now, back to the airmobile firefighting crash rescue vehicle. I guess we all think of the firetruck as a large functional work of art in gleaming chrome and brass—it's strong, beautiful and built to last for years. This concept is great for the hometown with its paved streets and highways. But the firefighting vehicle we need for air-supported sites must be an all-terrain vehicle, must be light enough to be carried by aircraft, yet cheap enough to be abandoned, if need be, and must still be capable of doing the job.

The vehicle that is available weighs 8,200 pounds and costs $14,000. It has a four-wheel drive, is capable of motion on a 20 percent sideslope and is 206 inches long, 78 inches high and 76.5 inches wide. It could be carried as a sling load by a CH-47 or CH-54, but as you can see, it would get very expensive in a total airmobile division operation. This unit carries 450 pounds of purple "K" and 100 gallons of



Artist's conception of Army mule-type firefighting vehicle for use in airmobile operations

"light water." Purple "K" is a dry chemical with a potassium bicarbonate base that has phenomenal flame knockdown qualities. It works like baking soda on a pan of grease; it cuts off the oxygen and starves the flame. It will not do much for the temperature and you can get reignition when purple "K" alone is used. However, combined with light water, it is excellent for flash fuel fires as the temperature reduction is taken care of by the light water. This is a clear, slightly amber-colored liquid that is an aqueous solution of two fluorochemical surfactants and a polymer. It has the unique ability to float on the surface of hydrocarbon fuels, creating a film which prevents the escape of vapors and, consequently, prohibiting ignition. The basic 6 gallons of liquid chemicals are mixed with 94 gallons of water to produce the compound known as light water. The purple "K" powder costs 47 cents a pound and the light-water concentrate $13 to $14.50 per gallon.

To give you an idea of the effectiveness of the purple "K" and light water combinations, a 40-foot-diameter fire (1,256 square feet) consisting of 160 gallons of regular gasoline was controlled in 15 seconds, extinguished in 21 seconds and the area secured in 42 seconds. This was accomplished by one man using twin-hand lines, one containing light water and the other purple "K." The entire operation consumed 79 pounds of purple "K" and 40 gallons of light water.

Now that we have an idea of what our crash rescue/firefighting vehicle should do, let's take a closer look at what is available. The vehicle or prime mover for the firefighting unit must be able to operate in all types of terrain and to maneuver in small places. Since it must be inexpensive and fast, a kind of double-track snowmobile with differential braking on the tracks would be an excellent basic vehicle. It would be light, cheap and fast. An Army mule-type vehicle with tracks would be of excellent size and design. The ability to ride on or walk behind the vehicle while it is in motion would make it extremely versatile for operations in rough terrain or in areas with little clearance. There is a skid-mounted firefighting unit on the market at the present time that would be excellent to complete this portion of our vehicle. It weighs 2,265 pounds and contains 450 pounds of dry chemical and 50 gallons of liquid. It requires one man to operate and it can deliver the dry chemical at 5 pounds per second and the liquid at 60 gallons per minute. The unit costs $5,600 or about one-third the cost of the smallest truck available.

Why a skid-mounted unit? The basic concept in the airmobile operation is to have many small units rather than a few large ones. In case a mishap occurs in extremely rough terrain, there are more possibilities of accessibility with several small units than with one large unit. If there is a large fire and the units have to be refilled, the skid-mounted unit can be sling-loaded back to base camp and exchanged for a fully charged one without risking the basic vehicle.

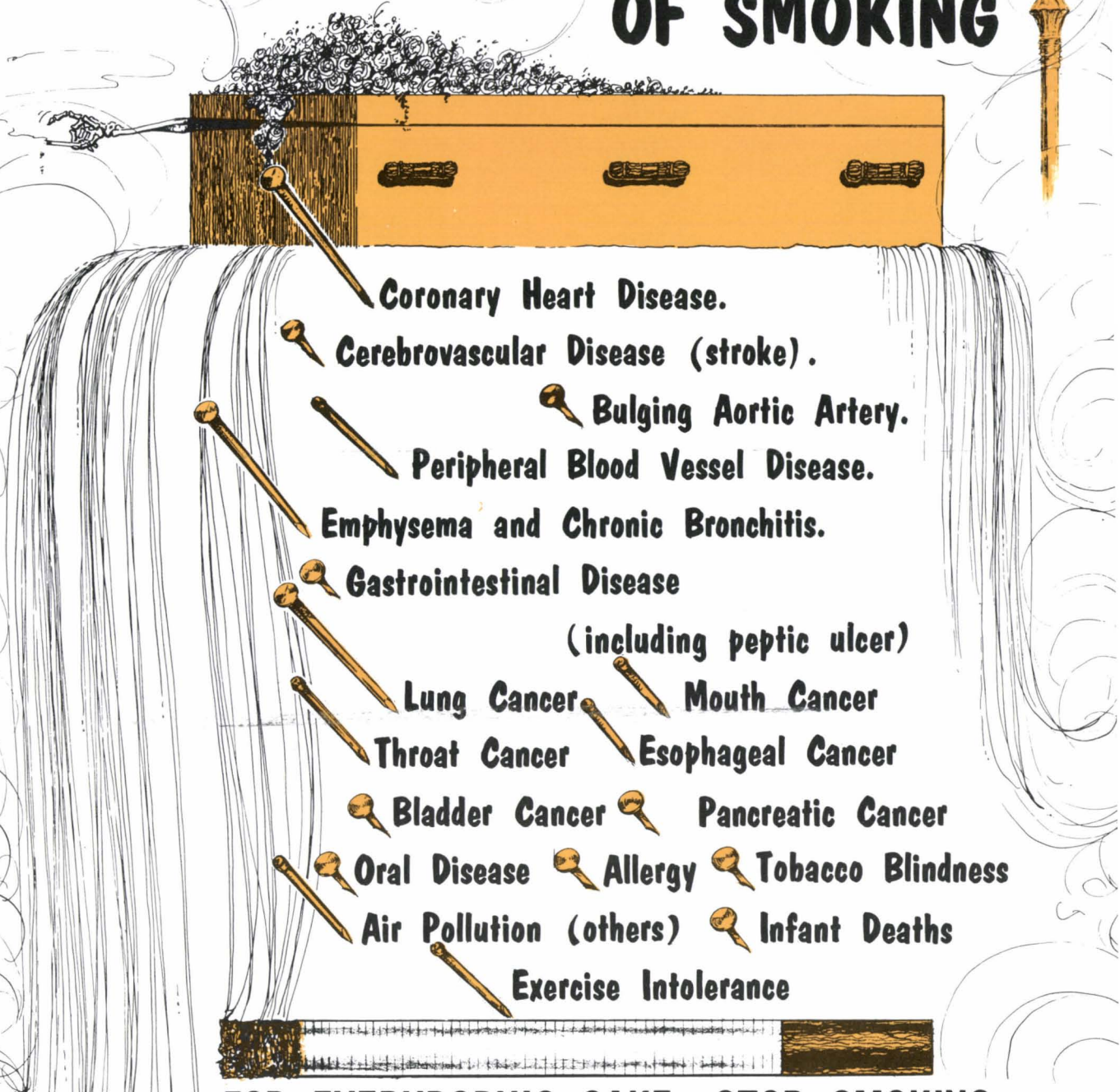
The basic unit weight of 2,265 pounds is well within the sling load capability of the utility helicopter. If the basic vehicle were about the size of an Army mule, four complete units could be transported inside a CH-47. In smaller operations, one unit could be moved in two parts by two utility helicopters. The personal protective and rescue equipment could be contained with the basic vehicle. Another advantage with a vehicle of this type is its capability to provide protection during maintenance operations such as defueling or welding without reducing the alert status vehicles.

A vehicle of this type is also needed for armed aircraft testing and demonstrations. The test ranges are usually constructed in areas that have no other practical use and, therefore, are almost inaccessible on the ground. This vehicle could be carried aboard a CH-47 and be readily available in case of a mishap in some remote area of the range. Adequate protection must be afforded at all times during all aircraft tests, not only to protect the occupants, but to preserve the cause of a mishap should a fire develop. If there is a structural malfunction or failure that causes the mishap and it goes undetected because of fire, further losses cf life and aircraft are sure to result.

The development of a small firefighting vehicle that is always readily available will be instrumental in saving lives and money during all aircraft operations, both military and civilian, no matter where they are conducted.

Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous To Your Health.

# THE HEALTH CONSEQUENCES OF SMOKING




## FOR EVERYBODY'S SAKE---STOP SMOKING

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

# USAASO Sez

## The U. S. Army Aeronautical Services Office discusses

Clear to Taxi? A recent civil accident that made the papers concerned an aircraft on departure striking a taxiing aircraft that had not quite cleared the active runway. You're right, marginal visibility was a factor, but "cleared to taxi" is a loaded phrase that relieves you of no responsibility for the safe conduct of your air machine on the ground. Some controllers may not advise you that your route of movement is not visible from the tower or that the C5A parked on the line to your right is getting ready to blow a blast. "Rogering" an instruction to follow the 707 to your left from an inverted position does little for one's professional reputation.

Some points to remember during ground operations are:

First, understand! Ask the controller to say again when in doubt about his instructions. By the same token, advise the controller if your ability or equipment is not in consonance with his instructions. If you need help in navigating through a maze of taxiways such as are found at many of our major air terminals, ask for it—particularly at night where at your driving elevation the field may look like a maze of blue lights.

Second, question what seems to be an unusual clearance.

Third, when instructed to change frequencies, you should *be instructed* also when and where, such as "ground control—when clear of the runway." Any time you receive a clearance to use ground control while operating on the active runway question it. It is your responsibility to double check for traffic before crossing *any* runway.

Finally, lest some few of you travel so far abroad as to be exposed to strange English or even English-English, learn something from another recently publicized airplane bang-bang. A pilot cleared to "take taxiway right—call on 121.7" later reported he understood the tower operator to say "back track if you like, change to 121.7." Could it be that this aviator was not used to American-English? A "say again" might have saved again.

Air Traffic Controller of the Year Award: On 27 October 1972, MSG Russell Ritter was presented a plaque and Certificate of Achievement recognizing him as the U. S. Army Air Traffic Controller of the Year for 1972.

MSG Ritter was selected from all active controllers serving the Army worldwide. Major commands submitted nominations to the U. S. Army Aeronautical Services Office, Cameron Station, VA, where the final selection was made. The award and selection procedures are established in AR 95-37. This presentation marks the first time this award has been presented. It will be an annual event.

MSG Ritter is the facility chief at Gray Army Airfield, Ft. Lewis, WA. The citation accompanying his award cites MSG Ritter's outstanding leadership, professional acumen and his training program which provides an outstanding example for other facilities to follow.

The U. S. Army Air Traffic Controller of the Year Award was presented to MSG Ritter by Colonel James B. Gregorie Jr., Director of USAASO, in conjunction with graduation ceremonies for Class 72-543 from the U. S. Army Air Traffic Control Course at Ft. Rucker, AL.

"Tis That Time of the Year": The next U. S. Army Air Traffic Controller of the Year could be you! Your facility chief has until 1 May 1973 to submit a nomination. This year, we would like to see a nominee from every ATC facility in the Army. Every facility has at least one controller who qualifies under the selection criteria listed in paragraph 3-3, AR 95-37. That controller should be nominated by his facility chief.

For sure, that next U. S. Army Air Traffic Controller of the Year won't be you if your facility chief does not submit a nomination.

USAAAVS (U. S. Army Agency for Aviation Safety) recently announced that the combined efforts of all personnel associated with Army aviation in support of the aviation safety program have resulted in reducing the accident rate from 32.1 accidents per 100,000 hours of flight in FY 1963 to 8.95 for the 12-month period ending in December 1972, the best safety record ever. If improvement in accident prevention during the remaining months of FY 1973 can be continued —*and this will require even greater efforts as we get closer to a zero rate*—the projected accident rate at the close of the year will be even lower.

Credit belongs to all the individuals in the long chain of command, and manufacturers, researchers and others, who enthusiastically accept and support the Army aviation accident prevention program.

Congratulations to all! Keep up your enthusiasm and efforts in this all-important area . . . and THANKS for a job WELL DONE!