UNITED STATES ARMY AVIATION DIGEST

LIBRARY, USAARU
FT RUCKER, ALA

A NEW YEAR OF PROGRESS

United States Army

AVIATION DIGEST

EDITORIAL STAFF
CAPT JOSEPH H. POOLE
FRED M. MONTGOMERY
RICHARD K. TIERNEY
DIANA G. WILLIAMS
SYLVIA N. DAY

JANUARY 1961
VOLUME 7
NUMBER 1

ARTICLES

MORE THAN A BLIND SPOT, Brig Gen Carl I. Hutton, USA . . . 1

"FAIR IS FOUL AND FOUL IS FAIR" 4

FEAR WITHOUT PANIC, Lt Frank S. Stewart, Arty 7

COULD YOU SPARE A LIFE? Capt John T. Stanfield, TC . . . 9

THE MISSING LINK 11

FIRST 500 HOURS, Lt Dewey C. Yopp, Inf 14

TWO BRAINS FOR ONE . . . ASE,
Lt Col William A. Howell, TC 16

TWX 18

MEMO FROM FLIGHT SURGEON, Col Spurgeon Neel, MC . . . 20

NEW LOOK TO AIRCRAFT ACCIDENT PREVENTION,
Maj William J. Hix, Arty 23

FAA — FRIENDLY AVIATION AGENCY.
Capt Derrell W. Sandel, Inf 25

FALCON'S NEST 30

A LITTLE MORE PLANNING, CWO Billy J. Fulbright, TC . . . 32

CRASH SENSE 33

U. S. ARMY AVIATION SCHOOL

Maj Gen Ernest F. Easterbrook
Commandant

Col Delk M. Oden
Assistant Commandant

Col Warren R. Williams, Jr.
Deputy Asst Commandant

SCHOOL STAFF

Col Robert H. Schulz
Director of Instruction

Col Allen M. Burdett, Jr.
Combat Development Office

Lt Col C. E. Lawrence
CO, USAAVNS Regiment

Lt Col Julius E. Clark, Jr.
Secretary

DEPARTMENTS

Col Oliver J. Helmuth
Rotary Wing

Col M. H. Parson
Tactics

Lt Col John W. Oswalt
Advanced Fixed Wing

Lt Col Harry J. Kern
Maintenance

Lt Col John R. Riddle
Publications and Non-Resident Instruction

Lt Col G. Wilfred Jaubert
Primary Fixed Wing

The U. S. ARMY AVIATION DIGEST is an official publication of the Department of the Army published monthly under the supervision of the Commandant, U. S. Army Aviation School.

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.

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

Unless otherwise indicated, material in the U. S. ARMY AVIATION DIGEST may be reprinted provided credit is given to the U. S. ARMY AVIATION DIGEST and to the author.

The printing of this publication has been approved by the Director of the Bureau of the Budget, 22 December 1958.

Views expressed in this magazine are not necessarily those of the Department of the Army or of the U. S. Army Aviation School. Unless specified otherwise, all photographs are U. S. Army.

Distribution:

To be distributed in accordance with requirements stated in DA Form 12.

More Than A Blind Spot

Brigadier General Carl I. Hutton, USA

A MID-AIR collision between a Bonanza and an F-86 is of interest to Army Aviators as well as other light plane pilots. In this case, the Bonanza was overtaken from the rear (fig. 1). The pilot of the Bonanza would have had to turn his head 50° to the right during the 30 seconds the aircraft were closing upon each other to bring the F-86 flight into his field of vision. Assuming that the pilot was scanning actively, the chances were still against him.

Most Army Aviators are concerned about being run down by faster aircraft. Examination of some of the factors in this case, and some of the inherent physical limitations of the pilot of the overtaking aircraft, will show that the concern is justified.

The general facts are not in question. According to the rules

General Hutton is Director of Training with the Federal Aviation Agency.

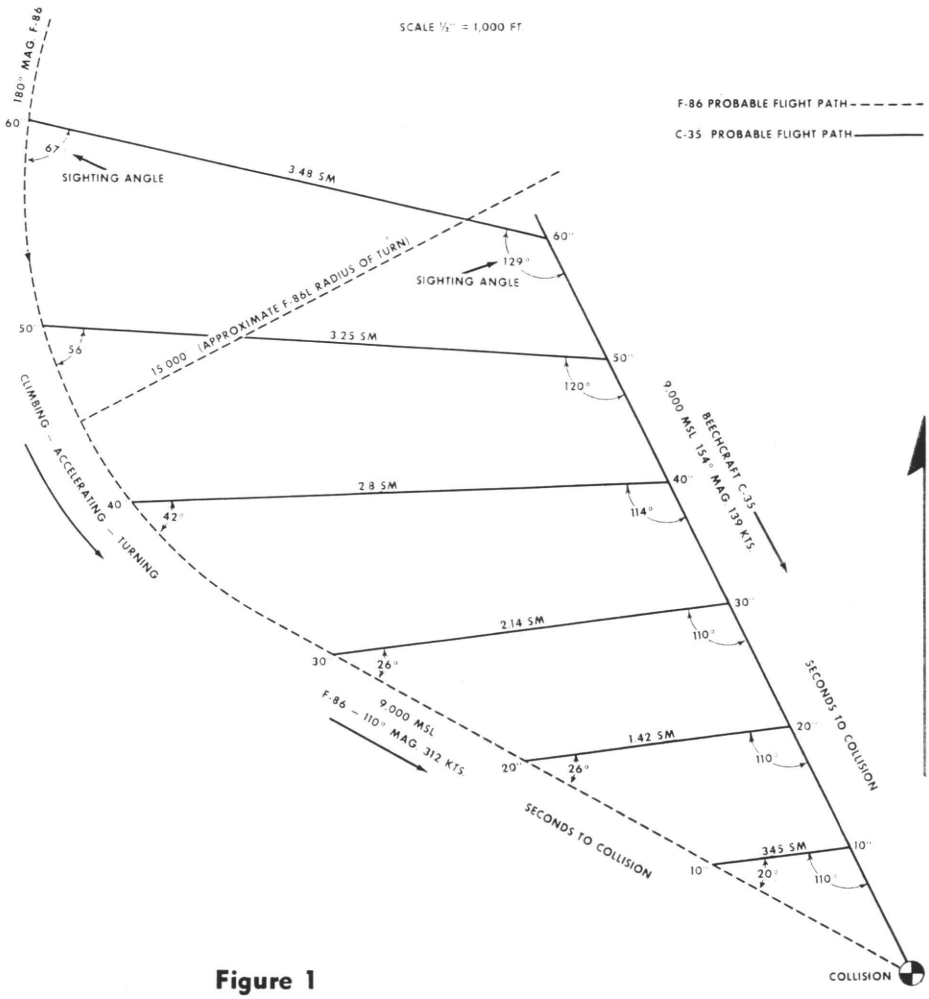


Figure 1

of the road, the Bonanza had the right of way; but this is of small comfort to the pilot. There is also no question that the leader of the F-86 flight was a skilled professional pilot who was exercising normal, alert vigilance.

He was scanning as best he could and did not have his head locked in the cockpit.

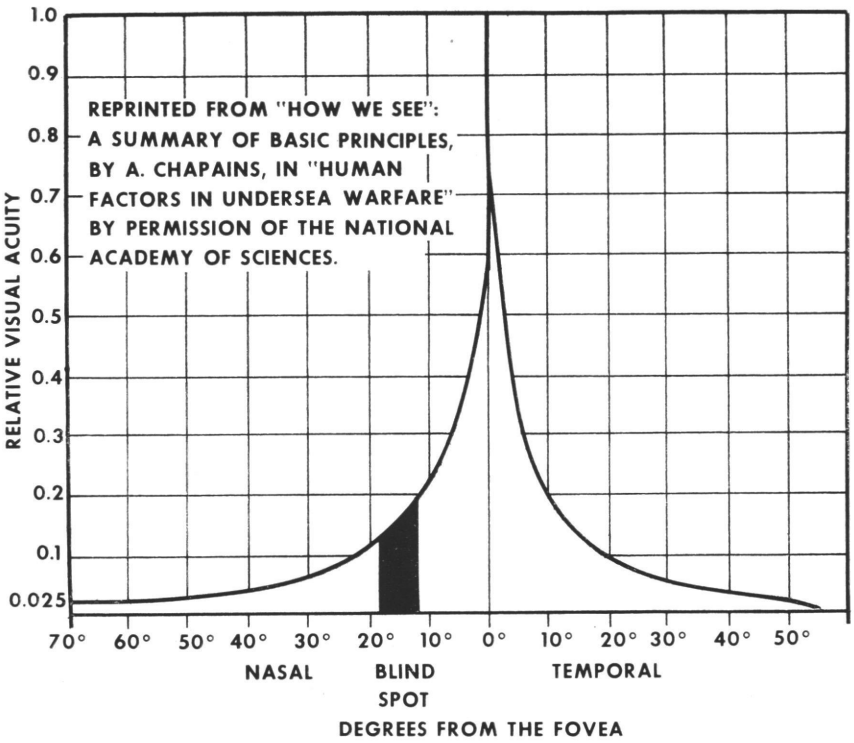
It should be noted from figure 1 that from collision minus 30 seconds to impact, both aircraft were flying constant heading, speed, and altitude. As in so many mid-air collisions, both were flying straight and level. Note also that the bearing angle, 26° left of the nose of the F-86 flight, remained constant, as it would necessarily have to for the collision course to be maintained.

The F-86 flight leader had only his eyesight to rely upon; he could not overhear radio transmissions from the Bonanza. From the recency of his FAA and Air Force medical certificates, it can be assumed that his eyesight was at least normal, if not better than normal. Given the facts that the leader was alert, careful, skilled, and physically sound, the question we must ask is: "How could it happen?"

MY THESIS IS THAT THE PHYSICAL CHARACTERISTICS OF THE HUMAN EYE WERE A MAJOR CONTRIBUTING FACTOR.

Figure 2 is reproduced from WADC Technical Report 58-399, "Vision in Military Aviation," November 1958. It shows that from the center of the eye (the fovea) daylight visual acuity drops off sharply at even small angles from the direction of vision. Thus, at 26° constant bearing angle of the collision course, the leader's vision was at less than one-tenth its normal acuity.

Figure 2. Curve of daylight visual acuity for different parts of the eye



The figure also shows that the cone of high-acuity vision is extremely small. On page 32 of the WADC report, it is stated that the cone subtends about five degrees of visual angle. In the 30 seconds between the completion of the climbing turn and the collision, the flight leader had to search the entire aerial sphere by eye and head movements. This normally would not take long, but if he searched the danger angle (the right hand quadrant) first, and his eyes were focused for distant rather than close objects, there was not much time.

Again looking at figure 2, we can ask the question, "If this is true how do we keep from running into things everyday?" The answer is that the eye has great sensitivity to **movement** as opposed to acuity within the angles outside of the cone of the fovea. This is one of the things the flight surgeon verifies on your annual physical. If there is movement, the eye is very sensitive peripherally. If there is no movement, there is nothing to attract attention.

THERE IS THE CRUX OF THE MATTER. Under the constant bearing relation, the two aircraft remained fixed relative to each other. (The rate of closure was comparatively slow, and the growth in apparent size was too gradual to constitute movement.) Since there was no relative movement, there was nothing to attract the eye of the flight leader.

This is a built-in trap, and it may explain many otherwise

unexplainable mid-air collisions. An airplane which is moving relatively will attract your eye, but it is not dangerous. An airplane standing still relatively will collide with you, but it will not attract your eye.

In the name of science, it is very interesting to know that it is possible for a fast airplane to run down a slower one without attracting the eye of the pilot. It is not very comforting, though. Is there anything an Army Aviator can do to protect himself? Perhaps not absolutely, but there are some things he can try.

The flashing high intensity light should be turned on for every flight. The action of the light simulates motion and will attract vision in the peripheral areas.

Be especially watchful around navigational fixes. Not only are there likely to be other aircraft converging on the fix on collision courses, but it is likely that the pilots are working computers, talking on the radio, looking at maps, or setting course selectors. No one knows how many collisions and near misses are associated with navigational aids.

Beware of the mistaken belief that "collision course" means a head-on meeting. Although collisions have occurred in turns and while one or both aircraft were changing altitude, by far most have occurred in clear weather between aircraft in straight and level flight. When clearing yourself, remember that the one that will kill you will come from the side or rear.

Even with these precautions, there will still be large blind areas from which an unseen threat can materialize.

There is one comforting fact. The odds are on your side. Although mid-air collisions tend to be sensational because they are dramatic and final, they constitute only a very small percentage of serious accidents.

Mid-Air Collision Study Underway

Federal Aviation Agency, in cooperation with interested groups in the aviation industry, has five active projects underway and ten projects scheduled in an effort to find methods to assist pilots in preventing mid-air collisions.

The projects were designed to meet two goals: First, a collision avoidance system which will give a signal indicating or initiating an appropriate avoidance maneuver at a suitable time; second, a pilot warning instrument designed to warn a pilot where other aircraft are located to assist him in avoiding a possible collision.

Neither system would relieve the pilot of keeping a sharp watch for conflicting traffic. However, another aspect of the group studies involves an effort to improve aircraft conspicuity in flight through the use of lights, smoke trails, and special high-visibility paint.

One idea is to bounce radio signals from planes off the ground to be received by all other planes. If this system proves out in tests to be made by the FAA, it will be developed to warn also against collision involving climbing or descending aircraft.

Another system under investigation that may provide both collision avoidance and pilot warning is a novel flush-mounted scanning antenna developed by the Air Force.

The Naval Ordnance Test Station at China Lake, Calif., hopes to devise a warning system based on the use of infrared rays. Preliminary findings indicate that planes 10 miles away can be detected in this way.

Other ideas being pursued include an omni directional interrogating pilot warning instrument and the use of weather radar now carried on some planes to do double duty in collision warning.

Other work is being conducted in connection with altimetry as part of the hardware of collision prevention devices, communication system capacity in crowded areas, and the kind of maneuvers to be made in avoiding collisions.

"Fair Is Foul And Foul Is Fair: Hover Through The Fog And Filthy Air"

—Shakespeare

"But, Sire, speaketh thou of the fog within the cup or that without?"

"Fool! Knowest thou not the surgeon of flight hath dealt with the cup? No man dare to touch the bird until the twenty-fourth hour hath passed!"

"Then what be thy concern?"

"It hath come to mine ears that our birdmen would fly through earth-bound cloud, using not the magic of needle and gauge, but trusting only their dampened vision to see the way. And loud is the crash thereof! And thus must the tax collector go forth and levy that which is ill received. For birds and birdmen must be replaced."

"Thy wisdom is greatest in the land! Speak, I beseech thee! Command this lowly scribe!"

"Tell the birdmen the ways of this cloud. Speak to them of dew point, temperature, moisture, and wind. Implore them to fly with the Rules of Instrument when it appeareth a cloud may blot their route. Teach them patience to await the clearance. Above all, impress them with the folly of looking where they see not. This do, and our birdmen shall suffer only gout and old age."

"It shall be done!"

FOG

Actually, as we very well know, there is little to tell rated aviators about fog that they haven't already heard. But the loss of 28 lives under weather conditions during the past year is a strong indication that weather knowledge is not being retained. Or, if it is retained, it is not used.

What caused these fatalities and accidents? Army Aviators attempting to fly by Visual Flight Rules through instrument or marginal weather. Fog played a dominant role in many of these accidents!

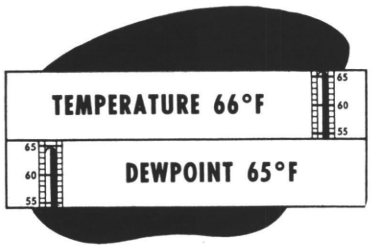
Aviators are not the only ones who need to understand the hazards of fog. Commanders and passengers must appreciate these hazards if fog accidents are to be prevented. Implications caused by high

---

Prepared by the U. S. Army Board for Aviation Accident Research.

ranking passengers — pilots' fears for professional reputations and military careers, whether real or imagined, have been determining factors in decisions to attempt VFR flights into known marginal weather conditions. For these reasons, a review of fog in its various guises should be of interest to all.

What is fog? Fog is any cloud which lies on the ground and restricts horizontal visibility. These clouds will form under certain conditions of air saturation, temperature, pressure, terrain, and wind. Air has



often been compared to a giant sponge in its relation to water vapor. The warmer the air, the more water vapor it can soak up without visible moisture. Conversely, the cooler the air, the less water vapor it can soak up and hold without visible moisture. Cooling saturated air is, in effect, squeezing the sponge. When this occurs, whatever the reason, fog will form.

The temperature at which saturation of the air is reached by cooling is called the dew point. Dew point indicates the temperature at which fog will start to form when air temperature is falling. When the air is saturated, dew point and temperature are the same and relative humidity (percentage proportion between water vapor present and water vapor necessary for saturation at a given temperature) is 100 percent. At all other times, the temperature will be higher than the dew point. A large spread between temperature and dew point indicates a low relative humidity. **A small spread between temperature and dew point indicates high humidity and a stronger likelihood of saturation and fog.**

WIND

Windspeed is important in fog formation because of vertical currents which result from friction between the air and the earth's surface. These vertical currents cause turbulence and mixing. When all other factors are favorable for fog formation, only dew, frost, or a very shallow layer of fog will form under calm wind conditions. A light wind produces turbulence which mixes air through a deeper layer as the wind increases. As long as there is sufficient moisture to saturate the mixed layer, fog will remain. The stronger the wind, the deeper this fog layer until it becomes so deep that available moisture is not enough to saturate the whole thickness. When this happens, the base of the fog begins to lift.

HAZE

Haze is closely related to fog formation. As air approaches saturation, prior to the formation of fog, haze becomes more dense, indicating that fog will form if other conditions are favorable.

AIRMASS FOGS

Airmass fogs are formed when a layer of air next to the ground is cooled by the colder surface below. Turbulence causes vertical mixing and deepens the fog layer. However, cooling of the air next to the surface makes it heavy so that no large scale mixing occurs and the fog persists. This cooling causes a temperature inversion, in which the temperature increases with altitude to the top of the fog layer.

With a slight wind, vertical mixing destroys the lower part of the temperature inversion and fog forms in the layer below the inversion. Stable air above an inversion acts as a lid on further mixing. A stronger wind may cause the temperature inversion to occur at a higher altitude and result in low stratus clouds.

Heat is the greatest enemy of fog. Dissipation of fog clouds normally occurs when heating from the sun produces three effects:

Heating produces convection currents.

It supplies energy to change liquid to vapor.

And it raises the air temperature, which causes newly formed vapor to remain in a gaseous state.

There are several types of airmass fogs. Each gets its name from the manner in which air is cooled to its dew point or saturated to condensation.

RADIATION FOG

Radiation fog generally occurs as ground fog. It is caused by the radiational cooling of the earth's surface at night and only forms over land surfaces. Ground fog is usually scattered over a wide area.

ADVECTION FOG

Advection fog is produced by air in motion, or it is fog formed in one place and carried to another. It is formed when the air is transported over a colder land or water sur-

face. Cooling from below gradually builds up a fog layer. The cooling rate depends on windspeed and the difference between air temperature and the temperature of the surface over which the air travels.

Advection fog is found on or near large bodies of water, as along seacoasts and large lakes. Most advection fogs occur at windspeeds between 5 and 13 knots. However, sea fogs have been found with wind velocities as high as 26 knots. Sea fogs can stand high windspeeds because of the lower friction effect over a water surface. Stated another way, winds of equal speed produce less turbulence over water than over land.

UPSLOPE FOG

Upslope fog is formed by the adiabatic cooling of rising air. When a sponge of air rises, the pressure on it decreases and the air expands. This expansion, as it pushes aside the atmosphere to make room for it, is work. The energy for this work comes from thermal energy within the sponge of air. As a result, its temperature drops. These changes which take place within a system of air without the addition of heat or the withdrawal of heat from the system are called adiabatic changes.

The word **upslope** describes fog which is formed when warm, moist air is forced up a slope by the wind. The cooling of the air is almost entirely adiabatic, since there is very little conduction to the surface of the slope. Air must be stable before it starts this motion so that the lifting will not cause convection currents which would dispel the fog. This type of fog is usually found where air moves up a gradual slope. It is usually a deep fog and requires considerable time to dissipate.

STEAM FOG

Steam fog is formed when air is saturated by evaporation of water. It occurs when cold air moves over warm water. Evaporation from the surface of the warm water saturates the cold air and causes fog.

FRONTAL FOG

Frontal fog is caused by rain falling from warm air through cold air below. The falling rain evaporates and gradually saturates the colder air. Any slight cooling of this air is enough to produce fog.

In the formation of frontal fog, evaporation from rain continues as long as the temperature of the raindrops is higher than the temperature of the air, even though the cold air is already saturated. The upper regions are saturated first, as the temperature and dew point in these regions are lower. As the evaporation process continues, a layer of clouds builds down from the frontal surface. This layer of clouds eventually extends down to the ground and becomes fog.

During the day, turbulence caused by solar heating keeps the cloud off the ground. After dark, dying convection currents and nocturnal cooling of air causes the cloud layer to drop suddenly. This sudden drop gives frontal fog its most dangerous characteristic — zero ceilings with almost no warning.

Cold fronts usually move so rapidly and have such narrow bands of precipitation and high wind velocities, that cold-front fog is comparatively rare. The warm front type is the most common and dangerous. Frontal systems are extensive and warm front fog may cover a wide area. As this fog extends from the ground to the frontal surface, it is also very deep. In addition, clouds above the frontal surface slow down the dissipating effect of heat from the sun. All these factors make warm-front fog the most serious type to encounter. Flights under warm fronts should be made only after careful inspection of the weather map, noting dew points and rainfall. Conditions in this type of system worsen during night hours.

FORECASTING FORMATION OF FOG

Most fogs are caused by a combination of radiation and advection and occur most frequently at night. A reasonably accurate forecast of the time fog will form can be made if it can be determined at what time temperature and dew point will come together.

To summarize, fog may be formed by cooling air to its dew point or by raising the dew point by the evaporation from warm water which will saturate colder air. Haze warns of fog. Smoke intensifies it.

The best way to deal with fog is to avoid it. This can be accomplished through an understanding of the various ways in which fog is formed and full use of weather advisory services.

Weather conditions should always be a determining factor in making your decision to go or not to go, to file VFR or to file IFR. Let passenger rank, imagined or real pressure to make a particular flight sway this decision and you're asking to become an accident statistic.

fear without PANIC

Lieutenant Frank S. Stewart, Arty

YOU ARE on a routine administrative flight. The engine is roaring; everything is smooth. Weather is CAVU, and the old L-20 is really making good time. Not a worry in your head. Then it happens: silence. The engine has stopped. What do you do now? Your decisions in the next few seconds may mean your life and the lives of your passengers.

The cold fingers of fear reach into the pit of your stomach as the shock of the emergency travels the nerve paths. (Many Army Aviators have at sometime experienced a similar reaction. When deliberately choosing to allow the fuel tank to run completely dry before switching, a moment's inattention as the engine quits can cause terror.) But a moment later, you've remembered and reacted. The warm feeling of security thaws the cold sitting so heavy within you. But it could be real!

Fear is an emotion experienced by every creature. Some of us never experience a great fear, but our daily lives are made up of small fears. Part of maturity is an ability to recognize the fears, call them by name, and then work to minimize their affect on us.

Occupational fear is felt sometime by every Army Aviator. He knows its reality in every aircraft accident report, in every death of a fellow pilot. The mature aviator knows that he chances a grave emergency each time he flies and that fear can either take his life or save it.

Fear will help make him a good aviator, careful of the minute details that will extend his lifeline. Fear can cause panic that leads to despair and death. The pilot holds the key of choice — even here. Fear cannot always be overcome, but panic can be eliminated.

The feeling of shock and fear during an emergency is natural. Most people never overcome the fear, but the effect on our actions can be lessened.

Lt Stewart is assigned to the Protocol Division, U. S. Army Aviation Center, Fort Rucker. He is fixed and rotary wing rated and instrument qualified. He has approximately 1,700 flight hours.

The time lost and the confusion caused by sudden panic may be unimportant when cruising along at several thousand feet but can be fatal in such instances as short final or take-off or during a low-altitude flight. This delay in reaction is often due to our feeling of being inadequate and unable to handle the situation correctly.

There is really no excuse for an Army Aviator to ever be in a situation of not knowing what to do. Proper reactions should be so studied that they come almost automatically. How long has it been since you reviewed the emergency cockpit procedures in the aircraft you are qualified in but fly only occasionally? (Or for that matter, the aircraft you usually fly?) Reading them in the -1 or from some checklist is no substitute for actually going through the procedures in the aircraft. Try it; you'll probably be surprised at the number of items that seem almost new because it has been so long since you've thought about them. Routine refreshing of your memory and reaction is necessary if you are to handle emergencies well.

Another good refresher is the aircraft itself. How far will it glide with power off? Where can you put it down? How long a ground roll is necessary before you can safely stop? Try some power-off landings and limit yourself to the first 1,500 feet of runway. Any use of power or inability to stop in this length should be considered a warning: you are not as sharp as you should be. Many of us have forgotten how tough it can be. But if we think back we can remember the days when we were flying in and out of fields that length all day and power-off landings were no sweat. If you can hit the field on a power-off 180° side, 360° overhead, or cut it at the right point on those long straight-in approaches, you can be confident of hitting your field in an emergency landing. If you can't do these things at your home field, how can you do it under the pressure of an emergency in unfamiliar, unprepared terrain?

If you really know these procedures, the cockpit procedures come almost automatically in an emergency. Confidence and proficiency gained and maintained by constant practice and review will cut the time lost due to initial fear. And this time loss can be precious.

A feeling of panic and the resulting confusion, with sudden distractions and the lost time due to them, breaks a chain of events and thoughts that are occurring rapidly. It puts the pilot behind a situation instead of on top of it.

We have all heard pilots say, "The wing struck a tree limb and the next thing I knew she got away from me and I tore her up," or "Suddenly I heard a loud noise just as I touched down, and I lost directional control and ground-looped." Yet, how many such incidents actually cause accidents? How many times has it been almost impossible to determine where the wing struck the tree or what caused the loud noise? These sudden incidents cause distraction; the speed with which the pilot recovers and continues his landing or makes his decision and acts on it determines their outcome.

Individual differences cause one man to go through one of these incidents or distractions and make a successful landing, etc., while the next man ends up with an accident. Some believe this ability to make a quick recovery is instinctive; some that the key is training and proficiency; others that it is a matter of good or bad luck. Instinctive reactions must play a part, but these reactions can come only through training and proficiency, for none of us was born with the instinctive ability to fly. As for luck, most of us realize that luck can often be controlled by the individual. Good luck comes to those who work hard.

It is in training and discipline that we can help ourselves. We must keep high standards of proficiency at handling the aircraft in all situations. We must know the emergency procedures and checks. The ability to think and act quickly is highly important. This ability to make rapid evaluations and prompt recoveries can be improved by self-discipline. The aircraft does not stop at the moment of distraction or emergency; neither must the mind nor reflex of the pilot. There is no time to weigh a situation before action; such delay can be fatal. Training, discipline, and procedures must be so well learned that the mind will work like a calculator: supplying the right decision, making the proper procedural movements. Only then can inflight panic be eliminated from our daily work. Only then can fear work for us, not against us.

Could You Spare A Life?

Captain John T. Stanfield, TC

IT WAS ABOUT 1600 hours on a rainy February afternoon when I looked up from my desk to see two Army Aviators handing their completed flight plan form to the flight operations sergeant for weather entries and approval.

I automatically turned to glance out the window, since it had been raining off and on all day. The ragged edges of the clouds hung lazily around the horizon. The rain had stopped for now though, and the weather did look some better around the airfield. Turning my attention back to the work on my desk, I also tuned an ear to the Plan 62 loudspeaker where the pilots would receive their weather briefing. Shortly there came the familiar voice of the weather forecaster stating, "One thousand foot ceilings, three miles visibility, with rain showers." I watched the two aviators' brows furrow a little at this, but they acknowledged the weather forecast. The sergeant completed the form with the weather officer's initials and a briefing void time.

The operations sergeant passed the flight plan over to me for approval, since both aviators were 3-3 pilots and their destination exceeded 100 nautical miles. I looked over the flight plan carefully. Before I signed it I could not refrain from suggesting that they remain overnight at our post, since it was only an hour before darkness and the weather was at the bare minimum for VFR flying.

The taller of the two replied, "I'd really like to stay, Captain, but when we left this morning the operations officer at our field said that there would be no per diem available for this trip and we should be sure and get back. Anyway, I've already spent ten dollars of my own money for a stopover last week when I got caught out in bad weather at Smithville. I didn't get per diem for that trip either."

So there I was, a flight plan properly filled out, weather at bare minimum, and two 3-3 aviators who wanted to get home to save paying out of their pockets for another night away from home. I signed the clearance, but not before I put in a few words about the merits of a 180° turn in case the weather got worse or was not as good as predicted.

I stayed around operations a little later than usual that night. It was quite a relief when I finally heard Flight Service calling to give an arrival time on the two aviators at their home station.

It has been a few months since this incident, but I can't shake the idea out of my mind. I keep thinking that the same story is being repeated at other Army airfields. And I keep wondering, how many times has it happened before? How many times has this been the real reason behind an accident or a death?

How about you? Have you ever gambled your life on a trip home through marginal weather to save a few bucks?

If you ask any pilot you know to gamble his life for twelve dollars he'd probably inquire about **your** sanity. And yet, that same pilot will take off for home in poor weather just because it's going to cost him the price of a BOQ and supper at the club.

You can sit back in your easy chair with your feet up, and say that this kind of pilot uses bad judgment — and you're right. You can "rubber stamp" bad judgment all over the accident reports in such cases, but let's look into this just a little further. What about the supervisory responsibility in a bad judgment case? Why shouldn't an aviator receive a definite assurance of per diem if he uses good judgment and decides against a flight because of weather conditions? Time and again aviators are assigned missions to fly and all too frequently there's the added reminder, "Don't get stuck, Joe; there's no per diem for this trip."

Now let's take a closer look at the supervisory level. The

Capt Stanfield is an instructor in the Instrument Division of the Dept of Advanced Fixed Wing Training, USAAVNS. He is fixed and rotary wing rated and instrument qualified, with approximately 2,700 flight hours.

Mr. Safety Officer, Are You Pennypinching On Per Diem?

aviation staff officer or the senior Army aviator at a station is responsible for advising the commander on all aspects of employment of Army Aviation. What larger aspect can you think of than being able to successfully perform your mission in a safe manner? Have **you** advised the commander of this need for per diem to stop aviators from making regrettable decisions? The comptroller can certainly never budget for the money if you don't show him the need.

This situation is closely related to other current problem areas. You have probably noticed recent articles in the ARMY AVIATION DIGEST which suggest that there are some underlying motives which cause a pilot to take certain courses of action. Two of the ones mentioned were: What effect does a family quarrel before work have on a pilot's ability to make good decisions and fly safely? How does a pilot respond in an emergency when he's worried about a big debt that's due? These questions and many others pertain to the field of aviation psychology, and I think this is the place to fit in our old friend "per diem." When forced to use personal funds all kinds of worries can harass some aviators. Depletion of take home pay—without assurance of refund — can result in poor judgment and a needless waste of lives and equipment.

If a pilot uses good judgment and elects to RON due to weather or other valid reasons, then he should not have to foot the bill himself.

How about you, Mr. Aviation Staff Officer, have you planned for this situation? Are your pilots still gambling their lives against a few dollars because you have been a little reluctant to mention additional funding to the Old Man? Better take another look at your program. Pennypinching may be the very thing that causes a big loss in lives and property in your organization.

Meet The New Iroquois

	YHU–1B	HU–1A
Seats	9	6
Engine	T–53–L5; 960 shp at 6,600 rpm*	T–53–1A; 860 shp at 6,400 rpm
Rotor blades	21 in. wide	15 in. wide
Rotor mast	53 in. high	40 in. high
Max gross op wt	8,500 lbs	7,200 lbs
Empty wt	4,450 lbs	3,960 lbs
Main rotor system and transmission	1,100 hp continuous	770 hp continuous

*Approved for test purposes for 1,100 hp at 6,600 rpm.

Army Aviation's YHU-1B Iroquois is undergoing user tests conducted by the U. S. Army Aviation Board at Fort Rucker, Ala. The B model has the same overall appearance as the HU-1A, but incorporates several improvements.

The HU-1B has exceeded 160 mph, climbed 19,686 ft in 8 minutes, 10.2 seconds, and flown 345.1 miles nonstop. It incorporates the Army standard T instrument panel for pilot and copilot. (See DIGEST, Dec '60, page 15.)

the missing link

"HI SARGE! Where's Lieutenant Brown?"

The first sergeant looked up from his work into the eyes of Corporal Smith, a bouncy little man new in the outfit. "He's getting in a little link time, Smitty. What can I do for you?"

"Nothing, I guess. It can wait till later." Smitty walked over and gazed out the window. "Boy, Lieutenant Brown must be a bug for golf—playing in the rain like this."

The sergeant raised his eyebrows in disbelief. Smitty **was** slow, but surely not **this** slow. "He's not playing golf, Smitty; he's over at link. You know — he's in one of those idiot boxes, boning up on instrument flight."

"Oh, yea—Link, LINK. Up at building 606. You know . . . I thought. . . ."

"I **know** what you thought," the sergeant interrupted, "but you still have it all wrong. Those are procedural trainers up at 606. Lieutenant Brown's over at 1050 in an instrument trainer."

"There's a difference?" Smitty asked.

"Of course!" The first sergeant searched his mind for a quick explanation. When it was not forthcoming he bellowed, "Are you ready for the Old Man's inspection at 1000?"

The sergeant sat scowling as Corporal Smith beat a hasty retreat.

"Links, flight simulators, instrument trainers, procedural trainers, idiot boxes — what ARE the proper names for these machines?" he thought to himself. "And just what does each one do?"

He returned to his paperwork, but found himself wondering about "link trainers." Anxious to settle the matter, he reached for the telephone and called several friends. But they too were hazy on the subject.

After querying several aviators passing through the orderly room, he found that he was getting nowhere fast. It seemed there was a great deal of confusion about the nomenclature of these ground-bound whirlarounds.

The inspection was barely over when the first sergeant grabbed his hat and hustled over to building 1050. He entered the huge building and found himself facing two long rows of tilting, tipping, and turning "idiot boxes."

"Can I help you, Sarge?"

The first sergeant turned and saw a lean, weather-beaten specialist sitting at a nearby desk.

"Maybe," the sergeant answered. "I'd like a little information about link trai . . . er, that is, ground trainers. I'm a little confused over the different types and how they are used."

"You've come to the right place," the specialist said, "I've worked with them all. Pull up a chair and have a cup of coffee."

The specialist began his explanation as he strolled to the coffee pot. "Flight simulators, or trainers, fall into three categories. First we have synthetic instrument trainers, like you see here." The specialist waved in the direction of the instrument trainers. "The trade name, 'link', is used erroneously in reference to these trainers. They are designed to climb, descend, turn, and follow imaginary beams — all 'on the gauges.' The flight instruments respond to stick, rudder, and throttle, and portray the aircraft attitude."

The specialist walked back to his desk and handed the sergeant his coffee. Then he continued, "In Army Aviation we use the 1CA1 fixed wing, single engine, single seat trainer [fig. 1] and the 2B3 rotary wing, single seat trainer [fig. 2.]

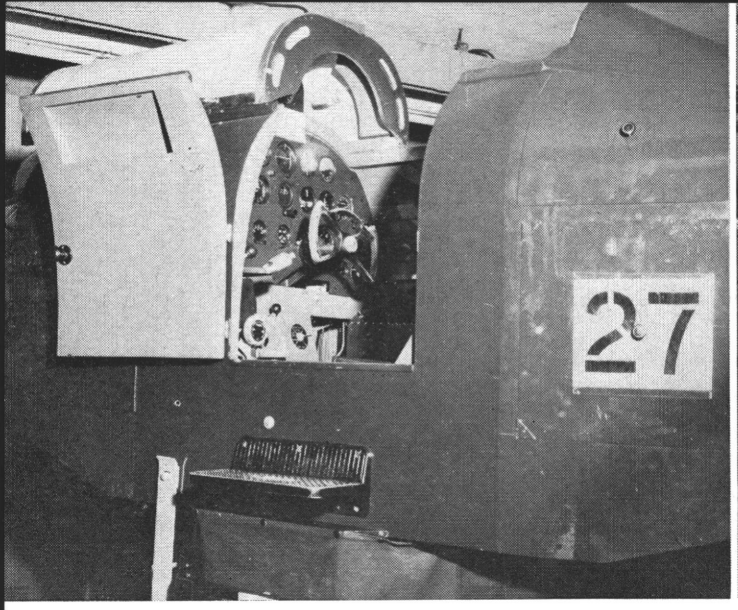


Figure 1. 1CA1 F/W synthetic instrument trainer

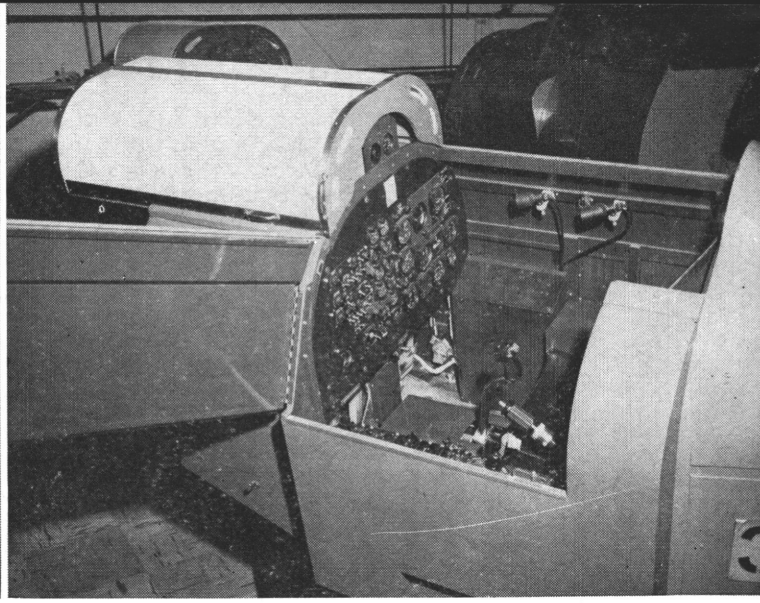


Figure 2. 2B3 R/W synthetic instrument trainer

The 2B3 is merely a 1CA1 modified to incorporate rotary wing equipment and simulations. [Figures 1 and 2 illustrate the differences in the panel and flight controls.] Both trainers tip, tilt, and rotate in response to the controls. In either case the instructor can communicate with the student, observe the 'flight' progress, and act as Air Traffic Controller. A recorder duplicates the 'flight' on a desk chart, which is used to criticize the student on his errors and weak spots."

"Are these the only types of instrument trainers?" the sergeant asked.

"The only kind we use," the specialist answered, "but there are some on the market that remain stationary, such as the C-11A."

The sergeant sipped his hot coffee, then asked, "How do instrument trainers differ from procedural trainers?"

"Well, Sarge, procedural trainers fall into another category. They remain stationary and only teach cockpit procedure. The students cannot 'fly on the gauges,' since the flight instruments do not portray flight attitudes. Actually, procedural trainers are just fairly exact copies of cockpits in particular types of aircraft.

"Here we use the H-21 Shawnee [fig. 3] and H-34 Choctaw [fig. 4] procedural trainers to teach prestarting, starting, warmup, rotor engagement, shutdown, and various emergency procedures. The student learns the location of all the switches and how to use them.

PUZZLER

No. 1

AN L-20 has been airborne for 2 hours on a cross-country flight. The engine is performing normally when the pilot notices the oil pressure is low. The oil temperature and cylinder head temperature gauges are in the green.

What is the probable cause of the low oil pressure?

A. Low oil supply.
B. Oil temperature regulator valve stuck.
C. Malfunction of oil pressure gauge.
D. Dirty oil.

No. 2

At the end of a flight, the Bird Dog pilot pulls the idle-mixture control to the rear to shut down the engine and the engine continues to run.

What is the probable cause?

A. The ignition system is shorted out.
B. The poppet valve is dirty.
C. The induction system has dirt in it.
D. The diaphragm between "A" and "B" chambers is ruptured.

Recommended solutions to the puzzlers may be found on the following page.

Figure 3. H-21 Shawnee procedural trainer

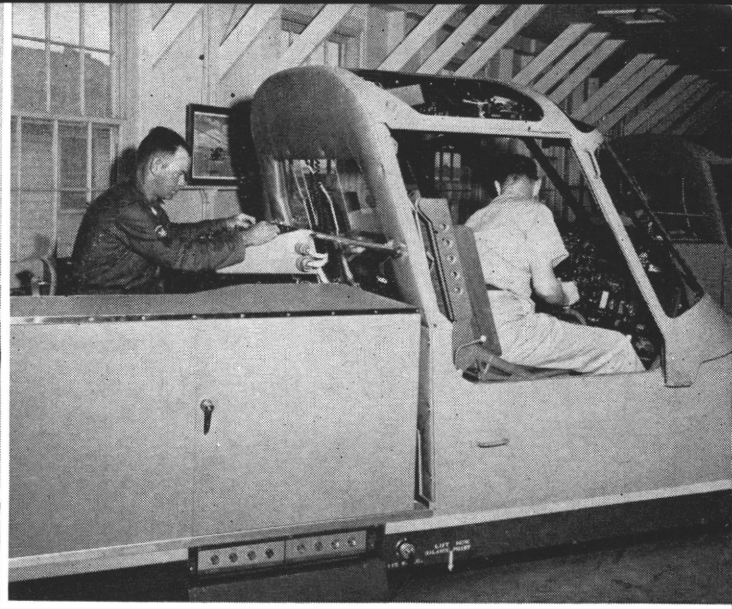


Figure 4. H-34 Choctaw procedural trainer

You can see these trainers up at building 606."

"Yes," the sergeant replied, "I'm going to stop by there on the way back. What about the third category?"

"They're called flight simulators — a combination of instrument and procedural trainers," the specialist replied. They simulate particular types of aircraft in cockpit layout, portray flight attitudes, control pressures and incorporate some degree of physical sensations of flight. They are one step short of giving a crew the actual in-flight feel of a complicated aircraft. However, Army Aviation does not use flight simulators at the present time.

"That about covers it, Sarge. Any more questions?"

"No, that clears it up," the sergeant answered. He thanked the specialist and after a brief stop at building 606 he returned to his office and sent for Corporal Smith.

In a few minutes Smitty appeared. "You wanted to see me, Sarge?"

"Smitty, I'm sorry I didn't have time to explain to you about flight simulators this morning. Are you still interested?"

A little surprised, Corporal Smith hesitated. However, when he noticed the scowl returning to the sergeant's face, he decided it was best to quickly answer in the affirmative.

"Good!" the first sergeant said with a crafty smile. "You've come to the right place. Flight simulators fall into. . . ."

Solutions to this Month's Puzzlers

No. 1

C. Malfunction of the oil pressure gauge is the cause of this condition and the proper answer.

Answers A, B, and D would also cause low oil pressure, but in each case the oil temperature would rise.

No. 2

B is the correct answer. Foreign matter behind the poppet valve will not allow the valve to close. A mechanic will have to remove the valve and flush the line, allowing fuel under pressure to wash the poppet valve seats.

Answers A and C would have no effect on the idle-mixture control.

Answer D — the engine will not run above idle range (1300 rpm). Engine will cut off even though the diaphragm is ruptured. The engine will perform normally at speeds below 1300 rpm.

First 500 Hours

Lieutenant Dewey C. Yopp, Inf

MARGINAL WEATHER

APPROXIMATELY two weeks after signing in for duty, the newly graduated Army Aviator was assigned a routine mission of flying an inspecting officer approximately 60 miles away and return. The weather was approximately 2,000 feet scattered condition. Trip to destination was uneventful, with a 2-hour stop and then return.

After takeoff and reaching altitude, he noticed that the scattered condition had become overcast and appeared to be lowering toward their flight direction. Almost halfway back and over mountainous terrain the Army Aviator flew into a cloud. After 3 to 4 minutes (which seemed much longer) the pilot made a 180° turn. With the lowering condition and still over mountains, the aviator failed to break out of the scud. Completely on instruments the pilot tuned in a local homer, but static made reception difficult. While tuning and jiggering with the radio the pilot saw a hole and approached it. He came out on a mountain ridge and followed it down into a valley and out of the dangerous situation. After a 15-minute flight to the home strip, the pilot landed and tied the aircraft down. While performing this task the pilot noticed quite a bit of ice on the propeller, more on the wings, elevators and the prop. Needless to say, this Army Aviator was extremely lucky to be able to relate this story. However, his education had just begun.

SUPERVISORY ERROR

A few weeks later he was assigned the mission of organizing and training a formation flying demonstration team of nine aircraft. Organization and practice was accomplished smoothly and efficiently. After several days of practice the team was ready for a wet run the day prior to the big show. Unfortunately the left wingman of the second vee could not make the wet run or the actual demonstration. Another pilot who had little practice in formation flying was picked for this position.

Our AA was leading the second vee, with the new man on the left wing. The formation called for a low pass over the division parade ground with a burst made in front of the reviewing stand. The lead aircraft made an abrupt pull-up, while the wingmen made 90° chandelles to the left and right respectively. The new man made his turn to the right, flying his aircraft into our aviator. The result was considerable damage to his left wingtip, aileron, spars, and top of wing. Both aircraft made it back to the home strip without difficulty.

Perhaps you think this is enough to ruffle anyone, but we aren't through yet. Several weeks later the same Army Aviator was assigned to organ-

---

Before his assignment overseas, Lt Yopp was an instructor pilot in the Advanced Contact Division of the Dept of Advanced Fixed Wing Training, USAAVNS.

ize and conduct an aerial observation course for the division. On one occasion there was a shortage of pilots and our AA flew one of the students. The whole period was flown on one gas tank. On landing for fuel, the pilot told crew chief to gas it up. The observer was critiqued and a new observer was ready to go up. The aviator checked gas GAUGES and strapped himself in, made the engine runup, and began the takeoff roll. After gaining about 300 to 400 feet the engine coughed, sputtered, and quit. Pilot made a safe dead-stick landing.

After the pilot restarted the engine, made a long runup, and satisfied himself that the engine was running properly, he took off again. On breaking ground the aircraft again quit. Pilot landed safely just prior to running out of runway. (Strip was on mountain with deep drop-off on each end.) This made the AA start thinking. A VISUAL check of the gas tanks proved he was making the runup on the full tank. The other tank was so empty it read full on the gauges. This was the one the pilot was attempting to use on takeoff.

Education still not complete. A few days later this Army Aviator was assigned a routine mail run. He was briefed on existing weather, which included icing conditions. The pilot called for a straight-in approach to destination. He was cleared and began descent with carb heat and 1800 rpm. The approach was long, low and short. Our Army Aviator attempted to add throttle and the engine began to run rough, and quit. He continued to jazz the throttle and began an approach to a road nearby. After gliding between the telephone wires and rounding out, the engine caught; pilot aborted the forced landing without further ado. Aircraft carb heat was only working partially.

TOO MUCH DEPENDENCE ON TOWER

More to come. Several weeks later this Army Aviator was returning to his home strip. Requesting a straight-in approach, the tower cleared him to report when one out on final. In the meantime tower cleared one H-13, one H-19, and one L-20 on base or straight in who were closer than our aviator. (In mountains the policy is to fly on one side of valley so a turn can be easily made.) Our aviator was flying to the south on the right side of the valley and at mountaintop level. He called one out on final and expected to make a 360 to the left. Tower requested the turn be made to the right, since the straight-in could not be made. Our AA attempted a climbing turn; as he approached the mountaintop the engine failed. Pilot was not able to lower the nose, so a sharp left turn was made, lowering the nose and gliding down the mountainside. A restart was successful and aircraft landed without incident. Inspection revealed the fuel pump was not functioning properly, resulting in fuel starvation.

Perhaps this is an unusual number of incidents happening to one pilot. Some were made through a lack of experience and foresight on the aviator's part. Some of the near misses resulted from mistakes of other people.

A review of these incidents might prove useful to other young aviators on their first assignment. First, the pilot flew into a cloud. The fatality rate among 3-3 aviators who attempt to fly under actual instrument conditions is extremely high. Never under any circumstances fly in marginal weather unless you are instrument qualified and have an aircraft equipped for instrument flying.

Next, we can consider a possibility of supervisory error: new man flying formation with no experience in this type flying. Make sure you are briefed properly and are allowed sufficient time to practice before attempting to fly any mission involving formation flight.

Third, we can see the importance of always making a proper preflight inspection. Never depend on your crew chief to make this inspection for you. Fourth, the pilot depended on the tower too much. Remember, the tower personnel are there to assist you in making safe, prompt takeoffs and landings. They advise as well as instruct, so if a tower operator should make a mistake notify him and advise him of your intentions. This coupled with a maintenance problem could have caused an accident.

Fortunately none of the above incidents resulted in an accident. They all had the ingredients of which accidents are made. These things could happen to you. If you are a new aviator with less than 500 hours first pilot flying time, you are the most vulnerable of all to crack up your airplane. ONLY CAREFUL HEADS-UP FLYING CAN PREVENT ACCIDENTS!

Two Brains For One ...ASE

Lieutenant Colonel William A. Howell, TC

"Automatic Stabilization Equipment" is the trade name of an item of equipment produced by one of the Army's prime manufacturers of transport helicopters. If this helicopter manufacturer will permit me, I would like to use "automatic stabilization equipment" as a general term rather than the nomenclature of a specific piece of his equipment. Instability, neutral control position, trim, etc., are common terms and problems of very realistic importance to every helicopter pilot. ASE solves these problems electronically far better than any pilot can, regardless of his proficiency and experience.

The present helicopter autopilot system is not as mystifying as it may sound. In simple terms, this stabilization gear is nothing more than an electronic brain which controls the helicopter hydraulic servo system, which in turn stabilizes the desired attitude, altitude, and heading set in by the pilot.

ASE is presently available in all H-34C model helicopters. I say "available" rather than "in use" because I find that it is

Since 1957 the author has been the Senior Army Presidential Helicopter Pilot and Commanding Officer, Executive Flight Detachment, Military District of Washington. In photo above, President Eisenhower and Naval Aide disembark from helicopter piloted by Lt Col Howell.

not used in many instances. Even more disturbing is the fact that some units equipped with H-34A models are not at all anxious to have them retrofitted with stabilization equipment.

For the past two years I have employed ASE from takeoff through touchdown and am extremely confident in its reliability. I have found it to be especially beneficial during my Presidential missions and I am sure it makes for a smoother more enjoyable flight from the passengers' standpoint. Under field conditions ASE renders invaluable assistance even to the most experienced pilot, and of course its contribution during long cross-country flights is readily apparent. For these reasons, I was extremely interested in finding out why pilots were hesitant to utilize what I think is the greatest safety device yet installed on helicopters.

In my discussions with experienced aviation officers, most of them seem to think it is fine, but some feel that any autopilot is just for the pilot's convenience, and generally a waste of money. Usually these officers are in a position to pick the time, place, equipment, and mission when they want to fly.

Experienced helicopter duty pilots who have been newly introduced to ASE reveal mixed emotions concerning this equipment.

"Never thought I would see the day," one aviator says, with his hands and feet nervously hovering near their respective controls.

When he gets a little more familiar with it: "Mighty fine equipment to hold the heading, airspeed, and altitude, but of course I turn it off for takeoff, landing, and hovering."

Now he is thoroughly familiar with ASE and using it constantly: "I turn the ASE on in my regular warmup procedure and I turn it off in the shutdown procedure. It is the greatest, particularly in night flying and low visibility conditions when a stable aircraft prevents grey hair."

Many fatal accidents have occurred in helicopters at night and in marginal weather conditions caused by instability and the pilot's inability to cope with this lack of stability due to vertigo and plain lack of a natural horizon. This inherent instability in helicopters becomes even more important with the advent of helicopter instrument flying. Many Army Aviators believe that helicopters are more conducive to pilot vertigo than fixed wing airplanes, because of main rotor blade shadows and vibrations. Assuming these comments to be facts, a system that will give a helicopter stability is a necessity if we are to exploit the full potential of these extremely versatile machines for employment under tactical conditions. An autopilot that will permit precision approaches to a small landing area in a forest under instrument or blackout conditions is the ultimate.

Probably the greatest deterrent to the general use of ASE equipment where it is available is the lack of maintenance. No equipment is any better than its state of maintenance and its method of operation. ASE is not as complicated to maintain as many other items of electronic equipment in the Army. The real requirement does exist though for certain specialized training of maintenance personnel and the procurement of a few special tools with which to troubleshoot ASE.

The immediate fact and the point of these remarks is that we do have at least one system of automatic stabilization in the hands of operational transport helicopter units. This system is the first of its type that has been available to operational units, and it is reasonable to assume that it will be the simplest insofar as maintenance is concerned. Future systems of automatic stabilization will be more complex, more sophisticated, and it is hoped more precise and efficient, if knowledge and experience continue to mean what they have in the past. It is of utmost importance that commanders, aviators, and maintenance personnel learn to use, maintain, and exploit this safety device to the fullest in order to prepare themselves for the more sophisticated, and efficient VTOL and STOL equipment of the not-too-distant future.

To quote a general officer, "The helicopter is the greatest thing that has happened to the Army since the invention of the machinegun." With this type of feeling and support it behooves every Army Aviator and maintenance man in the Army helicopter program to exploit the potential of the helicopter to that end. Automatic stabilization equipment is an advancement in the technique of helicopter flying that cannot be underestimated.

"If you are not thoroughly familiar with it, don't knock it."

(See "No Hands!" June issue, U. S. ARMY AVIATION DIGEST for additional information about flying with ASE. Ed.)

THE U. S. ARMY BOARD FOR AVIATION ACCIDENT RESEARCH

TWX exce

L-19A STRUCK TREES during go-around from tactical strip landing approach. Incident damage to horizontal stabilizer. No injuries.

H-23D ENGINE FAILED during attempted power recovery from practice autorotation. Aircraft completed forced landing with no damage. Piston in No. 2 cylinder failed due to upper compression ring failure.

H-34C STRUCK TREE during approach to confined area. Main rotor blades damaged. No injuries.

H-13H TAIL ROTOR struck bush during approach. Incident damage. No injuries.

HU-1A ENGINE FAILED at 1,500-foot altitude. Aircraft autorotated to landing with no damage. Suspect governor control or fuel control failure.

U-1A LOST OIL PRESSURE during night flight. Engine seized and aircraft crashed into trees. Aircraft destroyed. No injuries. Cause of oil loss undetermined pending engine analysis.

H-13E STARTED SPIN to right during hovering flight. Autorotation completed with no damage to aircraft. Mechanic failed to install pin in forward splined coupling of tail rotor drive shaft.

L-19E ENGINE FAILED during takeoff due to fuel starvation caused by improper positioning of fuel selector valve. Aircraft landed with no damage. No injuries.

H-19C ENGINE FAILED during test flight. Aircraft completed forced landing on gravel bar. Rotor blades flexed into and severed tail boom during ground roll. Major damage. No injuries.

H-13H STRUCK TREE during night flight in marginal weather. Pilot killed. Aircraft destroyed.

H-13E STRUCK POWERLINE and crashed. Pilot killed. Aircraft destroyed.

H-34C TAIL ROTOR struck lean-to during landing. Major damage to tail rotor blades and one main rotor blade. No injuries.

L-23D CRASHED after takeoff from airfield at 13,403-foot altitude. Pilot, copilot, and crewchief killed. Aircraft destroyed. Suspect failure of right engine. Cause undetermined pending investigation.

L-23D CRASHED in mountainous terrain. Pilot and four passengers killed. Aircraft destroyed. Cause undetermined pending investigation.

H-13G LOST RPM during confined area takeoff. Aircraft struck trees as it settled to ground. Major damage to main rotor blade and left skid. No injuries.

H-23D SETTLED SUDDENLY during low-level search and rescue flight in mountainous terrain. Aircraft struck scrub trees. Major damage to main rotor blades, fuselage, and cross tube. No injuries.

H-21C ENGINE FAILED in flight. Aircraft completed autorotation into cornfield with no damage. No. 4 cylinder connecting rod and master rod bearing failed. No injuries.

U-1A RUDDER STRUCK L-20A while maneuvering into parking area. Right wingtip and right wingtip tank of L-20A damaged. Rudder of U-1A damaged. Visibility at time of accident: 11 miles.

H-13H CONTROL LOST immediately before touchdown from practice autorotation. Major damage to main rotor blades, cross tube, longeron, frame section, and tail rotor drive shaft. No injuries. Extreme wind gusts caused loss of control.

H-13G LANDED HARD from practice autorotation. Incident damage to forward cross tube and right skid. No injuries.

rpts from nov. and dec.

H-13G ENTERED uncontrollable vibration during hover. Aircraft rotated 180° left and main rotor blades struck ground. Major damage to main rotor blades, skid, and bubble. No injuries. Suspect failure of dynamic stop cable.

H-34 ENGINE BACKFIRED and lost power in flight. Aircraft completed forced landing with no damage. Suspect impeller failure.

L-19A STRUCK TREE during approach to tactical strip. Incident damage to left wing. No injuries.

HU-1A GOVERNOR FAILED in flight and rpm went to 7200 for approximately four seconds. Governor switched to emergency and aircraft landed with no damage. Cause of governor failure undetermined pending analysis.

H-21 OIL PRESSURE DROPPED for aft transmission. Oil pressure warning light remained off. Aircraft was landed in open field and inspection revealed most of oil gone from aft transmission. Loss of oil caused by failure of pressure warning unit seals. Cause of malfunction of pressure warning light undetermined.

H-34C ENGINE RAN ROUGH in flight. Aircraft completed landing with partial power. Welds supporting shaft on carburetor air duct found cracked. This allowed door to drop and bind, causing mounting bolts to shear. Door covered carburetor intake port and restricted flow of air, causing rough engine due to excessively rich mixture.

L-19A WING STRUCK 8-foot cross during landing roll on road strip. Incident damage. No injuries.

L-19A LEFT TIRE BLEW OUT during landing. Fuselage skin buckled on each side and left fuselage stringer broken. No injuries.

H-13E ENGINE MADE loud noise and lost power in flight. Aircraft autorotated to landing with no damage. No. 3 cylinder failed. Cause undetermined.

L-23D COWL CAME LOOSE during takeoff and flapped in slipstream. Cowl buckled. No further damage. No injuries.

H-21C ENGINE LOST POWER and reverted to idle speed in flight. Aircraft autorotated to landing in open field with no damage. Bolt connecting throttle push-pull rod to throttle assembly came loose, allowing rod assembly and throttle to separate from bell crank.

H-21C ENGINE FAILED and forced landing was attempted on road. Right main gear failed on impact and aircraft rolled to right side. Major damage. No injuries. Suspect carburetor malfunction.

L-20A TAILWHEEL CAUGHT on PSP touchdown markers at end of runway during landing. Tailwheel severed. Minor damage. No injuries.

H-21 POWER FAILED shortly after takeoff. Engine continued to run, but there was no transmission of power to rotor blades. Forced landing completed with no damage. Numerous metal particles found in forward sump. Apparent internal engine failure. Cause unknown.

H-23C STRUCK GROUND in nose-down attitude at estimated speed of 40 knots during night proficiency landing approach. Pilot was thrown through top of bubble, but apparently suffered only superficial scratches.

H-13G MAIN ROTOR BLADES struck wire during takeoff from confined area. Major damage to main rotor blades. No injuries.

L-23D STRUCK RUNWAY LIGHT while taxiing. Minor damage to propeller blades. No injuries.

Memo from Flight Surgeon

The Aviator's Other Eye

Colonel Spurgeon Neel, MC

VISION IS the most important single sense in flying, and is essential under both VFR and IFR conditions. While the Army Aviator generally understands and appreciates the importance of such visual processes as near and distant vision, depth perception, and color vision, he is frequently less aware of the precise nature, importance, and effective use of night vision.

Current tactical concepts envisage increased requirements for night flying to provide continuity in the support of ground operations and to take advantage of the concealment of darkness in reducing the vulnerability of the man-machine system. While infrared and radar sensing devices promise much in intelligence operations during the hours of darkness, the Army Aviator is still largely dependent upon his own night vision for the safe and efficient operation of his aircraft under conditions of reduced illumination. Thus, an understanding of night vision is assuming increased importance in Army Aviation.

Most people are familiar with the analogy of the human eye and the box camera, with the retina being the counterpart of the sensitive film. Actually, the retina is best compared with two types of film which vary widely in sensitivity to light and discrimination of detail. Light sensitive nerve endings located near the center of the eye consist almost entirely of "cones." These nerve endings function only when light intensity is equal to or greater than bright moonlight. They are responsible for so-called "central vision," discrimination of fine detail, and color vision. This is the type vision normally used and which is evaluated by the various tests during the physical examination.

The cones become less frequent toward the outside of the retina, being replaced by other specialized nerve endings called "rods." These light-sensitive nerve endings are capable of function under illumination down to that equal to starlight. They are responsible for peripheral or side-of-the-eye vision and perceive objects only by contrast. While sensitive to movement of objects, rods do not perceive fine detail or color.

The important differences between these two "eyes" of the aviator may be tabulated as shown in table below.

With this brief physiological background, some of the practical aspects of night vision in Army Aviation may be discussed.

Actual night blindness is extremely rare, and is found only in those individuals with congenital absence of rods in the retina. By contrast, many are functionally night blind because they have not learned to use this sense properly. There is no real evidence of any racial difference in night vision efficiency. Variations noted are easily explained by differences in nutrition or experience in the use of night vision. Individuals from so-called less economically privileged groups may demonstrate excellent night vision as they have not

Function	Cones	Rods
Type of vision:	Central.	Peripheral.
Illumination required:	Relatively bright. Moonlight or better.	Relatively dim. Starlight suffices.
Time to dark adapt:	Relatively fast. Eight minutes.	Relatively slow. Thirty minutes.
Discrimination of detail:	Good.	Poor. Only by contrast.
Sensitivity to wave lengths:	All wave lengths of visible spectrum.	Insensitive to red.
Perception of color:	Good.	Absent.
Perception of movement:	Good.	Good.

had the benefits of artificial illumination to the same extent as the more privileged classes. These facts lead to the conclusion that night vision testing should not be aimed at selecting individuals with good night vision, but at identifying those who need further training in its use.

Most aviators require training in the use of night vision. Because the central area of the retina is composed almost entirely of cones, there is a 10° "blind" spot in the middle of the field of vision under conditions of reduced illumination. To use rod or night vision the observer must look 4 to 12° to the side, above or below the object to be seen. In addition, the use of scanning vision (i.e., moving the head from side to side) takes advantage of the sensitivity of peripheral vision to motion. Most of us have had the experience of seeing something out of the corner of our eye only to have the object vanish when we look directly at it. This demonstrates the relative sensitivity of side and central vision under low illumination.

Even though the aviator is skilled in the proper use of his eyes at night, he will see little unless his eyes are properly dark-adapted. Dark adaptation requires time. Central vision (cones) achieves maximum dark adaptation within a period of approximately 8 minutes; whereas peripheral vision (rods) requires some 30 minutes.

Complete darkness is required for maximum adaptation. This poses a problem in tactical aviation, wherein important on-call missions might have to be delayed until aviators dark adapt. Fortunately, the insensitivity of the rods to red light permits dark adaptation while continuing to use central vision. This may be accomplished by wearing red goggles, such as those worn by radiologists before doing fluoroscopic examinations. While red light is not the most soothing, red goggles will permit the aviator to continue reading, flight planning, and other normal operations while dark adapting. After wearing red goggles, even central vision requires only 3 minutes, instead of 8, to become dark adapted.

Dark adaptation is quickly lost by exposure of the eye to even moderate intensities of light, requiring repetition of the entire adaptation process. Once achieved, dark adaptation should be protected during flight. Central vision is necessary for reading of instruments and the intensities of light required are sufficient to destroy night vision unless red cockpit lighting is used. Red cockpit lighting is not only the best to use, it is also the safest in tactical night operations. Unless an enemy is looking directly at the aircraft he will not see it due to the insensitivity of his peripheral vision to red light. A major problem in using red cockpit lighting is that it is difficult to read maps or charts containing red lines or figures. Red is invisible under red light.

The use of dome lights or flashlights during night flying must be held to a minimum. The aviator should know his cockpit thoroughly and be able to reach and operate all controls in complete darkness. He should memorize routes, radio settings, etc., to the maximum extent possible. Should it become necessary to use white light in the cockpit, one eye must be kept closed. Night vision adaptation is an independent process in each eye. Its loss in one does not affect the other. Inasmuch, as night vision is essentially monocular, the aviator can do a credible job of seeing in the dark with only one eye dark adapted. These precautions concerning exposure of the dark adapted eye to white light apply equally to exposure to such light from without the cockpit, either enemy searchlights or friendly flashlights used by ground personnel in taxiing or parking.

Regardless of the skill with which an aviator uses his night vision, or the care with which he dark adapts, there is considerable variation in its efficiency among individuals, and in a given individual from time to time. These differences reflect physiological variations. The retina is actually a part of the brain and reacts to physiological factors just as does the rest of the brain. This fact is used by medical scientists in the evaluation of the effects of certain factors on brain function. Some of the physiological variables are of such practical importance to the aviator as to merit brief review.

Diet has a definite affect on night vision. Vitamin A is essential to the proper function of both rods and cones. The time required for dark adaptation is actually that required for accumulation of sufficient Vitamin A derivatives to permit vision under greatly reduced illumination. This food element is found in milk, liver, dairy products, green and yellow vegetables, and cod liver oil. The provision of an adequate diet to aviators merits careful consideration, and is not always easy in the tactical situation. Certain assault type rations may not contain sufficient Vitamin A to protect the

night vision function. In such cases supplementary Vitamin A must be provided flying personnel. The provision of excess amounts of Vitamin A, however, does not increase the sensitivity of the eye beyond normal values.

Glucose, a simple dietary sugar, is also essential to good night vision. As an extension of brain tissue, the retina utilizes glucose almost exclusively in its metabolism. Should the blood sugar drop to even fasting levels there is a significant decrease in night vision efficiency. To maintain an adequate blood sugar level, aviators may have to eat candy bars before and during flights. Obesity may be avoided by reducing carbohydrate intake at other times during the day. As a general rule, eat carbohydrate foods before flights, protein afterwards. As in the case of Vitamin A, ingestion of glucose over that required does not improve night vision beyond normal levels.

A lack of oxygen reduces night vision. The retina is extremely sensitive to hypoxia, and the night vision function is the first physical sense involved in going to altitude. A decrease in night vision may be noted at altitudes as low as 5,000 feet. When available, oxygen should be used from the ground up on night flights.

Smoking reduces night vision by its interference with the oxygen carrying function of the blood. Carbon monoxide in tobacco smoke combines with hemoglobin in the blood to render it unavailable for the transport of oxygen. Smoking three cigarettes will tie up approximately 4 percent of the hemoglobin with carbon monoxide. This gives the aviator a "physiological altitude" of 8,000 feet while still on the ground. At this altitude, there is a 25 percent decrease in night vision. Cigar smoke poses an even greater problem than cigarette smoke. While smoking does allay tension and reduce fatigue, aviators should abstain from smoking before and during night flights.

Prior exposure to bright light also affects the degree to which the eye may dark adapt, as well as the time required for the process. Two to five hours of exposure to bright sunlight can result in a loss of 30 to 50 percent of night vision ability. Further, night vision function is still reduced some 5 hours after exposure to bright sunlight. Aviators who expect to fly at night should protect their eyes from bright sunlight the day preceding the flight. If it is necessary to be outdoors, proper sunglasses should be worn. To be effective, sunglasses must not transmit more than 25 percent of the visible light to which exposed.

Night vision deteriorates rapidly with age. It is the most correlated with age of any of the special senses. An individual 40 years old requires about five times as much light to see an object under reduced illumination as does one 21 years old. An individual 58 years old requires about ten times as much illumination. The older individual also takes longer to dark adapt. This represents physiological aging, and indicates that the older aviator must be even more particular when flying at night than the younger one.

Inasmuch as objects under reduced illumination are visualized by contrast only, care must be taken that all windows, windshields, glasses, etc., are scrupulously clean. Dirt grease, or cracks all serve to set up reflections and distortions which may confuse and obscure night vision. The night preflight inspection should include a careful check of all windows.

According to information released by the Royal Australian Air Force, a smoker who uses 20 to 30 cigarettes a day impairs his night vision by some 20 percent.

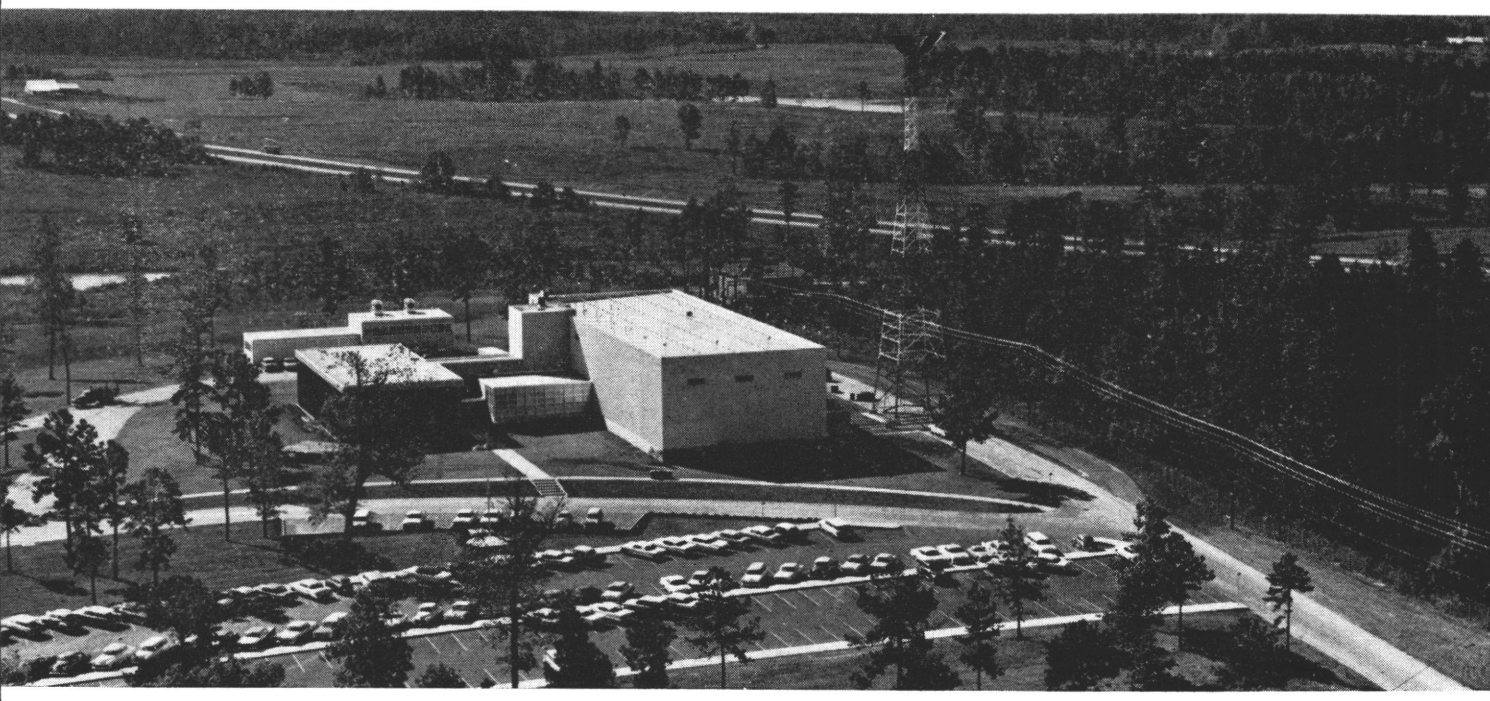
A bulletin of the RAAF states: "Carbon monoxide is readily absorbed into the bloodstream. It combines with the hemoglobin restricting the oxygen intake and inducing mild hypoxia. In the average smoker, the degree of carbon monoxide saturation is 5 percent. This degree of saturation reduces night vision by 20 percent.

"Thus the smoker begins night operations with a self-induced handicap of one-fifth of his effective vision."

The RAAF adds that smokers should not expect any reduction in this 20 percent handicap by using oxygen, due to the fact that carbon monoxide saturation takes many hours to counteract.

Night Vision Effectiveness

	Smoker	Nonsmoker
Sea level to 4,000 feet	80%	100%
6,000 feet	75%	95%
10,000 feet	60%	80%
14,000 feet	45%	65%
16,000 feet	40%	60%



FAA --- Friendly Aviation Agency

Captain Derrell W. Sandel, Inf

IN THE NORMAL course of governmental "alphabet soup" procedures, the Federal Aviation Agency has been given the short title of "FAA" or "F double A." Shortly after its organization, the short title became fair game for those who like to poke gentle fun and gibes at large agencies. One of the more popular puns for FAA is "Friendly Aviation Agency." For the Army Aviator this play on words is really meaningful. No other aviation organization does so much routinely for Army Aviation as the FAA. When Military Flight Service closes out January 1, 1961, the FAA will be the only agency with which the Army Aviator deals in the course of his domestic flights.

Some of FAA's more familiar functions for Army Aviation are to coordinate and control instrument flights along established federal airways; provide and staff instrument approach facilities at nonmilitary airfields; and provide and staff Flight Service Stations (FSS) to which Army Aviators make position reports on domestic flights and monitor so avidly for "quarter-past" and "quarter-till" weather broadcasts. Of course, each aviator can enumerate many more familiar functions of the FAA. Some of the lesser-known services FAA performs for the Army Aviation program are in order here.

The FAA provides, as qual-

Capt Sandel is Flight Facilities Officer, Airfield Command, Cairns AAF, Fort Rucker, Ala. He is fixed wing rated and instrument qualified, with approximately 1,000 flight hours.

ity control, a resident air traffic management specialist to each Army Aviation facility which has an approach control. This specialist, authorized under AR 95-185 and pertinent FAA regulations, monitors the quality of the operation procedures and the training level of controller personnel who man the approach control. He lends to planning and improvement the full weight of his years of experience in air traffic management, and provides an almost inexhaustible library of FAA policy and doctrine. He also acts as liaison between the Army commander and the FAA regional and ARTC center chiefs.

The FAA also provides the Army with technical assistance and advice on the installation and maintenance of radio navaids, on new approach procedures, and on air traffic management policies.

They provide specialist and equipment service in the routine flight check of existing navaids and commissioning flight checks of new navaids.

With the possible exception of the Flight Service Stations, the FAA function best known to the Army Aviator is the "Center," actually designated as "Air Route Traffic Control Center." The Center controls the movement of air traffic along air routes in its designated area. Each Center has several thousand miles of airways in its control area, and is responsible for them at all altitudes from an absolute altitude of 700 feet up.

Let me hasten to point out that Center is interested only in the control areas (airways) and control zones (terminal and airport areas), principally under instrument flight conditions.

Even though Center controls only those aircraft operating under IFR and in controlled airspace, they still have a monstrous job to do day-in and day-out. Of course, no one man could maintain a picture of the airways and traffic for the whole center area. So, the Center is comprised of many sectors. Each sector has a controller or controllers, a flight data man to prepare strips, and a radio controller to talk directly to the pilots by radio that is remoted from peripheral radios located all over the Center's control area.

These sector controllers are responsible for a specified part of the area and learn it thoroughly. The controller moves his traffic through his sector smoothly and routinely, envisioning possible conflicts before they have a chance to happen and resolving them well in advance. This sector controller and all his compatriots chained to their sectors during any given shift are en route controllers; they are also terminal controllers for those airports in their sector that have instrument approach facilities and no approach control. So you can see that their duties are very complex.

Two phrases were mentioned earlier that deserve elaboration. One was "maintain the picture"; the other, "chained to the sector." To an untrained observer the first seems impossible. To "maintain the picture," a sector controller must envision the complex airway structure in his sector in two dimensions: vertical (overall) and profile (at all altitudes). Then he must project onto this two-dimensional picture all the known IFR air traffic. When he has this complete picture established, he projects the aircraft ahead to determine if a conflict is going to develop. He must also keep in mind the aircraft on the ground that propose to take off, project their proposed route and destinations, and issue clearances to them. A prodigious task, but one that ARTCC handles 24 hours each day, 7 days each week.

While the first phrase above seems impossible, the second seems unbearable. "Chained to the sector" means just that. The controller's chain is his microphone and telephone cables. The controller is allowed no lunch or coffee breaks. When he starts his shift he "gets the picture" and works the shift straight through. The FAA feels that it would take too long to work a relief controller into the picture to allow a lunch break. The physical grind and the psychological pressure of this work must be experienced to be really appreciated.

New duties will be assimilated by the FAA's ARTCC and FSS upon the demise of Military Flight Service. The communicator manning the Flight Service Station assumes most of the extra work load; however, ARTCC will handle certain of the functions now performed by MFSC.

Principally ARTCC will control the DF (direction finding) net and coordinate of DF stations and agencies, to include receipt of DF bearings, courses or steers, as appropriate, and plotting such information to determine aircraft position. Also the ARTCC will exercise control over individual DF agencies as necessary, to issue advisory information, plotted

or fixed positions, appropriate weather information, recommended courses of action, and airport data as may be needed by the emergency aircraft.

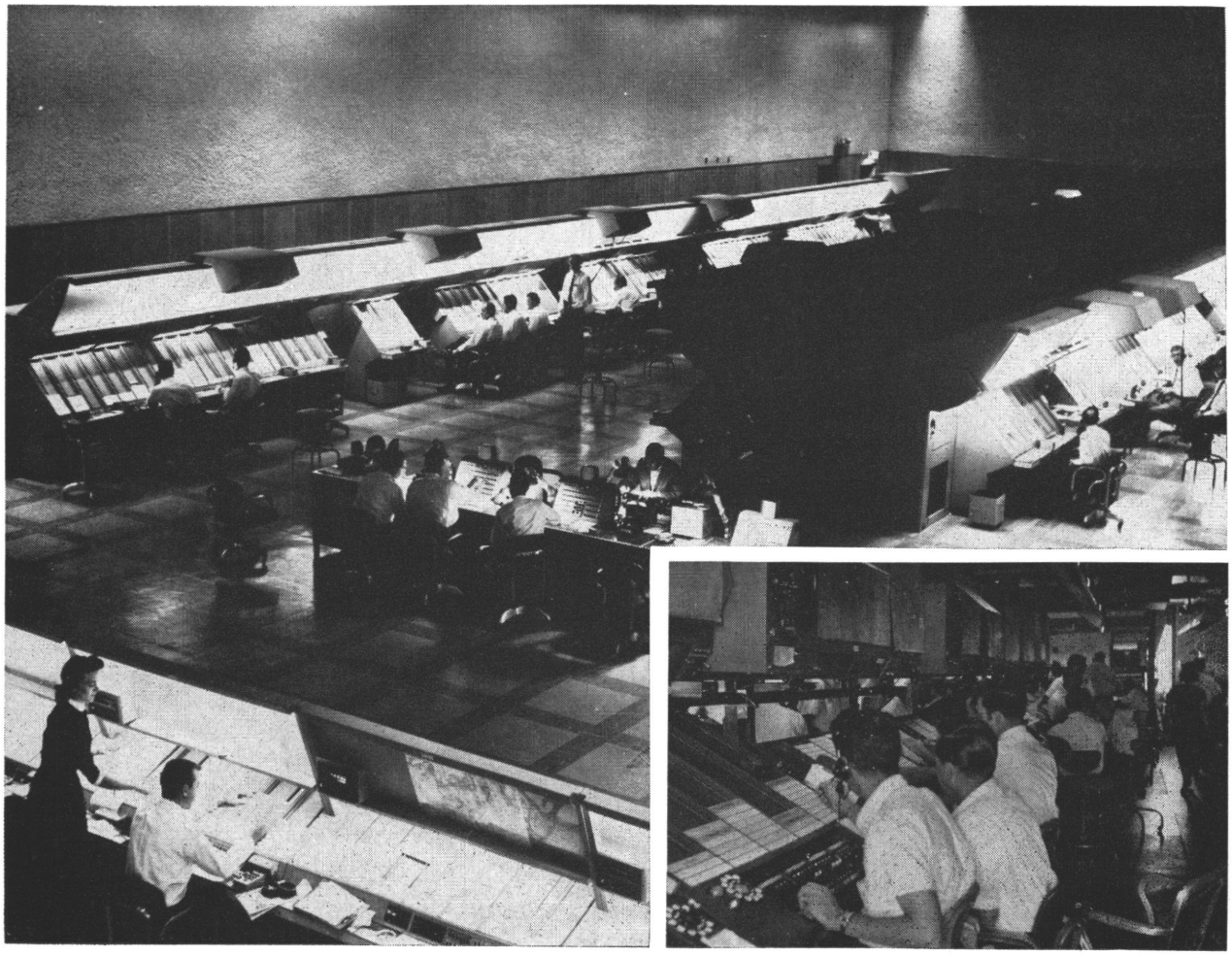
The ARTCC will handle air raid alerts now also, assuming that function from MFSC, and will be the coordinating center for hurricane evacuation missions.

The flight plan relay and the flight following functions of MFSC will be absorbed by the FAA's FSS, termed by the FAA as tie-in stations. Each of the designated tie-in stations will be part of a large teletype net. The military aviator filing a flight plan at his military base operations will follow established procedures. The base operations, however, will file the flight plan with their designated FAA tie-in station, either by intercom line or by teletype. The FAA FSS will then take over all relay and flight following.

From the user point of view, the operation thus far looks just like it did when MFSC had it. In the case of late, overdue, or lost aircraft, the InREQ (en route information request) will be initiated by the FAA. If the situation calls for it, the FAA will blow the whistle for a SAR (search and rescue) mission to be flown. However, the final decision for this will rest with the commander of the appropriate Air Force, as it does now.

In case the Army Aviator files a flight plan from an airfield having neither military base operations nor weather forecast facility, then his position changes considerably. He will file it in person or by phone with the nearest FAA FSS tie-in station. The aviator will satisfy the weather require-

Old crowded center working areas (inset) do not compare to airy centers in use today



ments for the flight by getting the weather from the nearest FAA facility providing it. (The FAA utilizes U. S. Weather Bureau circuits, reports, and forecasts.) If this is unavailable then weather can be checked by telephone from the nearest military operations having weather forecast service.

At this writing, Army regulations have not been published to provide clearance authority for those aviators and particular flights requiring it. Advance information indicates that the regulation changes forthcoming will conform generally to present Navy procedures in similar situations, i.e., aviators are authorized their own clearing authority when operating from airfields not having military base operations with clearing authority.

In addition to the several pilot and flight plan services outlined above, the FSS will assume many more administrative duties, such as advisories, message relays, etc. All this adds up to an enormous amount of operational and administrative support to be provided the Army Aviator and his whole aviation program by the Federal Aviation Agency.

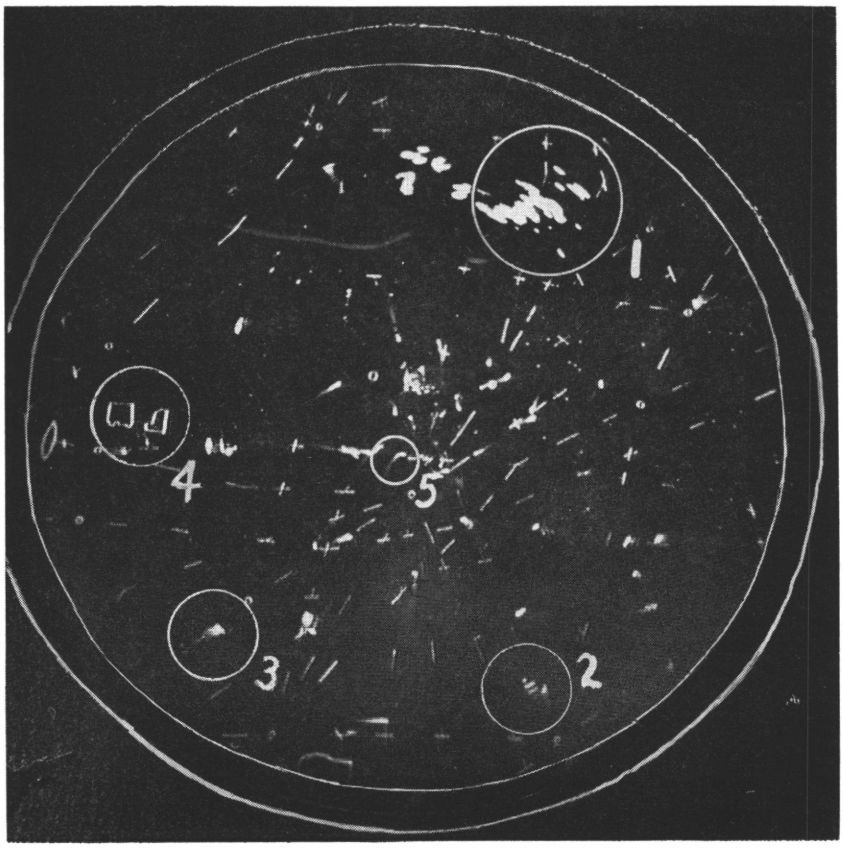
In the past, and presently in some of the remaining old Centers, the controllers performed their arduous duties under most adverse conditions. The Centers were designed for limited operations, and the operations had grown all out of proportion. They were crowded, noisy, sometimes not air-conditioned, and many times not soundproofed to the airport activities just outside. When the FAA succeeded the CAA, it became a young, vital and growing organization. New plans, larger appropriations, and modern construction projects were initiated.

The fruition of some of the improvement plans can be seen at Hampton, Ga., and at Hilliard, Fla., respective sites of the new Atlanta and Jacksonville centers. These installations are representative of proposed or partially completed center facilities to be found all over the country. For a closer look, let us briefly examine the Atlanta Center.

The whole installation is designed to accommodate all the known aids and devices for air traffic control, with the further feature of being expansible to house future developments. This is a three-level structure, built of steel and concrete with walls 18 inches thick. It has 54,000 square feet of floor space, of which 11,000 feet are in the control room area. The thick walls and the lead shielding used on the doors are designed to protect those inside from radiation in the event of enemy attack. There is a provision to wash down the roof and walls to decontaminate in case of radioactive fallout.

In the event of disaster or hostile attack, this facility can be self-sustaining for many weeks. Electric generators have been installed to make it independent of outside power. These generators are diesel operated, with a capacity of 550 kw each. Each has a fuel tank capacity of 9,800 gallons of fuel oil. The building uses two units for air conditioning, a

Modern long range radar systems are important new safety tools for the Air Traffic Controller. Among other things on the scope below, he sees (1) mountains in north Georgia, (2 and 3) jets with transponders, (4) Fort McClellan, and (5) aircraft in right turn on final approach at Atlanta Municipal Airport.



total of 500 tons capacity. The primary heating system uses natural gas; however, backup heating using fuel oil is provided, and a total of 12,500 gallons of oil is stored for this purpose. The Center has three water wells serving it; water storage totals 170,000 gallons.

The pressurization of the interior is a unique feature of this installation that highlights the planning that has made this an air traffic control facility that can function under any condition. A positive static pressure of four pounds per square inch is maintained in the control and equipment rooms at all times to ensure that dust, particularly radioactive dust and other particles cannot filter into these critical areas.

This Center plans to use four ARSR-1 radar scopes (200-mile range) and 22 scan conversion monitor sets (similar to closed-circuit TV for radar), giving radar coverage of two-thirds of the entire Atlanta Control Area, which encompasses 14,415 nautical miles of federal airways.

The ultra-complete FAA Center at Hampton, Ga., has more than four million dollars invested in the latest electronic control equipment and buildings.

Designed to safely control all en route instrument air traffic within more than 200 miles of its location, the new FAA Center will incorporate all of the latest electronic control devices developed in laboratories the past few years.

Among the outstanding Center features outlined by the FAA is the long range radar enabling the air traffic controllers to "see" airplanes flying within 200 miles of the Center. Each airplane is represented on the radar screen as a "blip." By tracking the paths of the blips, the traffic controller is able to keep large numbers of aircraft safely separated.

Air traffic controllers in the new Center will also be able to talk, with "push button ease," directly to pilots flying at any altitude within 400 miles of the Center. Pilots may also speak direct to the controller.

This reduces the critical communication lag existing when messages to and from aircraft flying overhead have to be relayed to control centers by other communication facilities.

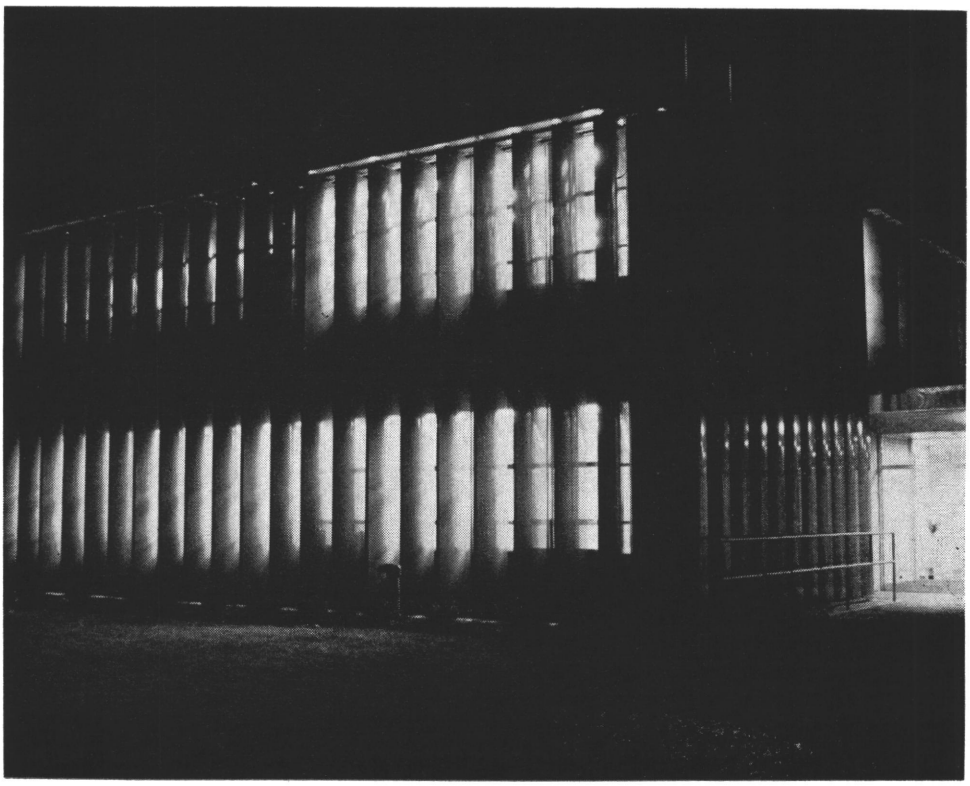
With an eye to the future, the new Center has been designed to permit installation of new and improved electronic equipment, including the new "electronic brain" now being developed and tested.

With the new brain, thousands of combinations of flight information can be fed the memory drums of the electronic computer. Then, with the single pushing of a button, the brain's memory drums begin to whir, and the intricate gear will electronically and infallibly compute exactly which altitude and speed the airplane should be assigned to keep it safely separated from other aircraft on the airways.

To assure near absolute and coordinated control, the complete Center is connected, by radio and thousands of miles of telephone cable, with airport control towers, flight service stations, and other Centers both locally and throughout the nation.

Modern electronic wonders such as these will make flying, as safe as it is today, even safer tomorrow.

Atlanta Air Route Traffic Control Center



From The USAAVNS

DEPT OF PRI F/W

Phase II of Project INTACT was initiated on 13 November when aviators departed Fort Rucker for the Cessna plant in Wichita, Kan. They will ferry 15 Cessna 180 aircraft from the plant to Tuscaloosa, Ala., where the aircraft will receive further modifications before their scheduled use in the HumRRO program, Project INTACT (integrated contact/instrument flight training).

Project INTACT will evaluate side-by-side instruction versus tandem type instruction, and integrated contact/instrument flight instruction versus the present form of contact and instrument instruction. Both Cessna 180 and L-19 aircraft will be used.

DEPT OF TACTICS

Chapter 13 of FM 1-5, "Army Aviation Organizations and Employment," has been placed in manuscript draft form and is presently undergoing field review. TOE 8-137D, dated 24 February 1960, established the Medical Air Ambulance Company with a primary mission of "Aeromedical evacuation of selected patients." Secondary missions are "Emergency movement of medical personnel and accompanying equipment and supplies to meet a critical requirement" and "around-the-clock delivery of whole blood, biological and medical supplies when there is a critical requirement."

This unit is organized to permit operations either as a unit or by the four individual platoons. When platoons are employed individually, aircraft maintenance and airfield support elements of the company accompany each platoon. In this manner, independent platoons may be attached to separate task force organizations as required. An example of a typical organizational structure for an independent operation is illustrated. With such an organizational structure, the surgeon is assured the necessary aeromedical capability to support the task force mission.

DEPT OF P&NRI

Since the FY 1961 Annual Written Examination is concerned with the new AR 95 Series (95-1, 95-2, 95-3 and 95-4), it is suggested that commanders take action to ensure that their units have, and are familiar with, these ARs prior to 1 Apr 1961. Testing is scheduled to begin on that date for most units. The new 95 series supersedes ARs 95-5, 95-7, 95-8, 95-18, and 95-32, with changes.

FM 1-10, ARMY AVIATION ORGANIZATIONAL AIRCRAFT MAINTENANCE AND SUPPLY, dated August 1960, is now available to all units and individuals requiring its use. The manual provides concepts, doctrine and techniques on organizational aircraft maintenance and supply. Guidelines are furnished for organizational maintenance and supply supervisors in management, supervision, and scheduling of aircraft maintenance and for instructor use in service schools.

Falcon's Nest

Current items of interest from Fort Rucker

Users of the manual are encouraged to submit recommended changes or comments to improve it. Comments should include the specific page, paragraph, and line in which the change is recommended. To ensure complete understanding and evaluation, reasons should be provided for each comment. Forward comments directly to the Commandant, U. S. Army Aviation School, Ft Rucker, Ala., ATTN: AASPI.

DOI

The AC-1 (Caribou) classes 61-1 and 61-2 were completed 7 Oct 60. Class 61-3 is not scheduled until 10 May 61. During this break in training, the four Caribou used for training at Fort Rucker have been transferred to Fort Benning to participate in troop tests. Classes 61-1, 61-2 consisted of Fort Benning aviators transitioned for duty with these four aircraft to participate in the troop tests.

CDO

The family of Army aircraft for the period 1965-1970 has been fairly well determined; however, very little has been established in the development of operational and organizational concepts for the long range 1970-1975 period.

Military planners must en-

vision potential capabilities and limitations of the aerial vehicles which the Army will have in the time frame under consideration.

A study is now in progress to identify and analyze tactical and logistical problems that may be expected to arise with the introduction into the field army, post 1970, of air and ground effects vehicles employing new applications of aerodynamic principles.

Most of the new aerial vehicle configurations that we could expect to have operational in the 1970-1975 period are still in the test bed phase of development. Since there is no way of knowing which configuration(s) will be selected, all are being analyzed. These include the following: helicopter, compound helicopter, aerial jeep, ground effects machine (GEM), conventional fixed wing STOL, tilting rotor convertiplane, tilt wing, jack knife wing, deflected slipstream, ducted fan, lifting engine, and fan-in-wing.

Each configuration is being studied to determine potential problem areas peculiar to it. When possible, the magnitude of problems common to more than one vehicle will be compared. Current operational concepts are also being analyzed and projected to reveal new logistical and operational problems. Problem areas include air traffic regulation, battlefield recovery, air transportability, fuel consumption, flight characteristics, and effects of downwash velocities on surrounding terrain.

DEPT OF R/W

In the past, students attending rotary wing courses at Fort Rucker have had to travel 16 miles from Hanchey Army Airfield to attend synthetic instrument trainer and procedural trainer instruction on the main post. But in early 1961 a new building will be completed at Hanchey to house facilities for 16 synthetic instrument trainers (2B3s) and 10 procedural trainers (five each for H-21s and H-34s). This will mean a great saving to the government in time, money, and effort. Also student training time will be more productive because students will be able to attend synthetic instrument trainer and procedural trainer instruction when not flying. The instructor-student ratio is usually 1:2 or 1:3, so while one student receives actual flight training the other(s) will receive some type of ground instruction. (See pages 12 and 13.)

From The USA Avn Board

Aviators destined to fly the Army's newest aircraft, the Mohawk, Caribou, and Chinook, will have the aid of a universal automatic flight control system, known officially as the AN/ASW-12 (v). This equipment is unique because it can be utilized by all Army aircraft — fixed-wing, helicopter, and drone. Service testing of the AN/ASW-12 (v) will begin early in 1961 with the equipment mounted in an H-21 and an L-23D.

Automatic flight stabilization has been of interest to the Army ever since the utility and command type aircraft entered the inventory. Additional emphasis has been placed on development of this equipment as the Army gained transport and surveillance aircraft.

Commercial autopilots in use during the development period will be replaced by AN/ASW-12 (v) when it becomes available. This system is capable of providing stabilization of up to five axes by adding or removing plug-in type modules. Coupling with existing navigation, guidance, and landing equipment is also possible.

Aircraft stabilization is accomplished by electrical signals generated in gyroscopes, which sense deviation from established reference attitudes and headings. The signals from the gyroscopes are amplified and fed to servo actuators which produce corrective motion of the aircraft control surfaces or swash plate. Automatic altitude control is maintained by signals from the barometric and radar altimeters, or a glide slope system.

The fixed-wing aircraft and helicopter systems differ in two main respects: the number of components, and the channels and types of control. Fixed-wing aircraft use a three-channel system (pitch, roll, and yaw). Commands are introduced in this system through a flight controller which is cockpit mounted. The helicopter system, in addition to controlling the pitch, roll, and yaw flight axes, maintains altitude and engine rpm. No flight controller is used in this configuration because the commands are integrated into the system through the primary controls.

The AN/ASW-12 (v) Universal Automatic Flight Control System has been developed by the Sperry Phoenix Company, Division of the Sperry Rand Corporation, under contract to the U. S. Army Signal Research and Development Laboratories at Fort Monmouth, N. J.

A LITtle MORE PLANNING

CWO Billy J. Fulbright, TC

SAM WAS READY for his first Korean mission.

After receiving a quick checkout stateside he was qualified in the H-21 Shawnee. He had approximately 500 hours rotary wing time. He had passed his local area check and flown the prescribed hours of local flight time since arriving at his new assignment.

The Korean hills seemed no different from those of his last assignment — just more of them. The assistant operations officer was also newly assigned. He gave Sam the mission: resupply a radio site on a 3,500-foot peak — a routine mission. The cargo: 75 barrels of oil. Special instructions: none.

Sam flew to the base camp of the radio site and checked his cargo nets and the oil he was supposed to fly to the mountaintop. Everything checked out OK, and Sam decided to try sling-loading three barrels at a time. Three barrels of diesel oil isn't too much of a load for the Shawnee at sea level; and it can be flown to 5,000- or 6,000-foot peaks, if it is handled right.

Let's ride along with Sam and check his mistakes. He picked up the load with seeming ease at 2700 rpm and made his takeoff. Sam had been using carb heat to keep it in the green under reduced power. (We will get back to this later.)

Sam reached the peak in good shape and set up his pattern for an approach. He started thinking of the old school solutions on pinnacle approaches. (Make it steep so if the engine quits you can still make the pinnacle.) Then he set up his final approach directly into the wind for a steep approach. About 150 feet above the pad he started reducing the airspeed, and neglected to notice that his rate of descent was 700 fpm.

At 75 feet Sam still had 20 knots of airspeed to lose; so he brought the nose of the Shawnee up to reduce the airspeed and at the same time started to pull in his power. This made the airspeed reduce much faster than he had planned, which put him short of the pad. Sam pulled in the remaining power, but could not stop the rate of descent. The aircraft struck the leading edge of the pad and —.

There were six items that Sam wasn't aware of when he made his approach. (1) Density altitude at the landing site. (2) A little carb heat at reduced power can rob an 1820-103 engine of 200-300 horsepower at full throttle. (3) When approaching into the wind on a pinnacle, a bubbling effect just above the ridge on the leeward side disturbs the lift in a rotor system, especially one that isn't in translational lift. (4) The recommended way to approach a pinnacle in a tandem rotor helicopter is very shallow, and with the wind quartering off the nose so that both rotors will be flying in relatively undisturbed air. (5) A steep approach with a sling load to a pinnacle with a small flare at the bottom to reduce the airspeed is just changing the attitude for the inevitable crash at the bottom. (6) If it takes 2700 rpm to pick up a load at sea level you will be very marginal on power at 3,500 feet.

If Sam had planned this operation more carefully, and had asked some of the older pilots how they handled these missions, he would have gotten the solution to all his problems and thus prevented this accident.

CWO Fulbright is an instructor in the Instrument Branch of the Dept of Rotary Wing Training, USAAVNS. He is rotary wing rated and instrument qualified, with approximately 3,300 flight hours.

JANUARY

SLOW! CURVE AHEAD

CRASH SENSE

PREPARED BY THE UNITED STATES ARMY BOARD FOR AVIATION ACCIDENT RESEARCH

They Said It Couldn't Be Done!

ACCIDENT RECORDS show that training classes of Bird Dog pilots is seldom accomplished without a few crumpled wingtips, bent propellers or other mishaps, particularly in the primary phase where trainee experience is at its lowest. But 159 students, 16 flight instructors, and their supervisors flew 9,707 hours and made 25,000 landings without scratching the paint on a single airplane. Remarkably, not a single elimination due to flying deficiency was made during that time.

For this outstanding record, the Hawthorne School of Aeronautics' Flying Safety Award was presented to the two fixed wing qualification sections of the Primary Flying School by Mr. Leo E. Carver, General Manager. The award reads: "Presented to J. F. Bitterman, F. E. Branchfield, R. E. Chambers, H. D. Grogg, J. B. Harrington, J. F. Howard, H. A. King, C. A. Lewis, G. E. Lynch,

Sixteen times well done! (One absent when this photo was made)

S. T. Nicholson, J. F. Sheehan, W. A. Richardson, J. E. Rogers, G. W. Russell, F. L. Sanderson, O. K. Shafenberg in recognition of their substantial contributions to the perfect safety record of fixed wing qualification classes during the period 28 September 1959 through 27 September 1960."

Mr. S. M. Phillips, Hawthorne Safety Director, attributed the perfect year to "the supervision exercised, standardized instruction, and ability of instructors to evaluate students' progress."

CRASH SENSE would like to add its congratulations for this fine record.

POSTHOLIDAY DANGER CURVE

Stash the tinsel away for another holiday. The merry capers have been cut and there's been time to break at least one New Year's resolution already.

Much of the recent flying has been of the ground or kitchen variety. During these holidays, proficiency is at its seasonal low. The postholiday danger curve is just ahead. At this time each year, after a flying lull, accidents caused by weakened proficiency are on the rise.

Holiday absences are not the only problem. Changes of personnel are frequent due to a flurry of orders issued in January. Whatever the cause, being away from flying dulls the knife edge of flying ability.

With flight activity scaled down, maintenance crews may be trying to give the aircraft their share of attention. But here, too, manpower is usually in short supply and spread thin. Key personnel have been on well earned leave; transfers are being made and new men are arriving for duty. Many shops are in a state of flux at this time of year. A small repair may be put off until a more convenient time. Then, bingo, an inflight emergency.

This can be the picture as the eager aviators start streaming back to the flight line for 1961.

What are the obvious methods for correcting the problem? First, let's all wise up to the situation. Neither pilots, mechanics, nor operations men are as sharp after leave as they were the day they signed out. Being aware will make you more careful — on your preflight, for instance.

Getting the back-in-the-saddle feel is not as difficult as you might think. One or two flights to refresh your experience in the particular aircraft you haven't flown for the past month should do the trick. Then—and only then—are you ready for operational flights calling for maximum performance from your aircraft, and you.

A sane and sensible setup of refresher flights can be scheduled for the outfit without sacrifice to operational commitments if plans are made. When this is done, the first of the year curve that plagues flight commanders, pilots, and accident prevention types can be leveled off.

In the following review of aircraft accidents, a prime cause factor was too little refresher experience.

ACCIDENT NO. 1

A Bird Dog aviator on a passenger hauling flight arrived at his destination and was cleared to land. The wind was across the runway 3 knots, gusting to 12 knots; he elected to make a wheel landing with 45° flaps. During the transition from wheel-landing attitude to three-point attitude, the aircraft veered to the left. The aviator applied power to attempt a go-around. The aircraft became airborne, struck a 3-foot snowbank that paralleled the left side of the runway. When the snow settled, a survey showed major damage to the landing gear, right wing, and propeller. In addition, there was sudden stoppage of the engine. Fortunately, there were no injuries.

Rusty technique — wheel landing

ANALYSIS

The pilot had not attempted a wheel landing in 2½ months prior to the accident. He had made only 14 L-19 landings during the previous 6 months. Lack of proficiency was considered a major factor in this accident.

ACCIDENT NO. 2

His mission successfully completed, another Bird Dog aviator flew to his home field and was cleared to land. He made a high approach, flared, and floated down the runway. The aircraft began to settle and he added power to cushion the landing. Torque, which he failed to notice, caused a slight turn to the left, and the Bird Dog touched down in a crab. It spun into a 170° groundloop, causing major damage.

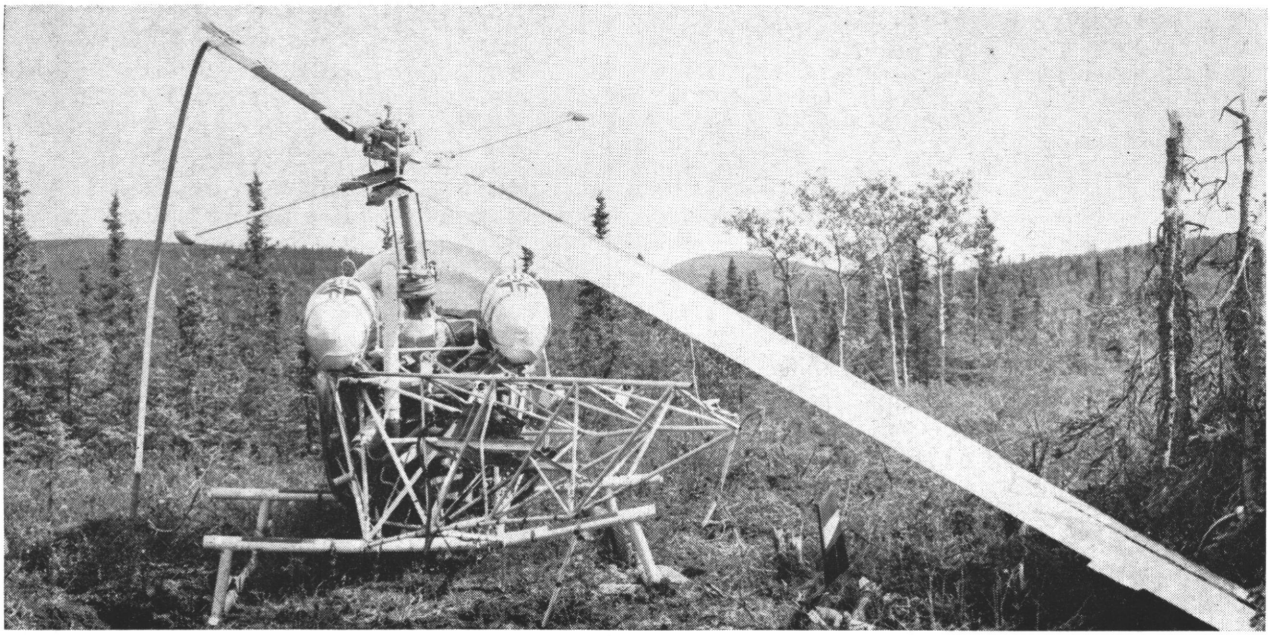
ANALYSIS

Following a **September** graduation from fixed wing training, the aviator involved in this **February** accident had flown a total of 9 hours. He had flown L-19s 4 hours in November and 5 hours in December.

Flying proficiency is never static. It either builds through practice or declines from inactivity. This is true of even highly experienced aviators. It is doubly true of those who are newly rated. As this accident proves, 9 hours of flying during a 5-month period is not enough.

Nine hours Bird Dog flying during 5 months

Eight hours helicopter flying during 6 months



ACCIDENT NO. 3

A flight of two Sioux helicopters landed in a confined area and were directed to the rear limits of the area for takeoff. One aviator climbed his aircraft to a height of 20 feet and moved forward approximately 75 feet. At this point, rotor rpm dropped and the Sioux settled back on the ground. It touched down and the main rotor blades struck a tree. The blades flexed downward and sheared the tail boom. The aircraft turned approximately 20° and slid to a stop upright.

ANALYSIS

The complexity of rotary wing aircraft calls for a flying touch that is both smooth and sure. An aviator who has been out of helicopters for more than a 30-day period needs training time to sharpen his skill. The aviator in this accident had only 8 hours flying in helicopters during the previous 6 months. Yet, he was assigned a flight calling for operation in a confined area which required maximum performance. The $22,000 that this accident cost would have paid for many hours of proficiency flying.

IT COULD HAPPEN TO YOU

To crib from Kipling: We, too, admire a man who can keep his head when all about him appear to be losing theirs.

Certainly CWO Merlin E. Watts and CWO Donald E. Herman qualify as quick thinkers, skillful pilots, and cool men. Their successful emergency action of releasing a sling load and flying their Choctaw out of ground resonance, following a near collision, saved the day on a field crowded with 22 helicopters.

This account was forwarded by the Army Aviation Safety Officer, Seventh Army, and we feel it is eminently suited to "It Could Happen to You."

Mr. Watts and Mr. Herman, pilot and copilot respectively, took off for an airlift. As part of the 59th Transport Company, they had airlifted three ¼-ton vehicles the day before, and had delivered troops for a fall field operation of the 16th Infantry Division.

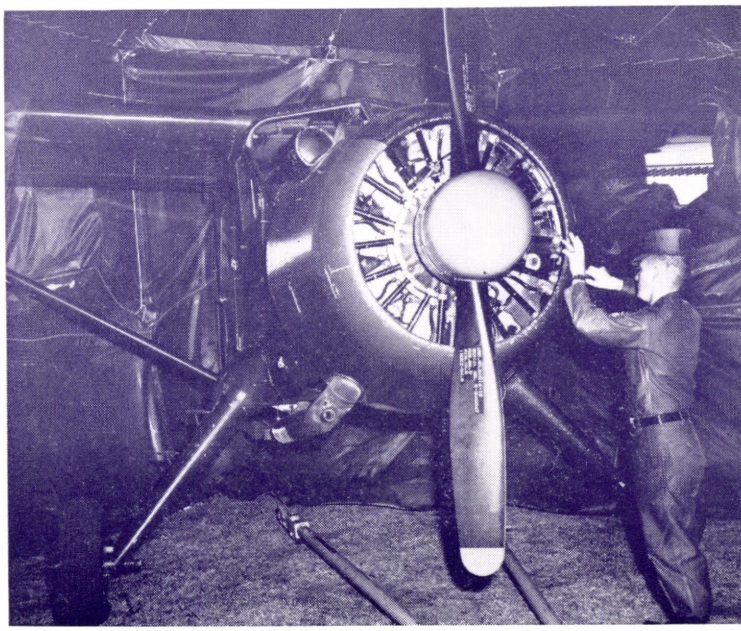
The German countryside below them had the well ordered look so familiar at this time of year — new mown hay neatly stacked in rows. They headed for the lift area in a flight with 6 other Choctaws. The field, approximately 200 yards wide and 350 yards deep, had limited operation capability because of cultivated fields on all sides. There were 7 H-37s, 13 H-34s, and 2 H-13s operating in the area simultaneously.

Helicopter 4532, flown by Mr. Watts and Mr. Herman, picked up a sling loaded jeep and started out of the area on a heading of about 180°. At the same time, another Choctaw carrying a load of troops, took off in the same direction and on a course parallel to and to the left of their aircraft. As it passed, to avoid collision, the pilot of 1731 made an abrupt turn and the ground cushion of air built up by the downwash from the rotor blades of 4532 was destroyed.

There was a large reduction in engine and rotor rpm, and although they attempted to milk the pitch, rpm continued to drop. Mr. Watts flared the aircraft and reduced airspeed to put the jeep on the ground. Their load was released without damage, but they were unable to remain airborne. Mr. Watts moved the Choctaw to the left to avoid settling on the jeep. As they cleared, the tailwheel struck the ground sideways and broke the tailwheel locking pin.

The aircraft settled to the ground, entered ground resonance and began vibrating violently. Power was quickly applied to increase rpm and the Choctaw again became airborne. After the vibrations subsided, the helicopter was landed and the few busiest moments these expert pilots probably ever knew were at an end.

Congratulations to CWO Merlin E. Watts and CWO Donald E. Herman for a fine job.



frame supports the tent. However, during high winds the compressor blowers are used to equalize the pressure within the tent, thus preventing its collapse.

The tent is staked to the ground by cables attached to spear anchors and can be easily attached. Two electric motors (inside) raise and lower the side of the tent which permits aircraft to be hangared.

Tests to date indicate the tent will accommodate three L-19s or an Otter, a Beaver, and a Bird Dog, or similar combinations of three. One H-37 with folded pylon and rotor blades will fit completely into the tent.

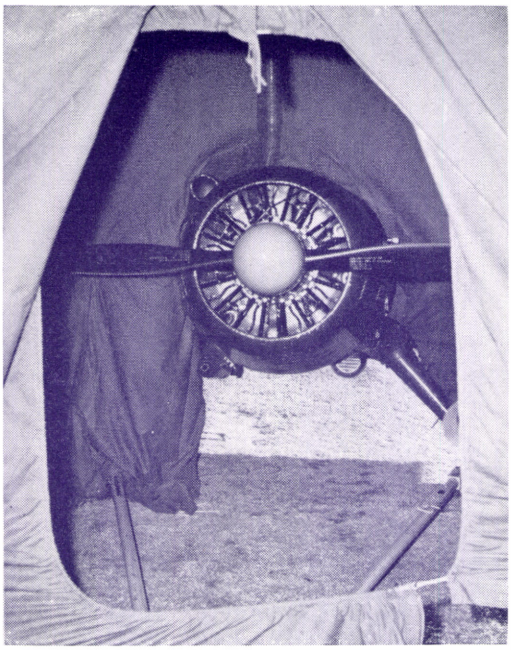
Although developed for servicing of Army aircraft in the field, the tent could also be adapted for other uses, such as a warehouse, recreational center, wardroom, etc.

A second portable hangar undergoing tests is of the nose-in type. Supported by lightweight metal frames, it is 19 feet, 5 inches wide, 13 feet, 4 inches high, and 23 feet, 8 inches long, with an 8-foot canopy. Four to six men can erect this tent in 45 minutes to an hour and a half, depending on the weather.

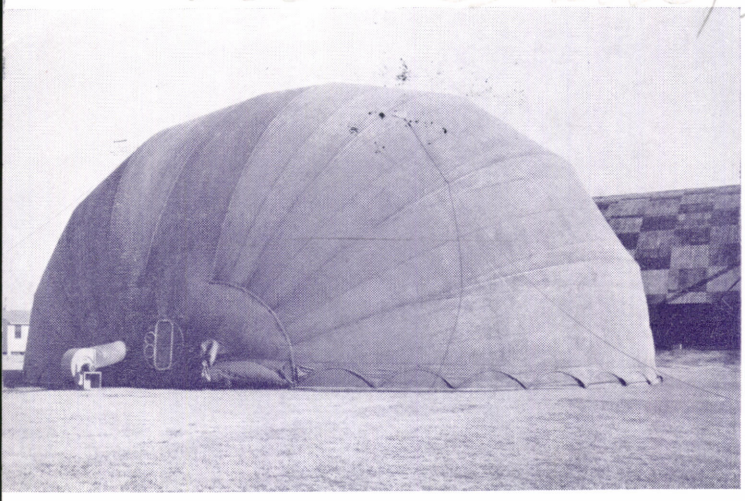
This tent will accommodate the L-19, L-20, L-23, H-13, H-19, and H-34.

The third portable hangar is much smaller. It also is supported by a rigid frame and is 12 feet, 8 inches high, 12 feet wide, and 10 feet long. Four men can assemble it in an hour or less, again depending on the weather.

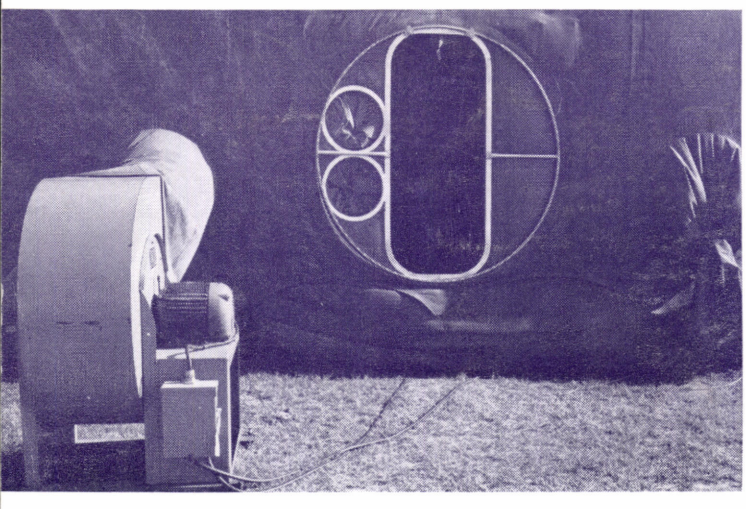
It can accommodate the L-19, L-20, H-13, and H-19.



Dir — Plans, Supply & Operations

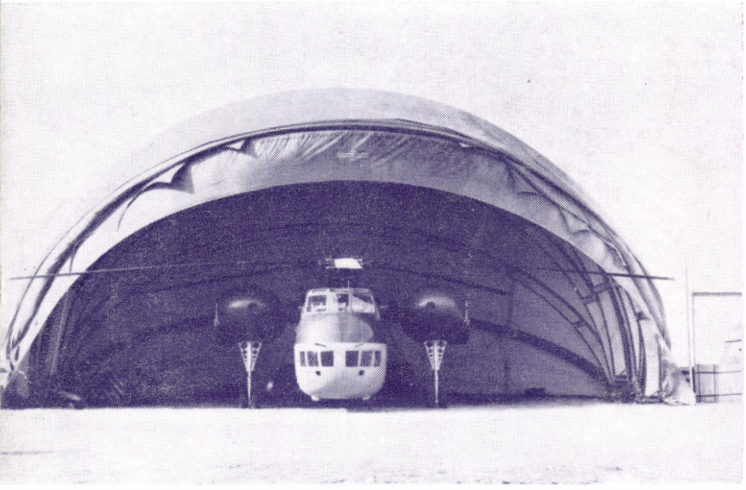
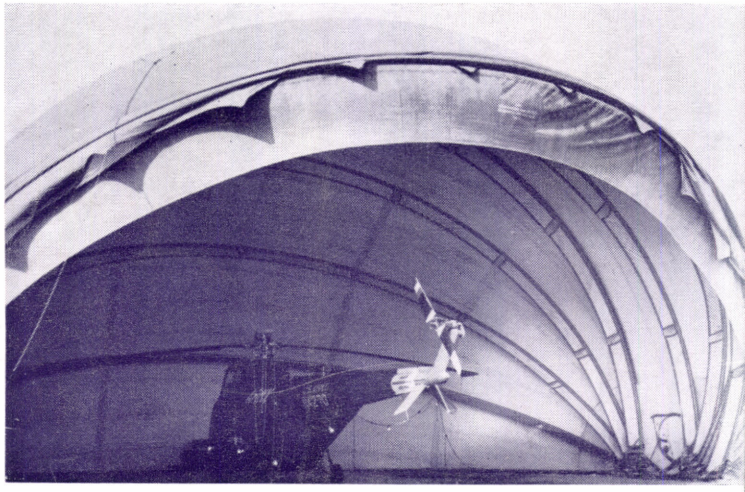


Maintenance Hangars Being Tested at Fort Rucker



THE U. S. ARMY AVIATION BOARD, Fort Rucker, Ala., presently is testing three types of portable aircraft maintenance hangars developed by the Army Quartermaster Research and Engineering Command for use in the field.

The largest tent consists of a neoprene coated nylon fabric supported by a lightweight metal frame. It is 72 feet wide, 80 feet long, 37 feet high, and weighs about 6,000 pounds. It can be transported in a 2½-ton truck or a cargo aircraft. Ten experienced men can erect the tent in 1½ to 2 days without the use of special tools.

The tent is erected by utilizing high pressure, low volume air supplied by two electrically driven compressors. Once erected, the

Continued on inside back page