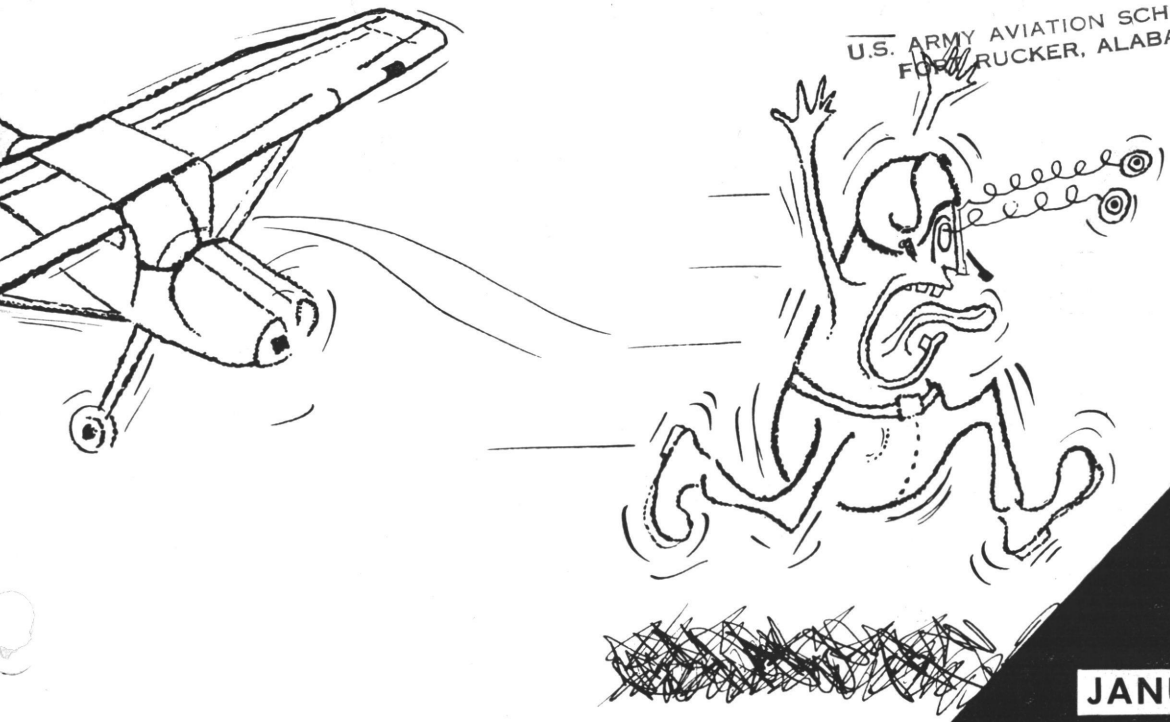
UNITED STATES ARMY AVIATION DIGEST

ELIMINATE THE HAZARDS OF NIGHT FLIGHT



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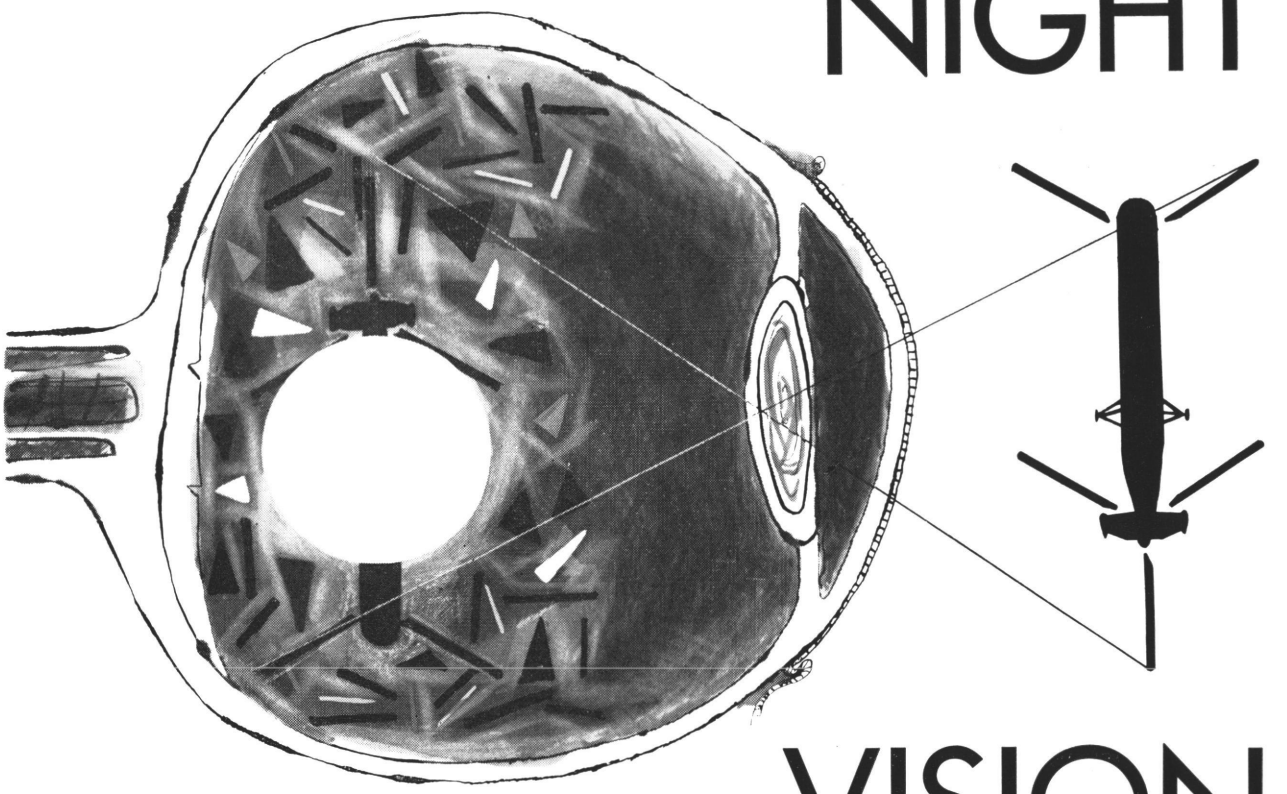
NIGHT VISION



CWO Clarence W. Tuxbury, TC

WHAT IS night vision? Why is it so necessary?

Night vision is simply the ability to distinguish objects in the dark. It is an ability that cats and owls have little difficulty with. Humans, however, must accommodate their eyes for it. Why is this so?

The light-sensitive nerve endings at the back of the eye are of two kinds, cones and rods. The cones, and there are millions of them, are concentrated at the center of the eye. They are used to distinguish color and detail and to pick up far away objects. The rods are concentrated in a ring or circle around the eye. They are colorblind and see colors only as shades of gray. The rods are used in peripheral vision; that is, to see out of the corner of the eye and to pick up things in motion not directly ahead.

Generally speaking, the cones are used in day vision and the rods in night vision. This does not mean that the cones are not working at night. On a moonlit night the work is divided. Technically speaking, the cones stop working in very dim light and the rods take over. The rods can detect light at 1/5000 of the intensity at which the cones go blind.

What you may or may not be able to distinguish in the dark depends on the dark adaptation of the eyes. When you walk from a lighted room in your home to one which is in

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Mr. Tuxbury is a Program Officer with the Department of Rotary Wing Training, USAAVNS. He has approximately 4,000 flight hours in both airplanes and helicopters.

darkness, it is nearly impossible to distinguish objects in the room. After staying in the dark for a period of time, objects become visible. Why is this so? The rods, which are used in night vision are 100,000 times as sensitive in the dark as they are in sunlight. You can become adapted to sunlight in 10 seconds; another 30 minutes is required to adjust for darkness.

A fundamental in any type of night operation is to keep the eyes dark-adapted. Scientific research has proved that red light does not destroy night vision. This is because you see with the cones in red light and the rods react much as they do in total darkness. Therefore, if we must have light when trying to preserve dark-adaptation of the eyes, it should be red light, or as dim a light as possible; the brighter the light in any other color, the more damage is done to night vision. Night vision may be preserved by the use of goggles with red lens.

The only way that objects may be defined at night is by effective use of night vision. There are cases on record during World War II of fighter pilots taking off at night and shooting down friendly aircraft. While it's true that they could see an object moving, they were unable to identify the object. Had they dark-adapted their eyes prior to takeoff, they could have identified the aircraft as friendly.

Another good example of why you want to see in the dark is this business of night navigation. It's nice to know where you are when radio failure occurs, and the only way is by distinguishing ground objects.

Red light is totally harmless. Use it to advantage when you expect to be out in the dark. Remember, if you must use light in the cockpit, other than red light, keep it as dim as possible. If you must fly over an area that is brightly lighted, keep one eye closed and thus preserve its dark-adaptation. If you are well prepared you will have red goggles handy which you can slip on.

After you have adapted your eyes and learned to keep them adapted, your night seeing problems have just begun. During daylight hours if you observe movement out of the corner of your eye, you turn your head and look directly at it. While this is the right way to look in daylight, it is all wrong at night. Trying to see through the night blind spot in the center of the eye is impossible. To properly see at night you should look slightly away from what you are trying to see. The angle of off-center vision varies with the individual. It is usually best at 6° to 12°.

When flying a traffic pattern at night it is foolhardy to stare straight ahead. If someone is in front of you, you won't see him but you will hear the rending of metal when you make contact. Instead of staring straight ahead, move your eyes around in a circle, focusing always slightly off center. It will take practice to do this but it will work. Learn to move the eyes frequently in dim light. The rods tire quickly and are at their best only for short periods. You can't see anything when the eyes are moving, but they are sensitive just after moving. For maximum efficiency of night vision move the eyes in short jumps of from 12° to 20°. Since this kind of seeing is far from the norm, you will have to practice until it becomes automatic while flying at night.

There are three aids to night vision that should be mentioned at this point.

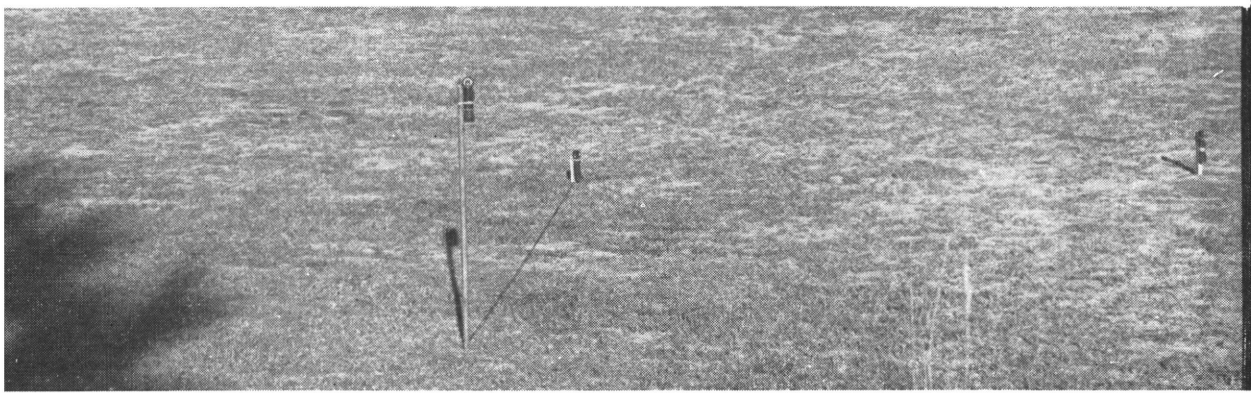
Clean windshields. It is even more important at night than in daylight to keep your windshield and windows clean and unscratched. Tests prove that a thin film of oil or dirt on a windshield will reduce visibility by more than 50 percent. Haze, fog, dirt, scratches—anything which absorbs or scatters light — reduces contrasts and makes seeing harder. There is not much we can do about haze or fog. We can keep our windshields clean and refuse to take an aircraft with the windshield all scratched up. While flying make sure there is no glare or reflection from the instrument panel in your windshield. When you want to see best get your face up as close to the windshield as possible. The best visual setup is to look through the glass at 90°. As this angle decreases, you suffer a loss in visual range.

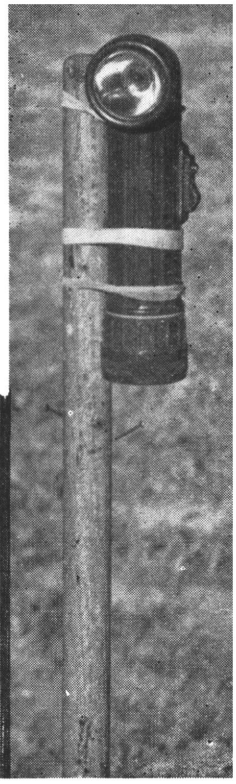
Good physical condition. As in everything else, good seeing is dependent on good physical condition. Fatigue, cold, vitamin deficiency, excessive alcohol or smoking, stimulating and cold-curing drugs all have a serious effect on night vision. If you entertain any doubts as to whether or not you should fly, see your flight surgeon.

Oxygen. Flight above 5,000 feet without oxygen reduces night vision. With the use of oxygen above 5,000 feet, a pilot's vision may be increased two or three times.

Let's help to make night flying enjoyable by properly preparing ourselves for it.

Once Upon A Flashlight





Captain J. I. Hunt, Inf

Lieutenant J. L. Hastings, Arty

IN ITS CONTINUOUS search for greater airmobility of troops, equipment, and supplies, the Army has given the helicopter an uncontested place on the battlefield. Originally used in Korea for evacuation of wounded, the helicopter has taken on new magnitude for today's battlefield commander. In the past, the commander had limited use of the chopper because he could not use it in night operations.

Considerable effort has been directed to overcome this handicap and increase the effectiveness of heliborne operations. For over ten years various Army boards have been testing night landing systems which could be standardized for safe fixed wing operations. The problem is a complex one and involves such questions as:

What kind of installation is necessary or desired — permanent, semi-permanent, or portable?

What kind of power source is most suitable—electric, wet or dry batteries?

What kind of controlled illumination is best — master switch or slotted hoods?

How near to the front lines should lighted airstrips be located — at division, corps, or army levels?

Which is best—a low-power light system that any pilot can see if he knows exactly where to look or a high-power system that uses a glide path beam of light?

With heliborne operations assigned a more important role on the future battlefield, the problem of finding an adequate (and safe) night landing system for helicopters becomes apparent. If the problem is not as complex as for fixed wing aircraft, its existence cannot be overlooked.

It is true that helicopters can use the same landing fields as fixed wing aircraft, but there will be many operations where only heliborne units can be used, or where the successful completion of a mission is ac-

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Captain Hunt is presently assigned as Operations Officer in the Department of Tactics. He is both fixed and rotary wing qualified and also instrument rated. He has a total of 1150 flying hours.

Lt Hastings is also assigned to the Department of Tactics as an instructor in the Air Mobility Branch. He is fixed and rotary wing qualified and has a total of 1871 flying hours.

complished with both F/W and R/W aircraft used to complement each other. It would be desirable to have heliports as well as airstrips so that all organic aircraft could be utilized at the same time if necessary.

"Who me? Fly helicopters in formation at night?"

"Land in formation guided by a flashlight?"

". . . without navigation lights in the boondocks?"

Such thoughts raced through our minds as we toyed with the idea of testing the tactical feasibility of the "Michelscope."

The "Michelscope" (named after its originator) was developed by an Army Aviator at Fort Benning over two years ago. It had been used successfully to guide single helicopters to a safe nighttime landing. We wanted to know if a helicopter formation could land with just the lead aircraft flying the scope. Also, what would be the best formation and the minimum aircraft lighting required for such operations?

The need exists for a simple, lightweight, reliable tactical night landing system for use in airmobile operations. A system is required that is almost impossible to detect unless its exact location is known. It should be light, compact, and of simple design so that it could be carried into the objective area by a Pathfinder. If such a system could be made from existing quartermaster or engineer stocks, so much the better.

The director of the Department of Tactics, USAAVNS, approved the use of six Chickasaws (H-19s) for the experiment. Our first concern was to find pilots experienced in helicopter formation flying. We found a few, but no one with a recent night flight. Three had previous experience with a "Michelscope." We added seven volunteers to bring our test crew strength to ten.

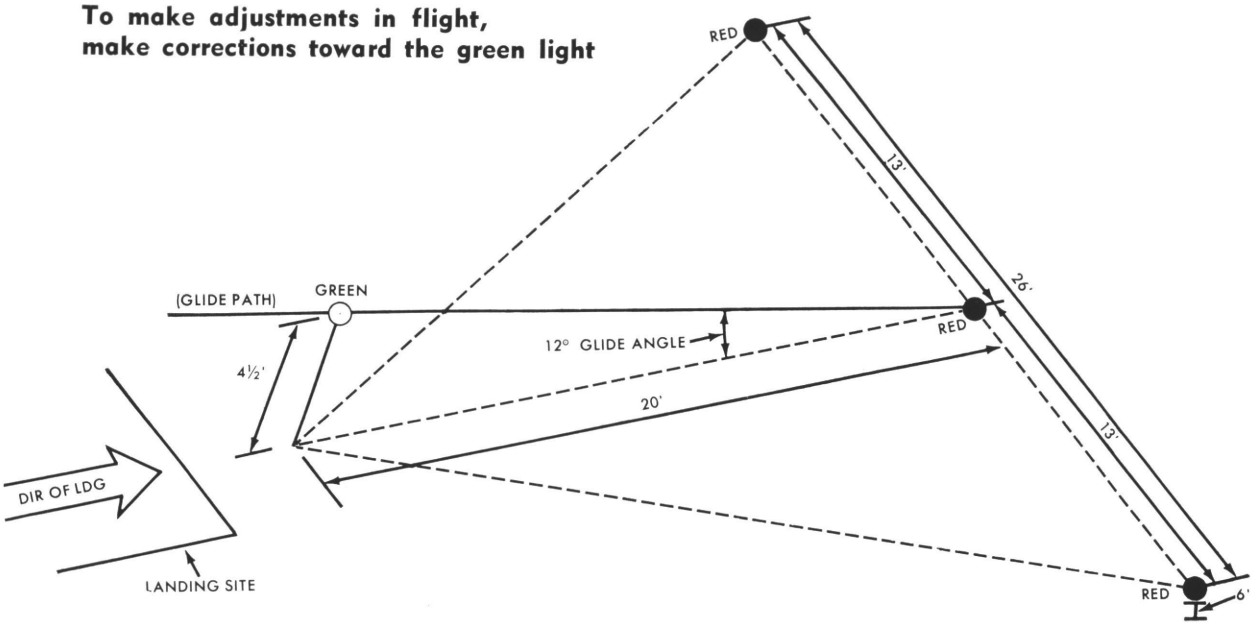
To add validity to the test, operations were conducted on a tactical field used by the Department of Tactics for student training. All pilots had landed in the field during daylight, but only two had landed there at night.

At the briefing the "Michelscope" night landing system was explained and described.

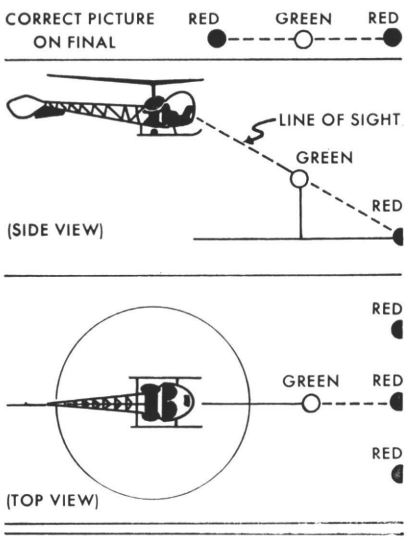
Four standard Army flashlights, three equipped with red lenses and one with a green lens, supply the necessary lighting. Four sturdy stakes, three 21 inches long and one 6 feet long, complete the equipment. Rubber bands hold the flashlight to each stake. Slanting this stake backward or forward increases or decreases the range of the scope. Inclination aims the light up the glide slope or flight path.

Fifty feet forward of the desired landing point, drive the short stakes into the ground, 13 feet apart and perpendicular to the flight path. Attach the three red flashlights to these stakes. This arrangement is suitable for formations of Sioux (H-13s) and Ravens (H-23s). When landing at night with formations of Chickasaws (H-19s), Shawnees (H-21s), Choctaws (H-34s), and Mohaves (H-37s) the perpendicular line of red lights should be placed a little more than 50 feet forward of the desired landing point. This is necessary because pilots in the larger helicopters sit higher above the touchdown point. The success of this night landing system depends upon the lights the pilot sees from the cockpit.

To make adjustments in flight, make corrections toward the green light



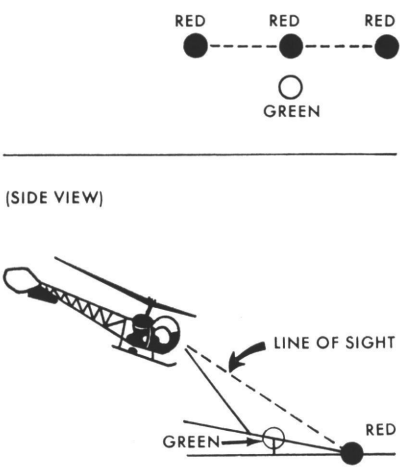
SIGHT PICTURES



Twenty feet from the line of red lights and centered on the middle one, drive the 6-foot stake into the ground on the side nearer the landing point. Secure the green light to this stake.

Here's what the pilot should see: From a distance of ¾ of a mile the pilot has a continuous reference to his flight path. This reference is indicated by the "sight picture," or the position of the green light in relation to the red center light.

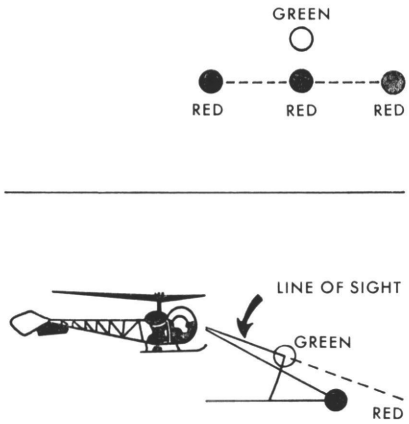
PICTURE WHEN A/C IS HIGH BUT ON CENTER



When the helicopter is on a correct approach, vertically and laterally, the green light blocks out the center red light. The pilot still sees the outer red lights which aid him in making the proper descent.

To make adjustments in flight, make corrections toward the green light. For example, if the green light is below the center red light, the flight correction would be downward. If the green light is to the right of the center red light, the flight correction is to the right.

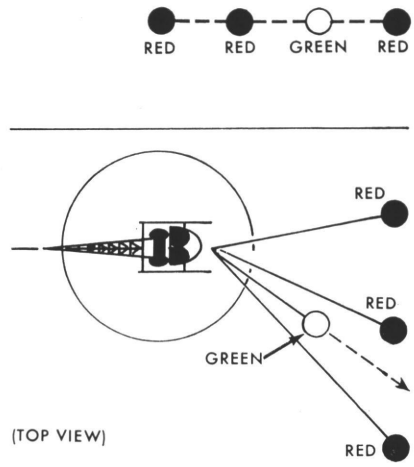
PICTURE WHEN A/C IS LOW BUT ON CENTER



The briefing over, and techniques still hazy, we flew out to the tactical field. A few familiarization approaches were made before we landed and grouped into two "V" formations. During our first trip around the pattern at night, we looked like flying Christmas trees. The navigation, formation, and Grimes lights precluded any tactical exercise, but they were valuable as guides to a safe landing.

Several nights and many approaches later we knew that the "Michelscope" landing system was practicable. Here are our conclusions:

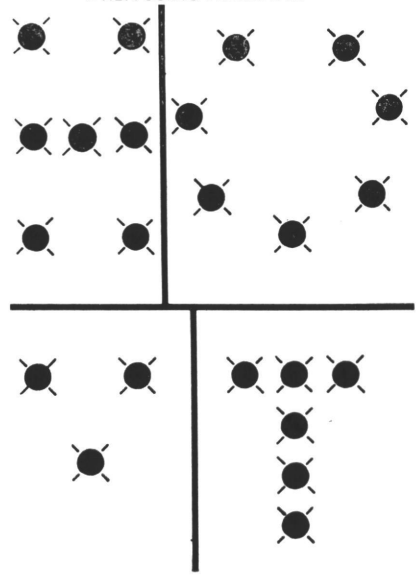
PICTURE WHEN A/C IS LEFT OF CENTER

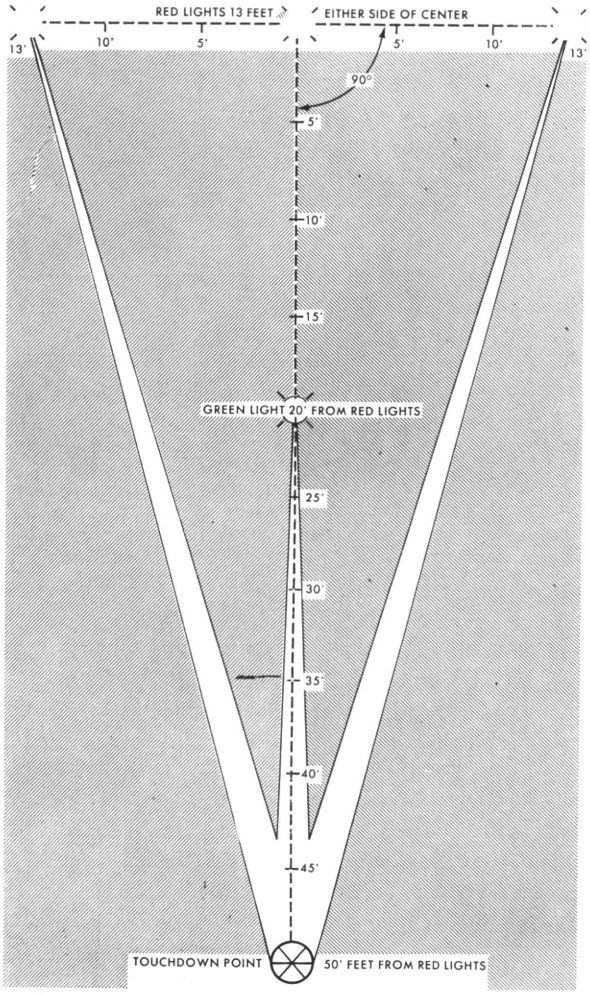


1. The "Michelscope" is a good tactical lighting system for night helicopter operations because it can be used to land several helicopters simultaneously. Each echelon must have a separate scope, or wait until the preceding "V" clears the glide path.

2. The best formation is a "V" of three or five aircraft. The lead aircraft makes the approach on the scope. The wingmen simply hold their position on the leader.

NO LATERAL / VERTICAL CONTROL WHEN USING FLAREPOTS





3. The best aircraft lighting: navigation lights steady and dim, formation lights on, Grimes light off. Pilots of the last two aircraft in formation keep their lights OFF.

4. The tighter the formation, the easier to maintain position. If aircraft get too much distance between them, pilots lose depth perception. A distance of 75-100 feet between rotors is recommended.

5. Each aircraft should have a pilot and copilot. The pilot has little time to watch the instruments (other than rpm and airspeed indicator); the copilot monitors the gauges and acts as lookout.

Extensive training in daylight formation flying is required. Night helicopter approaches must be practiced until perfect. With proficiency in these two operations plus two weeks training with the "Michelscope," pilots should be ready for any kind of airmobility operations.

Perhaps the "Michelscope" is not the ultimate answer to a tactical night landing system for helicopters. Such a system would be one (or more) lighting systems in a landing area large enough for all aircraft needed to complete the operation to land simultaneously. We do feel, however, that until something simpler, lighter, more compact, and cheaper to obtain is forthcoming, the "Michelscope" offers a reliable, tested night landing system. It is far superior to the old "three flare pots per aircraft" method.

As the Department of Tactics continues testing various night landing systems more information will become available. Meanwhile, for additional information or suggestions, write to:

Department of Tactics
USAAVNS
Fort Rucker, Alabama

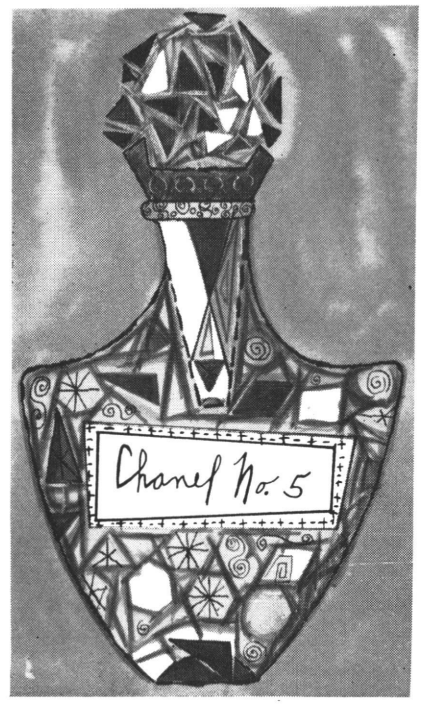
"Redhot Radio, this is Air Force 12345, listening Channel 7, over."

"Air Force 12345, this is Redhot Radio, over."

"Redhot Radio, this is Air Force 12345, #$%$%$#$ over."

"Air Force 12345, your transmission is garbled. Switch to Channel 5, over."

Have you heard similar requests and wondered what is the channel business on UHF? Our brother fliers are operating on interim UHF channelization. The old "BRAVO, CHARLIE" system still applied to VHF, but the Air Force and Navy are now using a numbered channel system on UHF. For your information the following channels are presently being used.



AIR FORCE/NAVY INTERIM UHF CHANNELIZATION

Channel	Air Force	Navy
1	236.6	340.2
2	—	360.2
3	275.8	257.8
4	257.8	272.7/255.4
5	272.7/255.4	—
6	301.4	301.4
7	263.0	—
8	348.6	—
9	—	—
10	364.2	—
11	—	—
12	—	—
13	344.6	—
14	305.4	—
15	363.8	263.6
16	270.6	310.6
17	335.8	258.6
18	289.4	270.6
19	—	—
20	—	—

AN APPEAL TO THE LADIES

SOCIOLOGISTS currently maintain that the average American woman's burden is becoming easier, whereas that of her spouse follows an opposite trend. In this age of precooked foods, supermarkets, superkitchens, and maximum outside services, the All-American-Girl is unique among the world's housewives. Although there still exist some back-breaking tasks that confronted her mother and grandmother, automation and time saving innovations have erased much of the drudgery from her domestic role. She tackles her work with comparative ease and, for a minimum effort, is rewarded maximum leisure time.

Providing the wherewithal for the domestic utopia with which he has surrounded his bride is the American male. However, to supply the needs of his modern family, he has had to sacrifice some peace of mind. In an aurora of growing job specialization and career competition his burden increases. The ulcers, nervous disorders, strokes, and coronary attacks common today are testimony to the pressures and excessive pace confronting the male breadwinner.

Medical authorities cite excessive worry, frustrations, anxiety, and fatigue as direct factors in many cases of ill health. The problem is now so acute that some sociologists are concerned lest we eventually face an overpopulation of women as vast numbers of the "stronger sex" succumb to their personal anxieties.

Does he worry about end-of-the-month bills?

This article was prepared by the U. S. Army Board for Aviation Accident Research.

The situation is not limited to the industrial scene. Our Army Aviators also strive to achieve in an extremely competitive career field. They work with equipment that demands a high level of technological "know-how," specialization, and physical fitness. Available statistics indicate that most Army Aviators are married. This then is an appeal to the ladies, specifically, to the wives of our Army Aviators.

Your husband has proved through competitive training and examination that he is capable of flying. He has demonstrated that the care and manipulation of certain flying equipment may be entrusted to his care. This equipment is some of the Army's best, so sensitive and complex that intense concentration, skill, and commonsense must be used in its operation.

However efficient the Army's flying machinery may be, it has an Achilles heel. Its weakness lies in a human factor: the pilot at the controls. As an Army Aviator's wife you may, or may not, be included in this human factor.

Does your husband-pilot often complain of exhaustion? Some of our pilots arrive at the flight line thoroughly tired from late hours the night before. There are many others who leave their castles without adequate breakfasts, only to "peter-out" in the midmorning. How many times a week do YOU make breakfast for your spouse? Do you feed him properly balanced meals? Enough salads? Enough proteins? Do you let him get overweight?

Does he worry and complain about end-of-the-month-bills? If so, do you economize the following month? Perhaps he calculates how they will be paid when he should concentrate on his flight. Do you attempt a peaceful and happy atmosphere in the home when he returns at the day's end? Do you allow the children to be noisy when he is tired? Do you insist upon entertaining or accepting invitations from persons he dislikes? Although his duty may absent him from the house most of the day, is he actually the HEAD OF THE HOUSE?

You may be responsible for an aviator-type who is both unfortunate and relatively common in Army Aviation. The flier who worries about money, the much-married fellow who is browbeaten by a domineering wife, the constantly tired pilot, or the old timer who goes up each day in unfit physical condition — all are prime examples of accidents waiting to happen. Give them an airplane and the odds are that, sooner or later, they will be exhibit number one in an accident investigation!

Your husband may be the outstanding "watchdog" on his post, but under those wings he is a simple creature. Give him a feeling of security and importance. Make him think he is eating better and receiving more care than ever in his life. Don't let him do all the worrying; after all, two heads are better than one. When he is at home, see to it that there is peace and quiet around the hearth.

With a little effort you'll succeed in your obligation to make him a happy, adjusted, and safe Army Aviator. Don't try to remake him. Just try to preserve him.

Two heads are better than one on this planet

SURVIVAL of the mind

Fred M. Montgomery

SURVIVAL from an accident occurring in the mountains, deserts, jungles, or polar regions can usually be attributed to one or all of the following reasons: TRAINING, using the proper equipment and following correct procedures; INGENUITY, using the equipment on hand to best advantage; INITIATIVE, taking command of the situation and detailing the work to be done among the survivors; DISCIPLINE, gaining and holding the respect of those sharing the experience; THE WILL TO LIVE, believing that the situation can be made better and never giving up hope that help will arrive.

After rescue, medical treatment heals the injuries (frostbite, broken bones, dehydration, malnutrition, fevers, etc.)

Time is also a medicant because it helps one forget the agony of injuries sustained, the fears of not being found in some little-traveled area of the world, the pains of hunger and thirst.

Thus far we have been talking about physical survival. What about mental survival if captured — survival from the kind of insidious psychological indoctrination as practiced by Communists? What safeguards can the Army Aviator inculcate in his training that will help him in case he is captured? Can he prepare himself against an attempt to rape his mind?

All the things useful to the Army Aviator regarding physical survival will help him if he is captured. A look into the methods employed by Communists to gain control of one's mind will give the Army Aviator added protection against a persistent and wily foe. Consciously and unconsciously, the brain controls physical actions and reactions. Consequently, some mental and physical safeguards should be erected to prevent the Communists from getting control of the mind. Knowledge of Communist propaganda, techniques and treatment of prisoners will help the Army Aviator resist and reject the subtle insinuations used by the enemy to foster hatred, distrust, discord, and disunity among his fellow prisoners.

If we know the objectives of the Communists, their tech-

niques of obtaining information, their interrogation and indoctrination procedures, then Army Aviation personnel will have a valuable tool to help them resist the attempted rape of their minds.

POW

A total of 6,656 Army troops were taken prisoner during the Korean conflict. One-half of these men died in captivity, most of them during the early phases of the war before the Chinese Communists began their planned program of prisoner-of-war exploitations. The data for this article is based on information from the 3,323 Army POWs repatriated in the prisoner exchanges after hostilities ended. Following are some of the characteristics of the Army POWs who returned from Korea:

Average age at capture was 21 years.

Average POW had a 9th grade education.

5 percent were officers; 38 percent were NCOs; and 57 percent were enlisted men below the grade of sergeant.

75 percent were members of the Regular Army; 10 percent were enlisted Reserve and National Guard; and 15 percent were draftees.

85 percent had over 3 years of military service.

50 percent had less than one month of foreign service prior to Korea.

84 percent had no combat service prior to Korea.

1 percent had been POWs before.

THE ENEMY'S OBJECTIVES

The Communist captor viewed the prisoners primarily as a rich source of potent propaganda materials. Over-all, 70 percent of the returned POWs had contributed to some degree —wittingly or unwittingly—to the Communists' phychological warfare in Korea. Eighty-eight percent of the returned POWs accepted no part of communism. Among those who did, more than half can be described as having only a mild affinity toward the captor's ideology.

By means of a heavy barrage of indoctrination, the captor attempted to convert Army POWs to communism. This is borne out by the fact that 97 percent of the returned POWs were subjected to enemy indoctrination during internment, and virtually all were given indoctrination lectures by the captor. In addition, 83 percent were required to attend group study periods, 43 percent smaller discussion groups and conferences, and 27 percent public gatherings called by the captor.

The major current of thought stressed in indoctrination was that of the social and economic merits of communism as against the "sins" of American capitalism. As further aid to rape the minds of the POWs, virtually all had been exposed to enemy - sponsored newspapers or magazines, and 85 percent heard Communist radio broadcasts. In contrast, only one-tenth received non-Communist news of any type during their internment, and over half of this consisted of innocuous sports and local news clippings sent in letters from home. Finally, 15 percent of the POWs had been given suggestions of Communist - oriented activities to be carried on after their release. Primarily these were suggestions for joining Communist organizations and reading Communist publications.

The enemy attempted to extract valuable military information from the POWs through interrogation. There is no data indicating the kinds or amounts of military information the enemy received from them. This can only be guessed from the fact that many prisoners could not see the value of interrogation information for the enemy. The Communists questioned half of our men about Army Tables of Organization and Equipment, 25 percent about military equipment and supplies, 15 percent about Army tactics and strategy, and 13 percent about political affiliations and personal attitudes.

THE ENEMY'S TECHNIQUES

To carry out his program of POW exploitation, the Communist used three major techniques:

1. REWARDS AND PUNISHMENTS

The Communist captor instituted a system of REWARDS AND PUNISHMENTS and played upon the natural tendencies to seek pleasure and avoid pain. Collaboration resulted in the rewards of preferential treatment; resistance frequently meant physical abuse and mistreatment.

At this point it might be well to identify or classify the prisoner-of-war.

PARTICIPATORS: Men who had been recommended for court-martial or dishonorable discharge under the Army Personnel Security Program. In addition, it included POWs who would have been prosecuted had they not already been discharged from the military service.

MIDDLE GROUP: These were POWs about whom the Army had little or no deroga-

tory information, and those cases temporarily marked "Undetermined" by virtue of the conflicting evidence then available.

RESISTERS: This group contained all POWs who were decorated for meritorious behavior as prisoners and those for whom recommendations for decorations were later disapproved. Of the 3,323 repatriated POWs, 15 percent were PARTICIPATORS, 80 percent fell into the MIDDLE GROUP and 5 percent were RESISTERS.

Information conclusively shows that the behavior of the Participators was opportunistic in nature and the behavior of the Resisters was not.

Opportunistic for what? Were the inducements of the captor real? Did POWs who were attracted by the opportunity to improve their lot through participation actually receive preferential treatment? The data answers this question in the affirmative. One-third of all POWs received some preferential treatment in captivity. Three-fourths of the Participators received such treatment to a great or moderate degree; all but a small percentage of the Middle and Resister groups received little or nothing.

Among Participators, the inducements ranged from such specific items as cigarettes, alcohol, parties, money, and mail to the more general benefits of better POW living, such as better food, medical attention, and special living quarters.

Half of the Resisters were mistreated as a result of their resistance; in contrast only 14 percent received mistreatment as punishment of asocial behavior (such as striking guards, infractions of camp rules), and only 5 percent for "no reason" (apparently — as interpreted by some POWs — out of pure sadism on the part of the captor.)

2. DIVIDE AND CONQUER

The captor sought to **divide and conquer** the POWs. In addition to denying them normal sources of leadership, the Communists encouraged divisiveness and suspicion among the POWs.

The act of informing was undoubtedly regarded by the captor as one of the most potent aids in prisoner manipulation and control, and rewards for informers were especially great. How susceptible were the POWs to threats made directly by the captor? Clearly the Participators were much more susceptible to threat than the Resisters: the Middle Group falls between the two, though closer to the Resisters. The POWs who conformed to the captor's demands when faced with threats of mistreatment and/or offers of preferential treatment avoided pressure in internment more successfully than those who did not conform. More important, there is every indication from the data that it was this very avoidance of pain on the one hand and the seeking of positive rewards on the other that, more than any other factor, accounts for the behavior of the Participators.

There is a high positive relationship between susceptibility to captor rewards and their receipt on the one hand, and degree of participation with the enemy on the other. Did a POW participate **because he received** preferential treatment, or did he **receive preferential treatment because** he participated? In other words, did the captor preselect a group of POWs for preferential treatment in the hope that through such softening up they would become cooperative? Or did the promise of preferential treatment precede participation as an incentive which was later realized as a reward? Available data does not altogether solve the cause-and-effect relationship, but does throw some light on the question.

Sixty-three percent of the Participators can be considered to have received preferential treatment **because** of their collaboration with the captor. Twelve percent were better treated as a **result** of their "compliance with enemy demands" outside the realm of collaborative activity. Eleven percent received preferential treatment in connection with their jobs in camp.

Perhaps the best way to summarize how the Communist sought to divide and conquer and the training problems involved is to quote a high ranking POW who was senior officer in one of the compounds:

"It was hard to keep morale up when certain individuals were getting preferential treatment for doing work for the Chinese Communist Forces. Many men could not see anything wrong with this morally if, by doing this, they had a better chance to survive. By doing so, an individual became entangled so deeply that he could never emerge from the clutches of the Communists. To many men it was a hard decision to make not to become **opportunists and collaborators.** It was tragic to see that some would not resist the temptation."

The idea environment of POWs was strictly controlled

3. IDEA ENVIRONMENT

The idea-environment in which the POWs lived was strictly controlled. The enemy prevented the prisoners from receiving news from friendly sources (radios, newspapers, letters).

Very much a part of the indoctrination program was the heavy diet of Communist news received by the prisoners in contrast to the virtual absence of non-Communist news sources. Ninety-nine percent were given enemy-sponsored newspapers or magazines. Among these men, 93 percent reported seeing Chinese publications and 83 percent U. S., English, and Russian Communist publications. Communist books, broadcasts over the camp PA system, and contacts with Communist news correspondents supplemented the diet of propagandistic news provided for the POWs.

In contrast, only 20 percent received non-Communist magazines sent from the United States; 5 percent got non-Communist books. Small handfuls of prisoners heard unbiased news broadcasts on POW-built radios, or received information on happenings in the outside world via friendly psychological warfare leaflets.

A great deal of evidence from basic psychological research indicates that when an individual is subjected to a homogeneous flow of opinion and news, there is a tendency for him to modify his own opinions—even to reject known facts—and conform to the group. Returning POWs frequently reported that in the restricted environment of prison camp they soon began to doubt what they knew to be true.

Under the circumstances in Korea, it is not surprising to find POWs doubting their own opinions and facts; this is a natural outgrowth of the intensity of one-way news and opinion presented by the enemy, and of the deprivation by the enemy of any normal news stimuli that might have reached the prisoners.

INTERROGATION PROCEDURES

Interrogation was both verbal and written, although the verbal type was more frequent (60 percent). Apart from the general interrogation procedures, prisoners were required to provide autobiographical information which usually followed an outline prescribed by the captor, and included information regarding the prisoner's personal background, family history, social and military history, and political affiliations. They asked for names and addresses of relatives in the United States, too. Autobiographies were written by 91 percent of all POWs in Korea. In describing these personal histories, the returning POWs gave little evidence of insight into the value the data had for the enemy.

The POW must expect always that he will be asked much more than his name, rank, serial number, and date of birth; primarily he will be interrogated regarding Army TO&Es, tactics, and strategy. Three-fourths of all prisoners reported being asked about their personal and family backgrounds. Half were questioned about matters dealing with TO&Es, Army organization techniques, and other military data. Less than 0.5 percent were asked only for their name, rank, serial number, and date of birth.

INDOCTRINATION PROCEDURES

Signs of cooperation in the captor's indoctrination program resulted in the "invitation" to attend special indoctrination sessions voluntarily. Ninety-seven percent of all Army

POWs were subjected to indoctrination of one type or another. Those few who came through internment without indoctrination were captured, for the most part, in the spring and summer of 1953, just a few months before the end of the war. The greater the POW's resistance, the less extensive and intensive were his indoctrination periods, even though virtually all had to attend indoctrination lectures.

In effect the captor tried to "make a deal" with the POWs. Those who wished to better their lot and live with increased comfort and freedom needed only to do the captor's bidding; those who refused could frequently expect to be punished and mistreated. Resistance meant not only giving up the rewards of preferential treatment, but also accepting the real possibility of reprisals. Primarily, the captor attempted to use POWs as tools for propaganda. Troops should familiarize themselves with the potency of psychological warfare as a weapon and realize that the act of signing a petition or making a recording has far-reaching consequences in terms of the enemy's success in his psychological warfare campaigns.

The captor encouraged and rewarded informing on fellow POWs. Quite apart from its other implications, no other act was so valuable to the enemy in his attempts to split and demoralize the prisoners. A "dog eat dog" attitude among POWs was exactly what the captor wished to develop.

We have reviewed the objectives of the Communist in regard to his prisoners. We have gained an insight into the techniques he employed to gain information, and have had a lesson in indoctrination. What recommendations can be made to help Army Aviation personnel withstand encroachment of Communist psychology?

RECOMMENDATIONS

Let's start with these. They were made in November 1948, several months before the outbreak of hostilities in Korea. They are based upon personal experiences of a field grade officer in a Japanese prisoner-of-war compound and are still valid.

1. Since POW survival is a problem of important consideration, it should be studied in the same manner as arctic survival and jungle survival.

2. The physical training of combat soldiers in the theater of operations should be greatly intensified because physical endurance and survival may depend upon how the body has been treated prior to capture. In other words, the combat soldier should be at his best, mentally and physically, at time of capture.

3. The education and indoctrination program for all combat soldiers should give a true picture of the enemy's treatment of prisoners, not to be presented in a defeatist attitude, but rather with the attitude that "to be forewarned is to be forearmed."

4. A study of the psychology of the enemy's treatment of POWs should be kept up to date through all intelligence sources.

5. Discipline of the mind, physical adaptability, and flexible behavior patterns should be strongly stressed in training periods, such as paratrooper and ranger training.

6. Ex-POWs could assist in briefing before missions by presenting helpful hints from personal experiences such as (a) wearing of durable clothing, as it may be the only clothing available for many months; (b) methods of stretching the food parcel and methods of obtaining news; (c) how to avoid breaking security; (d) the importance of a hobby; (e) suggestions as to extras to take along on a mission (example: jack knives, vitamin capsules, D-ration bars).

The following comments are from the same officer. They may help Army Aviation personnel who are concerned about this vital problem—survival of the mind. The treatment of prisoners by Russia has been shown to be similar to that of the Japanese during World War II; therefore, a captive of Russia will require great fortitude and considerable prior preparation, mentally and physically, in order to survive with a healthy mind and body.

"The human body can endure only so much physical maltreatment in the way of prolonged exposure, punishment, and pain, although it is surprising how adaptable the body becomes to adverse circumstances. Along with malnutrition and physical maltreatment, isolation and confinement played a large part in affecting the prisoners' state of mind and body. Some men found it easier than others to be cut off from the world. They apparently had the ability to exercise self-control in disciplining their mind, and could engross themselves in various forms of work which would give them release and escape from reality.

"Psychologists refer to them as 'escapists' (those who unconsciously seek relief from their oppressive environment

by means of escape mechanism). Thus in prisoner-of-war camps, men found release from their surroundings by conducting classes, constructing crude implements and tools, compiling cook books and recipes, fabricating radio sets, studying, reading, drawing, knitting, religion, and entertainment. Some wrote their own textbooks and taught classes in foreign languages, accounting, navigation, aerodynamics, law and chemistry.

"To those who were interested, there was always the opportunity of learning the language of their captors. This was not used, in the majority of cases, except as a momentary expedient for the purpose of barter or trade with the guards. In practically every camp in Japan, there were one or two individuals who became so proficient in the Japanese language that they were able to translate the Japanese newspapers.

"Customary American ingenuity was exhibited in the construction of tools and implements: tin can stoves capable of generating sufficient heat for cooking, tin cups and mugs, eating utensils, egg beaters, musical instruments, ship and airplane models, and Christmas cards. A particularly impressive result of hard work and application in one of the Japanese camps was a 500-page fairy story book, exquisitely printed by hand and beautifully illustrated with color drawings. The senior officer, in most cases, was the commanding officer of the camp organization. A staff assisted him in such duties as passing out news from the translations, dealing with discipline, maintaining military order in case of sudden release, etc."

Could you resist efforts of the enemy to "rape your mind"?

EXECUTIVE ORDER 10631

Could you "max" a course in "Code of Conduct for Members of the Armed Forces of the United States"?

Do you know just what Articles 3, 4, and 5 of the Code state? They refer to actions you must take if captured. They are printed here for emphasis.

3. If I am captured I will continue to resist by all means available. I will make every effort to escape and aid others to escape. I will accept neither parole nor special favors from the enemy.

4. If I become a prisoner of war, I will keep faith with my fellow prisoners. I will give no information nor take part in any action which might be harmful to my comrades. If I am senior, I will take command. If not, I will obey the lawful orders of those appointed over me and will back them up in every way.

5. When questioned, should I become a prisoner of war, I am bound to give only name, rank, service number, and date of birth. I will evade answering further questions to the utmost of my ability. I will make no oral or written statements disloyal to my country and its allies or harmful to their cause.

In conclusion, history shows attempts by nations throughout the world in past years to improve the lot of the POW have not been completely successful, and so the captured man still fights for his life (and mind) in a prison camp.

Could you resist efforts of the enemy to "rape your mind"?

Layout for Army Aviation Safety

Captain Marquis D. Hilbert, Arty

NEVER AN ACCIDENT in over 42 months of operation and more than 3,500,000 passenger miles flown. Such is the record set by the aviation section of the U. S. Army Ordnance Missile Command, Redstone Arsenal, Huntsville, Alabama.

What is behind such a record? A Casper Milquetoast approach to flying? Far from it. This perfect safety record was compiled in operations all over the United States and under all types of weather conditions.

Providing rapid, all-weather transportation 24 hours a day between Redstone Arsenal and other key installations, the highly efficient aviation section has helped save many precious manhours vitally needed in the international missile race.

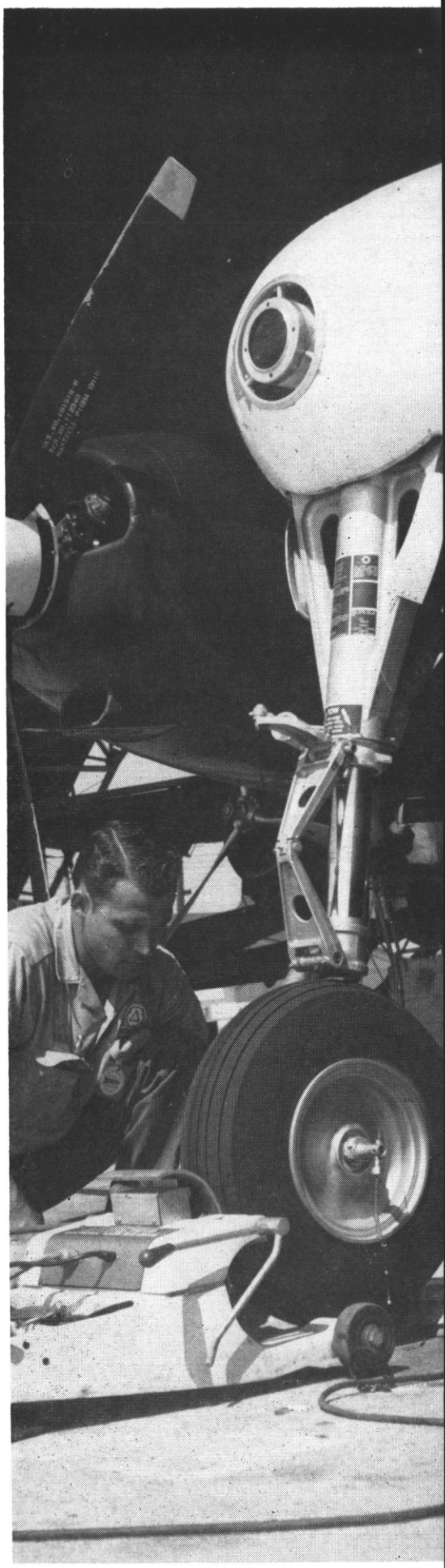
Equipped with five L-23 Seminoles, two L-26 Aero Commanders, one U-1A Otter, and one H-23 Raven, the section maintains an average of 515 aircraft hours and 955 pilot hours flown each month.

Shuttling satellites and nose cones between laboratories and missile ranges, transporting security material which cannot be shipped via commercial means, and hauling the first space travelers of the United States (the space monkeys) are commonplace occurrences to the section's experienced pilots.

The average section aviator has 10 years of flying time, with 250 hours of combat flying. Altogether the section has a total of 130 years in the air (42,000 hours).

This wealth of experience

Captain Hilbert is Operations Officer of the Aviation Section, U. S. Army Ordnance Missile Command, Redstone Arsenal, Ala.



alone does not explain a perfect safety record. The teamwork constantly displayed by pilots, enlisted specialists, and civilian technicians created this enviable record.

Sound organization, diligent maintenance procedures, and excellent training and supervision at all levels are the backbone of the program.

The training program is a continuous and dynamic one. With experienced aviators the primary problem is maintaining proficiency, but with 24-hour, all-weather operations being SOP, this is not difficult.

Unless pressed for time, section aviators always make an instrument approach, even during VFR conditions. Blind-flying hoods are kept in the aircraft at all times. Fabricated locally of light metal and padded with sponge rubber, these hoods give a good sweep of the instrument panel without giving the pilot the feeling of peeping through a keyhole.

GCAs are made at every opportunity. If the pilot neglects to ask for one, the GCA operator suggests it. During slack periods local flights are scheduled for practice GCA approaches. Flight simulators are not used. Since aircraft are available, actual flight practice is conducted rather than simulated flight practice.

Unless pressed for time, pilots always make IFR approach

Reports of hazardous flight situations peculiar to section aircraft are disseminated along with recommended corrective measures to all assigned aviators on a "read and initial" basis. Cross exchange of valuable experience is thus assured.

Assigned aviators are exempted from additional duties such as SDO, Courts and Boards, and Inventory Officer, allowing all pilots to be available for flying duty at all times. Without these distracting obligations, pilots conduct training flights when not scheduled for actual missions.

A continuing flight safety program is maintained by the Flight Safety Officer, a graduate of the UCLA Flight Safety Course. The basis of the program is not a beautiful flight safety bulletin board (although the section has one) and reams of written matter and posters. These have their place in the program and undeniably help; but the core of the flight safety program is in **more** flying, **more** training and practice, and **less** talk.

Continuous flight activity maintains proficiency, which is the most important element in any flight safety program. Constant exposure to instrument flight conditions, night flying, icing, turbulence, and low ceilings maintains a keen awareness among section aviators of the need for high level proficiency at all times. This is the key to any good flying safety program.

Memo from Flight Surgeon

LIEUTENANT DOE reported on sick call at 1300 hours with discomfort in the right ear. He had been unable to clear the ear on descent from altitude after a training flight.

Examination revealed the presence of marked nasal congestion, which had been present prior to the flight. The ear drum was retracted and markedly irritated. Immediate relief could not be effected by the attending flight surgeon. The student pilot was grounded and lost several days of training time before the condition cleared.

A visit to the flight surgeon at the onset of his head cold could probably have prevented the development of an acute condition. Such a condition might have been complicated by a middle ear infection with possible permanent damage to hearing.

The next time you have a slight cold, don't take chances with your hearing; don't fly unless approval is granted by the flight surgeon. Temporary grounding is far preferable to permanent grounding engendered by a hearing loss. Remember, it can happen to you.

CARBON MONOXIDE*

With the approach of winter and lower temperatures, heaters will be used, aircraft will be "buttoned up" to keep out the cold. Beware of carbon monoxide! It is insidious in its attack on you.

A broken cabin air heat intensifier tube is suspect in the fatal crash of a small twin-engined aircraft. Although the finding of the investigating board was inconclusive, its reasoning was simple and direct: (a) defective heater system, (b) carbon monoxide present in the cockpit, (c) pilot capability or judgment impaired.

Immediately after takeoff the aircraft pulled up into an abnormally nose-high climb. Between 100 and 200 feet it had an estimated 40° to 60° nose-up attitude. The aircraft then fell off to the left, rolled inverted, and dropped into a steep dive. All the occupants died in the subsequent crash.

The pilots were experienced and conservative in their flying habits. After the crash all control cables were found to be properly rigged, the rudder tab in neutral, and the elevator tab was in a slightly nose-down setting, normal for takeoff.

The cabin air heat intensifier tube at the collector ring of the left engine was found completely separated. It appeared to have a rubbed and leaded area extending halfway around the circumference which was not crash damage.

The pilot's cabin heater was found in the full hot position, and this, coupled with the failure of the intensifier tube, would have permitted a carbon monoxide concentration to enter the cockpit through the heater system.

The effect this had on the pilots in the period immediately preceding the accident could not be determined. However, in a test simulating the same conditions, samplings of the cockpit air and blood samples taken from the test crew both showed carbon monoxide concentrations.

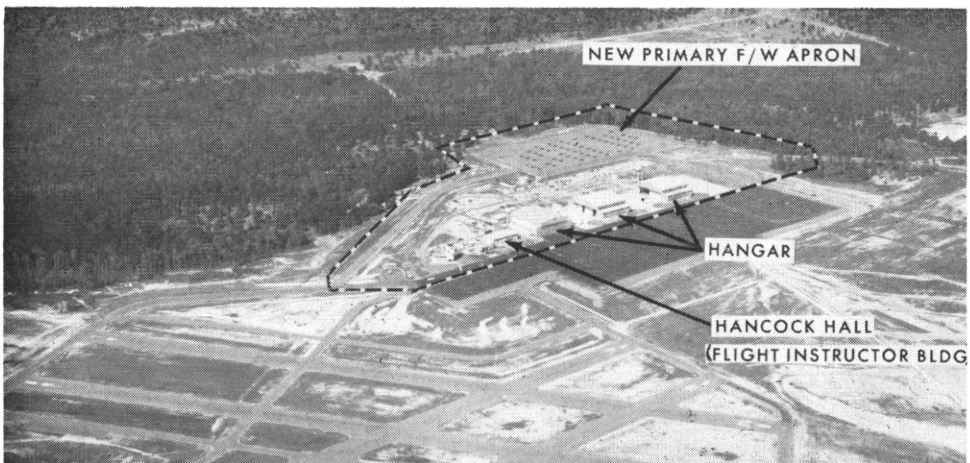
It is believed that this tragic incident indicates the need for a more rigid, and perhaps more frequent, inspection of all heater systems of this type.

You can't see carbon monoxide, smell it, or taste it, but it can be a deadly killer. (Fortunately, the exhaust fumes which hide it do have an odor.) Look for defects during preflight that might allow carbon monoxide into the cockpit. Even a low saturation which is not lethal in itself can impair a pilot's judgement and vision and cause a fatality.

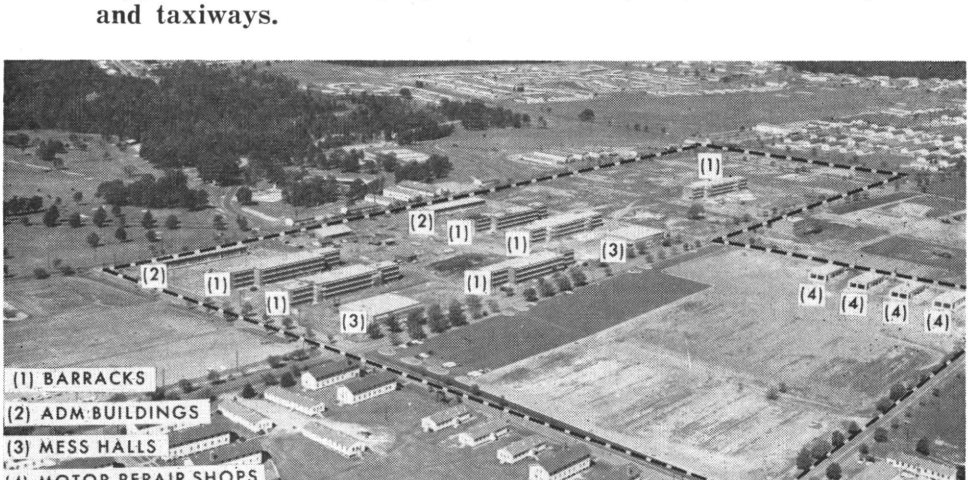
DON'TS FOR PILOTS

1. Don't smoke excessively, especially just before and during flight. It takes a considerable time to eliminate the resultant carbon monoxide from the blood stream.
2. Don't fly when suffering from an upset stomach.
3. Don't drink when intending to fly.
4. Don't fly with a cold unless cleared by your flight surgeon.
5. Don't fly with a troubled mind. When preoccupied, wrong decisions are made at crucial times.
6. Don't practice self-medication.

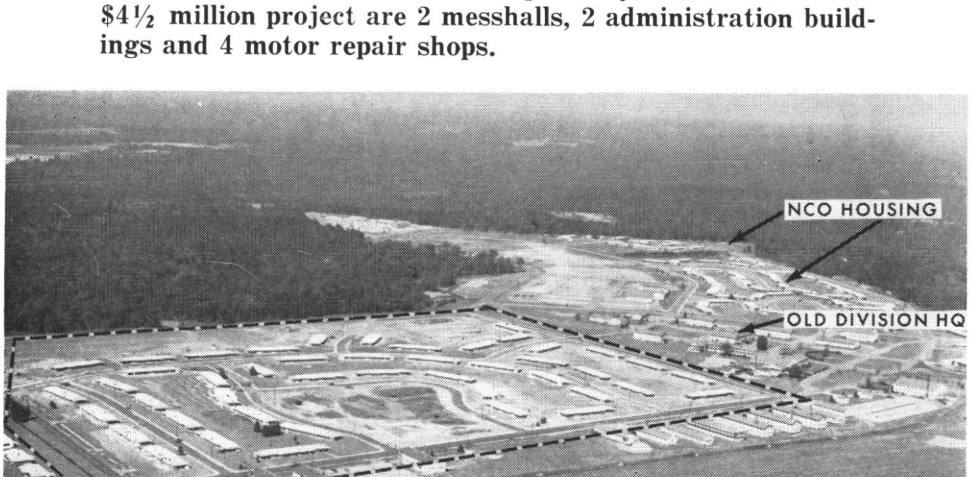
**Material on carbon monoxide is from the Flight Safety Foundation AVIATION MECHANICS BULLETIN.*



Lowe Field is temporary headquarters for the Department of Primary Fixed Wing Training. Construction of a permanent facility, Auxiliary #3, is expected to begin in FY 61. To accommodate the aircraft from Camp Gary and to facilitate movement, about 62,096 sq yds (12.8 acres) of blacktopped surface were prepared for the apron, access roads, and taxiways.



Perhaps the biggest change in the Fort Rucker skyline is made by the 6 new 3-story brick barracks that will house nearly 2,000 enlisted men. Each barrack will accommodate 326 EM who will live in 8-man-squad bays. Included in this $4½ million project are 2 messhalls, 2 administration buildings and 4 motor repair shops.



The Chang
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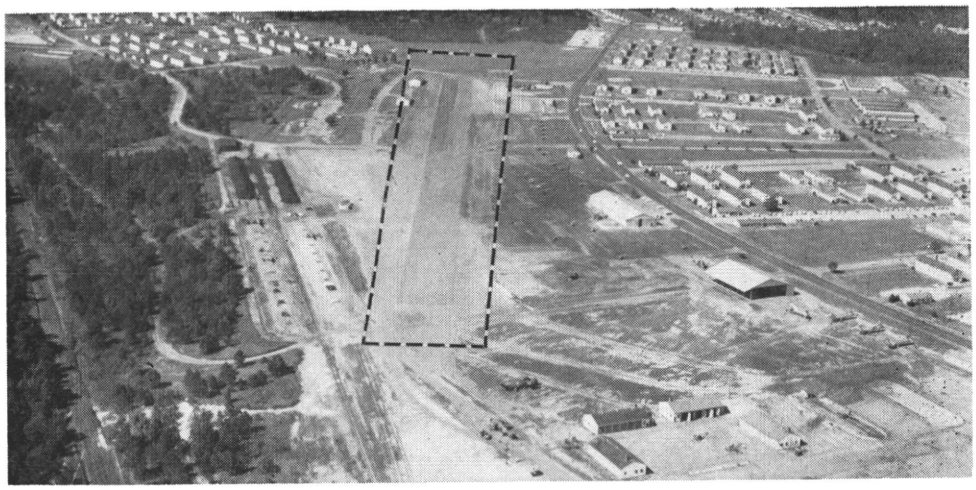
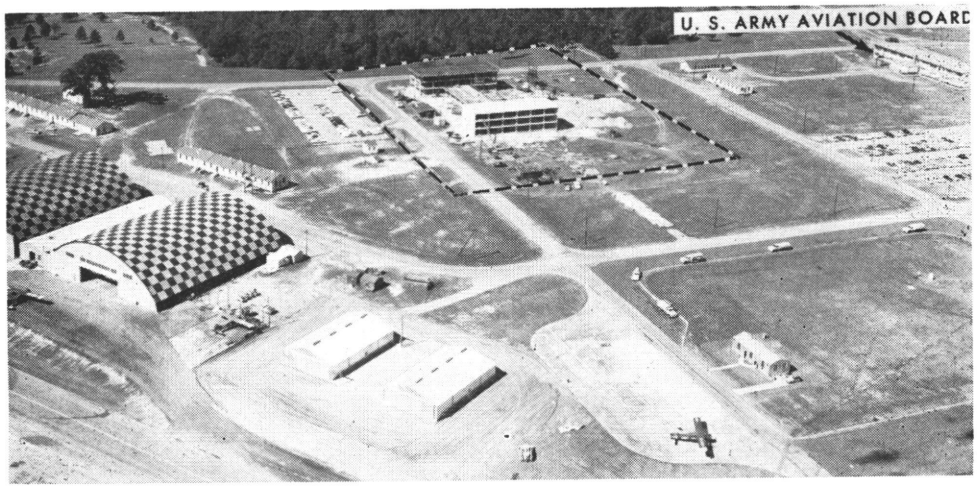
Dotted lines enclose 90 air-conditioned Capehart units for field and company grade officers. Of the 26 field grade quarters, 18 are 3-bedroom, 2-bath size (1,383 sq ft); the other 8 are 4-bedroom, 2-bath size (1,400 sq ft). All 64 units for company grade officers are 3-bedroom, 2-bath size with 1,250 sq ft living area.

By the end of April there will be
hart housing units (plus 31 MCA
officers and 510 NCOs at Fort Ru

ng Skyline tates Army School e Growth Aviation ppoints Role l Defense

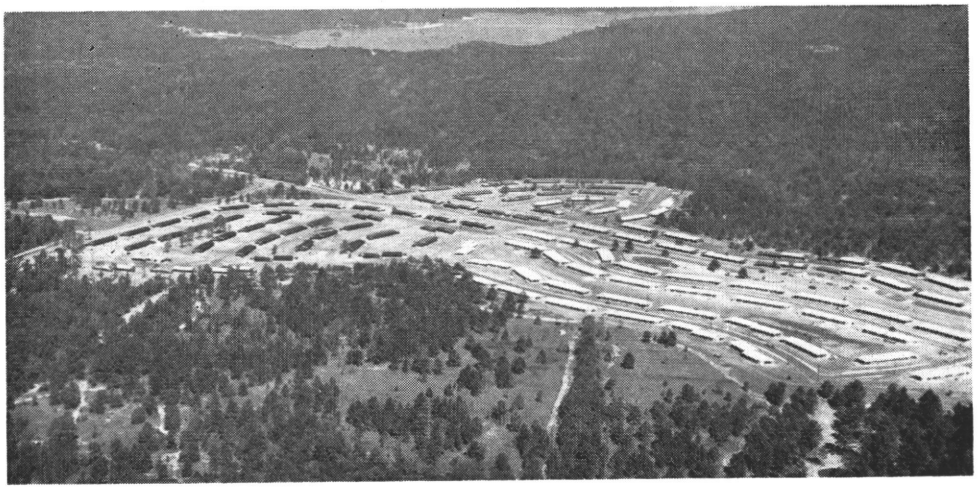


This new airstrip at Southport is used to bring in and fly out aircraft used in ground maintenance instruction by the Department of Maintenance. In the Fort Rucker master plan, the entire Department of Maintenance—headquarters, classroom and field instruction — will be located at Southport. Future plans call for construction of cantilever type hangars and new classrooms.



Sometime this summer the barracks, messhall, and administration building outlined above (now under construction at Cairns AAF) will be ready for its occupants. This unit will house EM personnel of the U. S. Army Aviation Board, SATSA, TATSA, and the 21st Aviation Company. Contract cost of this 3-story brick unit is $629,000.

These 310 air conditioned Capehart units for NCOs are a far cry from the temporary wartime units which carried the sobriquet "Splinter Village." Sixty units will have 4 bedrooms and 2 baths (1,250 sq ft living area); 250 units will have 3 bedrooms with 1½ baths (1,080 sq ft). This project is scheduled for completion in mid-1960.



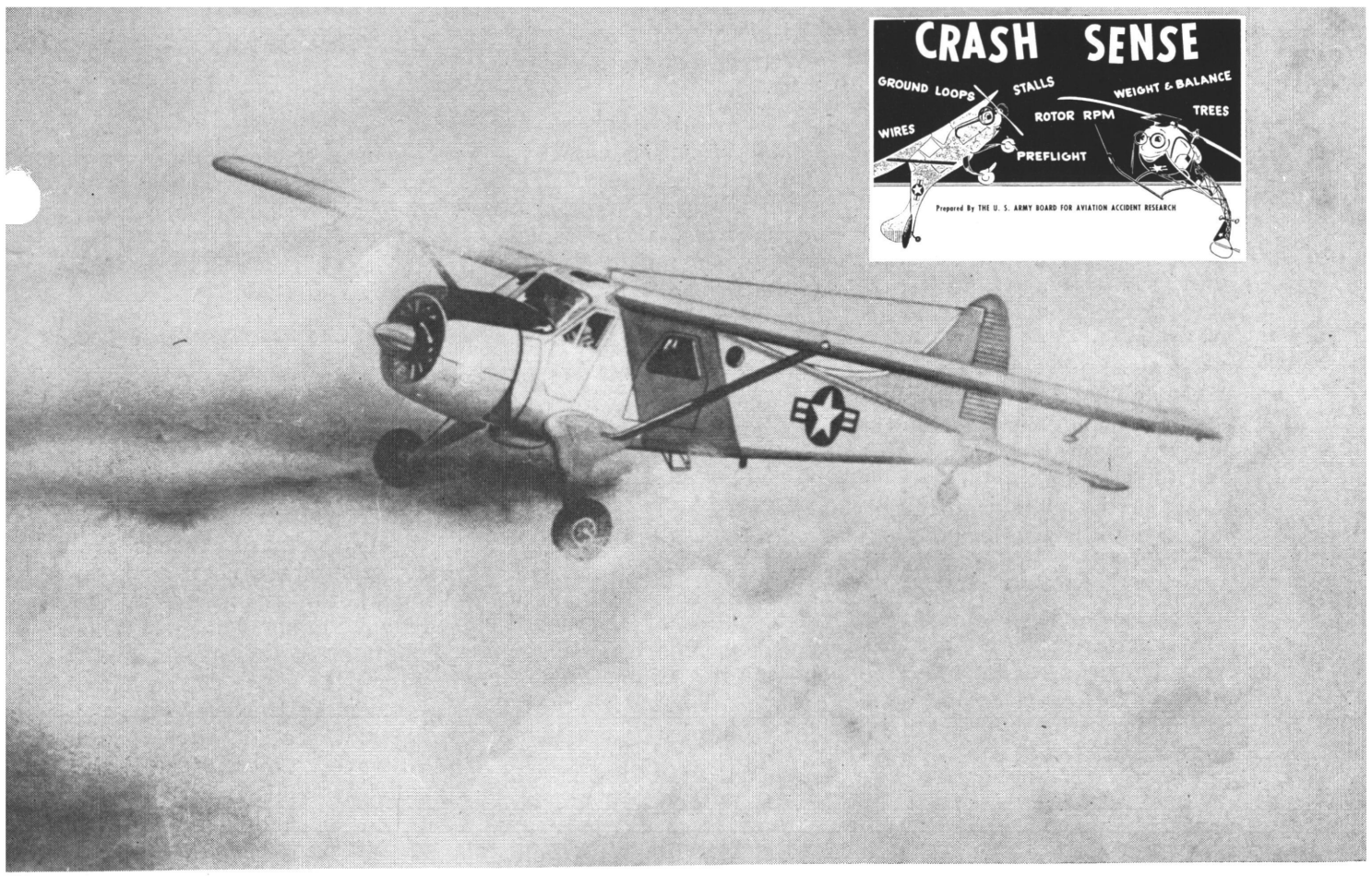
ximately 1,000 permanent Cape-
its) available for the families of 490
er.

This article was prepared by the U. S. Army Board for Aviation Accident Research.

PREFRONTAL OR SQUALL line thunderstorms are associated with and form in advance of a cold front. Conditions permit the cold air aloft to exceed the speed of the air below. A great amount of downslope motion occurs due to the greater density of the cold air aloft. As the cold air subsides, the warm air in the trough converges; under proper conditions, prefrontal thunderstorms result. In general, the storms caused in this manner are in advance of the front. Prefrontal storms usually appear very menacing. They generally have very low bases. A pilot approaching such a line of storms may think that he is approaching the front. Tornadoes are not uncommon when this type of activity is present.

THE FLIGHT

An L-20 Beaver with an instructor pilot and three students aboard departed a midwest Air Force base at approximately noon. The flight plan was IFR with an assigned altitude of 9,000 feet. The weather briefing, given prior to flight



and entered on clearance form 175, listed thunderstorm activity, with heavy turbulence along the intended flight route.

The last reported radio contact with the aircraft was approximately 1 hour and 20 minutes after takeoff and 40 minutes prior to the accident when the pilot gave a position report. At this time the aircraft was reported to be at 9,000 feet indicated altitude; the pilot was given a severe weather warning, but elected to continue the flight.

Almost immediately prior to the crash, many witnesses reported hearing the plane's engine roaring. One witness observed parts of the aircraft descending out of the low ceiling, followed by the aircraft "which looked like it had no wings on it."

All four occupants received fatal injuries and the aircraft was destroyed.

ANALYSIS

The wreckage distribution clearly indicated that the fuselage and engine section of the aircraft had made ground impact with the wings and empennage detached. The wreckage recovery and identification of parts was conducted along standard structural failure investigation techniques (see DA Pam 95-5).

Detailed examination of the wreckage after it had been brought into a suitable working location revealed:

1. The engine was operating and developing power at the time of impact.
2. All metal fractures were of the static overload type with no indication of fatigue.
3. Both wings incurred upward bending damage as a result of positive g forces, with no indication of the torsional type damage usually associated with high speed flight. The diagonal upward bending damage to the right wing progressed to the point of failure at a point approximately 8 feet inboard the wingtip. The tip portion moved upward in relation to the fuselage, carrying the aileron control cables which were still attached to the wing root. These cables ripped out of the ribs and the upper skin of the inboard portion of the wing and precipitated a jackknifing of this wing section at a point approximately midway between the strut attach fitting and the wing root. This jackknifing caused the failure of the upper end of the wing strut at the point where it enters the upper strut fitting. The failure of the

strut allowed the wing stub to hinge upward to a point slightly over a 90° position, where it became detached from the fuselage. It then traveled rearward over the fuselage and struck the empennage at the root intersection of the horizontal and vertical stabilizers. This was revealed by matching paint scratches and deposits on the leading edge of the wing stub and on the tail surfaces.

4. The diagonal upward bending of the left wing, raising the trailing edge, progressed to the extent that downward aerodynamic loads were imposed on the outboard portion of the wing. This caused the left wing strut to fail from compression and allowed the wing to hinge downward. The downward hinging of the wing levered the wing against the side of the fuselage and forced the front upper spar cap out of the upper surface of the wing. The wing and spar cap then left the aircraft.

5. All wing fittings were attached to the fuselage with the wing bolts in place and properly safetied.

6. Impact damage to the fuselage was so extensive that inspection of the internal control system for binding or jamming was not possible. However, all visible components of the control system were inspected and no evidence that would indicate failure or malfunction was found.

7. Analysis of weather data given to the pilot revealed that he had been informed that thunderstorms existed along the proposed route. He was given a severe weather warning during his last radio contact. Residents in the vicinity of the accident site stated that at the time of the accident, and immediately before the accident, low ceilings (estimated 200 feet or less), high winds, and heavy precipitation existed. Photographs of a radar scope from a nearby Air Force base revealed considerable weather in the vicinity of the accident.

8. Discussion with the medical member of the board revealed no physiological or psychological factors which may have contributed to the cause of the accident were involved.

CONCLUSIONS

1. The cause of this accident was structural failure of the aircraft as a result of receiving stresses for which it was not designed.

2. The most probable cause of the imposition of these stresses was encountering extreme turbulence.

3. The inexperience of the pilot may have contributed to his decision to continue the flight into known hazardous weather. This is further substantiated by failure to call available ground radar stations for aid in circumnavigating areas of heavy turbulence.

The February 1959 edition of THE AIRLINE PILOT contained an article by Howard W. Fleming entitled "Hail and Thunderstorm Damage." Mr. Fleming made a study of air carrier accidents caused by atmospheric phenomenon during a five year period, 1953 through 1957. This is what the article said about the

EFFECTS OF TURBULENCE

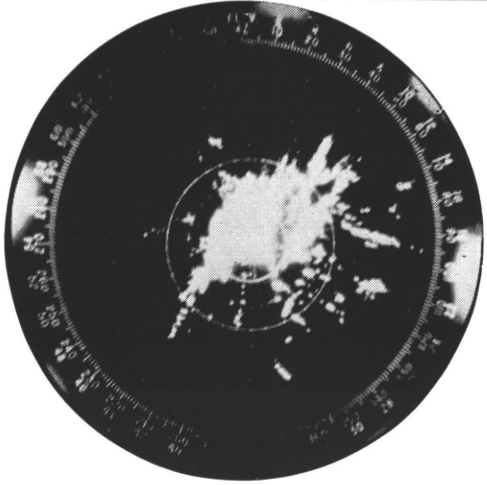
"During the five year period studied, there were sixteen accidents attributed to turbulence. This was 23.5 percent of all accidents caused by atmospheric phenomenon. Civil Aeronautics Board records show seven aircraft destroyed, two substantially damaged, and seven with minor damage. Where the damage was substantial or minor, the cause was easily established. However, in accidents where the aircraft were destroyed, the cause was difficult to establish.

"Evidence indicates that loss of control occurred in all cases where aircraft were destroyed. This does not necessarily indicate pilot error due to instrument flying technique. Instead, I believe that we have a great deal to learn about weather hazards. I found only one case where structural damage preceded loss of control. This occurred in the accident of a C-46 which was flown into a severe thunderstorm in 1953.

"In that accident, the outboard trunnion supporting the right aileron tab motor backed out of the support bracket due to inadequate safetying. The tab motor then tore loose from its bracket and punched through the wing. The conditions resulted in a tenden-

Weather given L-20 pilot — would YOU have gone?

D. WEATHER						
EXISTING	DESTINATION - - -	TIME OF OBS	FORECAST	DESTINATION (*ETA*) 15⓪ 1500/⓪ 10 ↖6 (29.85)		
	ALTERNATE - - -	TIME OF OBS		ALTERNATE (*ETE*) 15⓪ 1500/⓪ 10 ↖6 (29.85)		
ROUTE FORECAST	MIN CIG 500 FT AT IN TSTMS	MAX CLD TOPS 35000 FT MSL	THUNDERSTORMS SCTD MOD	TURBC SVR VCNTY TSTMS	HAIL VCNTY TSTMS	
	MIN VIS FLT LVL ZERO IN CLDS	DUST OR HAZE - -	SMOKE - -	RAIN ✓	FOG -	
	MIN FRZ LVL* 14000 FT MSL	ICING -	FRZ PCPN -	SNOW -	BRIEFING VOID AFTER	
	WINDS AT 5000 FT MSL 180/25			SIGNATURE		



1 hour 20 minutes **BEFORE ACCIDENT** **20 minutes**

Flight path was directly through storm area

cy of the aircraft to roll, and in conjunction with the extreme turbulence, caused the loss of control and subsequent overloading of the wing to a point of failure. In February 1953, a National DC-6 crashed after entering an area of turbulence and waterspouts over the Gulf of Mexico. Civil Aeronautics Board evidence indicated structural failure before water impact.

SOME EXAMPLES

"Five aircraft were destroyed by being forced to the ground during the period studied. In 1953, a DC-3 flew into a severe thunderstorm near Marshall, Texas. Turbulence and gusts caused a loss of effective control, and the aircraft was forced to the ground. In 1954, a CV-240 flew into an area of severe turbulence and heavy icing conditions in Wyoming. The aircraft made a rapid descent and struck the ground at a high speed in a near level attitude. A few months later a DC-3 was observed turning toward a thunderstorm at 300 to 400 feet. About a mile from the point of penetration the aircraft struck the ground in a level attitude with a considerable downward or sink velocity, in an area where severe storm ground damage occurred. In another accident, a C-46 descended for unknown reasons into an area of severe turbulence and heavy ice. The aircraft was unable to regain altitude and crashed through trees on a mountain, while in a near level attitude.

"The last accident of this group where loss of control was indicated involved a C-46 which was reported missing near Mobile, Ala., in April, 1954. Thunderstorm activity with severe turbulence had been reported in the area of the accident. During a several month period, parts of the aircraft were washed ashore and examination of these disclosed no indication of malfunction or failure of the aircraft or its engines prior to impact."

It is significant that the first method for avoiding turbulence listed by this article is **"Avoid thunderstorms by visual reference, airborne radar, or reports from ground radar stations."**

Still another article says:

"Thunderstorms are the result of strong vertical currents that are theoretically computed to be able to reach values as high as 200 miles per hour although this extreme has never been measured. The vertical currents within a thunderstorm are not often uniform but of extremely varying intensity in various parts of the whole storm. Such vertical currents as are found in the thunderstorm produce extreme turbulence which places heavy stresses on all parts of any aircraft unfortunate enough to be within the vicinity. If the craft is "tossed" bodily by the turbulent flow with equal stress on all parts no extreme hazard to the plane will result; if, however, cross or varying currents place shearing stresses on the craft it is possible for rupture of the structure to occur. **Thunderstorms are therefore dangerous to all aircraft and should be avoided.** Besides the extremely turbulent air within a thunderstorm, hail accompanies such storms. Hailstones at cruising levels of several thousand feet will be larger than those found on the ground; it would not be improbable that hail of greater intensity and stones larger in size than can safely be encountered would be found within large thunderstorms. **For this reason alone thunderstorms should be avoided."**

How much more evidence will we require to buy the simple fact that thunderstorm flying should not be attempted?

COLD WEATHER TIPS

Captain Joseph H. Poole, Inf

Balky Bird Dogs and Sulky Sioux
Frozen Choctaws, Mojaves too
Become Eager Beavers
When you use Prior Planning

THERE IS NOTHING like the fresh, invigorating air of an icy winter morning to hasten a pilot from the frozen expanse of a flight line with its silent and chilly aircraft up into the blue with the CABIN HEAT on FULL.

Although he is fortified with a hearty breakfast and many cups of hot coffee for the cold day ahead, the pilot sometimes forgets his poor partner in flight waiting on the ramp.

After a night at freezing or below freezing temperatures, Army 12345 is no more ready for a quick hop aloft than a sirloin in a deep freeze. It is cold, cantankerous, and downright dangerous as it sits there waiting.

Preparation for such a cold morning begins back in the summer months, when replacements for winterization kit items are requisitioned and heaters are checked for winter readiness. The cold weather SOP for the flight line is reviewed and brought up to date. Warming stoves, slave cables, and APUs are repaired and/or procured. When the first icy front roars in, the unit is ready.

Let's consider Army 12345 as it should be prepared for flight in cold weather — ready for the pilot as he shivers through the morning preflight. First, the vents into the cabin were left open overnight to prevent the windows from frosting up. The oil may have been removed overnight, heated, and replaced in the aircraft immediately prior to starting (or oil dilution procedures performed).

The battery was stored overnight at a place where temperatures were above freezing. 12345 was parked on a moisture-free surface to prevent the landing gear from freezing to the ground. The brakes were

in the OFF position to prevent their being locked by frozen condensation in the brake linings.

With these procedures accomplished, our now icy pilot, starting his preflight, has a better than 50 percent chance of getting off the ground.

What should he look for on the preflight, besides the normal indicators of a flyable aircraft? Any additional time spent at this point is going to prolong his agony on the cold and icy ramp!

Nothing could be further from the truth. This little bit of extra time spent in looking for cold weather troubles will assure that the aircraft (1) cranks, (2) continues to run, (3) doesn't fail him on his mission.

What are these special troubles to look for on a freezing or below freezing morning when preflighting?

Number one on the cold weather checklist is to ensure that all ice and snow are cleared from the fuselage and aerodynamic surfaces. How can a fine layer of snow or frost affect flight? Simple. With it the lift features of your trusty airfoil lose their effectiveness. It further increases the hazard of inflight icing. Keeping a whiskbroom in the cabin of small aircraft and a household size broom in larger aircraft ensures that you have a handy help in removing such accumulations when away from a flight line heater. Don't forget props and blades.

Sharp changes in temperature can cause moisture condensation to freeze inside wings, hull, gas and oil tanks, and vents, as well as on the outside of the aircraft. The safe way to remove it is with hot air from a heater. There are several makes and types, each calling for special handling. Read the operating instructions on them carefully. Remember that the heater can help overcome a lot of your cold weather problems — but only if it stays operational itself!

Most heaters are a gas engine operation and are a potential fire hazard. They should be kept well away from gas tanks, drained fuel, and other flammable materials. We don't want to get the situation too hot to handle by moving the heater too close in to the operation.

Where do you apply this heat? In many places. Let's start with that obstinate frost on the wings and blades. It's mighty effective here, but remember this: when the frost or snow melts, it sometimes runs off underneath the wing or blade and promptly refreezes. It can run down into flap assemblies and into retractable gear, literally welding them down or up. Another spot that heat helps is frosty windows. Remember here that your heater puts out a lot of heat. Excess heat and plexiglass can mean distortion. Moderation is the word. Also, don't chip or use scrapers; aircraft windows and skin are tender.

Fuel tanks should be warmed when drains are frozen. A frozen drain gives a fair clue to frozen moisture in the bottom of the tank. When the drain thaws, be sure to drain off **all** the moisture. Check your air vents, also. If they fail to allow the tank to breathe, fuel and/or oil starvation can result.

Next, let's check controls and related mechanisms, such as servos. Can't freeze you say? Moisture has been known to accumulate in enclosed cables, such as throttle linkage, and freeze the control tightly. If thawed, unless thoroughly dried out, it simply refreezes in flight. This area deserves special attention when you're thawing out your aircraft. Be sure and check linkage and controls **before** heat is applied to the aircraft. Then when heat is applied, ensure that the moisture is evaporated or removed if in an enclosed space where it could refreeze.

Don't forget flight and engine instruments, pitot and static sources, oil sump, lines, radios, and such special equipment as radar, infrared, photographic, or aerial TV equipment. Check your TMs on this equipment thoroughly; know the temperature ranges prescribed and don't exceed them. If special equipment is internally mounted, a threefold assist can be given to our thawing problem. Application of heat to flight and engine instruments and to the special equipment will also thaw out the cabin if doors are closed. Later the CABIN HEAT will take over and any thawed moisture will be evaporated.

Tires and landing gear should also be checked. Leaving your tireprint on the snow is fine, but leaving your tread on the ramp is frustrating—on takeoff. If heat isn't available, inflation to 1.5 times normal pressure will free your tires in an emergency.

Now that we have disposed of both visible and hidden moisture (and not just melted it away to refreeze again), let's see what can be done to get our partially - conditioned aircraft started.

An aircraft left in the deepfreeze can be cantankerous and dangerous

Where should we apply our external heater during engine starting? The carburetor needs assistance most at this point. Place the heater outlet so that the stream of warm air goes into the air intake. Be careful that the heater, outlets, and persons assisting are CLEAR prior to starting.

If possible, have the engine turned over by hand for three or four revolutions to help loosen up the engine and get the heated oil into the cylinders.

If an APU is available, by all means use it. If one isn't available for cranking, operate only the starter off the battery until the aircraft is cranked.

Proper priming is a must. Too much is as bad as too little. Goldilock's porridge is the best example—if it's **just right** the engine will slurp it up and start purring on all cylinders with one whir of the starter. Prime as the TM on your aircraft dictates, remembering to give the primer several short, sharp strokes as the engine is being turned over until it catches. Vaporizing the fuel, this priming precludes liquid or vapor lock due to excessive raw fuel.

If luck isn't with us and 12345 can't be aroused from its cold slumber, spark plugs may be the answer. Moisture forms in a hurry on plugs in cold weather. Take out at least one plug from each cylinder, heat points until thoroughly dry and replace plugs in the cylinders.

In subsequent starting attempts, **don't overprime.** Remember, your engine is having enough trouble trying to overcome the cold, much less being flooded.

Warmup, once the engine is started, can be hastened if carburetor air is put on HOT as soon as the engine is firing regularly. Remember though, apply the heat slowly, and only in the amount the engine will take without backfiring.

Sometimes you may be operating where APUs, heaters, and similar items are merely wished-for luxuries. If your flight unit is not in the luxury status, or in the field without them, don't give up and be philosophical over a cup of coffee. Sour grapes can be a costly item in the winter, particularly if your mission is a number one priority. Learn the wise old ways of the crafty crew chief. Even with little previous cold weather experience, there are some things you can still do that will mark you as an expert Man-About-Airplanes.

When heating facilities and equipment are not available, don't grab the nearest field expedient (blowtorch, for example) and apply a hot foot to 12345. Like an old mule, he's liable to get off his kicks when you least expect it. Heating up an aircraft with direct flame can cause some metals to lose their temper. Gas tanks, if they don't explode, can be melted if of the rubber variety found on some aircraft. Seals and gaskets sometimes get their dander up and blow, too.

Many good field expedients are available. Merely preventing the freezing wind from reaching certain areas on and about the aircraft will allow it to thaw out. Covering engine nacelles, oil coolers, and wrapping up exposed engines (on some helicopters) will keep the wind from supercooling their surfaces. A minimum of applied heat thaws them out. Electric blankets and heating pads have been used in some cases. Immersion heaters can be used to warm up oil. Careful use of hibachi (charcoal in a bucket) can also do the trick.

The best system, however, is prior planning. Prior planning prevents poor performance. Even if you have no fancy equipment, prior planning will let you arouse 12345 with a minimum of difficulty. After a flight, drain all of your engine oil into clean containers, and

store them in a sheltered place. If you haven't any warm storage space, heat the oil on a stove, or in an immersion heater, or with any other source of heat until it is free-flowing. Pour it back into the oil tanks immediately before starting the engine.

When containers and heating facilities are not available, drain all the oil out on the ground and replace it with fresh oil later. Never mind supply economy, a few gallons of oil solidified in your engine, oil lines, and sump will ground you until the thaw comes.

In an emergency, when you have no containers or heaters (if the temperature is not below 20°F.), here is a trick that will often work in starting your engine.

1. Use normal oil dilution before you shut down your engine.

2. After shutdown, drain the oil level down to 2/3 capacity.

3. Restart the engine and run with covers over the cooler, if necessary, until oil temperature is above 122°F.

4. With the engine still running at FAST IDLE rpm add enough gas at the oil filler neck to fill the system. This gives you an oil to fuel ratio of 2:1 and will dilute the oil adjacent to the tank hopper.

5. Shut the engine off, restart after 20-30 minutes; and give a second normal dilution procedure.

6. Immediately prior to final shutdown, cycle the propeller 3 or 4 times to provide diluted oil within the prop systems.

The procedure outlined is strictly an EMERGENCY MEASURE. Remember that when the fuel evaporates, the normal oil supply is reduced, and that has to be enough to get you to a new supply of oil.

On aircraft with oil dilution systems it may be necessary to dilute during engine warmup to prevent excessive oil pressure.

If you have no way to keep your engine warm, in extreme cold it may be necessary to keep it running at frequent intervals during the layover period. You can do this only when you have sufficient fuel available to keep the engine warm and to fly you to the nearest fuel source.

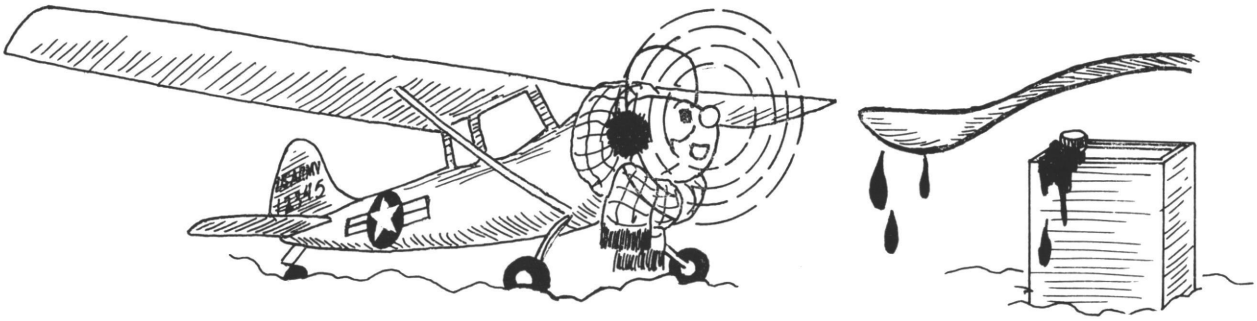
If you have a warm place to store your battery, it is a good idea to remove it from your aircraft when the temperature drops to 20°F. You may have to build up the battery with an APU (or vehicle with slave cable) before you can start the engine. Remember, even a new battery will operate sluggishly after being subjected to extended periods of low temperature. Initially, use your battery only to run the starter; then after the aircraft cranks, turn on the electrically driven aids.

If you haven't a heater, sometimes you can get an easier start by placing a hot rock immediately in front of the carburetor air inlet. Don't let it fall into the intake—and don't forget to remove it.

If the snow is heavy enough to interfere with your takeoff run but isn't deep enough to keep you from taxiing, taxi slowly up and down the takeoff course several times to pack down a runway before you try to take off. The depth and hardness of the snow or slipperiness of the ice will determine if takeoff is possible.

In landing and taking off on narrow field strips under icing conditions, watch out for crosswinds. Your plane hasn't much traction; therefore, it hasn't much maneuverability. If the wind is gusty, the plane may be blown off the ice entirely before you can regain control of it.

Prior planning prevents poor performance



After takeoff from snow- or slush-covered strips, it's a good precaution to operate your landing gear and flaps through a complete cycle two or three times to keep them from freezing in the UP position. You have instruction in your —1 on how to operate cowl shutters and deicing equipment, if you are lucky enough to have them. Be sure to know how to regulate your cowl shutters, if you have them, and maintain engine temperature at the best operating level.

When letting down, be sure to keep power on and regulate your shutters so that the engine doesn't cool off too quickly. If you can, keep the head temperature above 212°F. and oil temperature above 85°F. Lower readings may result in your engine cutting out when you advance your throttle.

In some aircraft an increase in the oil temperature may mean that oil is congealing in the cooler. You can correct this condition by closing the cooler shutters. During a long descent you can use the oil dilution system to prevent congealing in the cooler when closing the cooler shutters isn't enough.

As you well know, carburetor icing is less likely under extreme conditions of cold than when free air temperature is between 30° and 40°F. It's not a bad idea, though, to apply some carburetor heat every half hour during flight to keep the adapter from icing up. It's also a good move to rev up the propellers about 200 rpm over cruise setting and vary your throttle setting every half hour. It throws off prop ice and keeps the butterfly valve in the carburetor from sticking. Return to normal cruising conditions as soon as the tachometer shows that the cycle is completed.

Aerial equipment on the aircraft should be cycled through their functions periodically. Cameras should be either acclimatized or protected from the cold, or they will fail to function when you arrive over the target area.

Uncertain visibility conditions can be encountered even in the United States, and whiteout conditions are one of the worst conditions that can be encountered during winter operations. Be wary of your depth perception if you encounter a whiteout. Avoid steep turns or unusual attitudes close to the ground, when it is snow covered and the sky is overcast. Without dark objects to aid visibility, your old acquaintance, VERTIGO, will be flying copilot. In sustained flight you can generally rely on your instruments to counter these conditions, but when approaching for a touchdown, you must rely on your wits.

Don't forget ice formation in flight. If your first indication of inflight icing is given to you by the sluggish performance of your aircraft (loss of rpm, airspeed, altitude) you're already in trouble. Ice **prevention** is the word. Know the freezing level, watch the weather, know your aircraft, and use your ice prevention knowledge and equipment to prevent the first ounce of ice.

Before landing, drag the landing area carefully and check the tower, if there is one, for snow and ice on the landing surface. Be sure you know the depth of any snow coverage. On road and field strips, be sure that no one dug a ditch across the road or strip the day before the snowfall. Operations should be able to keep you fairly well informed on this. Be sure and check!

Listen to en route forecasts and have a good idea of field conditions prior to arrival. Keep in mind those fields with snow removal equipment and those without it. Select your alternates based on this knowledge.

It's important to stay warm yourself. Your body uses a tremendous amount of energy in the winter just staying warm. When you are unable to move about freely, such as in a cramped cockpit, circulation is slowed. Watch for the ever-present hazard of frostbite. Be sure to read up on cold weather indoctrination, and practice it on the flight line and in the air. Remember CABIN HEAT doesn't help when stranded out in the boondocks with a balky engine. Thick socks, heavy flight clothing, and mittens are much better cold protectors than cotton socks, summer flight suits, and bare hands — no longer backed up with the BTUs of a cabin heater.

Speaking of bare hands, don't leave your fingertips as well as your fingerprints on frigid metal tools in the winter. Use gloves. Cold tools can work in the same manner as the cigarette butt which pulls an acre of hide off your lip when removed quickly. Sure makes you touchy.

A pleasant reminder is that you need more energy-producing foods and hot liquids in the winter months. So have a cup of coffee, and mull over the high points of cold weather operations. Cold weather flying can be simple if you're ready. Prior planning will ensure that your unit operates at a high level of efficiency when the mercury is low in the tube.

When A Supervisor Goofs, It's Usually A

Thundering Blunder

IT'S A SAD FACT that supervisors contribute to accidents. Moreover, they occasionally give orders that foster mishaps. When the supervisor goofs, the accompanying loud noise is heard at all the upper levels.

The young pilot was on his first operational mission after becoming an Army Aviator. He was not familiar with the terrain or weather conditions peculiar to the area. He was eager to do his job, and when the operations officer said "go," he went.

Marginal VFR was forecast and it was just that as he took off and climbed out. Shortly after becoming airborne, clouds rolled in under him and became solid as far as he could see. He turned back and started circling the field. He called the tower, but got no help there; they told him the field was closed.

Tower personnel heard him calling other Army fields in the area, in a vain attempt to find an open strip. He received negative replies, and in a moment of truth knew he was on his own, a sad and lonely feeling for a spanking new aviator.

He found a small opening in the clouds—a sucker hole—and

This article was prepared by the U. S. Army Board for Aviation Accident Research.

decided to let down underneath the overcast. He went down through, found himself in a valley and hemmed in, decided to land. He must have been excited, nervous, even afraid. When a go-around was indicated he hesitated too long. His aircraft settled, hit a tree, spun and crashed.

These are the basic facts.

If you happened to be the accident investigator assigned, what would your verdict have been?

There are no hidden words, doctored pictures, or tangled clues. Actually, there's no puzzle at all. This was a simple case of supervisory error, a thundering blunder by those in authority.

When an inexperienced pilot is assigned a job that stretches his capability into an accident, one man alone must shoulder the blame: the supervisor.

It is the responsibility of all unit commanders to fill supervisory positions with their most experienced personnel, or provide a training program which will assure that supervisors know their duties.

After ascertaining that his supervisory personnel are as capable as humanly possible, the commander must see that flight rules and regulations are followed. Finally, he must ensure that aviators receive adequate training.

Supervisory errors show up in failure to provide proper unit transition training, failure to consider capabilities of the individual aviator, and in improper supervision of the unit operation.

The old proverb, "Man may work from sun to sun, but woman's work is never done," can be paraphrased to aptly describe the supervisor. His job is endless. Are facilities adequate? Is there a preaccident plan? Do unit SOPs really spell out who does what and how? He must know the right answers.

He must know, too, who among his aviators is light on flight planning, the pilot in the "kick the tire, light the fire" category. He studies the weak spots in his men and his organization and takes positive steps to eliminate those weaknesses.

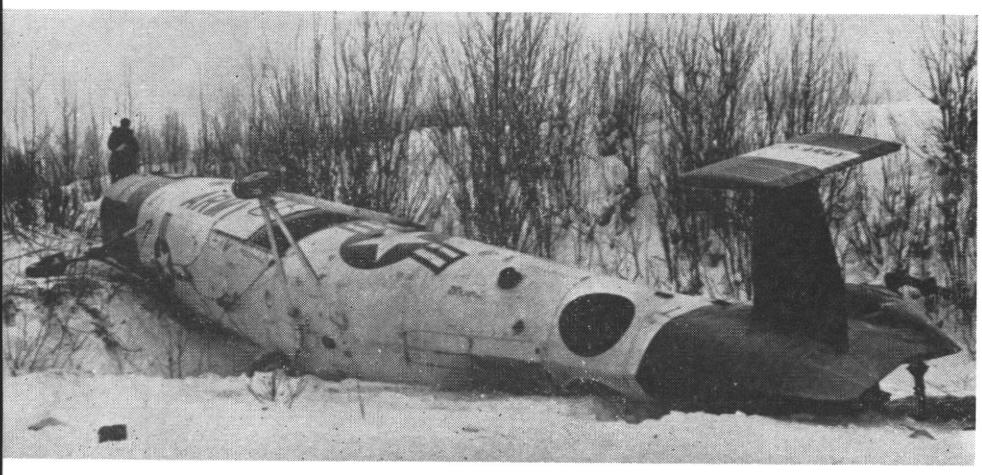
The remedy for an accident and insurance against recurrence does not always grow out of an accident. The real cause factor may be far removed from the scene of wreckage and still be a contributing factor to the accident. Rarely is there an accident that does not at least hint of supervisory error. In some cases it is the actual cause; in others a contributory factor.

An Army Aviator must rely on others for assistance. He depends on tower controllers for takeoff and landing information. Control over his flight plan rests with weather and operations officers. He is dependent on maintenance and servicing personnel. He must, above all, serve the commander. Actually, here is the most fertile ground for operating beyond the limits of human and equipment capability. Conditions to produce an accident may arise out of failure of any of these individuals to do his job right. All of them require expert, unending supervision.

In one tactical operation a Shawnee (H-21) pilot and copilot were to transport passengers and cargo from an outlying strip to main post. The sky was overcast, temperature 15° and light wind. The ground was covered with powdery snow that rotor downwash disturbed.

After loading, the Shawnee hovered down the taxiway and onto the main runway, which was about 3,000 feet long. Shortly after hovering around a Beaver parked on the taxiway and making a turn to line up on the runway, the aircraft was overtaken by loose, billowing snow. The disoriented pilot tried too late to take corrective action for a drift to the right. The aircraft hit the runway, lurched heavily to the right and began turning over. Still under power, the helicopter was dragged forward by rotor

Operational planning was a contributory factor in this H-21 accident



blades digging into the ground. The pilot cut everything and evacuated the aircraft, ordering copilot and passengers out. Slight injury was suffered by the crew chief and two passengers but the Shawnee was heavily damaged.

The accident investigation board said that this tactical operation had been in progress for several days; yet the landing and takeoff pattern had not been established to fully use the entire landing area. Had the pattern been set up correctly in the beginning, pilots would not have been restricted to the shorter portion of the runway. The investigation disclosed that operational planning had been a contributing factor in this accident.

The best accident prevention program in the world won't work unless combined with specific problems at the using level. The commander's staff know what problems exist. They can provide the program. But the commander must establish policy and, using the program as a guide, defeat the problems.

Commanders don't have to be sold aviation safety, but they must be petitioned to support a preventive program. If they know the score they'll act—before an accident brings a deficiency to their attention.

One commanding officer learned the hard way that his airfield unit wasn't functioning as it should.

An instructor and student in a TL-19D filed a long cross-country to this Army airfield, and because the forecast was for low ceilings they filed to a nearby field. On arrival in the vicinity at night, they found conditions much better than forecast so they went on to their original destination. The instructor and student didn't advise anyone of their change in destination.

Arriving over the field they saw the tower was dark. They circled several times and the runway lights came on. The two aviators didn't know that the lights had been turned on by a night mechanic, who lacked knowledge of construction in progress on the runways.

The instructor pilot, in the front seat, made a normal touchdown with his landing lights on. During the landing roll he switched off the landing lights. As the aircraft slowed to about 30 mph, the IP saw an obstruction across the entire width of the runway. It was closing too fast to avoid. The Bird Dog hit a barrier of pierced steel planking, shearing the main gear. The aircraft continued down the center of the runway on its belly for nearly 100 feet. The night crew mechanics rushed out and helped the instructor and student from the aircraft.

According to the investigation board's report, a contributory cause of this accident was allowing unauthorized personnel to operate the runway lights. The night mechanic who turned on the lights had done so in the past for other inbound aircraft. The instructor pilot was charged with deviating from his filed flight plan in violation of AR 95-8, but this in itself did not make the accident inevitable. This accident began the first time runways were lighted by unauthorized personnel.

Since the time of this accident the SOP has been rewritten and action recommended to check night operation of lights at all Army airfields.

Supervision means planning, directing, and leading. How each supervisor goes about this problem, only he can solve. But young pilots are impressionable. It is human nature to follow examples set by respected and experienced leaders. The supervisor who sets the proper example he wishes followed is lightening his own load.

New aviators are usually eager to do what they think their supervisor wants done. Sometimes what the supervisor wants and the outward manifestation of his desires are at odds. The result of this can be just as disastrous as not thinking at all.

Supervisory error convincingly evident in this Bird Dog mishap

Design for Living Is the Objective of

AVIATION CRASH INJURY RESEARCH

THE MAJOR objective of Aviation Crash Injury Research is design — design for living. This agency, known as Av-CIR, provides data for engineering design which will assure survival (with little or no injury) in aircraft accidents which involve survivable conditions of crash force.

BODY VS MACHINE

It has been demonstrated that the human body, if protected, can withstand forces of 150 g with little or no injury. Despite this tolerance of the human body to crash force, most present day aircraft are not built to provide more than 50 g protection. Modern military fighter aircraft are equipped with 40 g belts, harness, and seat tie-down; and the cockpits are stressed for loads of approximately 50 to 60 g.

Other aircraft, unfortunately, have not been designed for this desired degree of protection; requirements for Army aircraft of various types and civil aircraft vary between 6 and 12 g.

TOOLS NEEDED

To provide data useful for the development of crash safety engineering specifications, requirements, and design, a number of "tools" are necessary as well as "know-how." These involve the development of methodology, experience, and the ability to define the type of information needed, to obtain and classify the information in an orderly and useful manner, and to analyze it and reduce it to usable data for the engineer.

Av-CIR has accomplished a large portion of the initial ground work necessary to the development of practical engineering data. A classification system has been developed which permits the classification and orderly selection of accidents for study by degrees of severity of the following:

(a) the impact condition (velocity and angle of impact, type of object or terrain struck, the mass of the vehicle, and other related factors);

(b) damage to major structure of the aircraft, other than

AVIATION CRASH INJURY RESEARCH was taken from a paper prepared by Aviation Crash Injury Research for the recent ICAO Convention in San Diego, California. It was delivered by the Director, Mr. A. Howard Hasbrook.

Formerly associated with Cornell University, Aviation Crash Injury Research is now an agency of the Flight Safety Foundation.

the occupiable area (primarily that structure which comprises the wings, nose, tail, and other structures which have the ability to absorb energy and protect the occupiable structure);

(c) damage to the occupiable structure (major structure of the cabin or cockpit);

(d) damage to each individual structural environment and closely associated objects (primary structure immediately adjacent to the occupant, including his seat, instrument panel, etc.);

(e) damage (injury) to each occupant (injury scale based on severity of injury in relation to continuation of life under prompt and normal care).

These classifications permit comparison and isolation of the conditions, crash force or engineering deficiencies, which result in injury. They also permit comparisons of various types of aircraft in relation to their potential crashworthiness and crash safety (as related to various design concepts used in different types of aircraft).

To obtain data for this work, precise investigation of accidents from a crash-injury point of view must be accomplished. It is necessary, of course, to have experienced accident-injury investigators available to obtain sufficient information from field investigations of accidents involving the many types of aircraft in use.

SPECIAL COURSE NECESSARY

In the past, Av-CIR cooperated with the Federal Aviation Agency by presenting the "high points" of crash-injury investigation techniques to qualified FAA accident investigators at the FAA Oklahoma City School.

From these classes it became apparent that a special training course of sufficient length was needed to train personnel adequately for crash-injury field investigation. Such a course was developed by Av-CIR for the United States Army last year; three classes have been graduated to date. These courses were developed not only to provide accident investigators with the necessary know-how for crash-injury investigation, but also to train medical officers and flight surgeons in the phases of crash-injury investigation with which they are concerned.

Since research requires well defined as well as comprehensive data, a tool of vast importance is the methodology used in obtaining the proper type of data from the field investigations. This problem was solved by Av-CIR by development of special field reporting forms, including special medical forms for use by the field investigators and medical personnel. After numerous revisions, based on the testing of various types of forms, Av-CIR developed two distinctly new accident-injury reporting forms—one for fixed wing aircraft of single or twin engine type and another similar form for rotary wing aircraft.

These reporting forms are the check-box type, which minimizes the amount of narrative type reporting. This saves the field investigator's time and helps prevent erroneous interpretations of the facts, as sometimes occurs when analyzing narrative type reports. The special medical form offered for use with the accident-injury reporting forms was also developed after years of report-form testing aimed at obtaining the medical information needed for this type of research.

The final major tool necessary in this chain of research is an IBM code which can accommodate the information obtained, and which makes it possible to identify the factors that most frequently cause injury in accidents.

FIXED WING CODE COMPLETED

Such a code for fixed wing crash-injury data was developed by Av-CIR and submitted to the Army this year for its consideration; a similar code for rotary wing aircraft is in final stage of completion.

Accident-injury data, as obtained through the research program outlined here, can be used in two ways: qualitatively and quantitatively.

Qualitative use of the data permits analyses of selected accidents of particular interest, with emphasis on finding factors present which resulted in unnecessary injury or death. This type of analysis and reporting can be most useful in relation to individual types of aircraft.

Quantitative (statistical) analysis of large numbers of accidents, on the other hand, is necessary to point out design areas which repeatedly cause injury and which therefore warrant corrective action. For example, a quantitative study of 913 accidents, involving 1,596 people, shows that approximately 54% of these survivable accidents involved impact speeds of between 40 and 60 mph; 56% of the aircraft sustained a maximum cabin damage of "distorted", indicating a relatively high degree of crashworthiness. However, of the 1,069 persons involved in

Survivable? In this case a fortunate YES

these intact but distorted cabins, almost 12% sustained **fatal** injuries and more than 21% sustained dangerous (critical) injuries. Of the 350 people who died, **almost 35% received their fatal injuries in cabins which were no more than distorted.** This brief statistical finding shows that certain factors exist within the aircraft which are responsible for unnecessary death and injury; **qualitative** evaluation of these particular cases will undoubtedly indicate the design deficiencies which were responsible for the unnecessary deaths and injuries. These two types of analyses, therefore, permit a two-pronged attack on the problem.

WIDE RANGING RESEARCH

Another, and necessary, facet of crash-injury research should involve:

(a) development of crash-safety design parameters (specifications),

(b) review of model specifications,

(c) review of mockups,

(d) development of military crashworthiness specifications,

(e) development of design handbooks,

(f) crash-safety evaluation of current aircraft.

This facet would be a large undertaking but is of major necessity if the data developed through field (accident) investigation and analysis are to be used advantageously and profitably. If carried to completion, it would ensure the incorporation of desirable crash-safety design in future air vehicles and exclude poor crash-safety design features.

Another equally important phase of this research involves obtaining precise crash load data from experimental crashes. Such statistics, when integrated with information from the qualitative and quantitative analyses of actual accidents, will provide precise engineering data for use in developing design specifications.

This plan of research would involve actual crash testing of surplus or phased-out (and perhaps prototype) aircraft of typical design. This testing would utilize a low-cost track type of test facility on which air vehicles (fully instrumented and with dummies) could be crashed at the velocities and impact angles typical of their low speed operating ranges. Data derived from these tests would permit precise engineering design for crash safety without the weight penalties presently resulting from current static, rather than dynamic, testing.

Since air vehicle design is constantly changing as new performance requirements are developed, the investigation and analysis of accidents from a crash-injury point of view and the laboratory (dynamic) testing of such vehicles should be on a long-range basis, just as accident investigation and the testing of components **for the prevention of accidents** is on a continuing basis. This means that air safety should involve continuing attention in two areas: accident prevention, and **injury prevention.**

CONCLUSION

On a long-range basis, Av-CIR should continue its activities as in the past, while broadening its base to take in areas requiring the type of research peculiarly suited to the talents of the agency. This includes preparation of general design parameters and military specifications for crash-safety requirements, design handbooks for crash-safety design requirements, and evaluation and reporting on military model specification.

This is only a few of the proposed projects under study by Av-CIR. In developing Av-CIR into an international aviation crash safety research center, it is believed that the objective of aviation crash-injury research will benefit all facets of aviation throughout the world.

TKT Means TKO

Captain Jack W. Isler, Inf

YOU ARE A battle group commander. Your unit is on an independent mission when your S2 informs you that an aggressor armored column has been sighted approximately 5 miles from your position and heading your direction. What can you do towards disrupting this armored threat?

With prior planning, training, and ingenuity your unit should be capable and ready to take care of the aggressor tanks.

This problem can be met through the use of heliborne Tank Killer Teams (TKTs). Take any rifle squad, weapons squad, or combination of the two; give them four 3.5 Rocket Launchers (RLs), two Automatic Rifles (ARs), and a leader, then you have a team capable of wrecking an armored column.

My battle group experimented a great deal with various type units and methods to arrive at a workable solution for antitank protection, other than the organic antitank weapons and units in a battle group. After many field tests and experiments, we combined equipment and manpower into an effective unit. A team of eleven men is the normal payload of an H-34 helicopter. With four 3.5 RL teams, consisting of a gunner and an assistant gunner, the team had the firepower to deal a devastating blow to most armored columns, and the TKT leader had a certain amount of flexibility. The two AR men were used primarily for the close-in ground protection of the helicopter.

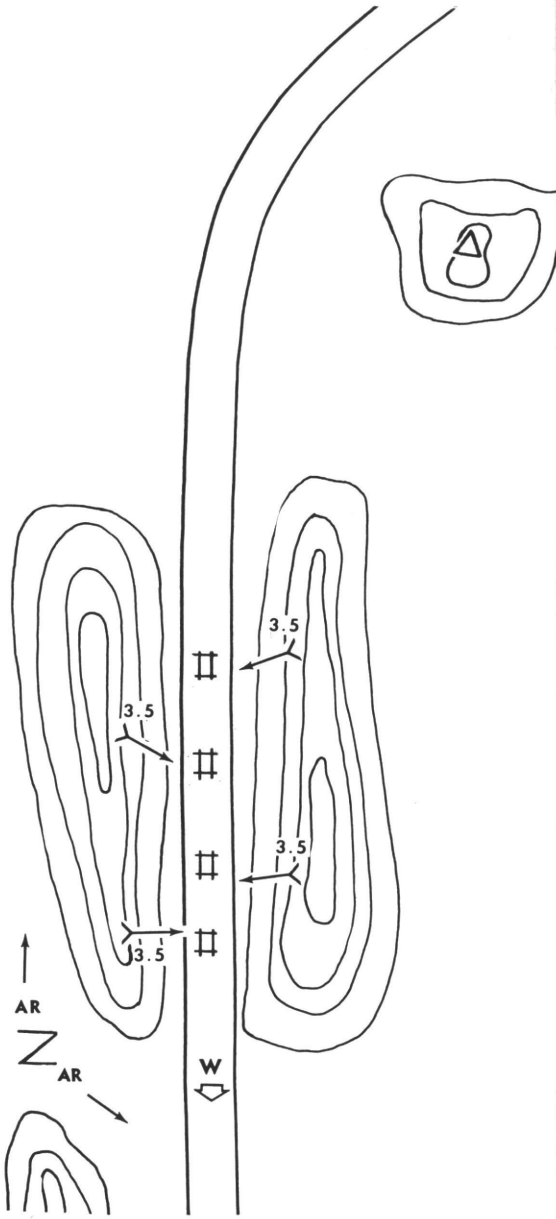
We instructed each of our rifle companies to organize four of these teams (one for each rifle platoon) on a standby basis, ready to be committed on short notice. The men perform normal duties with their assigned units until called on to carry out a TKT mission.

We tried various methods and techniques of employment for these teams, however the most successful technique was as follows (see sketch):

By maximum utilization of our long range and stay behind patrols, our intelligence effort was greatly enhanced. We received early warning of approaching armored columns and could take necessary action against these columns. Once a column was sighted, the battle group commander would make the decision whether or not to employ a TKT. These decisions were reached after a careful map reconnaissance, recommendations from our aerial OP (L-19), our air officer, and other intelligence available. Once it was decided to hit the column we had to decide where, when, and with how many teams. The landing site for the helicopter also had to be determined.

The company commander

Our best TKT employment



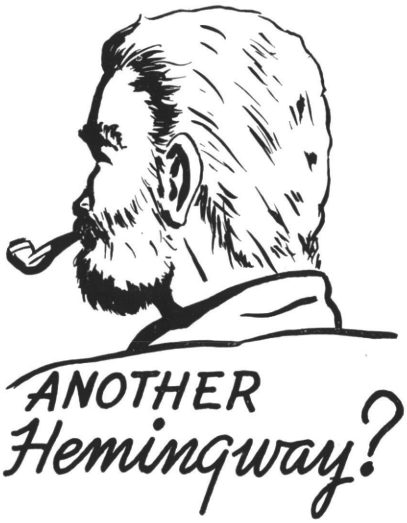
Captain Isler was with the S3 of the 2d Airborne Group, 502d Infantry, in Europe when this technique was tested. He is presently on ROTC duty at Siena College, Loudonville, N. Y.

was notified, using predetermined code, to assemble a team or teams at the company helicopter pad. It was SOP for the company commander to brief the TKT leader and helicopter pilot on details of the mission. The TKT leader briefed his team while waiting for the helicopter. On landing at the designated landing site, the RL teams were deployed at least 300 yards from the landing site. The two AR men were deployed to give maximum ground protection to the helicopter, and were normally the last men to board the helicopter for the return flight. The TKT leader utilized pyrotechnics to the maximum to control his team. The team would set up an "ambush" for the approaching column; when the lead vehicle reached a certain point, the RL teams could get off two rounds each before withdrawing to the pick up point. By deploying the RL teams in echelon, an RL team could withdraw through another RL team until the last RL team withdrew through the AR men.

By this time you are probably saying to yourself, "What a suicide mission for eleven men and one helicopter." True, unless your unit has concentrated on the use of helicopters and you have instilled in the men complete confidence in themselves, their weapons, helicopters, and teamwork. At this point something can be said concerning the helicopter pilots. We found that by working with the pilots over a period of time, recognizing their various problems, taking their professional advice, and giving them a feeling of "belonging" to our unit, we were successful in achieving complete cooperation and confidence between our unit and the helicopter units.

Proper choice of terrain plays an important role also. Defiles, heavily wooded areas, terrain and man-made obstacles which hinder and restrict the enemy, and yet provide cover and concealment for the teams, greatly enhance the success of the mission.

So there you have it, a solution to increase your antitank capability without the use of tanks or additional antitank weapons. It is a smug feeling to know you have a weapon within your own unit that could mean the difference between success and failure when operating against armor. The Tank Killer Team (TKT) is here to stay.



SO, YOU AREN'T a writer! You don't have to be an expert to write for the DIGEST. All we want is to be kept informed of what is going on in the field: new uses for Army Aviation, better maintenance techniques, ideas on tactical operations — anything being done that can improve Army Aviation.

If Army Aviation is to grow and develop, then Army Aviators must work together and pool their knowledge into one vast project dedicated to fulfillment of the aviation mission in the Army. There is no better medium of communication available for dissemination of information and expounding of ideas than the ARMY AVIATION DIGEST. One aviator might not have the answer to a problem, but if he sets down his thoughts as an article for the DIGEST then perhaps someone else will be able to contribute the key to the solution. Knowledge builds upon knowledge.

No one person can be an expert in all phases of the aviation program; yet every aviator has at least one aspect of the field in which he is an expert. Sharing of experiences and knowledge is part of the fun of being an Army Aviator, and it's a catalyst for Aviation growth.

Disagree if you will to what is printed in the magazine, but do it in an answering article. If you have a real interest in Army Aviation, you have something to say of interest or value to other aviators.

Don't worry about the grammar or spelling. The DIGEST staff will take care of that for you. Once you sit down to write, you'll be surprised how easy it will be to get your thoughts onto paper. You might even enjoy it. Who knows, perhaps you may develop into another Hemingway!

U. S. Army Executive Flight Detachment

THE EXECUTIVE Flight Detachment is a detachment of especially well qualified Army Aviators and maintenance personnel whose primary mission is the evacuation of the President, his family, and key White House officials in the event of an emergency. After satisfying this mission the unit often furnishes helicopter transportation for the President, members of the executive branch of Government, visiting dignitaries of foreign governments and, of course, members of the Army in fulfilling their duties.

The detachment was activated on 1 January 1958.

Crews for the helicopters consist of pilot, copilot, and crew chief. Personnel for these assignments are selected by Department of the Army on a basis of flying time, experience, character, and personality. These criteria are exceedingly important because all personnel are frequently in contact with very high ranking dignitaries of the United States and other nations.

The mission of flying the Chief Executive and others in helicopters is shared by the United States Army and the United States Marine Corps. The Sikorsky H-34C (HUS) helicopter is used by both services. It was selected by helicopter safety and design experts as best suited for this particular mission. Automatic stabilization equipment (ASE) and emergency floatation gear are standard equipment. The helicopters are fully instrumented, including omnirange and automatic direction finding (ADF) navigational aids, and FM, VHF, and UHF communications equipment.

Pilot personnel in the unit are continuously training in the use of all equipment aboard the aircraft. Helicopter crews practice water landings, cross-country navigation with ADF, omni and ASE, and instrument flying under simulated conditions. Ten hours a month first pilot time, of which at least one hour must be flown during the hours of darkness, is a minimum requirement.

To ensure that all personnel are thoroughly qualified and intimately familiar with all aspects of the operations peculiar to this unit, pilot personnel are assigned for a minimum tour of two years. Maintenance personnel serve a four-year stabilized tour.

Operating on the premise that well maintained and carefully flown aircraft are safe aircraft, the detachment has completed all missions without incident. For obvious reasons, the helicopters are continuously guarded. All fuel receives the same security as the helicopters. Ignition analysis is performed, magnetic oil sump plugs are inspected, a thorough preflight inspection, and a test flight are performed prior to each mission. Each flight is carefully planned, and flight routes are reconnoitered in advance to note unusual hazards, establish the best and safest flight paths, and establish emergency landing sites. Nothing is left to chance!

Evacuation of the President, his family, and key White House officials in the event of an emergency requires a 24-hour a day operation, with alternating crews on this duty. However, whenever weather conditions are favorable and time is critical in the crowded schedule of the Chief Executive or other government or military officials, the helicopters are called in to provide quick and efficient transportation to many locations within a 100-mile radius of Washington.

In addition to the evacuation mission which is performed in Washington and other parts of the United States where the President has traveled, the Executive Flight Detachment has also been on call in Canada and the British West Indies. These trips have been particularly well received by the pilots as they have provided excellent cross-country navigational training opportunities.

In addition to the President, dignitaries transported by the Executive Flight Detachment fill the pages of an International Who's Who.

An assignment with the Executive Flight Detachment is truly a unique experience and one which any Army Aviator or maintenance technician can view with a great deal of pride.

HANCHEY ARMY AIRFIELD

New Facility for Rotary Wing Training

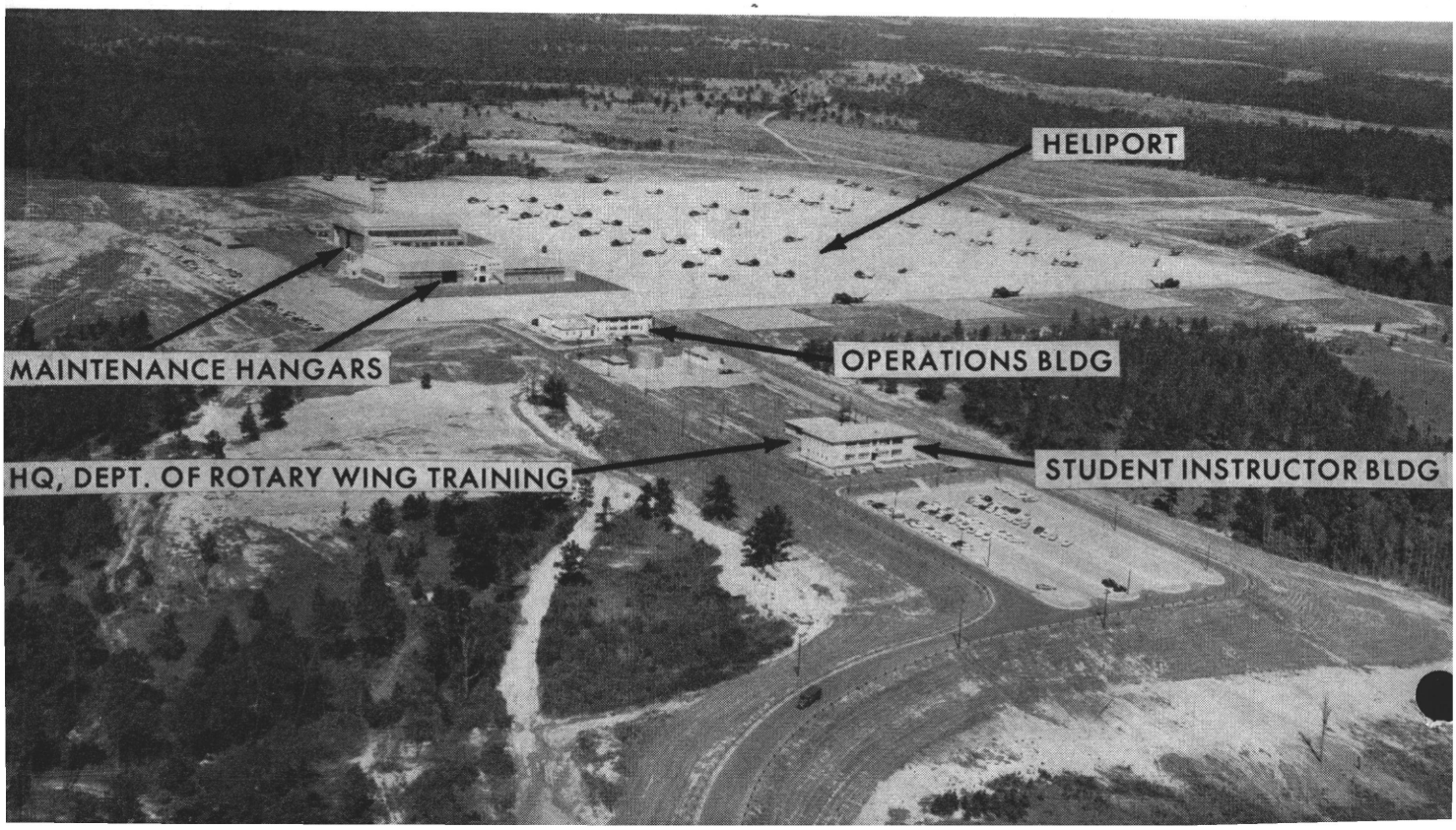
Another stage in developmental planning was completed at the U. S. Army Aviation School, Fort Rucker, Ala., when the Department of Rotary Wing Training moved into new quarters at Hanchey Army Airfield in October.

Known to hundreds of rotary wing personnel as Auxiliary #2, the facility was enlarged and developed at an approximate cost of $3½ million. Cost included a 2-story Flight Instructor building (which also houses R/W headquarters and administrative offices), a 2-story Operations and Fire and Rescue building, hangars, wash areas, lighting, extension of utilities, vehicle parking, and paving (heliport, overruns, taxiways, etc.)

Over 200,000 square yards of concrete was poured for the heliport apron. This size compares with the heliport at Camp Wolters, Texas, where approximately 208,000 square yards was used for the main apron.

More than 100 students are presently receiving instruction at Hanchey AAF. These courses are offered: Officers Rotary Wing Aviators Course; Helicopter Instrument Flight Course; Helicopter Instrument Flight Examiners Course; H-37 Pilots Course; HU-1A Instructor Pilot Course; Army Helicopter Transition Tactical Course, a 50-hour course for aviators who are R/W qualified but who need transition training into H-19 Chickasaws, H-21 Shawnees, and H-34 Choctaws.

Having all administration, operations, training, and aircraft located in one area makes for a smoother over-all operation, with better control.

Now the students can go directly to the flight line after briefing, rather than to a bus for transportation to different locations as before.

The new facility was named in honor of Major Charles Wesley Hanchey, a Senior Army Aviator who served as an artillery observation pilot in Europe during WW II. His enthusiastic support of Army Aviation encouraged a number of today's aviators to take flight training.