FEBRUARY 1963

UNITED STATES ARMY AVIATION DIGEST

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

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LETTERS

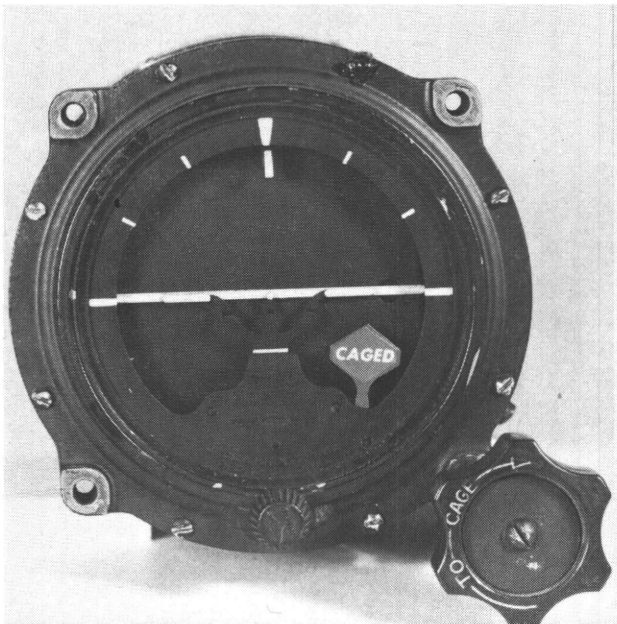
Sir:

OK - OK - so now I'm motivated. Captain Ford's article ("Cart or Horse") in the April 1962 issue was enjoyable. However, when he refers to the U-6A attitude indicator, he is on very thin ice. Evidently he was referring to an obsolete -20P as the September 1961 and April 1962 [and August 1962] -20Ps both list FSN 6610-557-3407 as the primary number to be used when requesting U-6A attitude indicators. The number referred to by Captain Ford (6610-247-9354) is listed as a substitute item for the U-6A indicator, directional, gyro! The new U-6A -20P still confuses the issue in the numerical index (page 258), where we find both 6610-557-3407 and 6610-557-3408 described as attitude indicators. Actually, the latter should be described as an indicator, directional, gyroscopic. The same error appears in the U-6A -34P also, page 487.

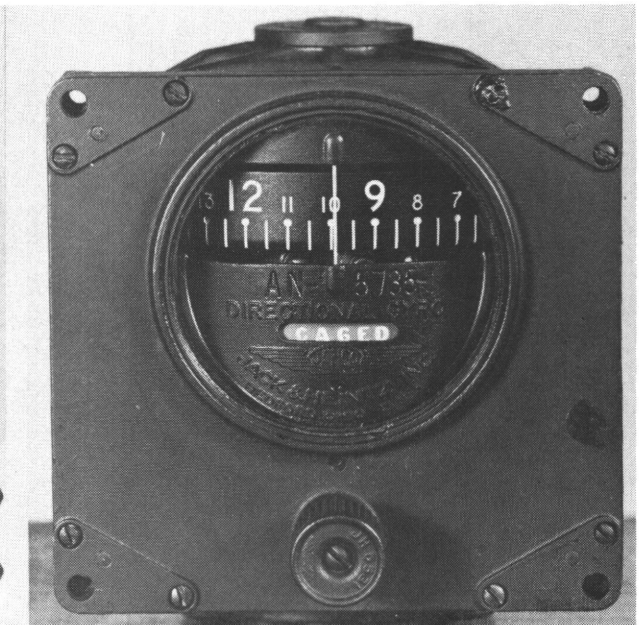
To further complicate our supply picture, the U-1A -20P and -34P contains the same mistake in *both* the numerical index and the systems breakdown. Our unit had submitted URs on all these errors prior to the new manual, but evidently not in time to make adjustments. So—all you maintenance and supply readers should make the necessary corrections in ink until the next revision comes out.

Now, let's see if I can help clear the air regarding interchangeability. The SM 55-135-1 series lists all Transportation Corps repair parts. These SMs also give each part listed a supply action code (SAC). If this SAC is 19, 31, or 32, the item may be ordered for stock and/or

FSN 6610-557-3407
Indicator, Attitude
(U-6A and U-1A)



FSN 6610-557-3408
Indicator, Directional, Gyroscope
(U-6A and U-1A)



added to your authorized stockage list (ASL) if you have sufficient demand experience or other authorization.

For each type instrument we find in Army aircraft, there are a multitude of substitutes; however, only one of these interchangeables is coded with a SAC of 32 (denoting a primary number). Eventually, this primary number will be the only one available in supply channels, and ultimately the only one found in Army aircraft. Meanwhile, all echelons of supply have authorized substitutes, and a substitute issue is much better than a deadlined aircraft.

The solution? You maintenance and supply officers at the organizational level should place all your requests for instruments having a SAC of 32. Should you discover you can't obtain the SM 55-135-1 series at your level, write or visit your field maintenance support activity and ask to be furnished the necessary information.

OK—so now you've been requesting only those instruments with a SAC of 32 and the joker from field maintenance has given you a substitute item (possibly with a SAC of 04 or 07). If you, as a maintenance officer or a commander, feel that the instrument face is appreciably different, and you have a group of Army Aviators who confuse as easily as poor ol' Joe, carry a writeup (red diagonal) on the DA Form 2408-13 or 2408-14 until the instrument is replaced with one that Joe understands.

While we're on that subject, the implication of an easily confused group of Army Aviators is far-reaching. Should we consider modifying the U-8D so that it will have a high-wing configuration like the O-1A's and U-6A's poor ol' Joe learned to fly originally? Possibly we could also replace the O-1A "Joy Stick" with a U-6A type control column for complete standardization. Of course some thought must be given to the fact that an OH-13 pilot sits on the left side of the cockpit while a UH-1 pilot sits on the right side.

Seriously, I believe most of our Army Aviators can cope with the problem of nonstandard instruments for a few more years —complete standardization is coming—and winning the battle of the instrument dials will give us another war story to tell the fledgling aviators in 1968.

RAOUL J. LE BLANC, JR.
Captain, TC

Sir:

I have noted in recent months several safety items in various aviation safety publications concerning failure to install cotter pins. . . . I feel that not all of the criticism has been directed in the proper direction. I am the first to admit that the mechanic was at fault in missing this critical item, but has it ever occurred to anyone that the chain of command may have been the CAUSE of the mechanic's error? . . . all in Army Aviation must work for safety, and there is no way to achieve it without the cooperation of the man behind the wrench. Pilots and passengers place their lives in his hands every time they fly, but few realize the problems this EM has when he finds an unsafe condition and places his Red X in the status block of the -13. It seems to him that the wrath of his entire chain of command descends on him when it should be praise. The regulations say no one can punish him for grounding an aircraft, but it takes a lot of courage to face all the harassment he knows from experience he will receive. When he grounds an aircraft for maintenance that someone at headquarters wants to fly, business really picks up. This brings us back to the reason he forgot the cotter pin.

My point is the insistence of commanders, operations officers, pilots, and all others who try to meet unrealistic schedules . . . never realize how the tendency to hurry makes for carelessness. The sad part of the situation is some of the reasons used for rushing a job. "I've already filed a flight plan" or "The CO wants to go now" are common ones. Does the CO want to go JUST PART OF THE WAY?

A mechanic has a cruising speed in his work just as the aircraft has. . . . Does a typist perform faster or more accurately when being rushed? The speed at which a mechanic performs varies with the individual, so no one can make a realistic estimate of his efforts without long and careful observation.

When a mechanic is told to rush a job and then receives a lot of UNUSUAL supervision he . . . tends to satisfy the demands of the superior and he gets careless. . . .

. . . "Haste makes waste." If the commander would tell the mechanic when the aircraft is needed and then leave the mechanic alone to perform the job without unusual supervision he would likely get better results. . . . Normal supervision is all that is required, and this will not shake the mechanic and cause the costly mistakes we have been reading about.

I hope these ideas can be used in some way to educate the commander and mechanic alike . . . that few missions are important enough to sacrifice safety to meet a deadline.

SGT COY D. DILLAHUNTY
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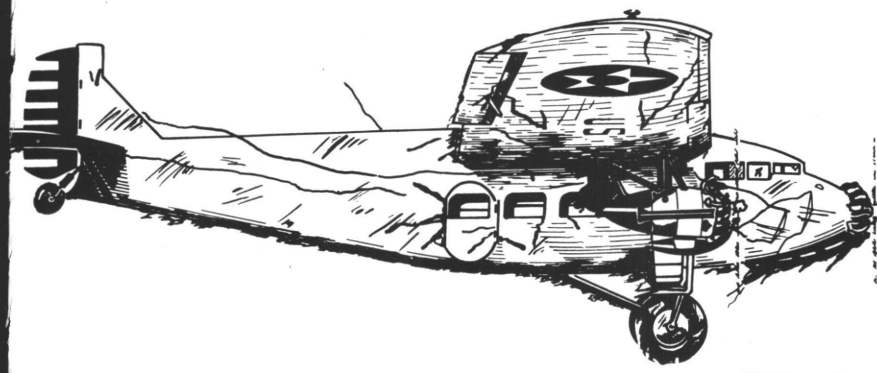
San Francisco, Calif.



THE FLYING DUTCHMAN

William H. Smith

The ship was cheered, the harbor cleared,
Merrily did we drop
Below the kirk, below the hill,
*Below the lighthouse top.**

Lieutenant Morgan stopped and listened. He could have sworn he heard an aircraft directly overhead, but he couldn't see one. It was a faint sound, like nothing he had heard before, and it soon faded away. "Must have been my imagination," he said to himself.

There was a sudden gust of wind and the sky grew darker. Lieutenant Morgan shivered, pulled his jacket a little closer, and started off toward the Caribou.

The bitter wind and the strange aircraft were soon pushed from his mind by thoughts of the night before. It had been a good one.

There was this girl, "A real dish," he thought. "M, m, m, ..." That was the nice thing about picking up troops in the boondocks. Girls in small towns seemed so interested in aviators.

The noise he made getting into the Caribou woke up Sergeant Steel, the crewchief. Lieutenant Morgan had known Sergeant Steel a long time and was not surprised to see him sleeping. The sergeant really enjoyed these weekends away from the fort and probably needed the sleep. Nonetheless, he was a good crewchief and could be trusted to keep the bird in shape.

"Got everything ready?" asked Lieutenant Morgan as he headed for the pilot's compartment.

"Yes, sir," he replied.

After assuring himself that all was ready in the front compartment, Lieutenant Morgan headed back toward the rear.

"O. K.," he said, "let's preflight this thing before Captain Schnider gets here."

Outside he said, "You take this side and I'll take the other."

This startled Sergeant Steel. Lieutenant Morgan was known to be a good and careful aviator. His preflight was a masterpiece of perfection. In fact, Sergeant Steel depended on these preflights a great deal. For instance, last night an old buddy had come to pick him up for a card game. He rushed through his postflight duties. Oh, he had refueled the plane and had caught a lot of the essentials, but there were a few things he didn't check. "Just little things that never go wrong," he had thought. "After all, Lieutenant Morgan would just check them again in the morning."

Lieutenant Morgan, though, was also feeling the effects of last night. Although he went through the motions, his mind wasn't on the preflight this morning.

The left passenger door was one of the things he always examined thoroughly. While boarding the plane, inexperienced ground troops often damaged the sill under the door. This he looked at closely. It was O.K.

He then started down the left side of the fuselage, but thoughts of the night before were too much for him. He hurried through the preflight, skipping some things entirely. After all, when he had left last night, Sergeant Steel seemed to have everything under control. "No point in going over them again," he thought as he cut the preflight short and climbed aboard the Caribou with Sergeant Steel.

*Coleridge, Samuel Taylor. "The Rime of the Ancient Mariner," Lyrical Ballads, London, England, 1798.

Captain Schnider arrived about that time and eased himself out of the jeep. He wished he had taken two aspirins instead of one. There was still a sharp pain in the center of his forehead, just over his eyes. He recognized this headache, as it came far too often these days. He knew that it was caused by the lack of sleep.

But how could you tell good-looking girls that you've got to be a partypooper and hit the sack early? Besides, Lieutenant Morgan was on this trip as copilot. He could party all night and still be wide awake the next day, ready to fly.

"Good thing Lieutenant Morgan is on this flight," thought Captain Schnider. The lieutenant had been his copilot many times and the captain knew Morgan would make a good preflight. It wouldn't be necessary to doublecheck everything.

As he approached the aircraft, Sergeant Steel dismounted and greeted him with his usual, "Good morning, Captain."

"Not as sharp as usual," thought the captain. "Bet he really laid one on last night." Aloud he said, "Morning, Steel. Got this beast ready to fly?"

"Sure thing, sir."

"Good. Troops should be ready any minute."

They both headed for the passenger door. The wind seemed to be getting colder. Sergeant Steel was still so sleepy he failed to notice that the captain was not stopping to check the Caribou.

As they were about to board the plane, they heard an aircraft in the distance. Sergeant Steel always prided himself on being able to identify any engine, anywhere. But these engines had the most peculiar sound he had ever heard. He shrugged it off and didn't mention hearing them.

Captain Schnider heard the same thing, but he didn't say anything either. He noted that the craft did not sound like a modern day airplane. Probably some privately owned older model, he thought as he pulled himself aboard the Caribou.

Before Sergeant Steel entered the aircraft, two Army trucks came into the clearing that served as an airstrip. They drove up to the Caribou and troopers began unloading. Getting the men aboard and settled occupied the sergeant's attention, so he was surprised to suddenly hear the captain going through the engine start procedures.

Grabbing the fire extinguisher, he jumped out of the passenger door just in time to see the number one engine roar into action. He rushed around the aircraft to the number two engine, on the windward side. It didn't start as quickly as the other. When it did start, it backfired a number of times. Sergeant Steel remembered that the operation manual said that the engines would backfire when they were cold, and the way to prevent this was to warm them at a slower rpm than usual.

But Captain Schnider was in a hurry. He failed to reduce the rpm, and the engines popped and backfired alarmingly. As soon as the sergeant was aboard, the captain moved the ship out onto the strip. In a few minutes they were off.

Sergeant Steel went about his duties without thinking twice about the incident. There was a lot to be done. But the thought of the money he had lost in last night's card game weighed heavily on his mind, and he cut corners whenever he could. He helped the passengers get into their parachutes but decided to take a rest before showing how to use them.

At first it seemed a little speck,
And then it seemed a mist;
It moved and moved, and took at last
A certain shape, I wist.

Up front, Captain Schnider and Lieutenant Morgan settled down for the long ride. Neither spoke of the night before. Each was fighting hard to stay awake. Lieutenant Morgan knew he had a reputation for being able to stay up late and still fly the next day. Captain Schnider did not want to admit that he was any less a man than the lieutenant.

As the Caribou winged its way southward, Lieutenant Morgan noticed another aircraft up ahead flying in the same direction. At first it was just a speck, but gradually it grew larger and larger.

He turned to the captain, who apparently had not seen the aircraft yet.

"That's a peculiar bird. What is it?" he asked.

The captain, realizing it was probably the same aircraft he had heard earlier, looked at it for a long time.

"Can't tell from here," he answered. "Must be an old model. Flying mighty slow."

As they approached the mysterious plane, its outlines became clearer. It was unlike anything Lieutenant Morgan had ever seen, even in a museum. A highwing multiengine monoplane, its fuselage was rectangular in shape and seemed to be aluminum, and the landing gear was fixed and the wide tread split axle type.

"I'll be damned!" exclaimed the captain, as he reduced the speed of the Caribou.

Lieutenant Morgan stared at the airplane as

though it were a ghost.

The captain muttered half to himself, "It's a *tin goose!*"

"Sir?"

"Tin goose," said the captain. "That's an old Ford Tri-motor!"

They both gazed at the airplane for several more minutes without talking.

Suddenly Lieutenant Morgan leaned forward and pointed at the strange craft, "Look, it's an *Army* plane."

Sure enough, on the fuselage, close to the tail was painted:

U. S. ARMY
Ford C-9

There was a third line, but the airplane was so old and weather-beaten that they could not read it. As they flew alongside the old plane, other details became apparent. The tires were in very bad condition. The black rubber on one was so discolored that it looked almost white. The other was practically no tire at all and would never again hold air.

The left outboard engine was dead, its prop windmilling. The large radial forward of the cockpit was streaming white smoke and showed every sign of quitting at any moment. In fact, it sputtered and coughed so often it seemed to barely produce enough thrust to move the plane forward. Yet it moved steadily along. The strong winter winds that caused the Caribou to rock and roll did not seem to affect the old Ford at all. It just floated along as if it had been doing this for ages.

The faint outline of a man could be seen inside the pilot's compartment. He was in the right seat. If anyone else was in the plane, he was not visible.

Slowly the figure slid back one of the panels in the pilot's compartment. For a few seconds he leaned his elbow out of the window, much the same as if he were driving an automobile. Then, as if seeing the Caribou for the first time, he extended the rest of his arm and waved. In doing so he gave a clearer view of himself. He was dressed in the typical garb of military aviators of the early thirties.

While Captain Schnider and Lieutenant Morgan gazed in fascination at the strange pilot, the radio suddenly became active. It crackled and hummed, and in a few minutes the voice of the old pilot spoke to them.

"Army, 73081, this is AC-31-402. Do you read me?"

The captain came to life. In a hoarse and shaky

voice he answered, "AC-31-402, this is 73081. We read you, loud and clear. Over."

"It works! It works! At last *it works,*" came the voice on the other end. Then, a bit calmer, the mysterious pilot said, "For 30 years I've been trying to get this radio to work. I've called a lot a planes, but you are the first to answer."

There was a pause. A sort of sobbing sound came over the radio. It was evident that the old pilot was so choked up that he was unable to talk.

Meanwhile Captain Schnider excitedly barked a series of questions into the mike.

"402, who are you? How did you get that thing in the air? Where are you headed? Can we be of help?"

There was another pause. The Ford's pilot was obviously composing himself. At last he said, "Going? I *was* going north, way up north, but now I'm just flying. Not going anywhere, I guess. Just anyplace. After 30 years everything looks the same.

In spite of his uneasy feelings, Captain Schnider began to get mad. "Speak up man! Who the h--- are you?"

"Don't get excited, son," the voice answered. "There's plenty of time where I'm going. So you want to know who I am? Well, I'll tell you. I'm Major 'Dutch' Vanderdecker, U. S. Army Air Corps. Thirty years ago I was in a hurry, but

ever since then I have had plenty of time to think about it. I left my home base bound for Canada with some troops on board. I was in a hurry. I didn't preflight my aircraft properly and rushed through the warmup. Ten minutes later I saw a speck in the sky ahead of me. As it grew in size I recognized that it was an old World War I Spad I was overtaking. The engine was streaming white smoke and the wings drooped—the struts and guy wires were hanging loose. The pilot looked as old and weary as his plane. His scarf, trailing behind the open cockpit, was ragged and wind whipped. Yet, I *thought* I could see a smile on his face. He waved a gloved hand in salute and . . . then it happened! My left engine failed, then another . . . the passengers didn't have their chutes on, since no one briefed them. My only hope was to descend through the cloud deck and hope I could make a forced landing. I never broke through. We hit Old Baldy. People saw the glow for miles. Guess some of the old timers still talk about it."

The captain looked at Lieutenant Morgan, who was visibly shaking. Then he pressed the mike button and asked, "Major, are you kidding me? How could you be flying that thing if it crashed 30 years ago? You don't make sense!"

"Sense you say? I'm making sense all right. We crashed. Yes, we crashed. Everyone died, and it was my fault. If I had only . . . afterwards, it was too late. I was sorry, but . . . too late. All I could do was pay for it. And pay I have."

"How did you pay?" asked the captain incredulously.

"I pay by flying this old plane as did the Spad pilot. For 30 years I've been flying. They said I would fly until . . ." He cut the sentence short, but finally added, "and I have."

"Until what?" asked the captain. "Who were *they?*"

"Well, captain, someday you'll know who *they* are. They said I would fly until I found someone as foolish as I. Someone who flies without adequate sleep. Someone who flies without proper preflight. Someone who flies without briefing his passengers. They said that someday I would find someone like that. Then they said I could rest and he would take my place. That he would fly until . . . until he, too, found a foolish man."

"And you haven't found a man?" the captain asked.

"Not yet, son," the voice answered. "I've seen many an airplane. I have tried to talk to the pilots. But none heard or saw me. No one . . . *until now.*"

There was a pause, and then the voice came back. "None would answer me, and none could see me. But you heard and answered, and you can see me. Perhaps you are the one I seek."

I pass, like night, from land to land;
I have strange power of speech;
That moment that his face I see,
I know the man that must hear me;
To him my tale I teach.

Major Jones entered the room and stood at attention. At the head of the table was Colonel Lang, with several other officers grouped around him. Major Jones saluted.

Colonel Lang spoke, "Sit down, Jones. We are not formal here. As you know, we're investigating the crash of the Caribou on Bald Mountain. Everyone was killed. We understand you were in the area and saw the accident. Tell us in your own words just what you saw."

"Well, sir, I was at 15,000 feet southwest of Bald Mountain. At my right and lower was a Caribou. I had been behind him, but suddenly he slowed down. At first I didn't pay much attention, but then he started talking on the radio. I couldn't see who he was talking to, nor could I hear the other half of the conversation."

He paused.

"Go on, Jones."

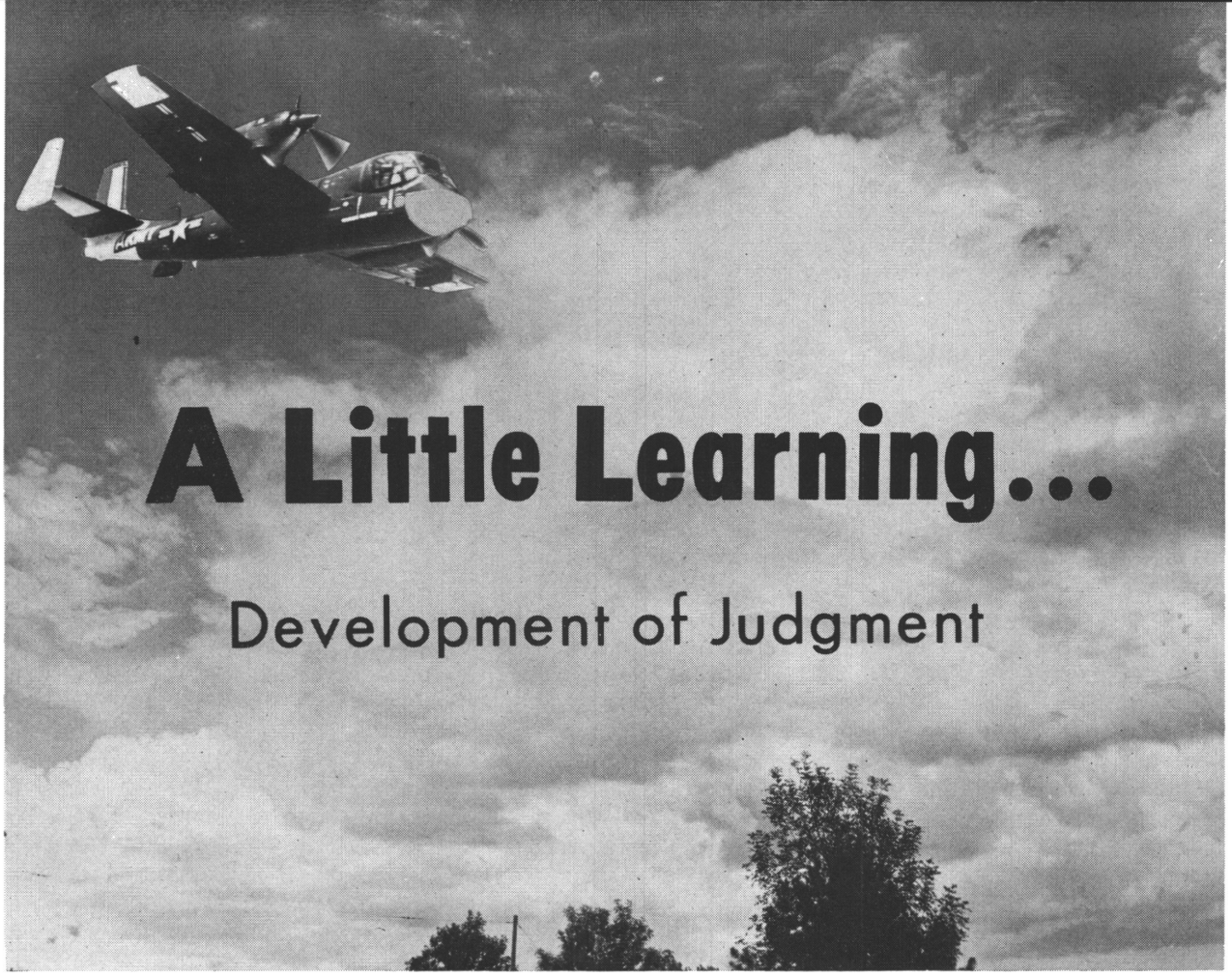
"I didn't take notes, of course, and can't repeat the conversation word for word. The first thing I heard was 'AC-31-402, this is 73081. We read you loud and clear. Over.' And then I heard Captain Schnider say . . ."

Major Jones repeated all the things he had heard.

Finally, a bit puzzled, he added, "The conversation ended when I heard the captain ask, 'And you haven't found a man?' Then it happened: the Caribou lost power on No. 1 engine. I could see it smoking. No. 2 went out shortly after. Apparently he didn't realize he was off course and started descending through the cloud deck for a forced landing. No one bailed out . . . I could see the orange glow through the clouds when he hit. I figured it must have been Old Baldy. . . ."

A silence hovered over the room before Major Jones added, "Just as it crashed into the mountainside . . . I'd swear I was on a collision course with an old Ford Tri-motor and before I could respond, so help me, it disappeared!

He went like one that hath been stunned,
And is of sense forlorn:
A sadder and a wiser man,
He rose the morrow morn.



A Little Learning...

Development of Judgment

John V. Florio

ANNUAL AWARD Monthly Winner CONTEST

ONCE FOUR BOYS attending summer camp were assigned to take swimming lessons.

One said he was not interested and went off to play. The second said he had seen the way the champions did it and felt he knew how to swim. He joined the first boy at play. The third took the instructions and received his swimming badge. But he rested on his laurels and did not practice or improve his proficiency. The fourth boy took the instructions and practiced diligently to improve his techniques.

The next summer, these same boys were in a boat when it overturned. The first boy, not being able to swim, had to cling to the boat to keep from drowning. The second boy, who had watched the professionals, found that he couldn't swim either and also had to hang onto the boat. The third started off for shore but found he was not proficient enough and barely made it back to the boat. The fourth boy did fine and was safe on shore long before the other boys were rescued by lifeguards and launches.

At first glance, this parable seems out of place in an aviation publication, but if you had been instructing "lo, these many years," as I have, you would readily see that these same attitudes exist in students of the airplane piloting business. This is especially true when a man reports for the instrument course.

The student who reports for instrument training has flown the airplane all by himself; he has landed on roads and in short strips; he has flown a few short,

---

Mr. Florio was assigned as a civilian instructor with the Dept of Fixed Wing Training when he wrote this article.

cross-country hops; he has flown at night. How does one convince a man who has completed all of these accomplishments that he still has a lot to learn about flying?

That pride of accomplishment is one of the big barriers we have to overcome in the instrument division before we can proceed with the training. This is the situation the man had in mind when he said, "A little learning is a dangerous thing."

Studies have shown that the most dangerous period in an aviator's career lies between the 500- and 1,000-hour marks. Prior to 500 hours, he knows that he doesn't know. After 1,000 hours, he realizes that anyone can make a mistake.

Much the same results can be expected of students entering the instrument phase as those that befell our boy campers, with one exception. Incompetency, or lack of proficiency in flying (especially on instruments) can have only one result: tragedy. Up in the wild blue yonder there are no overturned boats to hang onto until help arrives; there are no rescue launches to pick you up and remove you to safety. You are on your own until you get back to earth—one way or another.

But see what happens to our instrument students with attitudes paralleling those of our boy campers:

Number one man, the man who is not interested and wants no part of the training, should not be permitted to enroll in the course. It is a waste of effort, money, and time. He will be difficult to instruct, will not retain instructional material, and may develop a bad attitude. This man is a potential accident looking for a place to happen.

Anyone who has flown for any number of years can recall many instances when the weather closed in unexpectedly and some farmer's level pasture became a temporary airport for the lucky crew. I say lucky crew because there are many names on aviation's casualty list who never found that farmer's pasture. In today's flying, all-weather capability is a must. In the military, missions are usually a matter of vital importance. In today's flight picture, there is no room in professional pilot ranks for the "VFR only" flyboy!

Steady practice in instrument flying is conducive to long life

Number two man is our "Do It Yourself" boy, the man who thought he knew how because he had watched others.

Anyone who has ever handled any complex machine can see how preposterous this assumption is. Instrument flying is one of the most demanding arts; it lifts flying above the skilled labor class and places it squarely on a professional level. It requires complete concentration, unending repetition and practice, and constant study. A pilot who hasn't practiced instrument flying in three weeks can note a decline in his technique; if he hasn't flown in weather or practiced instrument flying in six weeks, he could become dangerous; and if he hasn't kept up with changes in procedures, instruments, facilities, etc., for a period of six months, he could find himself as antiquated as the flintlock rifle in modern warfare.

Our third example is, perhaps, the most unforgivable. Here is a man with proved ability who has not thought enough of his own neck to maintain the proficiency necessary to place him head and shoulders above the sportsman pilot. The dangerous part of this situation arises from the psychological attitude that results from having completed the training. This man might very well consider himself qualified and fly off into weather—and eternity. I cannot stress too strongly the importance of continuing practice and study in the area of instrument flying.

While our fourth individual seems to have the ideal attitude, he cannot exempt himself from certain hazards that are incumbent on every new instrument pilot. These hazards can be enumerated very briefly but never overemphasized. To avoid these hazards, we can set down four areas of interest. A thorough study of these points will almost automatically ensure a safe flight.

• *True evaluation of one's ability and state of training.*

It would be the height of folly for a man who received his initial "white" card on Monday to plan a flight into marginal weather in a high density area

on Tuesday. Once training has been completed, it is well to establish personal weather minimums well above the published criteria. Make sure that *very* good alternates are available and well within the fuel range of the aircraft. After a reasonable time and several trips using these minimums with success, one may lower his personal minimums gradually until they coincide with "Mr. Jeppesen's Almanac."

• *True evaluation of the weather.*

It is practically impossible to get a ship off the ground on an IFR flight plan today without a short conference with a professional weatherman. The only trouble, weatherwise, encountered today is with the "hot rocks," who look on this important service as an imposition on their valuable time. This facet of flight planning can often be the most important single item in your flight planning procedure. The man who thinks otherwise falls into the class of very poor insurance risks. Meteorology is a 4-year college course, and most forecasters have had the full treatment. The forecaster is as well qualified in his very complex field as the pilot is in his.

• *True evaluation of facilities at destination airport.*

In this area we must try to judge whether the letdown facilities at destination and alternate are adequate, in the light of existing and forecast weather, for the safe execution of an instrument approach. By this I mean that a good instrument pilot would never think of shooting an ADF approach with a minimum ceiling if the facility is 4 or 5 minutes from the field, especially in hilly country.

• *True evaluation of radio equipment installed in aircraft.*

Here we have the problem of determining whether the equipment available to the pilot of a certain aircraft, or type of aircraft, is adequate for the safe completion of the flight.

It would be foolish to fly into a highly congested area with only a low frequency receiver or limited channelization on VHF available. In most cases, sound judgment would dictate that a good copilot be included in the navigational equipment list.

Throughout this enumeration of requirements for a good instrument flight plan, you will notice the recurrence of such words as judge, determine, establish. They all condense to one word: JUDGMENT.

Any instrument school can teach flying techniques, proper radio-telephone phraseology, and ATC procedures. These are the very essence of any instrument course.

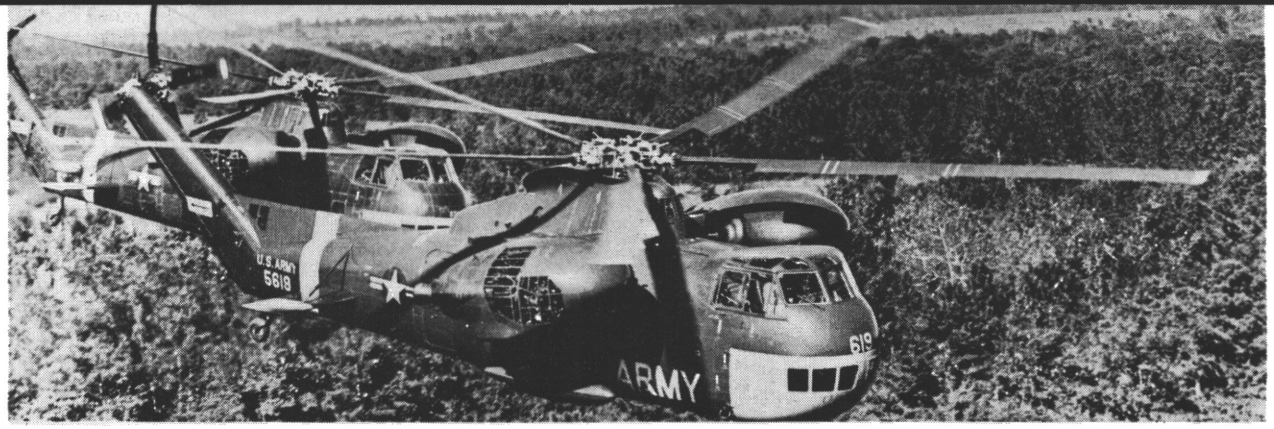
On the other hand, no school can teach or instill a sense of good judgment in any graduate. All the organization can do is employ the most experienced personnel, those who have proved the soundness of their judgment, to impart what advice they deem pertinent during their association in the flight course.

But the final decision to learn, to absorb, and to retain as much material as possible rests with the student. The student who looks upon his instrument training as just another hurdle to get over is seriously handicapping himself in his chosen field. There is no room for the slipshod, indifferent pilot in the sky. He is a hazard not only to himself but also to other pilots and to people on the ground.

The key word in this advice must be *conservatism.* In 20 years of flying, in all facets of the industry, I have never heard of a pilot who was criticized for deciding to hold on the ground for better weather, or for any other good reason.

This good judgment sense can only be acquired with the passage of time and the storing up of personal experiences from which to draw precedence. While gaining this experience, tread softly, my young pilot, and remember the old World War II axiom, "There are old pilots and there are bold pilots, but there are no old, bold pilots."

Each day before takeoff pilots from SETAF's 110th Aviation Company receive a weather briefing from personnel of Detachment 1



Formation flying with helicopters is no Roman holiday, but it can be S-M-O-O-T-H and S-A-F-E when you recognize

The Value of the Second Seat and Controls

CWO-2 Harold D. Wilcoxen

NOW, AS WE approach the landing area in a diamond formation, spread out, with number four sliding to the far left rear. To expedite our departure, watch for me to lift off, and follow in trail." As I sat listening to Major Drum continue the briefing, little did I realize these two sentences were so typical. We had adopted procedures such as this as normal. I was to learn later in the day, the only thing normal in this procedure is the confusion that accompanies it.

Major Drum did not realize he was contradicting himself in reference to our initial briefings. Looking back, I remember him saying, "The formation at low level provides the leader with a compact, maneuverable group, able to deploy as the situation demands." Does this explanation coincide with our instructions received as to landing and takeoff pattern? If you stop and think, considerable more planning and desire to remain as a formation was probably employed when you arrived in the nontactical pickup area with an empty ship. The colonel was probably there to observe the liftoff, so you wanted it to look good.

After our briefing, we filed out of operations to depart on the mission amidst the usual chatter concerning signals and techniques. Arriving at the pickup area, we looked like the "Blue Angels." The major jumped out and ran to the colonel, to assure him our performance would be outstanding.

Now, as we are ready to perform the most important part of the mission, the cogs in our brain start turning faster. "I have 13 on board, better loosen up the position a little," I thought to myself. Proceeding on the flight, other factors appear: "Looks like we'll be coming in crosswind; ground will probably be full of gulleys or foxholes."

Walker, the copilot, is edgy over the rough air and remarks, "I hope the major keeps his turns shallow and slows up early to avoid a big flare."

Even though we observe radio silence the FM sounds like the Yellow Cab Company in St. Louis, as inexperienced ground operators make continuous checks so as to hear their own voices on the radio. Manifold pressure will be close to the red line with 2700 rpm at this temperature. The crewchief is asking questions on intercom and I answer. The major is continuously banking to and fro to take advantage of terrain cover. Walker is starting the landing check.

As the landing area appears, each aircraft starts sliding out of

Continued on page 12

Mr. Wilcoxen is assigned to the 57th Trans Co (Lt Hel) Saigon, Viet Nam. He has approximately 2600 helicopter hours.

Pilot training and proficiency in helicopter formation flying cannot be overemphasized. The U. S. Army Aviation Human Research Unit makes the following comments on Human Factors Research and Allocation of Crew Duties in

Helicopter Formation Flying

Dr. Wallace W. Prophet

THE TECHNIQUE discussed in the preceding article—that of pilot and copilot sharing control functions during formation landings—is both interesting and novel. It has apparently been used with considerable success by the author. The ease with which this technique could be learned by other pilots can be debated back and forth, but it is a matter which can best be settled by an adequate test. However, the following human factors comments can be given on the specific technique itself, and on a larger problem area of which this technique is a part.

First, the article on CH-34 formation flying is, we believe, indicative of a very desirable trend in Army Aviation: the search for new and better flight techniques. It shows a willingness to reexamine critically some of our fundamental assumptions in flying—in this instance, the assumption that two persons sharing the flight controls of an aircraft, particularly during landing, creates a flight safety problem. Such reexamination is desirable, and is strongly advocated in this article. Another desirable feature is that the author has taken the trouble to advertise his new technique to others, which is most important.

The safety-of-flight question as applied to this technique is, of course, extremely important and warrants careful investigation. It is possible that investigation might show this technique—in which a team trains specifically in control sharing—to be as safe as the "one-man-on-the-controls-at-a-time" technique; or possibly, it might be even safer.

However, from the standpoint of the training psychologist, the "sharing-the-controls" technique presents one obvious difficulty: feedback, or knowledge of results. In a control or tracking task, such as landing a helicopter, when the operator manipulates a control he must receive feedback as to whether or not his movement of the control is producing the desired result. Without such feedback, learning and precise control are difficult, if not impossible.

When controls are shared by two persons it may not be possible for one person to tell how much of the change in attitude, flight path, altitude, or speed is due to *his* manipulation of the controls and how much is due to that of the other team member. In other words, there may be considerable confusion in the feedback portion of our loop. Some of the feedback indications which the pilot perceives as resulting from *his* manipulation of the controls may actually be the result of control movement by the copilot, and the results of the pilot's movement of the controls may be cancelled by actions of the copilot. Such confusion could be quite serious. However, it may be that this does not occur with a proper sharing of the controls. Apparently some such proper sharing can be learned,

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Dr. Prophet is a Senior Scientist with the U. S. Army Aviation Human Research Unit at Fort Rucker, Ala., a field research unit of George Washington University.

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position and flaring. I move to my position at far left, and finally we're on the ground. Number two man has landed slightly forward of the leader and 50 yards left. Staggered across the ridge, it's hard to see in the cockpit of other ships. Our troops are out and we sit on the ground for what seems an eternity. "Why doesn't he move off?" asks Walker excitedly. Finally, only number two lifts off and I follow, unsure of what happened or where we are going. In the excitement number two took off in the wrong direction.

There is the situation. What went wrong and how can we correct it? Luckily, it was a practice problem and our debriefing disclosed a comedy of errors. First of all, we determined that the leader cannot maintain control during radio silence when we spread out. Time is lost looking for and relaying signals. Confusion further developed when the leader couldn't develop enough power for takeoff. Number three was determined "hit" by umpires while waiting for the leader to take off. The end result: two aircraft lost on the ground, two lost in the air by going the wrong way.

Now you may say to yourself, "If I were leader I'd be on the ground 15 seconds, and when I go they had better be with me." That sounds fine in the ready-room but when you're out there earning your flight pay the hard way it's another story. You're not going to look back on takeoff at ol' Joe your wingman, whom you've been as close to as a brother for a year, and say, "Well, thats the way it goes" when you see him climbing out of a pile of smouldering rubble after landing. I haven't met an Army Aviator yet who doesn't consider himself his wingman's keeper, and I hope I never do.

That afternoon on the same problem we tried landing in a tight diamond formation. This eliminated several previous problems of signals, made it harder for artillery to hit us, kept the infantry together, and provided function as a unit rather than individuals. But what a hairy landing. Anyone landing in a tight formation has probably thought there must be an easier way.

To start with, we, in the 1st Aviation Company, are using CH-34s in elements of two, three, or four ships. We land in a diamond, vee, or echelon. It makes little difference which is used since spacing between blades is constant. When approaching final, a normal formation loosens up because each wants an extra margin of safety.

Reaching that point of glancing back and forth at the touchdown spot, manifold pressure and the leader's blades is akin to watching a tennis match. How can one pilot possibly concentrate on terrain features for a smooth landing when surrounded by several sets of whirling blades? There I sat, working like crazy doing several jobs while Walker sat hoping I wouldn't make a mistake. Before the next landing I instructed him to get on the controls at 50 feet from touchdown. I maintained our position in formation and let Walker concentrate on a recon of the landing point and perform the touchdown. The result was amazing. Our first two landings were slightly un-coordinated but as we accustomed ourselves to this easy driving we spread the word to others. After considerable practice by our group it was unanimously agreed we had found the reason for that second seat and controls in the cockpit.

When flying as right wingman the pilot on the left is flying the formation. The other is the touchdown pilot. On landing each knows there will be smooth stick pressure applied by the other and adjusts his movements to complete his portion in a smooth manner. This solution enables a pilot to comfortably perform a tight formation landing, without looking at the ground.

In a literary sense we have buried the copilot. Both men in our aircraft are qualified pilots, and with practice can function as a coordinated team, not only in general flying but during precision maneuvers such as this. Discussing this method with experienced Army Aviators from many units I believe we are original in its use. Safety-wise it is much easier to maintain both lateral and fore and aft spacing when sitting on the inside of the formation. Looking across the panel at your leader is not only hard on perception, but with a proper step-up you may lose sight of him on an inside turn. Pilot-copilot techniques should be practiced before attempting an actual formation landing. Normally the person maintaining position can make a fair landing unknowingly; the copilot ensures a smooth, safe one.

Beside the pilot's feeling more at ease and not getting ulcers, we accomplish our mission in a safer, more efficient manner. Six CH-34s can now be deployed in two vee's of three in the area we previously put four in. When ready for takeoff, the lead aviator need only look to his side for a "thumbs up" from wingmen, to verify both left and right are ready. Just one word of caution, don't try to see an up thumb when gloves are worn. All you'll see is a dark blur.

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as is indicated by the description in the article.

This article touches on a subject of wide interest and importance from the human factors point of view: *the determination of and training for crew duties in Army aircraft.* Less attention seems to have been paid to this area in Army Aviation than its importance warrants. Allocation of duties among crew members becomes more important as the equipment becomes more complex. For this reason, allocation of crew functions is becoming increasingly important to Army Aviation as we get more complex equipment, such as the Mohawk, Caribou, and Chinook.

However, we should also keep in mind that the simplest Army aircraft is part of a larger system, and that tactical use of even the O-1 necessitates some very important coordinations with other persons in order to accomplish the mission. For example, the division of duties between the observer and pilot in the O-1 can be just as important as that between pilot and copilot of the most complex aircraft system. In any instance, it must be kept in mind that allocation of functions and definition of jobs should be done in such fashion that we maximize the probability of accomplishment of mission by the larger system of which the aircraft and crew are a part.

What are some of the techniques used in defining crew duties? One point of view, which we will label as the "laissez-faire" method, states: "We do not define crew duties. We leave that for each pilot and copilot to work out for themselves in the manner that best suits them." This method has certain advantages and disadvantages. It allows the crew to work out techniques that seem "natural" to them. They can take advantage of particular skill-strengths of the individuals and avoid their skill-weaknesses (unless a weakness is common to both pilot and copilot).

On the other hand, it should be kept in mind that this is a trial-and-error method, and that success and error in flight techniques exist in varying degrees. Thus, particular crews of pilot and copilot may arrive at their unique or "natural" solution to division of duties in a fashion that may be successful only to a limited degree, or at least, to less than an optimal degree. Each of us adjusts to various demands in various ways, and with widely varying degrees of success. We have all discovered that our ways of doing things which we have followed for years may suddenly appear as inefficient when someone else shows us a different way. The thought "Why didn't I think of that?" is one which we have all had.

One obvious drawback of this laissez-faire method of allocating crew duties is that it may result in quite unstandardized ways of doing things. As a result, unit performance may vary widely from one unit to another, and it becomes more difficult to interchange crew members or to integrate new personnel into the system. At any rate, it is likely that there are more efficient ways of allocating crew duties than letting each individual crew go over much of the same ground that other crews before them have covered in trial-and-error fashion.

Another approach to allocation of crew duties is that characterized by statements such as: "This is the way we've always done it," or "Based on *my* experience, I think it should be done this way." In contrast to the laissez-faire approach, this method of determining SOP can be labeled as "authoritarian." It relies on the authority of an individual or the authority of tradition. Such an approach leads to the development of certain assumptions or dogma which may or may not be correct, and, more importantly, such assumptions or dogma may seriously limit our view of a particular problem. The result can be that our SOP or solution to the problem may be far from optimal.

For instance, in the example of formation flying and landing in the helicopter, if we make the assumption "Safety of flight considerations dictate that under no circumstances should two pilots share the flight controls," then the technique outlined in the article is not a possibility. We do not here argue pro or con on the validity of the above assumption. It is merely pointed out that assumptions limit, sometimes severely, the possible solutions to a problem which one might consider.

To maintain our tactics and techniques at the most efficient levels, we should examine or question our assumptions regularly and consider other alternatives that may appear as a result of different assumptions. The authoritarian approach is based on experience. However, it should be kept in mind that experience can be highly unique and idiosyncratic.

As weapons systems have become more complex, training personnel have observed that all too frequently the allocation of duties to system operators by the two techniques previously mentioned produces job descriptions that are well nigh impossible, or, at best, inefficient. For this reason we have seen in the last 20 years the development of the modern technique of job design.

This boils down to the question, "What tasks will be done by whom?" In other words, how can we best organize the necessary tasks into *job requirements for individuals* in the system?

Logically, design of a modern weapons system begins with the identification of the goals and functions of the system. Next, certain of these functions are allocated to machines and certain to the human operator. For the system to function, it is necessary that the human interact with the machine. (Although a wholly automatic, machine-controlled weapons system is possible, to the writer's knowledge none such is operational, though some approach complete automation.) This interaction produces the requirement that certain *tasks* be performed. Job design begins with consideration of detailed *task descriptions* and the environmental circumstances of time and space in which these tasks must be performed. The task description should contain the following information about the task:

- The instrument or thing which provides the operator with a cue or signal.
- The nature of the cue or signal which calls for a response.
- The control or equipment to be activated.
- The activation or manipulation to be made.
- The indication of response adequacy, or feedback.

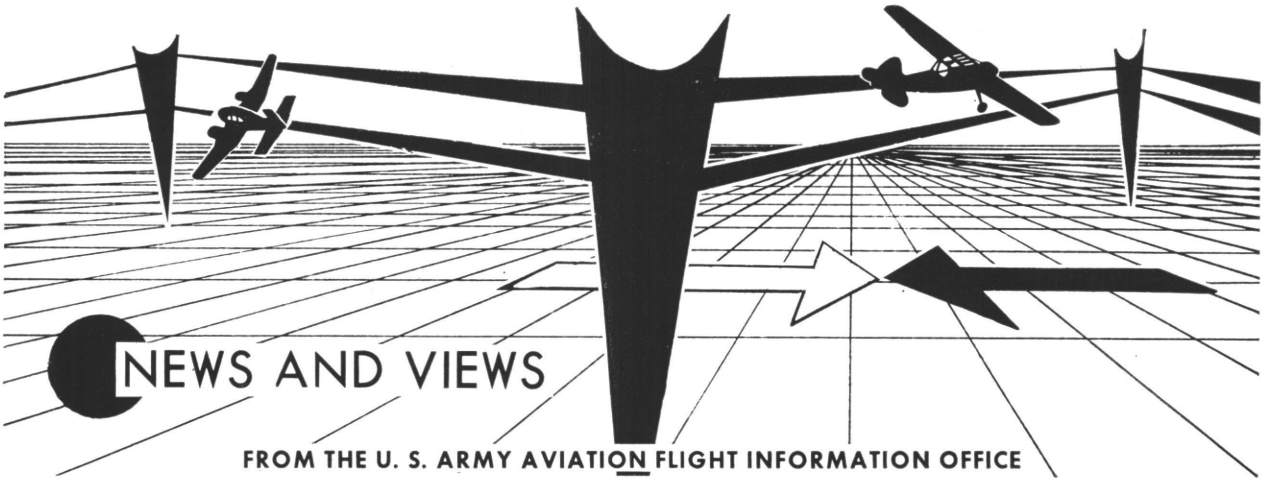
Assembling the detailed task descriptions and relating them to a time-line allows one to determine when peak perceptual and response loads occur, when particularly difficult or critical task behaviors are required, and what natural clusters or groupings of task elements occur. In this way we may "design" jobs to best fit the capabilities of the human to the task demands imposed by the man-machine interactions necessary to system functioning. Otherwise, we may find that arbitrarily defined jobs may produce less than desired system efficiency. The job design technique permits the job or position description to flow out of the required tasks and their best grouping, rather than having the tasks to flow out of an arbitrary job description.

How does all of this discussion relate to formation landing in the CH-34? The subject of formation landing illustrates the various possible approaches to job definition. To some extent, both the laissez-faire and authoritarian techniques have been used in assigning pilot and copilot duties. All too often when new techniques are suggested we find people arguing pro and con on the basis of their particular "authority" without seriously considering alternative solutions and without ever subjecting the technique in question to test. It is suggested here that the job design technique is a more efficient approach to this and similar problems.

Army Aviation is coming of age. Both the equipment and the mission are getting more complex. The approach which the Army takes to such problems as allocation of crew duties must be as efficient as possible if Army Aviation is to keep pace with and properly use the technological developments which have occurred and are continuing to occur in modern weapons systems. It is suggested that the following are needed to achieve this goal:

- *A systematic and scientific approach to training and tactical problems.* The problem of allocating crew duties was discussed here in terms of several older methods for such allocation and a newer, more systematic method. However, these general comments could be applied to problem areas other than allocation of crew duties.
- *An active, open-minded attitude on the part of individual Army Aviators, commanders, and training personnel to search for and examine new techniques and ways of doing things.* The constant questioning of our assumptions and consideration of as many alternatives as possible are central to such a state of mind.
- *A systematic means of testing and exploring those techniques which seem at all feasible.* We may never achieve the goal of "best-by-test," but at least we can achieve that of "better-by-test."
- *A means of disseminating results from the above three things.* Articles such as the one on control-sharing in CH-34 formation landings are good examples of this. It does us little good to develop or test a new technique unless we can spread the results of our experience and thinking to others. Persons who have ideas and have tried new things should take the trouble to share their experience.

The writing and publication of articles in publications such as the U. S. ARMY AVIATION DIGEST should be encouraged. However, those who do not feel that they have the time or the inclination for writing formal articles should be encouraged to write letters or comments on matters that pertain to tactics, flight techniques, safety, and training problems. Such comments are always welcomed by the Army Aviation Human Research Unit and the various instructional departments at the Army Aviation School. Feedback of this sort is very valuable to training research and school operation.



VFR Flight Following

WHILE THE filing of a VFR flight plan is mandatory in the Army, an FVFR flight plan, which requests flight following, provides a greater service to the VFR aviator. VFR Flight Following is intended to provide at regular intervals en route aviators with inflight reports of significant weather conditions and NOTAMs which may be encountered. These reports are specially prepared for the particular flight and cover information received since departure concerning communications services, status of radio aids to navigation, and weather conditions. Included also is information on airports which might be used by the particular flight.

To obtain complete inflight service, the aviator should file an FVFR flight plan and receive a thorough preflight briefing. In addition to a functioning two-way radio in the aircraft, the flight must be planned for more than one hour and "off time" reported to the FAA Flight Service Station serving the airport of departure. The route of flight must be planned so that suitable flight watch stations can be designated to which the aviator will report his progress. These flight watch stations are selected by the departure FSS approximately one hour's flying time apart and are identified to the aviator.

The Flight Condition Message, broadcast to the pilot by the FSS, is a brief summary of information significant to the particular flight and is prepared at the FSS 5 minutes before the estimated time of reporting. Included in the Flight Condition Message are SIGMETS or Advisories to Light Aircraft, PIREPS, ceilings below the cruising altitude plus 2,000 feet, visibilities of 5 miles or less, rapidly dropping barometric pressures or any below 29.00 inches, and variable winds at destination with peak gusts exceeding 30 kt. When any of these weather conditions exist, any pertinent forecast of worsening weather conditions is included or any change or amendment to a previous forecast.

When advisable, more favorable routes of flight are recommended. Available information concerning weather conditions in passes, ridges, and valleys of mountainous terrain or peaks along the route of flight are added, along with the latest available sky, ceiling, and visibility report of the next reporting station. NOTAMs are included and a reminder to contact the next flight watch or destination station.

By contrast, the en route aviator reporting under a VFR flight plan receives only the altimeter setting, SIGMETS or Advisories to Light Aircraft, if any, and replies to requests for pertinent information.

When the FSS has been notified of the "off time," a VFR Flight Notification Message is transmitted to the flight watch stations, information stations, and the station with which the flight plan is to be closed. The Flight Notification Message contains generally the aircraft identification and the information required in Section C of DD Form

175 plus, for an FVFR flight plan, time of departure and cruising altitude. The route of flight should be included for FVFR only if the actual route to be flown differs greatly from the most direct by airways, and the locations of the flight watch stations do not indicate the deviation.

Flight Advisory Messages, transmitted by the FSS to the pilot, are limited to conditions (such as destination area weather and status of airports and navaids) which may be hazardous to the operation of the aircraft and are originated by airfield operations, weather offices, or other competent military authorities or FSS facilities.

Information stations, in the case of Flight Following, are those along the route not designated as flight watch stations. Without Flight Following all stations along the route are information stations and do not perform a flight watch.

When a flight plan change en route is filed, such as a major route change or extension of en route time, the receiving FSS shall transmit appropriate information to the point of departure and to the old and, if appropriate, to the new point of destination. The ETA and fuel exhaustion time is computed by the FSS, receiving the change from the information received. A complete current file of inbound Flight Notification Messages is maintained by the destination FSS on aircraft destined for airports which the station serves. Generally, arrival reports are not transmitted unless no Flight Notification Message is on file.

When the aircraft does not arrive or report arriving within an hour after ETA or upon fuel exhaustion, the destination FSS initiates communications search (INREQ) and when necessary Alert Notice (ALNOT) messages. The INREQ is teletyped to all stations along the proposed route of flight and to the departure station. If the aircraft remains unreported, all FSS on the intended route of flight broadcast over a 2-hour period ALNOTs—details concerning the missing aircraft. The full facilities of search and rescue are activated if the aircraft is missing 3 hours after ETA.

The Exam-O-Gram is a training aid that covers specific operational situations and related aeronautical knowledge similar to those encountered in the examinations for FAA pilot licenses. They are, in effect, simulated flights, including emergencies and air traffic control procedures, and are considered of potential value to the professional airman.

FAA Instrument Pilot EXAM-O-GRAM No. 1

Reports from controllers and operations inspectors indicate the need for more thorough understanding of approach and landing procedures by applicants for the instrument pilot rating. Where radar is available, the pilot can become especially negligent about his own responsibilities. How would you cope with the following situation?

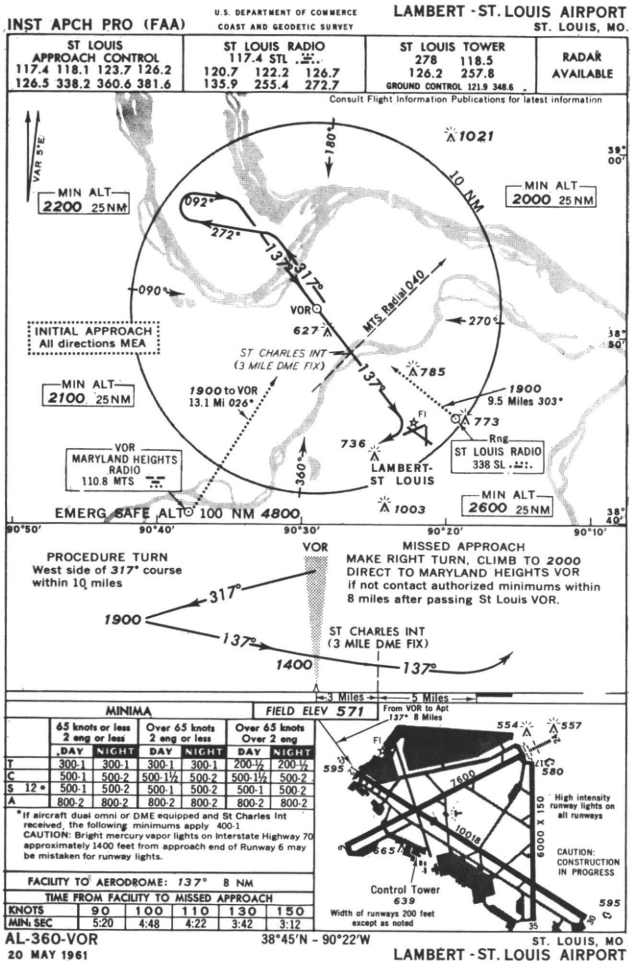
You are flying a light twin on an IFR flight plan to Lambert-St. Louis Airport, Mo. Your radio equipment includes two VHF transmitters, two omni receivers (108.0-126.9 mc.), an ADF receiver, and a marker beacon receiver. Before arrival at your clearance limit (STL VORTAC), you are cleared for an ILS approach to Lambert-St. Louis Airport, runway 24. Approach Control vectors you from the St. Louis VORTAC to the localizer course for a straight-in approach to runway 24 (see approach and landing charts). St. Louis weather is 500-1, wind 200°/10 kt. Approaching the Outer Compass Locator inbound, you are advised that the ceiling and visibility are now 400-1, wind 140°/20 kt, landing runway 12.

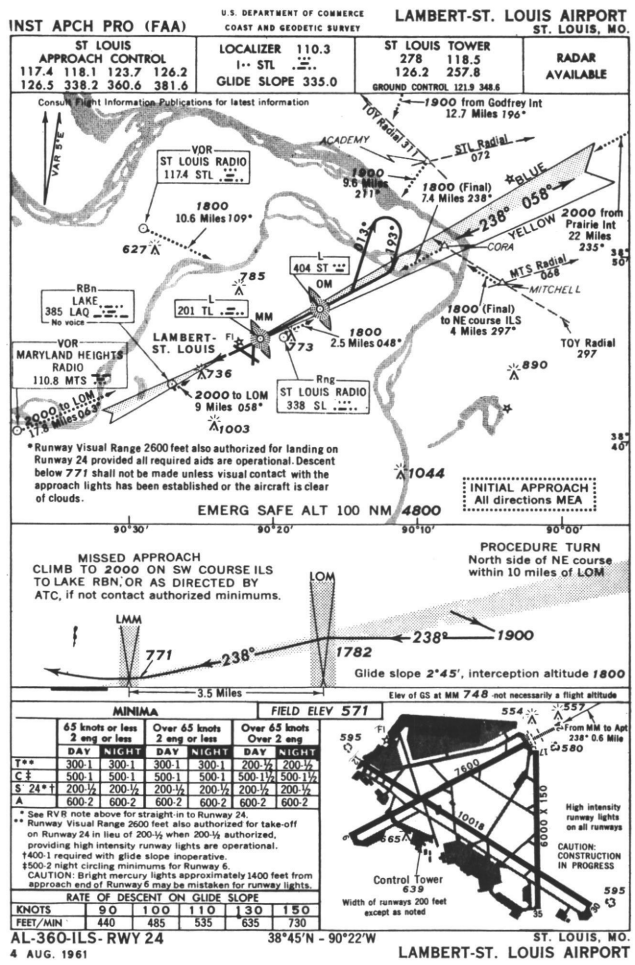
1. UNDER THE WEATHER CONDITIONS FIRST REPORTED, WERE YOU EQUIPPED FOR AN ILS APPROACH TO RUNWAY 24?

   Yes. With either VOR receiver you can use the localizer course.

2. WHAT ARE YOUR MINIMUMS FOR AN ILS APPROACH TO RUNWAY 24?

   Straight-in minimums are 200-1/2 (day minimums, over 65 kt, 2-eng or less). However, though cleared for a straight-in approach, you are not equipped with a glide-slope receiver. Thus your minimums are higher, 400-1.





3. HOW HAS THE WEATHER CHANGE AFFECTED YOUR MINIMUMS?

   Though the ceiling is not below your straight-in minimums, you must now circle to land on runway 12. The circling minimums to runway 12 are 500-1. With the ceiling reported at 400 feet, you cannot complete either a circling approach to runway 12 or a straight-in approach to runway 24.

4. WHAT IS YOUR CORRECT COURSE OF ACTION ON RECEIPT OF THE LAST WEATHER REPORT?

   a. Execute a missed approach and request clearance to your alternate or

   b. Request a radar vector for a VOR approach to runway 12. The AL chart lists 400-1 as straight-in minimums for aircraft *equipped with dual omnis* and receiving St. Charles Intersection. If you are faced with deteriorating weather and/or prolonged holding, request clearance to your alternate.

5. DOES THE ACCEPTANCE OF A RADAR VECTOR AFFECT THE PRESCRIBED MINIMUMS?

   No. It is the pilot's responsibility to determine whether approach and landing are authorized under existing weather conditions. You are informed of local weather conditions whenever the ceiling and visibility are at or below the highest circling minimums for the airport. If you violate the authorized minimums, the responsibility is your own.

The inherent duties of an Army Aviation assignment call for additional individual effort to achieve an effective

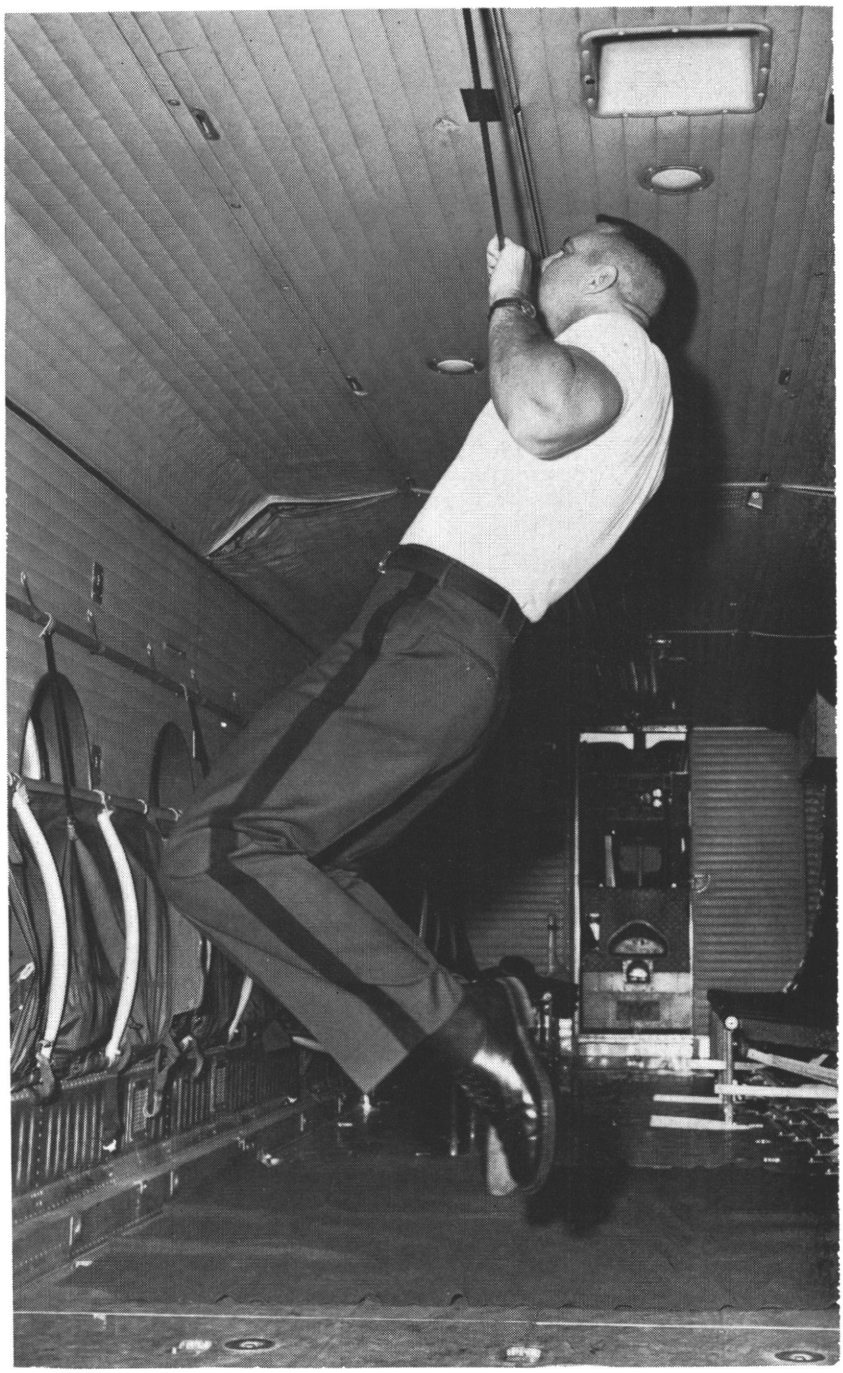
Physical Fitness Program

Capt Andrew N. Alford

EVERY CONSCIENTIOUS American soldier should realize that he has a responsibility to himself, his family, and his country to keep himself in a state of physical readiness for whatever demands may be suddenly placed upon him.

President Kennedy has said: "The knowledge that the physical well-being of the citizen is an important foundation for the vigor and vitality of all the activities of the nation is as old as western civilization itself. But it is a knowledge which today, in America, we are in danger of forgetting. We are rapidly becoming a nation of spectators. Many of us have a tendency to take our recreation passively instead of being active participants."

The new emphasis on physical fitness in our Armed Forces stems from a presidential direc-



"A well-nourished human being, in good physical and mental condition can tolerate a great deal before becoming incapacitated, and can recover satisfactorily from relatively severe disease or injury. Conversely, the individual in poor physiological condition quickly succumbs to the slightest adverse circumstances."

Colonel Spurgeon H. Neel, MC
SFS Surgeon

A former physical education major with extensive military coaching experience, Capt Alford is now assigned to the Fixed Wing Branch, Dept of Maintenance, USAAVNS. He is dual rated with approximately 1400 flight hours.

tive to the Secretary of Defense originated by C. B. (Bud) Wilkinson, Special Advisor to the President on Physical Fitness. It emphasized the obvious reason physical fitness is important in the military: *the man who is physically and mentally active is the best man for his country's uniform.*

In July 1961, Deputy Secretary of Defense Roswell L. Gilpatric issued a memorandum which read: "The importance of physical conditioning of our Armed Forces personnel is an essential element to combat-readiness and each service's training program must recognize and provide for that objective." The memorandum directed that the Armed Forces establish a clearly defined program to ensure the attainment of effective physical fitness. It directed that all personnel, except those excluded for medical reasons, be exposed periodically to tests.

As yet we do not have a physical fitness program geared to the needs of aviators. Tests have been administered, but what's happened to the *pretest conditioning program?* By testing aviators are made cognizant of the fact that they are in poor physical condition and that it's their individual responsibility to keep themselves physically fit. AR 600-160 prescribes that one-half day per week be devoted to physical conditioning, that officers should take exercise in the open air or well ventilated room regularly, and that not less than 2 consecutive hours of conditioning exercise should be taken weekly. Yet, this is not being done universally due to the pressure of other "more important" duties or procrastination.

Although flying requires very little vigorous muscular activity, a pilot must maintain a constant state of readiness in antagonistic or opposite muscle groups. This is necessary to produce the delicately coordinated control movements which are key factors for the accuracy and precision so important in flying, and which are dependent upon well coordinated responses in the muscles of the upper and lower extremities. Although no great amount of muscular activity is expended in flying our modern aircraft, nevertheless, flying does produce fatigue in the personnel who operate them. Susceptibility and reaction, as well as ability to recover from this fatigue, is influenced by the individual aviator's state of physical fitness.

The attainment of good physical condition by correct and adequate exercise is very important. An aviator in good physical condition will suffer less fatigue from a comparable amount and type of flying than one who is in poor physical condition. Exercise of an organism produces growth and strength; disuse results in atrophy and weakness.

HOW PROPER EXERCISE HELPS THE BODY

The goals of exercise are the development of a strong and vigorous body with efficient circulatory, respiratory and excretory systems to provide energy for activity and to remove its waste products efficiently. Muscle tone throughout the body benefits from regular training. The desirable effects are reflected in greater resistance to and more rapid recovery from fatigue, improved coordination and reaction time, better digestion and absorption of ingested foods, as well as improved bowel elimination.

Circulation of the blood supplies nutriment and oxygen to produce energy and rebuild tissues throughout the body, and removes the waste products produced by this metabolism. Physical training develops the muscular power of the heart along with the other muscles of the body. It has been determined that the heart of the *trained* man pumps more blood per minute with fewer strokes than does the heart of the *untrained* individual. In the *trained* man there is a rapid return to normal of the heart rate after exercise, while in the *untrained* person a considerably longer time is required for the return to a normal state. Thus with proper exercise, the circulatory system becomes more efficient, with an increased oxygen and nutriment transport, a reduced heart rate, a more stable blood pressure, and an overall beneficial effect upon the whole body.

Respiratory efficiency is also favorably affected. Physical training brings about well defined changes in the respiratory system and its functioning. Chest expansion increases, depth of breathing is increased and the rate of respiration is slowed.

In addition to the beneficial effects already mentioned, exercise provides the Army Aviator with an outlet for the tensions and worries that build up in the daily activities of flying.

DO IT YOURSELF CONDITIONING COURSE

The U. S. Air Force has adopted the Five Basic Exercises (5BX) plan originated by the Royal Canadian Air Force in 1952 and published in illustrated booklet form in September 1958. It will soon be distributed throughout the Air Force in Air Training Command pamphlets. The name 5BX stands for the five basic exercises used in the booklet. These exercises are scientifically designed to develop the *four major muscle groups* (biceps, triceps, abdominal, and

quadriceps—forepart of upper leg) in the body and the heart and lung systems.

The plan is designed so that exercises may be performed conveniently any time or place, alone or in groups. The individual determines his own rate of progress. The program is based on a graduated series of exercises and requires only 11 minutes a day. The whole idea is to increase the number of repetitions for a given exercise in the allotted time.

OUR LEADERS IN WASHINGTON SET EXAMPLE

The Air Force has at least made an attempt to establish a clearly defined program to ensure the attainment of effective physical fitness for its members, including its pilots. Whether or not this program proves to be an effective method of attaining physical fitness remains to be seen. However, the President participates very actively in a similar program. Dr. Hans Kraus of Kraus-Weber fame has prescribed for him a series of special resistive exercises. The President usually does these exercises at the time of his daily dip in the White House indoor pool.

Further evidence of the emphasis being placed on physical fitness by the President and the top members of his administration in Washington is the establishment of the Officers Athletic Center in the Pentagon, and the gyms in the Supreme Court building, the Senate and House office buildings, and other government buildings, including the one housing the Department of Justice. In fact the FBI gym in the basement of that building has been so overcrowded that the Attorney General (Robert Kennedy) recently authorized the outfitting of an all-weather outdoor gym on the roof. Here there are facilities for tennis, badminton, volleyball, and a special area for calisthenics and heavy exercise. It is possible for the Attorney General or members of his staff to walk from their offices to the gym, take a 20 minute workout, shower, and be back at their desks within half an hour.

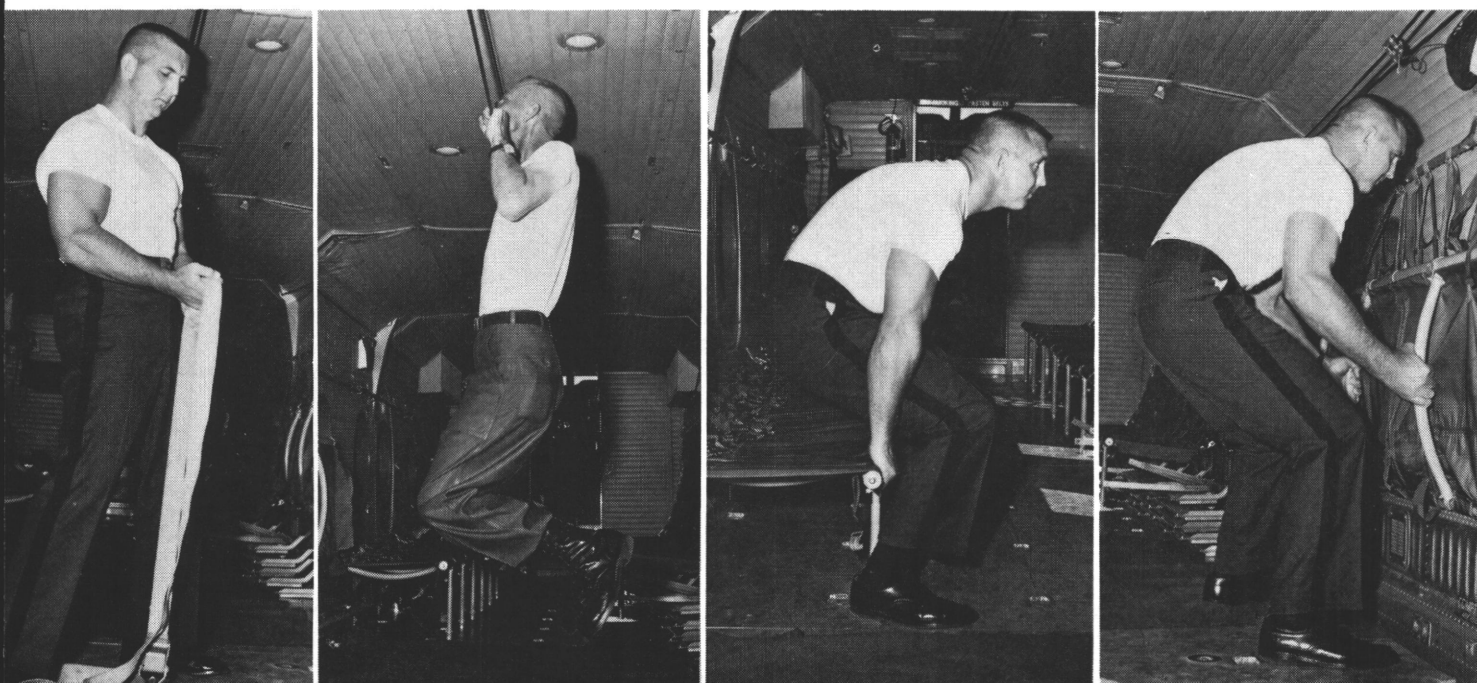
FACILITIES AVAILABLE

At almost all CONUS Army

When Capt Andrew Alford, who wrote the above article on physical fitness, became an Army Aviator he found that the inactivity associated with sitting in the cockpit of an aircraft caused muscular fatigue, even though he exercised diligently when not flying. To relieve this discomfort he has found ways to increase circulation in order to bring more oxygen to muscles and help prevent cramps.

Without leaving the cockpit, he relieves the neck muscles by extending his neck fully and relaxing it completely several times, repeating this procedure at convenient times during the flight. Shoulder muscles are relieved by a circular movement of his shoulder girdle. Discomfort in his legs is overcome by alternate contraction and relaxation of the quadriceps and calf muscles. Backache is relieved by the full extension and relaxing of the spine. He does these muscular contractions slowly, imitating the natural stretching which occurs almost automatically in people who have been asleep or in one position for a long time.

When flying the Caribou, Ot-



posts, camps, and stations a well equipped gymnasium is provided. Available are handball courts, basketball courts, volleyball courts, and weight rooms. In addition, at most installations Special Services provides a bowling alley, swimming pools, golf courses, softball fields, and tennis courts. All of these facilities are within easy access to aviators. These training facilities are available for an effective physical fitness program that the Army Aviator can gear to his own needs.

To the aviator in Europe the USAREUR Athletic Office provides a multitude of facilities and equipment for the American soldier, ranging from the elaborate Soldiers Field in Nuremberg, Germany, and the Kafertol Sports Arena in Mannheim, Germany, to the small company-sized gym on the border. Within the civilian populace of most European countries there is a tremendous amount of emphasis on physical conditioning for all age groups. Many civilian athletic clubs in these countries welcome the membership of the American soldier.

The 8th Army Athletic Office in the Far East also furnishes the American soldier with more than ample physical training facilities and equipment. The field house in Seoul, Korea, for example, is as well equipped as any major college gymnasium in the States today. The Japanese and Koreans take great pleasure in teaching the American soldier judo and karate.

RESPONSIBILITY OF AVIATOR

In most other overseas areas similar facilities are available. In remote areas, however, individuals may have to resort to calisthenics, locally fabricated pull up bars, weights, etc.

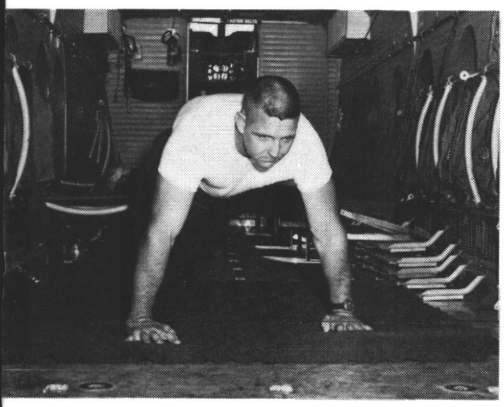
Training facilities *are* available for an effective physical fitness program that every Army Aviator can gear to his own needs. It behooves all of us for personal as well as patriotic reasons to pay heed to the importance of an effective physical fitness program. Start planning yours today.

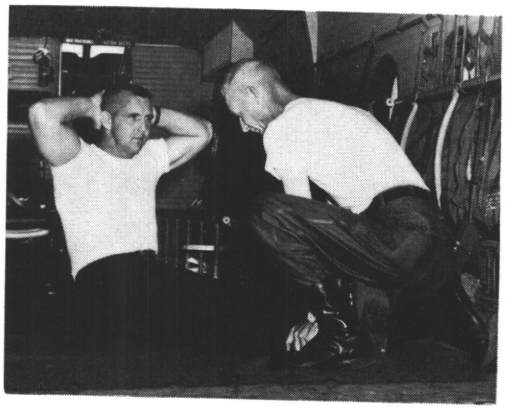
ter, or other aircraft where it is possible to leave the cockpit, Captain Alford and his flight crew use a series of exercises that can be performed in the cabin. Generally speaking, these exercises are in three groups.

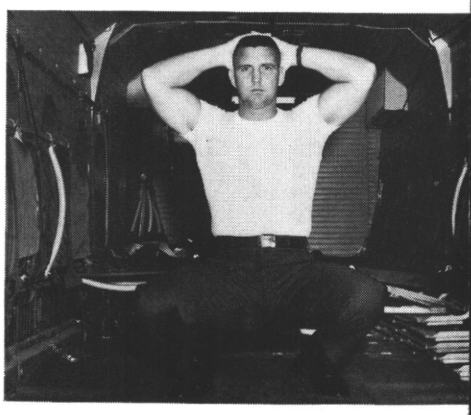
The purpose of the first group (below) is to exercise the upper body and get the blood circulating. The pushup being demonstrated by Captain Alford exercises the triceps (the major muscle group in the rear of the upper arms). Sgt Dexter H. Holland, who has flown many hours with Captain Alford, demonstrates the situp with him which exercises the abdominal muscle group.

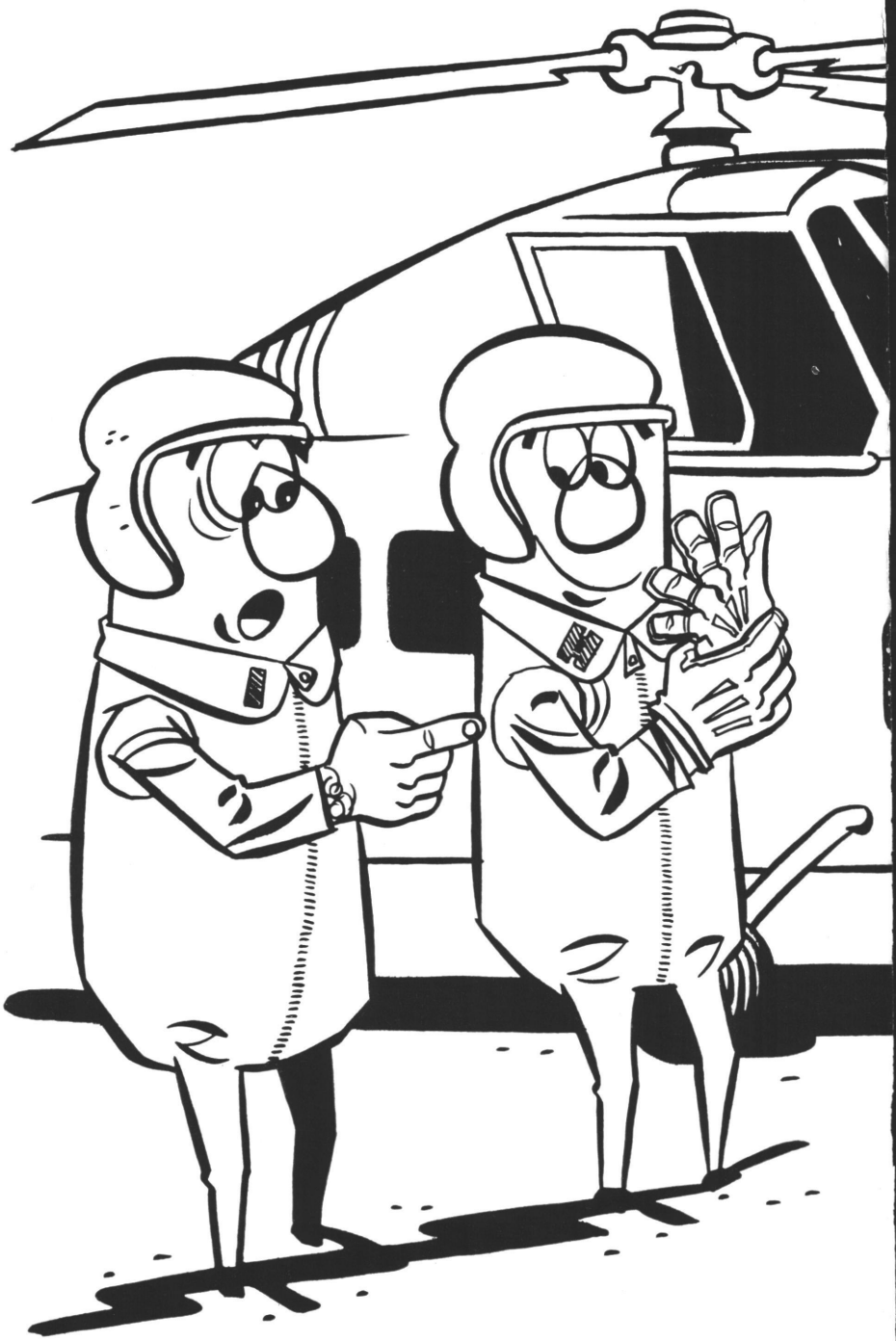
The second group of exercises is designed to help the lower body. One of the best for this is the deep knee bend. It exercises the quadriceps, a very large and powerful muscle occupying most of the front thigh.

The last group (opposite page) is designed to assist in the isometric contraction of the muscles. Isometric contraction is the muscular contraction taking place against resistance without significant shortening of the muscles and with marked increase in muscular tone. In the Caribou a strap can be used. The harder the pull, of course, the better. Or if straps are not available, seat bars or any other firmly tied down object can be used. Care must be taken not to damage the aircraft. Another method is to use the static line for pullups. In this the front part of the upper arm, biceps, is exercised.









PIGskin or YOURskin

James E. Coleman

"ME? WEAR GLOVES?" the young lieutenant exclaimed. "No, sir! I'm not going to fly with those clumsy things on until the regulations say I have to!"

The captain smiled as he listened. He slowly pulled his gloves on and started to board the Choctaw.

"If you knew what I know, you'd wear them," he answered softly. "Gloves are mighty good insurance in this business."

"You mean you wear those things in the hot summertime, too?"

"Sure do. They're as much a part of my equipment as this helmet."

These opposing views about wearing gloves are typical. Since no regulation requires the use of gloves, it boils down to this: Individuals who have been educated to their value as protective equipment wear them; others do not. Some of the reasons given

are: (1) too clumsy, (2) not available, (3) just something else to keep up with, or (4) if they're not required, they must not be important.

The question is, How important are they?

One way of measuring their worth is that some 23,000 aviators in our sister services have worn them for years on a mandatory basis. Both services operated for years without them, but repeated hand injuries finally resulted in the requirement to wear gloves. Their aviators were educated to these experiences, and gloves have now become a natural and accepted part of their protective equipment.

A Navy aviator recently interviewed in Norfolk, Va., said: "Fly without gloves? Never! They're almost as important to me as shoes. I'd feel lost without them."

An Air Force flight instructor at Craig AFB, Ala., had this to say: "I've worn gloves for the past 12 years. At first they felt awkward and I was 'all thumbs,' but this feeling soon went away. At Craig we wear gloves not only for protection but to set good examples for our students."

Some Army Aviators are wearing gloves of their own accord—many of them nonsupply types which they purchased themselves.

The reason for this, according to one aviator, is that the Army-issue flight glove is unsuited for use in the cockpit. Bulky and loose fitting, it does not readily lend itself to such delicate tasks as manipulating radio controls, closely spaced toggle switches and other controls.

Occasionally, an accident report on file at USABAAR shows where gloves have paid priceless dividends to the wearer. Unfortunately, because too few Army Aviators wear them, such examples are rare.

Here are some typical accident briefs where aviators who didn't wear gloves no doubt wish they had.

An OH-13 was practicing slope landings when the aircraft crashed and burst into flames. The pilot left the helicopter through the right door. He sustained first and second degree burns of the hands.

An O-1A on a flour bombing mission struck a tent, cartwheeled, and caught fire. Both occupants were taken to the hospital with second and third degree burns of the hands.

A CH-34 entered fog during a low-level flight, and an 180° turn was started to fly back to VFR conditions. The aircraft struck a wooded slope and the fuel tanks exploded. All personnel escaped through the flames and sustained injuries, including severe burns of the hands.

An OH-13 pilot was making an early-morning takeoff. The bubble fogged over and the aircraft crashed and caught fire. Result: injuries to the pilot, including second and third degree burns of the hands.

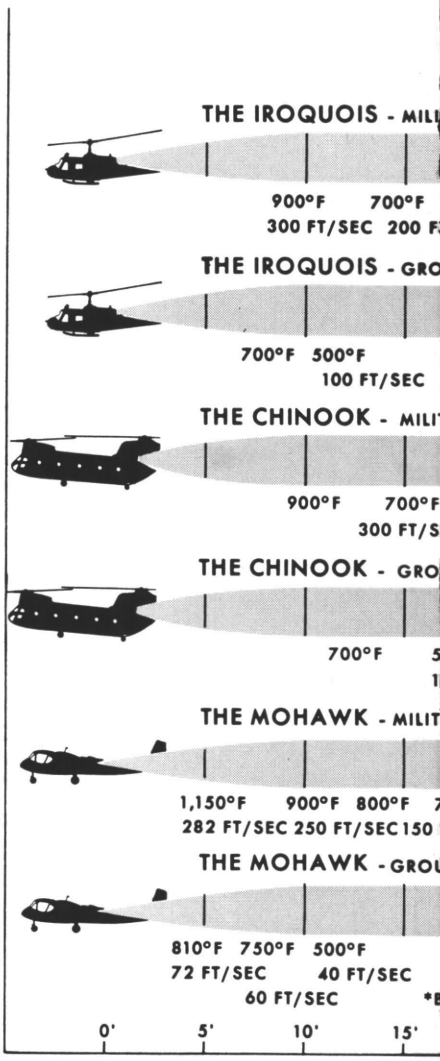
For each of these accidents, recommendations of the flight surgeon were similar: the use of gloves by all flying personnel was strongly urged.

The value of gloves as protection from hazards other than flames cannot be overlooked. There are known cases where crew members leaving crashed aircraft have sustained serious burns from touching hot metal during hurried escapes. Gloves also have been known to come in handy for putting out clothing fires.

During one accident in which the pilot was hurled through the front of the aircraft, a flight surgeon praised gloves for preventing injury to the pilot. "Because the pilot wore gloves," he said, "he prevented serious injury from jagged metal to one hand. Part of his glove was torn off instead of part of his hand."

A good set of human hands is at stake every time a pilot takes off without gloves. As one flight surgeon said following an accident, "I recommend that an Army regulation be written whereby all personnel flying regularly, whether for pay or not, be issued gloves by the unit supply officer. Personnel should be required to wear them during all flights."

Yes, AGAIN



I HAD JUST PUT away a large platter of those delicious Gulf Coast shrimp and was feeling mighty comfortable as I sat waiting for friends at Keesler AFB in Biloxi, Miss. The club reading room was cool and half-empty. I must have dozed off, for I awakened with a start when I heard someone exclaim, "What? Not again!"

The speaker was a young airman standing by the magazine rack.

"I bet," he told his companion as he thumbed through a safety magazine, "the Air Force has spent a million dollars telling us to keep away from jet intakes and blasts."

Well, I don't think the Air Force has spent a million dollars on this one area of safety; but that service is well supplied with jets, and the hazards of intakes and blasts have long been recognized.

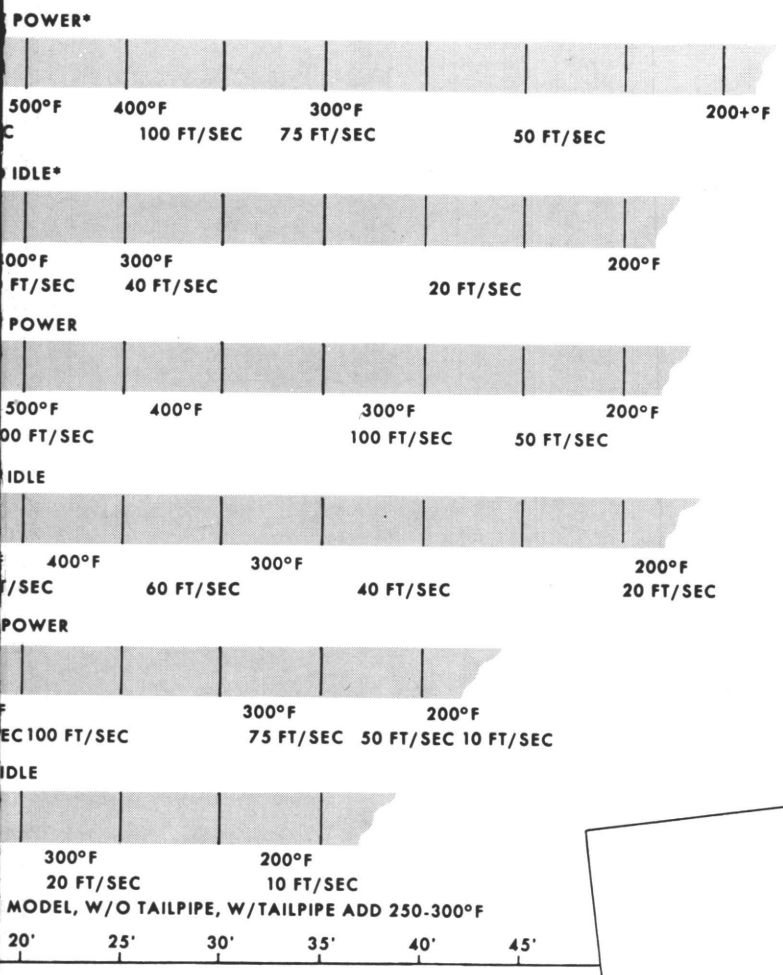
Up to now the Army has not had to worry much about this problem. Reciprocating engines have been the mainstay. But this situation is changing fast. The Mohawk, Chinook and Iroquois are powered by turbine engines. The new short takeoff and landing (STOL) tactical transport aircraft will use a turboprop. The new light observation helicopter (LOH) now being developed will use a gas turbine. The vertical takeoff and landing (VTOL) aircraft will most likely use pure jets.

Whether we realize it or not, Army aircraft have reached the jet age, and we are faced with jet-type problems. With turboprop motors, the intake does not cause much trouble. The presence of a prop, or blades whirling around at high speeds, is a visible danger and discourages accidents. Also the characteristic high pitch sound of turbines indicates danger areas. But the rear blast is another thing altogether.

Take a look at the above chart and you will see how great this danger really is. Forty feet behind the Chinook motors you have hurricane force winds with 300°F temperature. This is about the temperature my wife uses to bake a turkey, without the help of the searing winds. Five feet behind the exhaust of the Mohawk engines, the temperature of the air is 1,150°F. This is hot enough to melt numerous metals, including aluminum, magnesium, tin, zinc, and lead. It is almost hot enough to melt the gold ring right off your finger—if the finger doesn't disappear first.

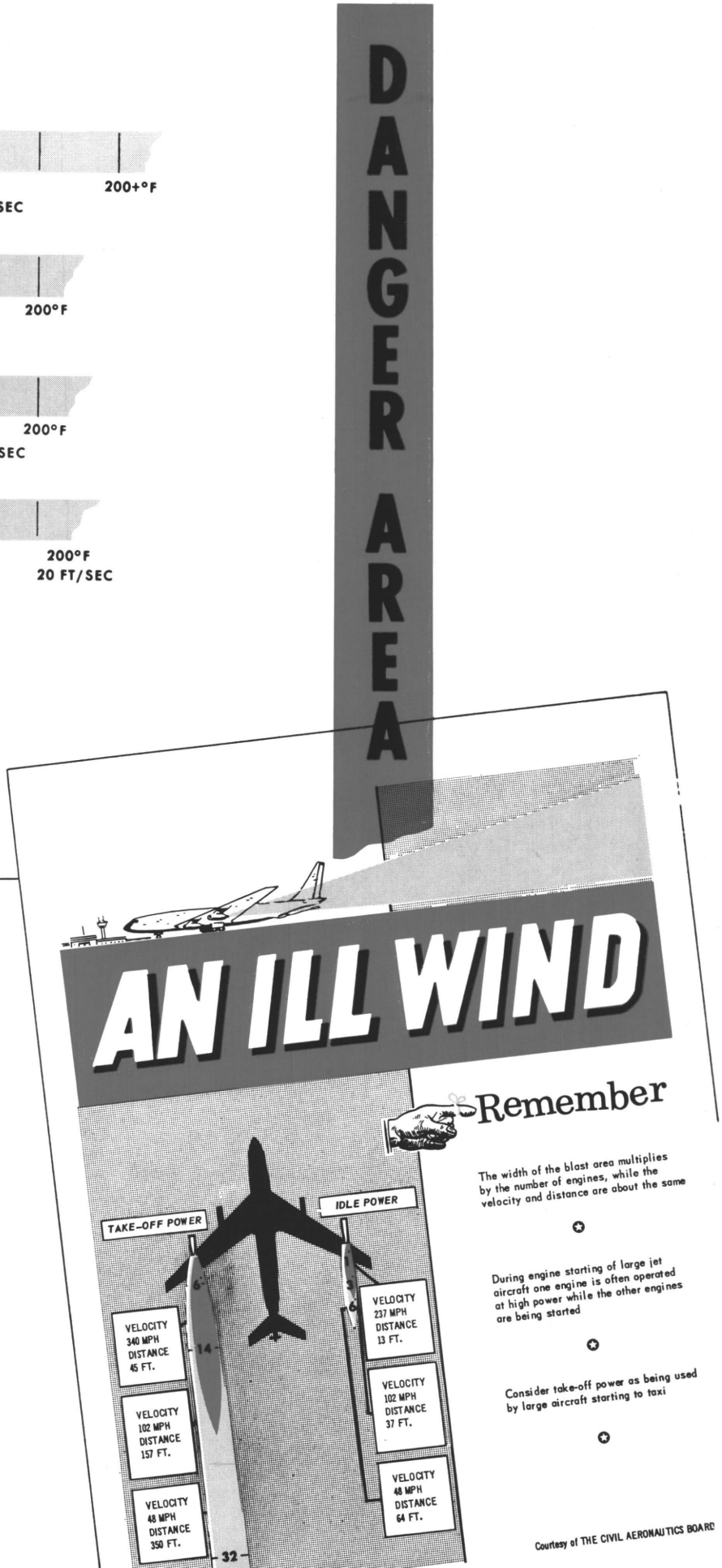
What it will be like around the VTOL aircraft is, of course, still not known. Present plans call for the airplane to have a jet thrust diverter system which will direct the jet blast downward. After the aircraft has gained altitude, the jet stream is diverted rearward and the aircraft moves forward. To land, the procedure is reversed.

While raising or lowering itself, the aircraft has a ground blast. Mixing with outside air is said to reduce the temperature of this blast from about 1,200°F to 300°F with a similar reduction in exhaust velocities, which will help reduce, but not completely alleviate, the danger from this quarter.



When the engines are first started and when conventional takeoffs and landings are made, they act as pure jets and direct high temperature gases rearward.

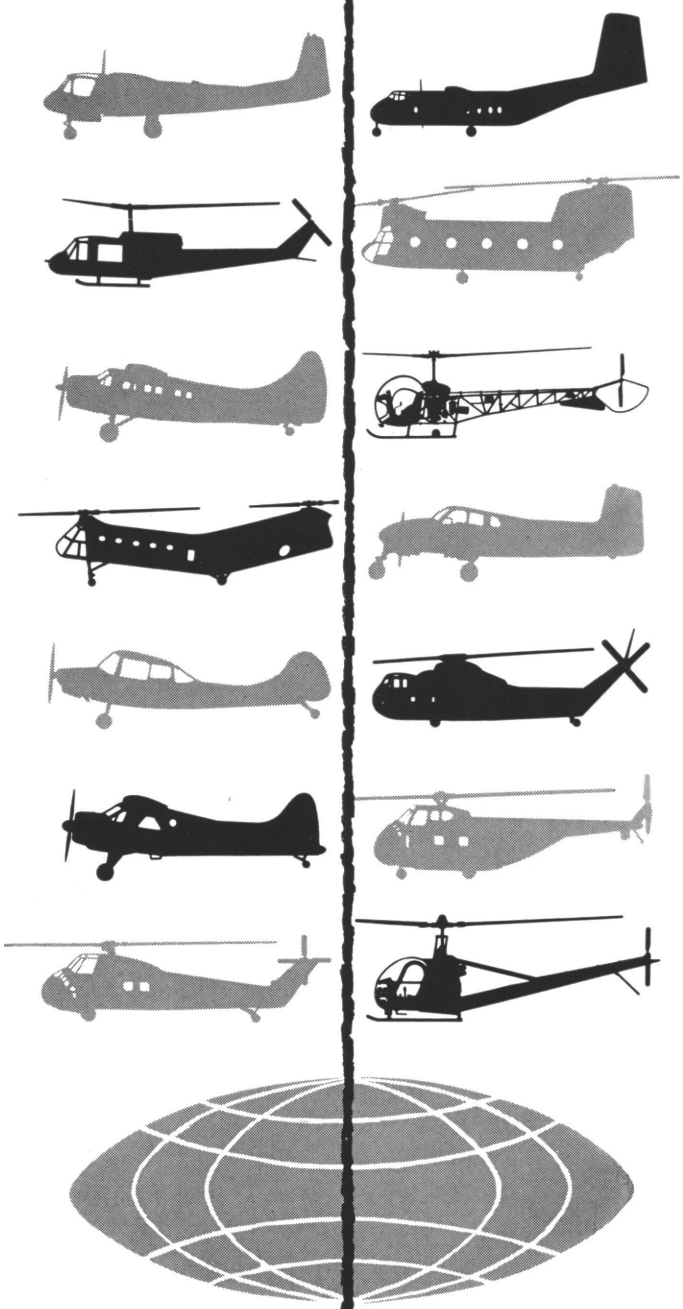
So the problem of jet blasts (and intake) is already becoming a serious one for the Army. In the near future it will be even worse. The answer? A well-rounded educational program to point out this danger to airfield personnel. Start with lectures. See to it that all personnel are familiar with those pages of -10 of the TM 55 series that deal with intake and blast effects. And then keep them reminded by posters, homemade if issue ones are not available. Emphasize the danger—again, again, and again.



prepared by
THE U. S. ARMY
BOARD FOR
AVIATION
ACCIDENT RESEARCH

TWX EXCERPTS

From Dec. and Jan.



UH-1A LOST COUNTERWEIGHT in flight. Sheared counterweight shaft struck 90° gear box and tail rotor blade causing incident damage.

OH-13E LOST RPM and settled with power over area of rocks and trees. Major damage to main rotor blades, tail boom, tail boom extension, and tail rotor assembly. Weather not a factor. No injuries.

OH-13G STRUCK TREE during low-level reconnaissance of road. Major damage to main rotor blade and aft cross tube. No injuries.

OH-13H LOST POWER in flight. Forced landing accomplished with no damage. Caused by oil on contact points of left magneto and binding of magneto drive shaft.

OH-13H ENGINE RAN ROUGH during test flight. Forced landing accomplished with no damage. Caused by failure of No. 6 cylinder. Excessive lead deposits found in cylinder and on piston. Suspect detonation caused cylinder failure.

UH-19D CRASHED during attempt to land on helipad to investigate accident of previous aircraft. Aircraft destroyed. No injuries.

UH-19D BECAME UNCONTROLLABLE during training demonstration hover with servos turned off. Right front gear struck ground and broke off. Major damage to landing gear and bulkhead. No injuries.

UH-19D ROTOR BLADE TIPS struck tree during takeoff from road strip. Incident damage to tip caps.

UH-19D CHIP DETECTOR warning light came on in flight. Forced landing accomplished with no damage. Two small steel particles, appearing to be pieces of a tang washer, found on magnetic plug of engine oil sump.

CH-21C CLUTCH went into "jaw" position during attempted manual engagement. Suspect malfunction of engaging tool handle. Incident damage to one blade of each rotor head.

O-1A CRASHED into trees during takeoff from field strip. Aircraft destroyed by fire. Pilot and instructor pilot sustained first and second degree burns on face and hands. Crosswind considered possible factor.

U-6A LANDED SHORT of sod runway. Major damage to landing gear, propeller, and left wing, plus sudden engine stoppage. No injuries. Weather not a factor.

UH-19D STRUCK TREE during maximum performance takeoff from confined area. Incident damage to tip caps.

CH-21C TAIL CONE STRUCK runway during practice autorotation touchdown. Incident damage to tail cone.

CH-34C FELL THROUGH during power recovery from practice autorotation and left strut collapsed. Aircraft was flown back to home base. Fuel leak was noted and pilot was advised to land. Engine failed approximately 3-5 feet from ground. Aircraft landed and caught fire. Major damage to main gear, tail wheel, pylon, undercarriage, fuel cells, and engine compartment doors. No injuries.

U-6A STRUCK WHEEL CHOCKS while taxiing on congested ramp. Incident damage to propeller tip and skin.

U-1A OIL PRESSURE DROPPED and cylinder head temperature rose, followed by severe engine vibrations and loss of power in flight. Forced landing accomplished with no damage. Undersurface of aircraft was covered with oil and No. 1 and No. 8 cylinders were cracked.

RU-9D ENGINES FAILED in flight. Aircraft destroyed. No injuries. Suspect frozen fuel lines.

U-6A ENGINE FAILED during letdown for landing. Forced landing accomplished with no damage. Caused by ice in fuel system. Ice found in main fuel filter, main fuel line, main primer line to primer manifold, engine driven fuel pump vent plug, and carburetor airbox. Aircraft, on ground for 21 days without refueling, was refueled 1 hour and 50 minutes before flight. Front and center tanks were used en route during flight. Switch to rear tank was made for letdown, and engine failed. Suspect water accumulation due to partially empty tanks and/or water pumped out of dispensing equipment during refueling.

OH-13H STRUCK WIRE during takeoff from hover over dry river bed. Control was lost and aircraft settled hard, coming to rest in level position. Aircraft destroyed. No injuries.

OH-13E FUEL EXHAUSTION occurred after 1 hour and 30 minutes of flight. Forced landing accomplished with no damage. Engine was operated with carburetor heat in full ON position and mixture control at full rich.

CH-21C LANDED TAIL LOW during practice autoration. Incident damage to tail cone.

OH-23D ANTITORQUE FAILURE occurred during hovering flight. Forced landing accomplished with no damage. Outer input shaft thrust bearing (P/N 306 RDF — refer to TM 1-1 H-23D-4, page 28, item 8-17) was installed backwards, causing improper bearing seating. Tail rotor gear box had 7 hours and 10 minutes since overhaul.

CH-34A STRUCK mound of snow-covered dirt while aircraft was hovering over heavy bank of snow. Incident damage to lower section of tail cone.

O-1A FLEW INTO TREE during low altitude bundle drop. Major damage to both wings. No injuries.

U-6A STRUCK SNOWBANK beside taxiway while en route to runup position. Major damage to right bulkhead, fuselage skin, tail section stringer, left elevator, horizontal stabilizer, and tail cone. Icy taxiway and snowbank considered factors. No injuries.

U-6A ENGINE FAILED momentarily in flight and throttle froze at approximately two-thirds open position. Forced landing accomplished with no damage. Main discharge nozzle in carburetor vibrated loose, jamming carburetor butterfly in open position. Suspect discharge nozzle was not safetied.

U-8D LANDING GEAR retracted during takeoff roll. Aircraft skidded to stop on underside of fuselage. Major damage to propellers, fuselage, and flaps. Suspect landing gear motor was activated by contact of two crushed wires. No injuries.

UH-1B CONTROLS STIFFENED and hydraulic system warning light came on in flight at altitude of 500 feet and airspeed of 100 knots. Forced landing accomplished with considerable difficulty and with no damage. Failure of servo sea (P/N 204-076-026-11 cylinder assembly) caused servo failure.

O-1A STRUCK WIRE during simulated bomb run. Incident damage to left wing, propeller, and whip antenna.

O-1E OIL PRESSURE dropped and oil temperature rose beyond red line during flight. Forced landing accomplished with no damage. Caused by materiel failure of oil pressure relief spring.

U-6A WENT OVER DIKE during takeoff and came to rest in ice-covered water. Caused by loss of directional control. Aircraft destroyed. Pilot sustained minor head injury. Crosswind considered possible factor.

crash sense

REPARED BY THE U. S. ARMY BOARD FOR AVIATION ACCIDENT RESEARCH

cough, s-p-u-t-t-e-r, quiet

A SHAWNEE, one of several assigned to a task force for a jungle exercise, had a mission to carry sling-loaded supplies from an airfield over the jungle to a unit in the field. This mission was assigned after the aircraft had flown for an hour. The crewchief checked the remaining fuel with a dip stick, found 75 gallons, and the aircraft was supposedly refueled with an additional 96 gallons.

One round trip to the field unit, requiring approximately 40 minutes of flight, was completed; then the aircraft picked up another load and started back across the jungle. Suddenly, the fuel quantity gauge began dropping rapidly and *the red warning light came on.* Deciding that the gauge and light had to be wrong, the crew continued the flight. Five to eight minutes later, the engine sputtered and

electric driven fuel pump, the fuel tank, and the carburetor were checked and found normal.

On questioning the crewchief, investigators were given this account of the refueling operation: The refueling tanker was driven to the side of the aircraft, and the crewchief took the fueling nozzle from the POL driver and placed it in the fuel cell opening. The driver went to the rear of the tanker and engaged the pump. When the tanker meter read 85 gallons, the crewchief called to the driver to stop the pump. As the pump stopped, the meter read 96 gallons. The crewchief did not stick the tank to determine the level of fuel after refueling, but accepted the reading of the tanker meter.

Before refueling, the Shawnee had 75 gallons on board. At a normal rate of consumption under load of 80-90 gallons per hour, 75 gallons of fuel would

died. The Shawnee was autorotated into a steep gully and crash-landed through trees and brush.

The pilot and copilot sustained back sprains, and the crewchief, the only other person aboard, escaped with a minor abrasion. Thanks to the orange flight suits worn by the crew, they were immediately spotted by rescue personnel. The aircraft, hidden in dense underbrush and trees, was very difficult to see, even though the exact location was known.

When the accident investigation board arrived on the scene, one of their first actions was to take a fuel sample and check the fuel level. The fuel tank was found to contain approximately 3 pints of fuel. An immediate check for evidence of a fuel leak was made. None was found. All fuel components, including the engine driven fuel pump, the

last for approximately 50 minutes. Since the first round trip required 40 minutes, it was apparent that 75 gallons of fuel were burned before the engine stopped.

The investigators questioned the POL tanker driver, who stated that the refueling had been accomplished in the normal manner. However, several discrepancies were noted as to the amount of fuel he actually had aboard the tanker and the behavior of the tanker meter.

The next step was to test the tanker meter. This was done in the following manner:

1. Fuel was pumped from the vehicle until the tank compartment was empty. During this procedure, the gasoline meter was under constant observation, and it functioned in a normal manner.

2. When the tank compartment was empty, the gasoline meter continued to register that fuel was being dispensed, though no fuel passed through it.

The following was extracted from the crewchief's statement:

"At approximately 1030 hours, we started the aircraft and moved to the sling load area to start the mission. After the first ship got its load hooked up, we moved in and got ours, then made one trip to the unload area and returned to pick up load number two. At this time I told the pilots that I would stick the fuel, as they had told me before the mission that we would do this before each flight. I didn't receive a reply from either pilot, so didn't repeat, and did not stick the fuel.

". . .After approximately five minutes of flight, the pilot informed me the fuel quantity gauge was dropping and that the 20 minute fuel light had come on. From his description of how fast the needle had dropped, I determined that the fuel quantity [gauge] was inoperative or inaccurate and told him to disregard the gauge.

"At this time, the pilot unscrewed the warning bulb. After approximately five minutes more flight, the pilot told the copilot and myself we were going to run out of gasoline if the fuel quantity indications were right. After another three to five minutes, the aircraft engine coughed once. At this time, I released the sling load and the engine stopped."

Another Shawnee pilot was called to make an emergency flight to a civilian hospital to pick up a critically injured military patient and carry him to a mili-

However, I was falling short, so I turned toward another small clearing, but hit trees attempting to make the area. Just prior to contact with the trees, I cushioned the landing by pulling collective pitch and flaring the aircraft."

The Shawnee settled through the trees and came to rest on its right side. There were no injuries.

A third Shawnee pilot was assigned a flight to deliver an aircraft to a dock for defueling and preparation for overseas shipment. Aboard were the pilot, a copilot, and three passengers. Five minutes before landing on the dock, *the red fuel level warning light came on.*

tary hospital. Here is his description of the flight:

"We departed for the civilian hospital at 1940 hours, picked up the patient and orderlies, and proceeded to the military hospital. I could not locate the landing area and circled for approximately ten minutes. I contacted a nearby tower and they directed me to the area.

"One minute before touchdown on the baseball diamond beside the hospital, *the fuel warning light came on.* I shut down immediately after touchdown and both the crewchief and I made a physical check of the fuel. With the use of a graduated stick, we were able to determine we had 35 gallons. I made a computation and determined we had sufficient fuel to get home and allow a reserve.

"Eight minutes after starting the aircraft, we were at 1,300 feet over a town when the engine sputtered and died. I went into a 180° autorotation to avoid touchdown in the town and attempted to land in a clearing.

After landing, the crew were informed the aircraft would have to be repositioned on another dock. A takeoff was made and the engine failed at an altitude of less than 100 feet. The pilot only had time to flare and pull pitch. As the aircraft settled into the water, he rolled it to the right to shed the blades. Crew and passengers escaped uninjured, and the Shawnee sank to the bottom.

Three accidents, three injuries, and $400,000 in aircraft damages because three pilots wouldn't believe what a bright red light was trying to tell them.

In each case, the fuel gauge was known to be inaccurate and reliance could only be placed on a dip stick. Yet, when the fuel warning light, **which is activated by the needle of the fuel quantity gauge,** came on, they expected to be able to fly for at least another 20 minutes.

Here's what the -10 has to say about it:

WARNING

"MALFUNCTION OR INCORRECT CALIBRATION OF THE FUEL QUANTITY GAUGE WILL RESULT IN A MISLEADING INDICATION BY THE FUEL RESERVE WARNING LIGHT, SINCE THE LIGHT IS ACTIVATED BY THE POINTER ON THE FUEL QUANTITY GAUGE. . ."

And here's what AR 95-2 says:

"WHEN AN AIRCRAFT IS CLEARED VFR, SUFFICIENT FUEL MUST BE CARRIED TO REACH THE DESTINATION WITH A MINIMUM REMAINING FUEL RESERVE OF 30 MINUTES AT NORMAL CRUISING SPEED."

USABAAR records show a decided upswing in fuel exhaustion accidents in the past two years. During the 1959-1960 period, nine major accidents were caused by fuel exhaustion. In the two-year period that followed, 17 major accidents and two forced landings without damage came from the same cause. Fuel exhaustion is simply a high toned way of saying, "They ran out of gas."

Red is the universal color for danger, whether it's a light on the panel, a mark on the fuel quantity gauge, or in your wife's eye after a late poker session. We can't help you with your wife, but we can tell you the only way to avoid the other reds. It's

FLIGHT PLANNING

OH-4A Prototype Airborne

FIRST LIGHT observation helicopter (LOH) to fly is Textron's Bell Helicopter Company Model 206, prototype of Army's turbine-powered, four-place OH-4A. Pilots remarked on the helicopter's excellent control response, hovering stability and near-zero vibration level.

One of three LOH designs (DIGEST, July 1961 and January 1962) under development for Army flight evaluation and production, the OH-4, flew two months ahead of schedule. Exhaustive company ground and flight tests are going on prior to FAA certification trials. The first of five commercially certificated production models will be delivered to U. S. Army Materiel command in late 1963 for competitive flight evaluation against entrants of the Hiller Aircraft Corporation and the Hughes Tool Company, Aircraft Division. Army planners say winner of evaluation may receive an estimated $200 million production contract for approximately 3,600 aircraft.

PHOTO COURTESY BELL HELICOPTER COMPANY

The Army Aviation Story

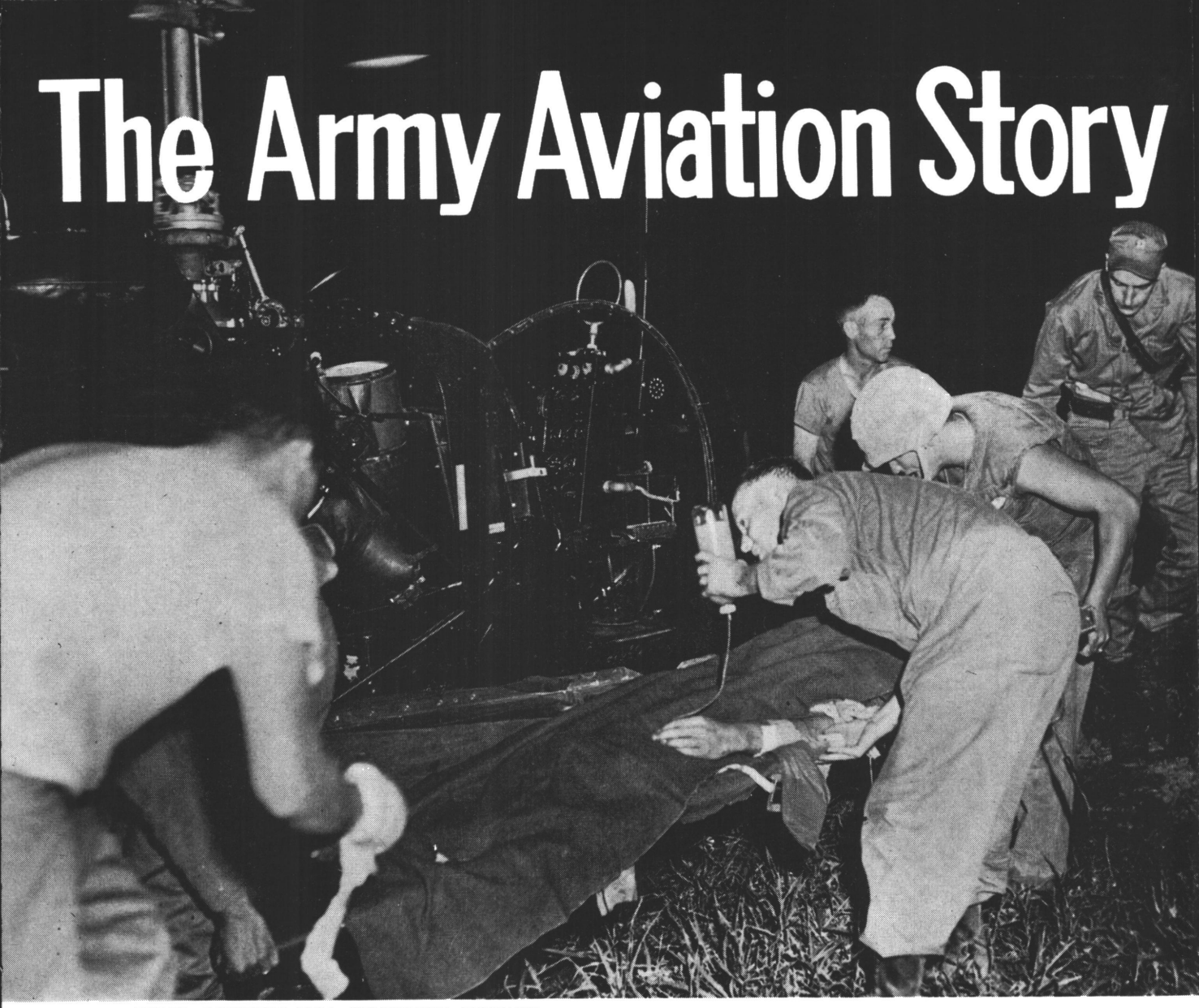


PHOTO COURTESY BELL HELICOPTER COMPANY

Part IX, Medical Evacuation

Col Spurgeon H. Neel and Maj Roland H. Shamburek

This is the final chapter in The Army Aviation Story. The nine-part series started in June 1962 to commemorate the 20th anniversary of Army Aviation. Over a year of research, interviewing, and cross-checking of material to ensure accuracy, plus innumerable rewrites preceded publication. This is the most comprehensive treatment of the subject to date. Admittedly, some discrepancies exist, but we trust that our readers will continue to channel into our office pertinent authentic data which will complete the story.

CRITICALLY wounded PFC Gene A. Thaxton didn't realize it, but as he was being carried down the back side of a battle-scarred Korean hill in early 1952, a helicopter was already en route to evacuate him. Within minutes he was being administered whole blood at an aid station bunker directly behind the front line. Almost simultaneously Capt Hubert D. Gaddis arrived in his H-13, picked up Thaxton, and immediately left for a Mobile Army Surgical

Hospital (MASH).

Captain Gaddis had fastened the bottle of whole blood to the inside of the helicopter and continued to administer blood during the flight. Thaxton lay in an evacuation bag in an externally mounted litter and was shielded from the biting wind by a transparent pod covering his head. In less than half an hour he entered surgery, still receiving blood from the same bottle the battalion medical officer had started at the front.

Later Thaxton had some well deserved praise for medical evacuation helicopters and the men who flew them. "They're pretty wonderful..." he recalled from his hospital bed. "I guess they've saved a lot of lives—I guess they've saved mine."

This is a true story, and, while it is no more or less representative than thousands of others, it is significant in that Thaxton was the 10,000th helicopter evacuee of the Korean War. Indeed, the Army's concept of frontline aerial evacuation of casualties had come a long way, but it had also traveled a long, rough road since the early 1900s when it was not only considered mechanically impossible but also militarily unfeasible.

THE FIRST EXPERIMENTS

In 1910 appeared the first known report of an aircraft equipped for the transport of patients. Captain George H. R. Gosman and Lt A. L. Rhoades, both Army officers at Fort Barrancas, Fla., modified at their own expense and flew an airplane for transporting patients. Captain Gosman reported their findings, hoping the War Department would authorize funds for further improvements and recommend such aircraft for the transportation of medical supplies and patients. However, he was unable to arouse any interest. Two years later the Surgeon General recommended to the Secretary of War that specially modified aircraft be used for such purposes, but this proposal was similarly denied because airplanes were not considered to be sufficiently improved.

During World War I the airplane was used spasmodically to evacuate patients. In 1918 Maj Nelson E. Driver, Medical Corps, and Capt William C. Ocker of the Air Service converted a JN-4 (Jenny) into an airplane ambulance, which was used principally for return of patients from aircraft accidents. Usually the flight surgeon would fly out to a crash site with the "Jenny" pilot. There he would do what he could for the patient and help load him into the "Jenny." Then while the patient was being flown out, the surgeon would wait for either ground or air transportation.

In 1920 the first Army plane with a fuselage designed primarily for transportation of sick and wounded was built and flown at McCook Field, Ohio. This was a DH-4 model and carried a pilot, two litter patients, and a medical attendant. Several of these were used in operations on the Mexican border.

The Medical Field Service School at Carlisle Barracks, Pa., also experimented with aircraft for use in patient evacuations when in 1936 it field tested an autogyro as a forward evacuation vehicle. However, the idea was discarded, due more to engineering and budgetary reasons than for any defect in the basic concept.

In World War II the transportation of casualties within the forward combat zones was seriously limited by the availability and capabilities of existing aircraft. This is not meant to minimize the use made of converted L-4 and L-5B aircraft in the transport of casualties; rather it is to emphasize that it was not until the development of the helicopter that it became feasible to regularly evacuate wounded from the most forward installations.

In early 1943 a proposal to organize helicopters into air ambulance units was submitted to the Air Surgeon. But personnel involved could not reach a decision on whether to transport patients internally or externally in pods. The urgent wartime need for materials for other purposes caused this project to die a slow death.

However, units in combat soon discovered the helicopter's potential as a medical evacuation vehicle. On 3 May 1943 Col Philip D. Cochran, commander of the 1st Air Commando Group at Hailakandi, India, reported that his unit was using a two-place helicopter [R-4] daily to evacuate casualties from columns fighting in North Central Burma. This is the first known use of the helicopter for medical evacuation, certainly from behind enemy lines.

The first helicopter evacuation accomplished by Colonel Cochran's unit occurred late in 1942 or early in 1943 [exact date unknown] when a light airplane was forced down behind Japanese lines. The pilot and three casualties he was evacuating were not injured. A message was dropped to the group informing them to burn their aircraft and climb a nearby ridge, where food and supplies were dropped.

Realizing it would be impossible to rescue the group by light airplane, Colonel Cochran called on his helicopters. An R-4 was sent from Lalukhet, India, to Jorhat, Ledo, and Taro [India], the latter a base for light plane operations in North Burma. At Taro the R-4 was fitted with an L-5 gasoline tank and then flown non-stop across the mountains to a forward base about 25 miles from the downed group.

Another message drop instructed the isolated men to make their way to a rice paddy, from which the helicopter rescued them one by one. Thereafter the R-4 was placed in regular use as a medical evacuation vehicle in that area, and in the next several days 18 missions were flown.

Although designed to carry only one passenger, R-4s in North Burma evacuated two at a time; it also accommodated stretcher cases, which were carried on the outside of the fuselage. In May 1943, Colonel Cochran stated, "We want people to know that it's not just a stunt. It really works. Just imagine what we could do with a couple hundred of them [R-4s]. . . ."

SLOW GROWTH

Between World War II and the Korean War only occasional use was made of reconnaissance and utility aircraft for medical evacuation; procedures and modifications were developed on a local basis. There was no real organized aeromedical evacuation capability, due largely to the absence of the stimulus of active combat. Extreme competition for the limited organic air support available pushed medical evacuation well down the priority ladder when requested for training and field exercises. In essence, air evacuation was limited to that provided by Air Force elements located near or adjacent to Army troop concentrations.

Finally, the National Security Act of 1947 (and subsequent documents clarifying roles and missions) made the Army responsible for

> "Aeromedical evacuation within the Army combat zone to include battlefield pickup of casualties (except those from an airhead or airborne objective area which is supported by Air Force air landed logistical support), air transport to initial point of treatment and any subsequent moves to hospital facilities within the Army combat zone."

These words provided Army Aviation with the frontline medical evacuation mission, but at that time the hardware needed to effectively perform this mission still had to be procured.

By 1949 helicopter development had progressed to the point that several types of helicopters became available to the Army for field testing. In the summer of that year a board was convened at the 82d Airborne Division, Fort Bragg, N. C., in conjunction with Army Field Forces Board No. 1 to conduct tests and make recommendations relative to medical evacuation by helicopter. The test vehicle was an early Sikorsky H-18 helicopter with forward clamshell doors. It was capable of transporting two internal litters and a medical attendant in addition to the pilot. After extensive tests, this board concluded that helicopter evacuation was both feasible and desirable, and it made specific recommendations concerning further development.

Organized use of helicopter ambulances and the development of a real aeromedical evacuation capability by the Army was delayed until the onset of war in Korea in mid-1950. The helicopter had been accepted as an organic vehicle by the Army, and the stimulus of active combat reawakened command interest in the evacuation of battle casualties. Korea is considered the beginning of Army aeromedical evacuation.

The origin of helicopter evacuation in Korea was not the result of any preconceived plan; it was more the result of expediency (a most common cause of military progress). During the early days of the war (June 1950), helicopter detachment F [H-5s] of the Third Air Rescue Squadron (USAF) began to receive requests from forward ground elements for the evacuation of patients from areas difficult to reach by ground vehicles. Inasmuch as this unit was not fully occupied with its primary mission of rescue, it responded to those calls and flew many heroic sorties. By August 1950, this detachment was answering so many calls that it found itself in the medical evacuation business.

Quick to note the advantages of helicopter evacuation in the mountainous Korean terrain, the Eighth Army developed a keen interest in the operations of this Air Force helicopter detachment. On 3 August 1950,

Army and Air Force representatives tested the concept of helicopter evacuation in the school yard of the Taegu Teachers College. As a result, the Army accepted helicopters for aeromedical evacuation and developed the first procedures to use. Shortly thereafter, the Surgeon General of the Army (then on tour of the Korean theater) urgently requested Department of the Army to send a substantial number of helicopters to Korea for use in medical evacuation. Simultaneously, a senior representative of the Surgeon General of the Navy urged that helicopter landing pads be constructed on the fantails of all Navy hospital ships to allow aerial evacuation direct from the battlefield.

In November 1950, the Second Helicopter Detachment arrived in Korea to be used for medical evacuation. Initially assigned to the 47th Light Aviation Maintenance Company at Taegu, members of this unit spent the remainder of the year assembling their newly arrived H-13s. Since the aircraft were not equipped to carry external litters, the group obtained Stokes litters from a Navy hospital ship and modified and mounted them on their H-13s to externally carry patients. On 1 January 1951, the Second Helicopter Detachment became operational and flew from Taegu to Seoul, where it was attached to the 8055th Army Unit.

Credit for the first Army helicopter evacuation in Korea is shared by 1st Lts Willis G. Strawn and Joseph L. Bowler. On 3 January 1951 Strawn and Bowler flew their H-13s from Seoul to an area about 60 miles northeast of Seoul. Each picked up one wounded American soldier and returned to an Army hospital at Seoul.

The Second, commanded by Capt Albert C. Sebourn, actually received its first baptism of fire on 14 January when its four pilots and four H-13s evacuated 23 critically wounded soldiers from a surrounded battalion. Despite enemy small arms fire, in 2½ hours all of the wounded were evacuated 25 miles. The four pilots who flew this mission —Captain Sebourn and 1st Lieutenants Bowler, Strawn, and Joseph Hely—were later each awarded the Distinguished Flying Cross for their work in Korea.

Late in 1951 Lieutenant Bowler established a Korean War medical evacuation record. In 10 months he had accomplished 824 medical evacuations in 482 sorties. One year later at the Army Medical Field Service School at Fort Sam Houston, Texas, Lieutenant Bowler met Lt William P. Brake, an old friend and rival who was en route to Korea. Brake, who arrived in Korea in March 1952, vowed that he would remain until he broke his friend's mark of 824 evacuees. It became necessary to extend his stay, but Lieutenant Brake flew his 824th and 825th evacuees on 22 April 1953. He decided to remain in Korea until he reached the 1,000 mark, but on the morning of 14 May 1953 Brake flew his 900th evacuee in the Chorwon area and decided it was time to go home. While establishing this record he flew 545 missions and accumulated 700 hours.

In January 1951, the Third and Fourth Helicopter Detachments arrived in Korea with minimum operating personnel and four H-13 aircraft each (see box). In February 1951 the First Helicopter Detachment arrived. At that time all helicopter detachments used for medical evacuation were assigned to the 8085th Army Unit, Eighth Army Flight Detachment. They were attached to forward surgical hospitals, but were under the operational control of the Eighth Army surgeon.

The early days of these helicopter evacuation detachments were quite stormy, reflecting the chaos of Korea in early 1951. The Fourth Helicopter Detachment suffered a complete breakdown of all its aircraft and was returned to a rear area for reequipping. It did not become operational again until March 1951. The First Helicopter Detachment never became operational. The three operational detachments, despite recurrent maintenance problems, especially shortages of high octane gas and inadequacy of spare parts, performed exceptionally well. With only eleven reconnaissance helicopters, the detachments evacuated 1,985 patients during the first six months of 1951. This record is even more remarkable when it is realized that only one or two patients could be evacuated per sortie.

In May 1951, all helicopter

THE ORIGINAL THIRD & FOURTH HELICOPTER DETACHMENTS

Third

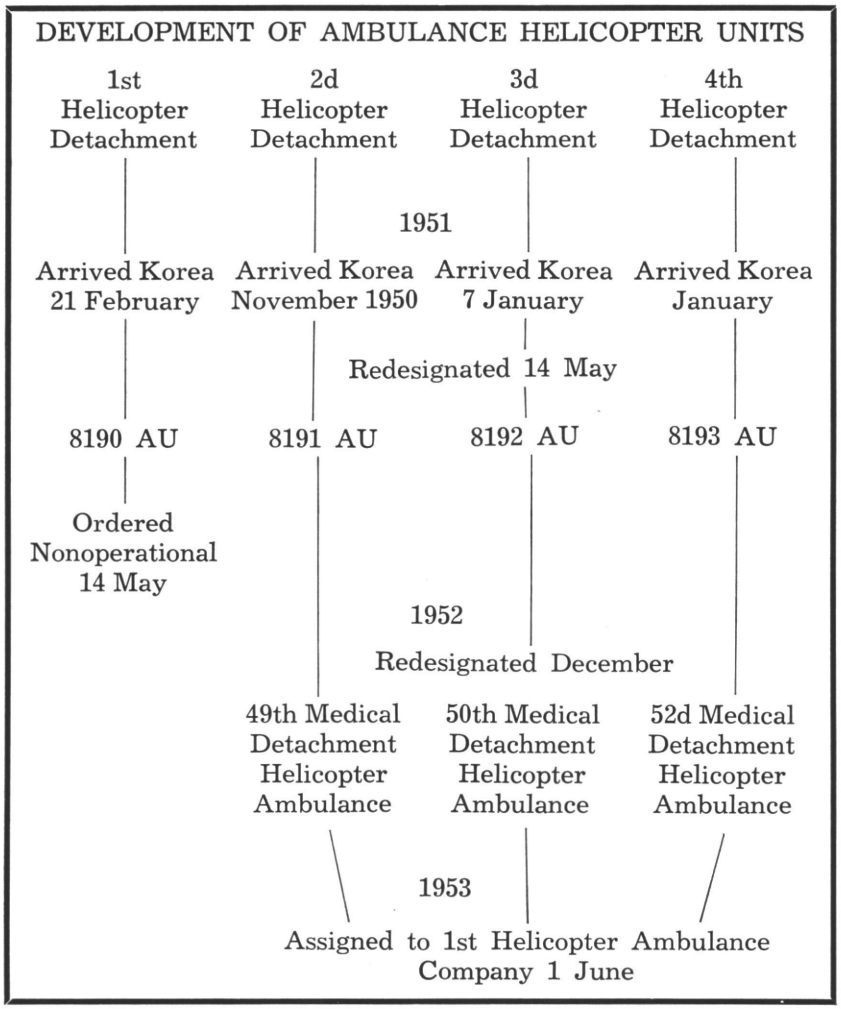
Maj Arne Eliasson, CO
Capt Homer Johnson
Capt Douglas Moody
Capt Elbert Drane

This detachment evacuated 77 wounded from Heartbreak Ridge during that bitter engagement.

Fourth

Capt James E. Childers, CO
Capt Henry J. Lamar
Capt Harry W. Wiltse
Capt Dayton L. Warren

This group set an intra-detachment record of 68 evacuees in one day.



ambulance detachments were redesignated (see chart) and their organization standardized (at least within Korea). The First Helicopter Detachment was inactivated and its personnel and equipment transferred to the three operational detachments, bringing them to five reconnaissance helicopters each. Despite all difficulties encountered, the three operational detachments evacuated 5,040 casualties during the first year of operation and logged a total of 4,421 flying hours.

Meanwhile, the Surgeon General was making efforts to establish a specific Table of Organization and Equipment (TOE) for aeromedical evacuation units. Based on the Korean experience (and certain staff expediency), decisions were made in favor of the cellular detachment organization rather than the larger self-sufficient company organization adopted by transportation cargo helicopter elements. In August 1952, Department of the Army authorized the Helicopter Ambulance Unit, TOE 8-500R, Cell RA. This detachment contained five reconnaissance helicopters, seven Medical Service Corps officer pilots, and essential supporting personnel and equipment. With minor modifications, this unit is still the basis for field organization of such a cellular detachment.

In December 1952, the operating detachments in Korea were reorganized under TOE 8-500R, were designated Medical Detachments, Helicopter Ambulance, and became medical units for the first time. In the spring of 1953 two additional helicopter ambulance detachments were organized in Korea, one operational and the second a "paper" organization.

Army Aviators played prominent roles in Operation Little Switch, which involved the exchange of wounded or sick prisoners of war from 20 to 26 April 1953. Helicopter pilots of the 50th Medical Detachment, Helicopter Ambulance, evacuated repatriated United Nations' prisoners from the exchange site at Panmunjom to field hospitals near Munsan-ni (dubbed Freedom Village). The exchange wounded were then taken from Munsan-ni to other rear areas by H-19s of the 6th Transportation Co.

Captain Gaddis, CO of the 50th Medical Detachment, evacuated the first two wounded in Operation Little Switch—one a Turkish soldier and the other an American. General Mark Clark met both at Munsan-ni; within minutes he welcomed two more, who were flown into the area by Capt Earl Russell.

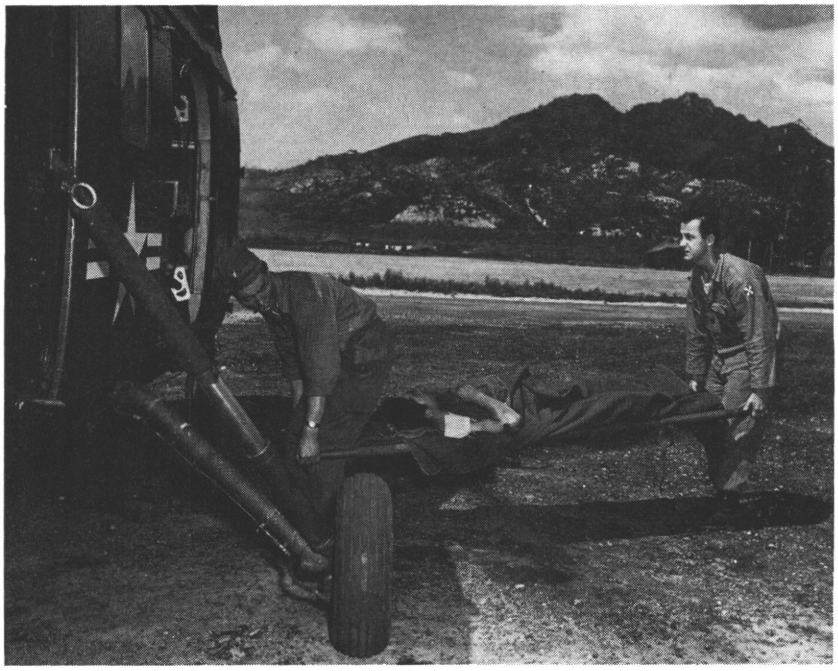
In May 1953, shortly before the cessation of hostilities in Korea, the First Helicopter Ambulance Company (Prov) was organized by Eighth Army. This unit, organized and commanded by Captain Gaddis, consisted of the four operating detachments, with the fifth being used as the company headquarters. Even in the short combat period that remained, the operational, administrative, and logistical advantages of the company versus detachment organization became obvious. This provisional unit was retained even

after the end of hostilities. It served as the prototype for the present day medical air evacuation companies.

Between 1 January 1951 and the cessation of active hostilities on 27 July 1953, helicopter detachments under the control of the Army Medical Service evacuated a total of 21,212 casualties. The availability of forward helicopter evacuation (along with whole blood) contributed considerably to achieving the lowest mortality rate of wounded reaching medical channels of any major war to date.

The preceding paragraphs are not intended to imply that these small units represented Army aeromedical evacuation in its entirety. Division aviation elements evacuated many patients throughout the campaign, particularly during the early hectic days of combat when organized medical air evacuation was not available. Medical evacuation was considered an ancillary mission of these units, and operating procedures were developed on a local basis. It is difficult to measure their contribution in terms of specific numbers of patients moved, as record keeping was secondary to more immediate problems. The First Marine Division placed specific emphasis on helicopter evacuation; and it perfected the technique of direct evacuation to U. S. Navy hospital ships, a technique later exploited by Army helicopter evacuation units.

Toward the end of the Korean War, two Transportation Corps helicopter companies, the 6th and 13th, were operational. These companies, each containing twenty-one H-19 helicopters, achieved an enviable record in mass aeromedical evacuation in support of medical aviation units. They moved casualties at the request of medical staff agencies and patient regulation was smoothly effected. Similarly, helicopters of the U. S. Air Force Air Rescue Service continued to perform special missions at the request of the Eighth Army surgeon. These aircraft, equipped with special communications and navigational means, as well as flotation gear, were especially suited for overwater evacuation in support of isolated Army units operating on off-shore islands.



A wounded infantryman is loaded into an H-19 in Korea in 1953

While helicopter evacuation units became medical detachments after December 1952, the first Medical Service Corps pilots were not trained until 1953 and did not arrive in Korea until one month after the end of hostilities. During the entire combat period, aeromedical evacuation missions were flown by line pilots of the Artillery, Infantry, Armor, Transportation Corps, Corps of Engineers and Signal Corps. These officers were dedicated to their mission, and several of them subsequently transferred to the Medical Service Corps.

DEVELOPMENTS AT HOME

Army interests and activities in aeromedical evacuation were not limited to the Korean battlefields; nor did it cease with the end of that war. In November 1952, an Army Aviation Section was established in the Medical Plans and Operations Division of the Office of the Surgeon General. This staff agency, redesignated the Aviation Branch in August 1956, is responsible for monitoring and supervising overall aviation medicine and aeromedical evacuation activities within the Office of the Surgeon General.

In late 1952, Brooke Army Medical Center, Fort Sam Houston, Texas, was selected as the site for activation, training, and

ARMY AIRCRAFT MEDICAL LOADS		
Rotary Wing		
OH-13	2 Litters	External
OH-23	2 Litters	External
UH-19	6 Litters	Internal
UH-1A	2 & 1 Ambulatory	Internal
UH-1D	6 Litters	Internal
CH-21	12 Litters	Internal
CH-34	8 Litters	Internal
CH-37	24 Litters	Internal
CH-47A	24 Litters	Internal
O-1	1 Special Litter	
Fixed Wing		
U-6	2 & 2 Ambulatory	
U-1A	6 & 3 Ambulatory	
CV-2A	14 & 8 Ambulatory	

deployment of medical helicopter ambulance detachments. On 15 October 1952, the 53d Medical Detachment, Helicopter Ambulance, was organized from the 53d Malaria Control Detachment. Historically, this unit was the first medical helicopter ambulance detachment organized; the redesignation of operating detachments in Korea followed by some two months. Within one year, five helicopter ambulance units had been activated at this center.

Even during the Korean War it was decided that while there was a need for direct medical control of ambulance aircraft, there was no requirement for special purpose ambulance aircraft from the design or procurement standpoint. Instead, the policy was adopted that whenever practical all Army aircraft would be designed to incorporate a capability of transporting patients as an ancillary function. Therefore, the aeromedical evacuation mission is included in the development of military characteristics for all Army helicopters and utility airplanes.

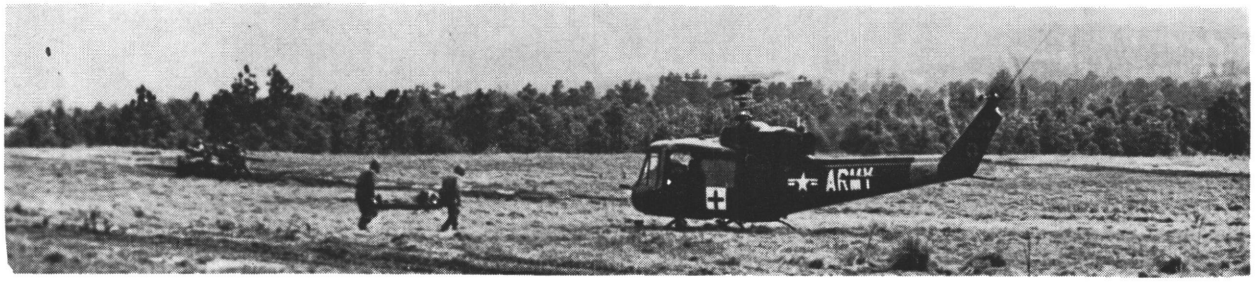
In January 1955 a design competition was held to select the new standard Army utility helicopter. Each proposal was subjected to complete medical evaluation before being considered for any of the other functions for this aircraft. Such emphasis was placed on the aeromedical evacuation function that the winning proposal (Bell's HU-1) is frequently referred to as a "helicopter ambulance," in spite of the fact that it is a general purpose utility helicopter with a variety of functions.

Since the Korean War major efforts have been devoted to the development of improved field organization and procedures for the accomplishment of the Army's aeromedical evacuation mission. While this function is an accepted mission of Army Aviation, there has been less consensus as to the most effective organization for its accomplishment. Consequently, considerable attention has been given this mission in all major maneuvers and field tests conducted since the Korean War.

In addition to planned exercises utilizing and evaluating the capability of Army aeromedical evacuation, on numerous occasions Army helicopters have been called upon to assist in emergency rescue or evacuation missions. In the wake of Hurricane DIANE in 1955, Army helicopters and fixed wing aircraft helped rescue 900 persons, in addition to delivering 223,000 pounds of cargo. During this period over 900 flying hours and 109,000 miles were registered by the involved aircraft.

Also noteworthy is the record compiled by the 56th Medical Detachment (Fort Bragg, N. C.) and the 57th Medical Detachment (Fort Meade, Md.) during Operation Amigos (see DIGEST, August 1960) after the series of Chilean earthquakes and subsequent tidal waves in 1960. These units, each with five HU-1A helicopters, were flown by Air Force cargo carriers to the site of the disaster in Chile. In less than one week, the HU-1s were flown over 4,000 miles on rescue, evacuation and supply missions. During the first 3 days, approximately 8½ tons of relief supplies were hauled to remote regions. Almost every medical helicopter ambulance detachment or installation possessing helicopters has performed similar mercy missions but on a smaller, less-publicized scale. The helicopter has truly taken its place among rescue and evacuation vehicles in peacetime, as well as in wartime.

With the reorganization of Army field units, which began in 1955 and is continuing to date, a substantial aeromedical evacuation capability has been built into a variety of nonmedical units. Division aviation companies (infantry, airborne, and armored) contain utility and reconnaissance helicopters and utility airplanes, all capable of transporting patients. Corps and Army Aviation companies include a similar aeromedical evacuation capability. Utility air-



planes and cargo helicopters contained in Transportation Corps aviation companies, battalions and groups, provide a substantial supporting aeromedical evacuation capability. Medical control of the movement of patients by nonmedical aviation means is ensured through normal staff organization and procedure. An Army Aviation medical officer is included in each major command, and his duties include regulation of aeromedical evacuation by organic means.

Medical helicopter ambulance detachments have changed little since the end of the Korean War. There have been adjustments in unit dispositions but no reduction in their number, even during considerable cutbacks in supported troop strengths. This relative increase in the Army's aeromedical evacuation capability is a reflection of the increased reliance and emphasis placed on this type of evacuation by medical planners.

Recently, several medical air ambulance companies have been activated. Each of these companies consists of 25 utility helicopters of the UH-1 type, and are allocated on a basis of one per Army corps and one per field army. The current cellular detachment is being retained for the support of smaller task forces and as augmentation elements. Efforts are being made to secure fixed wing ambulance aircraft for the Army Medical Service, and selected Medical Service Corps aviators have qualified as fixed wing pilots.

In 1956 Department of the Army authorized the use of organic aircraft for the movement of patients between adjacent Army installations and from the sites of off-post accidents. No additional aircraft are justified on the basis of this mission, and local procedures are developed by appropriate medical and aviation officers. This use of Army aircraft for aeromedical evacuation within the continental United States accomplishes two primary objectives:

- It improves the caliber of the Army's medical service by providing a quick means of transportation to specialized military and/or aviation medical facilities.
- It provides medical and aviation elements with experience and training in the evacuation of actual patients. A prime example of this procedure is that in effect at Brooke Army Medical Center. Its helicopters ferry patients from the Military Air Transport Service terminal at Kelly Air Force Base to Brooke Army Hospital; they also pick up severely injured personnel within a 150-mile radius of San Antonio. This use of available Army Aviation is not considered an infringement on MATS, as the situations and numbers of patients involved are beyond MATS' scope of interest.

BASIC DEFINITIONS

Before summarizing current Army Medical Service policies regarding forward aeromedical evacuation, certain basic definitions are in order. The term "forward aeromedical evacuation" has a double connotation. *Geographically* it refers to the air movement of patients within the Army combat zone only. Here, immediate responsiveness to requirements and complete integration with other tactical and logistical operations are of the essence. This phase of aeromedical evacuation functions forward of the support provided by tactical aeromedical elements of Air Force troop carrier units. *Medically* it refers to that portion of the aerial chain of evacuation occurring forward of the first medical facility able to provide definitive medical treatment. Here timeliness of treatment, reduction of trauma, selectivity in evacuation, and complete medical control are essential.

Forward aeromedical evacuation may be further categorized as either "emergency" or "routine." These arbitrary categories establish the medical requirements to be met by organic Army aeromedical evacuation.

Emergency aeromedical evacuation is concerned with the rapid movement of seriously wounded soldiers where timeliness of treatment will determine whether they live or die. These men must be picked up quickly (on an individual basis) and evacuated directly to hospitals located *within* the combat zone. There must be no initial nor intermediate delays nor transloading. The selection of casualties for this type of evacuation and the designation of the treatment element to which individual patients should be taken are based on medical considerations related to the individual patient and the status of supporting medical facilities. These patients normally require detailed medical care during flight, and aircraft transporting them normally cross one or more Army tactical boundaries.

Routine aeromedical evacuation is indicated when surface means are either nonexistent, inadequate, or inefficient. Within the combat zone, these are patients who, other factors being equal, could well be evacuated by surface ambulance. In these cases, time is not of the same essence as in the emergency category. If adequate facilities are available in forward combat areas for collection, treatment, and holding, these patients may be held for reasonable periods

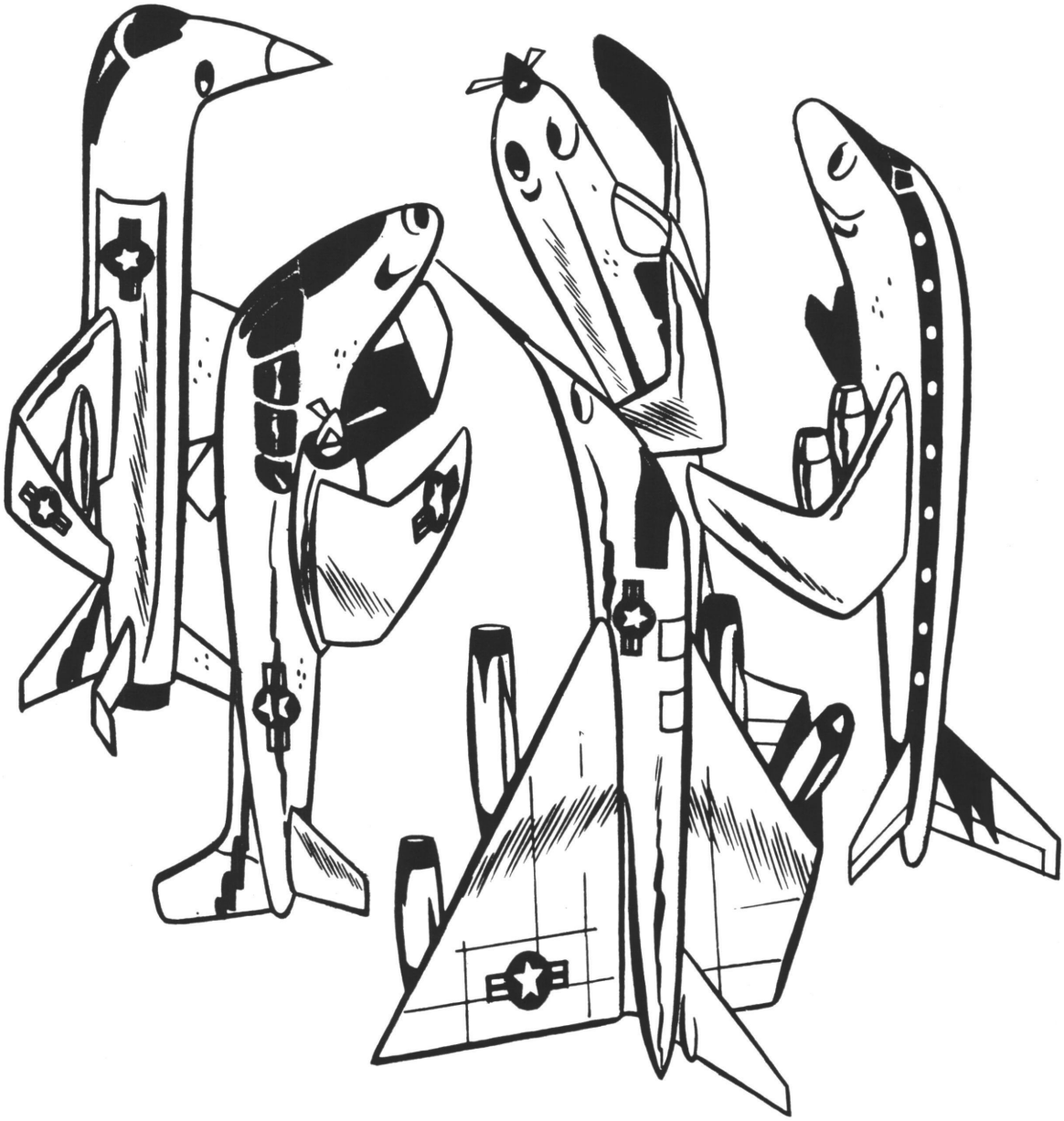
pending necessary arrangements for their evacuation. Such patients are usually moved by air only to the point where surface evacuation is available and further disposition and treatment can be accomplished. If properly selected and prepared before evacuation, routine air evacuees do not normally require detailed medical care during flight. Normally, air evacuation of routine cases is made only from units largely dependent upon air transport for resupply and other logistical support. This type of forward aeromedical evacuation resembles that provided by U. S. Air Force troop carrier and MATS elements to the rear of the combat zone.

In 1957 the Surgeon General of the Army authorized the issuance of certain policy statements as guidance for all medical and nonmedical agencies concerned with Army aeromedical evacuation. These policies are based on extensive experience gained in combat, field exercises, and operational analyses. Developed in a formal staff study (classified) they have been disseminated via several unclassified publications. (See box for statements of policy that have been guidelines in the organization and use of Army aircraft in aeromedical evacuation.)

The organization and procedures developed by the Army Medical Service apply specifically and exclusively to forward aeromedical evacuation of emergency casualties within the combat zone. They would be impractical and uneconomical if applied to tactical and strategic supporting aeromedical evacuation provided by the Air Force on MATS.

Today the United States Army stands on the threshold of a new era of airmobility which will meet the challenge of awesome weapons systems and rapidly changing strategic and tactical concepts. Whether our forces might become engaged in a general nuclear war over great land masses, or in counterinsurgency operations in a tiny, distant land, or in a combination of both, it is certain that the agonizing cry of the wounded will be heard. Army surgeons have gone about as far as they can in reducing the death rate of the wounded who reach their hospitals. To further reduce this mortality rate, we must turn to improved medical evacuation from combat areas. The only answer is the constant betterment of Army Aviation and the aeromedical evacuation program.

- Aeromedical evacuation within the combat zone is an accepted mission and capability of organic Army Aviation.
- Warfare of the future will be characterized by an increased use of organic Army Aviation for both emergency and routine aeromedical evacuation within the combat zone.
- Within the Army, the Army Medical Service has the basic technical responsibility for all medical evacuation, whether by surface or aerial means.
- The Army Medical Service requires sufficient organic aviation of the proper type to enable it to accomplish its continuing mission of rapid evacuation of the severely wounded directly to appropriate medical treatment facilities.
- In the future, both fixed and rotary wing ambulance aircraft will be required for the combat zone aeromedical evacuation mission.
- Ambulance helicopters are required for the forward pickup of casualties and their transportation to initial points of treatment and to hospitals capable of resuscitative surgery.
- Ambulance airplanes are required primarily for the longer lateral and rearward movement of patients needing special surgical treatment that may not be available in every forward hospital, or to bypass intermediate hospitals with long surgical lags.
- The company-type organization for the aeromedical evacuation function is superior to the current cellular detachment concept.
- Medical air evacuation units, either fixed or rotary wing, should be assigned to the field army to permit full exploitation of their capabilities and to facilitate shifting of evacuation support to meet actual requirements.
- The current procedure for requesting emergency aeromedical evacuation missions is adequate, but electronic means need considerable improvement to increase their reliability.
- The Army Medical Service does not require sufficient organic aviation for the entire Army aeromedical mission. The movement of nonemergency patients by air can be accomplished economically by making use of utility and cargo aircraft in conjunction with normal logistic missions, provided there is adequate medical control over the movement of patients.
- The Army Medical Service must maintain jurisdiction over all Army aeromedical evacuation, regardless of the category of patient or the source of the aircraft.



Round Table of the Sky

Lt Col Emmett S. Davis

WE ARE LIVING in a small world today. Because of different reasons—pleasure, business or military—people must travel long distances in a short period of time. How is this travel performed? Mostly by air transportation. This increase in air traffic has brought about many control problems, but the main one is in the control of traffic in and out of the terminal area.

Now I realize that all aircraft are not operating from a high density area, but air traffic is increasing everywhere. Are you doing everything that can be done about this problem in your local area? Do you have a functional safety council? Are interested civilian and government agencies invited to attend your council meetings? If the answers to these questions are yes, then you are on the right course toward doing what is necessary. If the answers are no, then I would

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Col Davis was a student at the University of Southern California safety course when he wrote this article.

like to give you some thoughts for consideration.

Over five years ago a few people connected with flying in the Montgomery, Ala., area became concerned about the increase in air traffic. This was brought about by the increase in military, airlines, and civilian flying. Some of the reasons for this change were that training was stepped up in the military establishments, the number of airline flights a day increased, and more private aircraft were flying. The airport manager of Dannelly Field, together with Federal Aviation Agency, Air Force, National Guard, and civilian flying personnel, after several days of planning, formed the Montgomery Area Safety Council. The council has a chairman, vice-chairman, secretary, assistant secretary-treasurer, and FAA flight service station chief.

The council meets once a month. At these meetings flying information and problems are discussed and recommendations are made. Committees are appointed to follow through on recommendations. Reports are made back to the council at the next meeting, or sooner if time is a factor. FAA personnel from the weather station, flight service station, and tower RAPCON bring everyone up-to-date on the status of operating equipment, new equipment, and current regulations. Operations and flying safety officers from Maxwell Air Force Base, Craig Air Force Base, Dannelly Air National Guard Base, Fort Rucker, and the Army National Guard add their experience and know-how to this highly professionalized group. Representatives from civilian flying companies, airlines, Civil Air Patrol, Maxwell Aero Club, and Alabama State Highway Patrol are also members of this council.

The following instances show what can be done on a joint effort such as this.

- One of the council members was flying in the local area and sighted what he thought was a new airstrip about 20 miles north of Montgomery. After considerable effort he found that this was not a new airstrip but a U. S. Navy Space Surveillance Station. Instead of it being an airstrip, ramp and operations building, the airstrip and ramp contained a maze of antennas from one side to the other for the entire length of the strip, and the building housed radio and electronic gear.

This hazard was reported to the council at the next meeting. After much discussion, the decision was made that a visit to the station was in order. The next day I flew the secretary of the council to the station by helicopter. We talked with the chief of the station. He was not aware of this condition but became deeply concerned at our findings and made arrangements to meet with the council at the next meeting. After discussing the problem, written recommendations were presented. These recommendations were forwarded to the Bendix Corporation, which has a contract with the government to run the station. They bought the request 100 percent. Bendix had the strip marked by placing specially designed flashing lights at each end and marking the strip HAZARD.

- Personnel from Fort Rucker, Ala., in conducting a very intensive instrument flight training program, fly in and out of Dannelly Field regularly. Usually they made a VOR approach first, then being at low altitude climb to 1,700 feet flying out-bound on the ILS to make an ILS approach. This practice would have been all right, except for the in-bound traffic on the ILS at the same altitude. This information was given to the Fort Rucker representative of the council. Quick action was taken to inform all personnel to fly out-bound on the ILS at 2,500 feet.

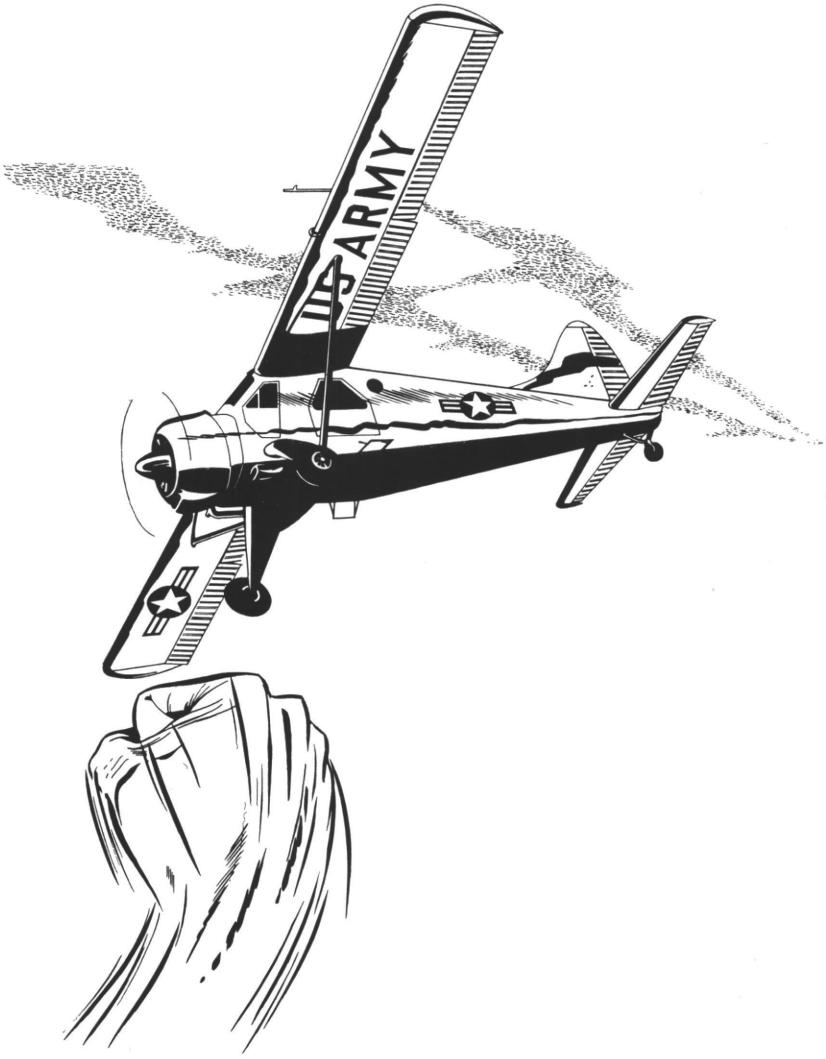
Although the marking of the U. S. Navy Space Surveillance Station and the change of the out-bound altitude on the ILS approach are important, they are only the product of people with common problems working together.

This council makes it a policy to periodically visit with the organizations they represent. We have visited Maxwell Air Force Base, Craig Air Force Base, and Fort Rucker. The Fort Rucker trip was an all-day affair. We visited the fixed and rotary wing training programs and ended up at Cairns Army Airfield, the main field at Fort Rucker, to look over operations and Cairns Approach Control. In visiting with the various units, we have a better understanding of their operations and problems. Then we can sit down on the working man's level and iron out these problems as they happen. This saves the time of people in higher headquarters and, most important, speedily corrects a small discrepancy before it results in something big. The time saved may have been the time in which an accident would have happened.

Working together like this places everyone on a common level. If you get into trouble, then you have someone to turn to that you know. Cooperation brings on the feeling that *your* problems are *my* problems. Therefore, two-thirds of your trouble has already been licked. If the joint efforts of this council prevents one accident or saves one life, then our labor will not have been in vain.

Lest the Ground Reach Up and Smite Thee

Capt George F. Christensen



IT WAS A cold, windy day in Korea. Two Army pilots, one a new arrival, took off in a U-6A for a short passenger flight from K-47 to the east coast. They climbed to 4,000 feet to clear the mountain range, picked up a good tail wind, and the flight to the coast was uneventful.

After discharging their passenger, they decided to fly along the coast to K-18. This leg took them through moderate turbulence. When they arrived at K-18, the new pilot turned west toward a mountain pass and home base.

"That pass is about 3,200 feet," said the other pilot. "We'd better climb to 4,000 feet."

The new pilot climbed to 4,000 feet, leveled off, set up normal cruise power, and continued toward the pass. Groundspeed appeared slow, but they were still making headway. The turbulence had all but stopped.

About 6 miles from the pass, the new pilot noted a slight loss of altitude and applied back pressure to correct. To his surprise, this only served to kill off airspeed and the Beaver continued to lose altitude. He applied more back pressure with the same result. By this time the aircraft had lost 300 feet. He advanced the prop pitch to 2,000 rpm and opened the throttle to 30 inches.

The aircraft continued to lose altitude as it approached the pass. More power was applied, and climb flaps were lowered. The only result was a further loss of airspeed. Finally, ¼ mile from the pass, full power and rpm were applied. The aircraft

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Capt Christensen was a student at the University of Southern California safety course when he wrote this article.

continued to lose altitude. The altimeter now read 3,150 feet, and they were still losing altitude.

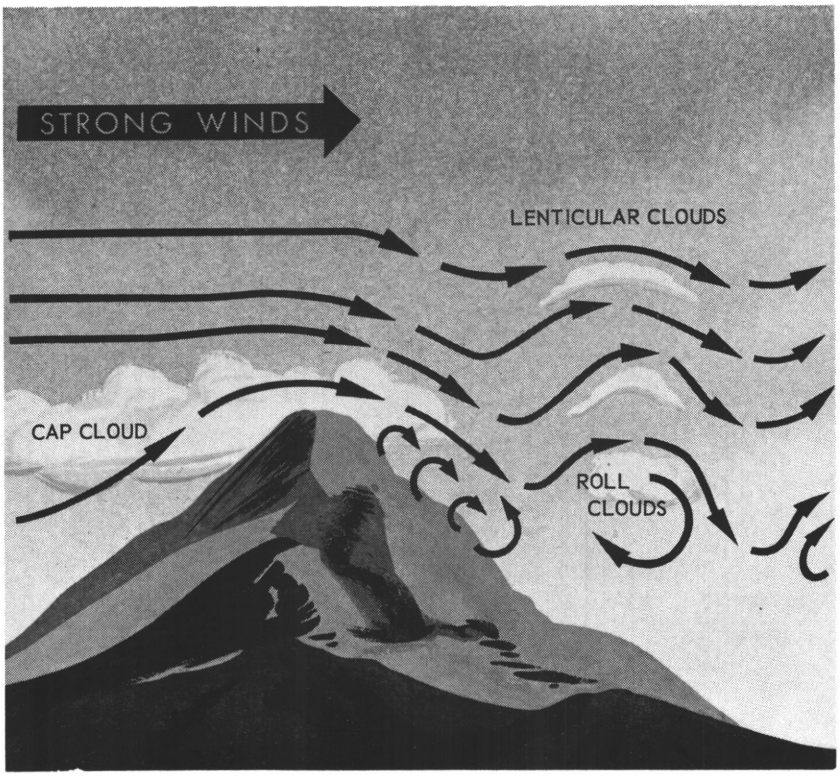
Flying toward the exact center of the pass, there was little room for a 180° turn, but it had to be done. The turn was made to the right and scrub pine trees passed between the right wheel and right wing. Two very scared pilots looked at each other and shook their heads. They were lucky; they had flown into and escaped from one of the greatest hazards associated with flying over mountainous terrain—*MOUNTAIN WAVE.*

A mountain wave is wind—wind that is lifted, lowered, and directed by the terrain over which it flows. This wind flows over the crest of a mountain, spills down the lee side following the slope, and continues to the valley floor. It then ricochets back up to form a second wave. This second wave can be found over level ground or water some distance from the mountain. If, instead of flowing over a plain or water, it hits another mountain, the wave may either be intensified or cancelled, depending on the spacing of the mountains and the strength of the wind.

The mountain wave is most dangerous when approaching high terrain into the wind. If you wait for the "updraft that is always associated with the downdraft," the wait might kill you.

The two pilots in Korea were flying toward the center of the valley because the terrain was lower and they thought it would be easier to penetrate there. This only multiplied their problem. Not only was a strong wave present in the area, but a venturi effect in the pass increased headwind velocities and the intensity of the wave.

The first thing to learn about mountain wave is recognition. These pilots were given some good hints by the strong tailwind they had on the first leg of their flight when they were flying over the mountains toward the coast and when they flew through the turbulence along the coast.



Mountain waves should be suspected any time strong winds exist over uneven terrain. How strong a wind? How high is up? It depends. Wave formation depends not only on wind velocities but also on the angle from which the wind strikes the mountain, the spacing of the mountains, and many other factors.

There are other signs to watch for. One is the formation of lenticular (shaped like a lens) clouds. Cumulus clouds may form on the upslope of the wave if temperature and moisture conditions are right. These clouds are not necessary for the formation of a mountain wave, but their presence is evidence that a wave has been formed.

Following a few simple procedures will help you avoid the hazards associated with mountain wave:

- When flying toward a mountain with a headwind, get plenty of altitude before reaching the point of penetration. How much is plenty? A good minimum is 1,500 feet.
- Don't fly toward the low pass. The winds are usually stronger there because of the venturi effect. Pick a high point, left or right, and preferably on the downwind side of the pass. This will assure a minimum velocity wind and a clear escape route. Also, the initial part of that 180° turn, if needed, will be into the wind.
- Never sacrifice airspeed in an attempt to gain altitude. Use power and if that doesn't work, turn around early, climb, and try it again from a higher altitude. Don't wait for the updraft to lift you over the hill. It isn't there.

Aviation in the Canadian Army

Maj J. A. Beament, RCD

EARLY ONE morning in August 1909, in a field at Camp Petawawa, Ontario (some 100 miles northwest of Ottawa), a small group of Canadian Army officers gathered for a demonstration. They had heard that the Wright Brothers had flown their aircraft for the U. S. Army and wanted to see if this new invention could be of help in the defense of their own country.

In the Canadian demonstration, J. A. D. McCurdy (later, Hon J. A. D. McCurdy, lieutenant governor of Nova Scotia) and F. W. "Casey" Baldwin flew Dr. Alexander Graham Bell's "Silver Dart" around the little field four times. On the fifth flight, McCurdy, who was piloting the aircraft, was coming down for a landing when one of the wheels struck a slight rise in the ground. The resulting crash convinced many that the airplane could be of little practical use in actual warfare. In fact, one officer forecast that there would never be any place for such a machine in the armed forces.

This skepticism prevailed for many years in the Canadian Army. While the British Army used aerial observers, mostly balloonists, during World War I, there was no distinctly Canadian Army aerial service as such in that war. With the official formation of the Canadian Air Force in 1924, all military flying responsibility evolved on the "boys in blue."

The requirements of the field army, however, were not overlooked. In fact, the first RCAF squadron to move overseas in World War II was an "Army Co-operation" equipped with Westland "Lysander" aircraft. This was an RCAF-manned, controlled and administered squadron designed to provide assorted reconnaissance support for the field army, including artillery, tactical, photographic, and contact reconnaissance. The unfortunate experience of the Battle of France in 1940, although not directly involving Canadian forces, showed three factors:

1. The aircraft for Army cooperation, the Lysander, was totally inadequate to the changed methods of warfare.

2. There was an obvious need for proper tactical air support.

3. There was an urgent need for light Army aircraft, under operational control of the Army, to do certain local reconnaissance tasks, primarily artillery observation and correction of fire.

The period immediately after Dunkirk was one of defense, and not conducive to the advancement of the offensive implicit in seeking out and engaging enemy targets by aerial artillery observers. Nevertheless, one small group of officers, headed by Lt Col Charles Bazeley of the British Army, kept insisting that this type of flying was necessary. Finally, in 1942, their efforts were rewarded when authority was given by the British for the RAF to form twelve light aircraft squadrons equipped with the Auster aircraft. These squadrons were to be trained, maintained, and administered by the RAF, but under British Army control, and the aircraft were to be flown by Artillery officers. The success of the first of these squadrons, numbers 651 and 654, piloted by Royal

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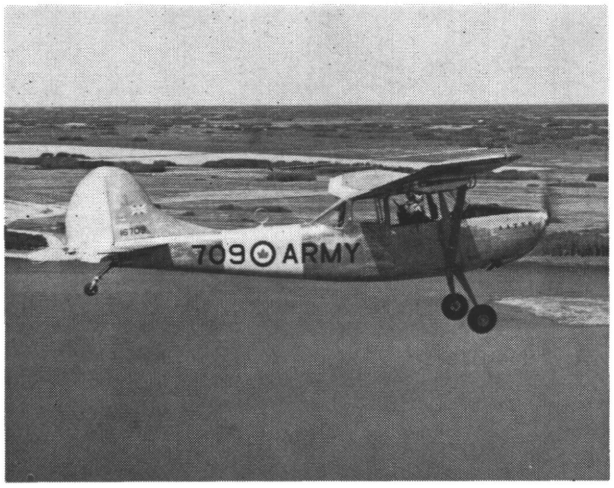
Maj Beament is the Canadian liaison officer to Fort Rucker, Alabama.

Artillery Officers and serving in North Africa with British First and Eighth Armies assured the future of the Air OP.

When the first Air OP organization was developing in England in 1941-42, the Canadian Army sent three artillery officers to take pilot training. These officers were then attached to British Air OP units, as the Canadian Army decided not to go ahead with an Air OP organization. It is interesting to note that of these first three artillery captains to take flying training, one was killed, the second captured, both being on ground duty at the time, and the third recently retired from the Canadian Army as Lt Col D. R. Ely, Director of Land/Air Warfare.

In June 1944, the formation of three Canadian Air OP squadrons, numbers 664, 665, and 666,



was authorized, but they saw action only in the last few months of the northwest Europe campaign and were disbanded shortly after the end of hostilities.

It is also appropriate to record that a large number of Canadian NCOs were trained as glider pilots, and served as such with the British 1st and 6th Airborne Divisions.

These Air OP and glider pilots provided, then, the impetus for and nucleus around which peacetime aviation has been built in the Canadian Army. In 1947 a small number of Auster aircraft was purchased and the Light Aircraft School as a part of the Canadian Joint Air Training Center at Rivers, Manitoba, was established. One of the school's responsibilities was to provide Air OP support for the Artillery School at Shilo. To this end a detachment was located at Shilo's Proctor Field. Incidentally, Proctor Field is named in memory of one of the first Canadian Army para-

Above: The de Havilland DHC-1 Chipmunk is the RCAF aircraft used by student pilots for primary training.

Left: The L-19A is used as a trainer and an operational aircraft in the Canadian Army.

Below: CH-112 (Hiller 12E). This is the basic and only helicopter type in the Canadian Army. It is both a training and operational aircraft, and its basic difference from the OH-23D is an uprated 305 hp engine with an increased maximum gross weight.

troopers in World War II. He was killed in training at Fort Benning, Ga., in 1942.

The main task of the Light Aircraft School was to train artillery officers as light aircraft pilots. At first Auster aircraft were used, but these were replaced by Cessna L-19s in 1954. Glider training was discontinued in 1950.

Canadian Army pilots, all of them Artillery officers, took part in the UN action in Korea. One was shot down and spent over a year as a prisoner of the Chinese Communists.

In the mid-50s, interest developed in an expanded scope of Army Aviation, and flight training was opened to officers of other corps (branches), initially as liaison pilots using L-19s and shortly after as cargo helicopter pilots. Fixed wing training was conducted in Canada, but rotary wing training was conducted at the U. S. Army Aviation School, Fort Rucker, Ala., and at Camp Wolters, Texas. This training was almost invariably followed by a training attachment for one year with one of the divisional aviation companies in the continental United States.

From 1950 to 1959, fixed wing training consisted of 60 hours of beginning flight training and 220 hours of ground school training. This was provided by the Brandon Flying Club, using Cessna 140s. After the beginning training the student pilot went to the Canadian Army Light Aircraft School, one of several schools that comprise the Canadian Joint Air Training Center at Rivers, Manitoba, for advanced training. Here the student received 125 hours flying the L-19, including all the necessary tactical flight techniques and procedures, and another 60 hours of ground school, culminating in the award of his Army Flying Badge.

In 1959, the beginning phase training was given to the RCAF, and the student received much the same training, but in the de Havilland DHC-1 Chipmunk instead of the L-19. The difficulty here was to convince the aerobatically minded beginning pilot that there were certain limitations on the L-19 when he finally reached the latter.

Finally, in 1961 CH-112 helicopters (Hiller 12E) were purchased for the Canadian Army. A full-scale revision of Army pilot training was instituted at the same time. The RCAF assumed responsibility for basic flight training on fixed wing and rotary wing aircraft. The advanced, or tactical flight training, was conducted at the old Light Aircraft School, now redesignated the Army Aviation Tactical Training School (AATTS).

Today, the fixed wing student does his first 125 hours flight training on the Chipmunk, plus 336 hours of ground school, at the RCAF Station Centralia under RCAF instructors. He then goes to the AATTS for 124 hours flying the L-19 and an additional 90 hours ground school. Here he not only converts to the L-19, but gets his full scope of tactical flight instruction. The whole process, at the end of which wings are awarded, is scheduled for 28 weeks, 16 at Centralia and 12 with the AATTS.

It is the exception for a Canadian Army pilot to enter directly into helicopter training. Normally he will have completed his fixed wing training. Then he will return to the RCAF Basic Helicopter Training Unit for a 60-hour, 8-week course, plus 20 hours ground school. He is not a helicopter pilot until he follows on at the AATTS and completes a further 8 weeks advanced and tactical training, during which he receives an additional 118 hours flying training and 11 hours ground school.

The major training differences between the Canadian and U. S. Armies are that the Canadian aviator is not required to be trained to IFR standards and there is not yet any aircraft armament training.

Currently, there are some 160 qualified army aviators, about 60 percent of whom are both fixed and rotary wing rated. Artillery, with about one-third; Army Service Corps (corresponds to the U. S. Army Transportation Corps), with about one-third; and the Armored Corps, with just under one-fifth, are the three corps, or branches, contributing the major share of pilots. This arises from the Canadian system of more rigidly assigning the Air OP function to the Artillery, reconnaissance to the Armored Corps, and transportation to the Army Service Corps.

The aircraft strength of the Canadian Army today is 46 aircraft. Twenty-one of these are L-19As and Es assigned to the School and with the Air OP troops with each of the artillery regiments. Four are L-19Ls with the Army Headquarters Liaison Flight in Ottawa, Ontario, and 21 are Hiller CH-112 helicopters, nine of which are serving with the reconnaissance squadron and brigade headquarters of the Canadian NATO Brigade Group in Germany.

In the future the Canadian Army hopes to have cargo helicopters. The acquisition of additional CH-112 helicopters and a moderately increased training program for aviators should ensure Canadian Army Aviation increasing capability to be of major assistance to the ground forces.

Safety is the Byword

The Second U. S. Army Flight Detachment produced an accident-free 18 month period of operations from March 1961 to September 1962.

The detachment was presented a Department of the Army Certificate of Merit for Safety in recognition of its safety record.

The detachment was also cited in 1959 when a Second Army safety certificate was presented to the unit.

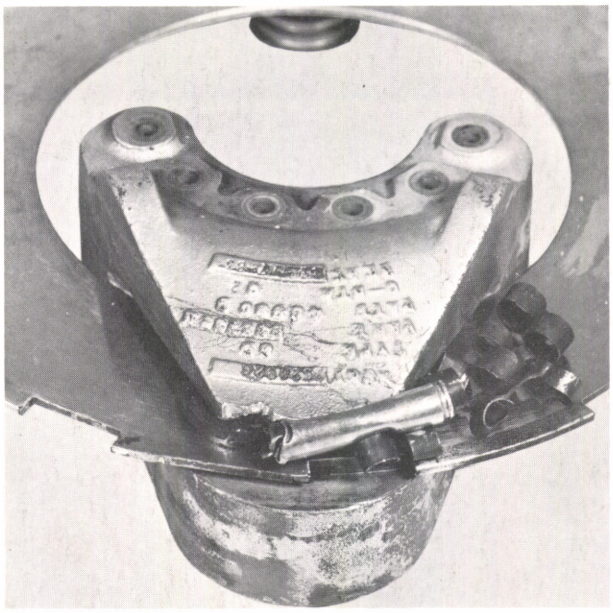
Operating out of Tipton Army Airfield at Fort Meade, the 12 pilots assigned to the detachment chalked up 638,400 passenger miles during the period while logging in 8,182 flying hours.

Maintenance on the fixed wing and rotary wing aircraft used by the detachment is performed by the 22 men assigned to the ground crew.

Primary mission of the unit is to provide air transportation for the Army commander and his staff and to support the post and attached units with air transportation and air support. The detachment has also assisted in civilian emergencies, such as providing air transportation for Civil Defense officials in the surveillance of damages along the East Coast during the severe storms in March of last year.

"Safety is the byword of the men in the unit," states Major W. J. Hennessey, CO, "and the integrity of the men, plus their applied skills, has enabled us to receive this safety award."

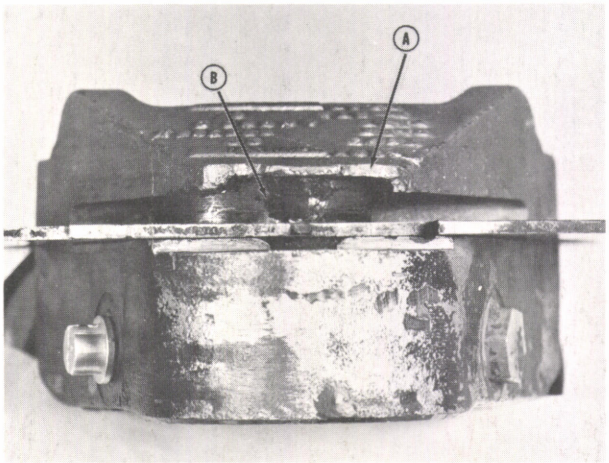
(Top) An accurate air mileage computation, plus (center, right) a thorough preflight check an hour before take off, plus (center) a close examination of the exterior portions of the engine, plus (bottom) a diligent check of navaids are SOP for the detachment and add up to a S-A-F-E F-L-I-G-H-T.



Breaking the Brake

The .30 caliber machinegun is mounted in the UH-19 and CH-34 helicopters to teach familiarization gunnery to CH-21 crewchiefs going through maintenance courses at the Department of Maintenance, Fort Rucker, Ala.

On a recent familiarization flight in a UH-19, after firing the .30 caliber machinegun mounted in the cargo door, the expended shell cases and links were swept out the cargo door. Some of the links and a shell case lodged in the brake housing. This caused the right landing gear brake to lock on landing, which caused the right wheel to drag and the tire to blow out.



Such accidents can be prevented by a detachable deflector made to cover the brake assembly, or by the crew waiting until the helicopter has landed before sweeping out expended links and shells.

The photo above shows the pile up of links and shell case between brake disc and housing, which caused brake to lock.

The photo at right shows that the flange (A) on the brake housing was broken off, which allowed the brake puck (B) to move out of its dish.

The photo below shows the condition of the puck and housing after disassembly.