Flying Safety

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THE COVER PICTURE

This month's cover depicts a man downed in the desert signaling a search plane with smoke and mirror. The picture was taken by Associate Editor Hal Basham in the desert near El Paso, Texas. Lieutenant Basham made two trips to Biggs AFB and spent a week talking to desert survival experts and taking pictures in the desert under simulated emergency conditions to obtain first-hand information and photographs for this month's lead article, "Don't Fight the Desert," page 2.

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LAST MONTH'S COVER

Lost in the shuffle last month was the cover story for the B-17 on ice. This plane was wrecked in an attempt to get the C-47 survivors off the Greenland ice cap last December. When the downed men reported the hard-packed snow seemed strong enough to support a B-17, the mission was flown as a calculated risk with only two crewmen, pilot and engineer. Unfortunately, the snow was not strong enough, and the two courageous crewmen of the B-17 had to wait until the ski equipped C-47 finally made the rescue. The photo was used because of its pictorial excellence.

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HABITS

"THE PLANE CRASHED while on a routine training mission."

While this phrase is often used in releasing news of an Air Force aircraft accident, it is seldom realized what a wealth of truth it contains.

The trouble undoubtedly was that the flight was *too* routine. The maintenance may have been routine. The flight planning may have been routine. We do very little conscious thinking when we perform a routine act. Most of our actions take place through force of habit. We work by habit.

The first time a man safties a bolt or lands an airplane he thinks about it. Actually, the only time we do much thinking about our work is when we do something for the first time or something we don't do frequently. If we have never done a radio range letdown before, we must consciously direct our efforts to every detail of the procedure. Later on, as we make letdown after letdown, a habit is formed—a sort of groove along which our subconscious mind is guided. The more we repeat the procedure the less our conscious mind is required to think out each step.

Now it is all right when a flying procedure or maintenance job becomes second nature *if* the habits developed are safe. To prove that the habits developed among airmen are not always safe we need only look at our accidents. Here a pilot failed to observe other traffic. There a mechanic "forgot" to fasten a piece of cowling.

Aircraft accidents, for the most part, whether labeled pilot error, maintenance error, or supervisory error, are the result of unsafe habits. It is natural that people form work habits—without habits or the development of a routine a person couldn't acquire skill after skill. Therefore, the purpose of any safety program should be to instill habits that will safeguard people from accidents—protect them from wrong routine. Many who now lie in graves or in hospitals are there because they were in the habit of doing a job the unsafe way.

Why should anyone commit an unsafe act while engaged in a routine task? Certainly his training had taken that possibility into account, and no instructor knowingly ignored unsafe habits. It must remain then that for the most part, unsafe habits are formed by the individual through his own carelessness or because his supervisors have permitted him to do a job unsafely over and over. The victim of the accident, or his supervisors, could have prevented it if emphasis had always been on the safe way of doing his job. Safe work habits carry insurance against accidents and injury.

The line chief, the instructor, the check pilot—each a supervisor—should see that his men form safe work habits. He must accept the responsibility for the safety of his men. Likewise, each airman has the responsibility that routine tasks do not develop into unsafe habits.

THE NOISE of the windmilling propeller was an ominous whisper in the sudden silence after the engine died. With the illogical reaction of shock the pilot shoved the throttle forward in a futile gesture to bring back the roar of the now silent engine. Then years of training took over and the pilot ducked out of sight of the passenger in the rear seat as he reached for the gas selector and wobble pump. Automatically he lowered the nose in a gliding turn as he ran through all the procedures for starting a dead engine in flight. It was no use. The T-6 was through.

Hastily the pilot grabbed the mike and told his passenger they would have to bail out or make a forced landing. The flat ground 6,000 feet below looked smooth and freckled like a red-headed boy's face in summer, and the two men decided to ride the plane down. The pilot leveled off and too late saw that the terrain was not flat but very rough in a mass of sandy hollows and sand-clogged mounds of brush.

The pilot dragged the passenger from the inverted cockpit and placed him on the hot sand under the shadow of wing which tilted crazily skyward toward the afternoon sun. His right leg was broken just above the ankle.

The third morning a ground party reached the wreck and found the passenger uncomfortable and thirsty but otherwise in fair shape. That same afternoon they found the sun-shriveled body of the pilot 20 miles south where he had fallen for the last time in a fatal attempt to walk for help.

Today the passenger owes his life to a broken ankle because he would have attempted to walk out also if he had been able.

In the desolate, burning reaches of the American desert country a man's chance for survival after a forced landing or bailout depends on two things—how much he has been told and remembers of how to survive on the desert, and how much common sense he can muster at the time.

The first rule to remember when you start planning to walk out from your plane is *don't do it!* The only case where walking for help is advised is where a highway, railroad or house is seen while you're coming down in your chute or maneuvering for your forced landing. Don't try to walk out even then unless you are absolutely certain you can reach your objective with the equipment and water you have available.

The only way to fight the desert and live is not to fight it at all. If you have filed position reports

DON'T DO THIS. This crew is inviting death. Your best bet is to make shelter near plane and wait for rescue.

First step in making lean-to is leveling ground on lee side of shelter. Work only when it is cool.

DON'T FIGHT THE DESERT

By 1ST LT. HAL J. BASHAM *Flying Safety Staff*

along your route (and the man who fails to do so is a complete fool), rescue will be on the way very soon. Your immediate problem is to stay alive until you are found.

The information here on how to stay alive in the desert until help arrives was obtained from Flight "B," 2151st Rescue Unit of the Air Rescue Service. This unit teaches the desert survival phase of the ARS Rescue and Survival Training School in the desert near El Paso, Texas. These men are the number one authorities in the Air Force on how to survive in the desert until you can be found and rescued. What they have to teach might well save your life some day.

No one expects to be forced down when he makes a flight across arid country, but a very good practice when preparing for such a flight is to make sure the plane's thermos jug is full of water or that several canteens of water are placed aboard just in case. Even in the hottest desert with temperatures of 100 degrees and above, you can live as long as five and a half days if you have a quart of water with you and if you stay in the shade and rest during the day.

Your great enemy on the desert is the sun. If you would live you must protect yourself from it. Caves and overhanging rocks may be found in mountainous desert terrain and provide excellent shelter. Caves should be inspected for occupancy before using as they are frequently inhabited by poisonous insects, snakes or sometimes animals. If animals have been using the cave, a fire at the entrance will be sufficient evidence that you are the new tenant. Only small animals are likely to be encountered but some of them, a Gila monster for instance, would hardly be a desirable bedfellow.

Standard equipment aboard the average airplane provides ample protection from the sun. A parachute can be used to make a tent or a lean-to against a sandy bank or against your wrecked plane. Always erect your shelter on the lee side of whatever protection is at hand. The parachute can be supplemented by whatever natural growth you can find.

Despite the terrific heat of the day, desert nights are cold in many areas. Parachute material can be used for protection against the chill of night as well as the heat of day.

Stories have been told over and again about how to find food and water in the desert. But if you count on your knowledge of such lore to survive you're only kidding yourself. Actually, the chances of finding water in the desert are very slim, almost

Sand piled on rear edge of tarp or chute will keep out wind and strengthen structure. Crash axes make good tools.

Lean-to is mounted on frame of yucca stalks. Brush piled at sides of lean-to will aid in keeping out wind and sun.

remote. Unless you can see a water source from a high point near your crash location, your best chance to live is in staying with your plane and conserving your strength. The less you exert yourself the less you will sweat. Every drop of sweat is moisture your body could use to keep you alive that much longer. So stay put. Lie in the shade during the heat of the day and move about leisurely only at night and in the early morning.

Possible sources of water in the desert (not to be depended upon) may be indicated by green trees, flight of birds or game trails. There is a small chance you might find water by digging on the low side of the bend in a dry stream bed. If you should find water, three drops of iodine from your first aid kit will act as a purifier for a quart of water.

If your supply of water is meager, as it probably will be, drink none the first 24 hours. Then take water in small sips and hold it in your mouth before swallowing. Do not eat or take salt, or smoke or wash if your water supply is low. Don't put a rock in your mouth. It will be dirty and may partly dissolve. A button held on your tongue *will* help keep your mouth moist and alleviate thirst somewhat.

If you should find yourself on the desert with an ample supply of water, the problem of food can be solved much more readily. All snakes and lizards are edible and can be skinned and baked or roasted. Rabbits and small rodents, for that matter, all fur-bearing animals, are edible and can sometimes be caught by snares or deadfalls, or killed with a club. You can eat any flowers you find in the desert. The pulp of prickly pears can be chewed for moisture also. Never eat any plant that tastes bitter or soapy. Food is not so important, as you can live a lot longer without it than without water.

From the time you first crawl from your plane or dump your parachute, you should plan for the search plane that will eventually pass your way. The highly efficient Air Rescue Service organization in this country makes it certain that within a reasonable time after you go down a search plane will be coming your way. There are a number of things you can do to make sure the first plane that comes looking will find you.

The easiest thing for a searching plane to spot is your wrecked airplane whether it burns or not. If you have to bail out, trim the plane, if possible, to glide down in a circle. As you float down keep your eye on the plane and note where it crashes. Take your time and make your way to the wreck after you land.

When it is cool enough to move about, get set to make yourself as conspicuous as possible when the search plane comes your way. A couple of white chutes spread out wide on the ground show up well. Gather up a pile of brush or cactus bushes to make a fire. Any search plane will investigate smoke, so the more of it you make when you hear or see a plane, the better off you are. Green cactus thrown on a fire or oil from your plane will make a dense smoke that can be seen for miles.

The wreckage of your plane will provide shiny metal with which you can improvise a signal mirror. You can make sun goggles from a piece of your parachute pack or from the back side of your black cardboard checklist or any other material in which you can cut narrow slits. Sun glare on the desert is very severe, almost as bad as on snow sometimes, and colored glasses or slit goggles are a must.

Whatever you do, protect yourself from the sun at all times. If you must venture out in the sun during the day, keep all your clothes on and make a mantle to cover your neck from the line of your

Two things not to do. Don't remove any clothing and don't exert yourself like this man is doing in the sun.

Resting beneath their parachute lean-to, these men are making a signal mirror and slit goggles—two vital survival aids.

cap to your shirt. The more you lie quietly in the shade during the heat of the day, the less water you will need and the longer you will live.

As contradictory as it seems, there is a remote danger of drowning if you are forced down in the desert. Once in a long while the various desert areas of the country are visited by violent storms and cloudbursts. To be safe, never set up your shelter in the bottom of a ravine or dry wash. The storm you might think was solving all your water worries could cause a flash flood and wash you away.

Ideal forced landing spots are dry salt lakes in the desert. However, once you are on the ground you should move to the edge of the lake to more sheltered and cooler ground, remaining as close to your plane as possible. The temperature in a dry lake bed may be 20 degrees hotter than the rest of the desert and the glare is as blinding as sun on snow.

These are things to remember when you are flying across the desert. Make sure you have water aboard before you take off. File position reports as often as you possibly can. If you should have to go down, remember searchers will be looking for you within an hour after you fail to show up at your destination. If you stay with your plane, conserve your strength and prepare a smoke signal, the chances are very good that you may not spend more than one night on the desert.

If you do not file position reports, are forced down in the desert and wander away from your plane, someone may find you eventually anyway. They will find you right where you fall the last time, where the wind and weather will have polished your skeleton white against the gray of the desert sand.

Use stick for mirror "gunsight." Line up top of stalk and plane. Catch tip in light beam. Your beam will hit plane.

LIKE $ IN THE BANK

IN THE PAST FEW YEARS several serious aircraft accidents have occurred when pilots either botched up a single-engine approach or single-engine go-around. An example of the perfect botch job involved a B-25 and a pilot who had considerable B-25 time.

It was quite a while from the date of this pilot's checkout ride until the day he overshot a runway and attempted to go around. He didn't quite make it.

His trouble began when the left engine oil pressure dropped to zero after about an hour and a half of flight. No check was made of the head temperature or oil temperature gages. Granted, it is a good idea to keep the feathering switch in mind when the gage indicates a loss of oil pressure. However, the head temperature and oil temperature gages will go right into the red and tell you for sure almost as fast as the pressure needle hits zero if you are actually losing oil. There was no need for this pilot to feather an engine. The gage was inoperative.

The pilot did feather the engine. That was his decision. Good or bad, he made it and as it turned out, he was stuck with it. As he approached a landing field he requested permission for a straight in approach. He dropped wheels and full flaps at about 5,000 feet above the ground and passed over the end of the runway 2,300 feet above the terrain with wheels and *full* flaps down, airspeed indicating 130 mph.

The copilot, a bright boy, decided that they were overshooting the field so he pulled up the wheels and raised the flaps to 30 degrees. The pilot added full throttle to the good engine with a resulting glimpse of 360 degrees of horizon being had by all. The pilot noted that the flaps had been raised to 30 degrees so he promptly lowered them to the full down position. This move, he said later, was what kept the airplane in the air. The airplane descended rapidly and came to an abrupt stop at a municipal airport 10 miles from the first intended point of landing. This change in destination was entirely unintentional and was caused solely by the yaw resulting from low airspeed, increased drag of the full flaps and loss of directional control.

The crew escaped with minor injuries. The B-25 was picked up with a shovel after it had cooled sufficiently.

Put yourself in this pilot's shoes, what would your diagnosis of the trouble have been? If you had decided to feather the engine what type of traffic pattern would you have made? When was the last time you practiced a simulated single-engine landing? When was the last time you practiced a single-engine go-around? Have you *ever* made a simulated single-engine go-around? Would the checkout at your base include these procedures?

Often on check rides and transitional checkouts pilots will make a beautiful pattern and approach on two engines. But the moment one engine is retarded to simulate single-engine operation the pattern becomes a cross-country. Downwind and base legs are barely within sight of the field. Often pilots fly 500 feet higher than the normal pattern altitude. Why? If the B-25 is flown normally at 160 mph in the pattern then it should be flown at 160 in the pattern on single engine. It is obvious that the same amount of work is being gained from the one engine at 160 with higher power settings as with two engines in normal operation at lower manifold pressure and rpm settings. When you figure it that way single-engine operation ceases to be a harrowing emergency but in reality is no more than single-engine flight. Why the mental hazard which is usually inherent in making a single-engine landing? Why not fly a normal pattern? The pilot mentioned above wouldn't buy that statement. He tried something different.

The following points should be remembered: The only difference between a single-engine landing and a normal landing is that you actuate the rudder trim tab to counteract the yaw induced by the unbalanced power condition. Therefore, trim should be lessened or increased as power is reduced or added. Also, because two hydraulic pumps are employed in lowering the gear normally, it requires more time for the gear to extend on one pump. The increased drag of wheels on the base and flaps on the final will usually necessitate an increase in power, and an increase in power will obviously necessitate an increase in rudder trim.

Using more than half flaps on a single-engine landing is comparable to playing Russian Roulette with a single-shot target pistol. Why? Because your chances of making the grade on a go-around below 500 feet with full flaps are not very good.

There isn't a twin-engine airplane in the Air Force which cannot be flown around on one engine if the pilot knows what he is doing. It will usually require considerably more trim than is necessary on the ordinary approach. The most important item on a go-around is airspeed. If you haven't got single-engine airspeed your chances of survival are much greater if you fly through an obstruction rather than attempt to gain altitude to clear it at the sacrifice of airspeed with the resulting loss of directional control. That is where the steadfast rule of "do not use more than half flaps" comes into the picture. Remember, it takes more time than usual for the gear and flaps to come up when operating on a single hydraulic pump. It was quite evident that this B-25 pilot was not proficient in all phases of single-engine operation when he was checked out. If he was, he certainly did not practice single-engine operation often enough.

After reading this article, ask yourself whether single-engine operation in twin-engine airplanes is second nature to you. If it isn't, your best bet will be to line up a check pilot, standardization board member, or whatever he is known as on your field, and get yourself rechecked. Go out and practice simulated go-arounds at a safe altitude. Fly a pattern on cardinal headings at 6,000 feet above the terrain. Feather a prop, time the gear operation on the clock. Tell yourself you are going around at 5,500 feet. Pretend that is 200 feet above the ground. See if you can do it with half flaps. Try it with full flaps and convince yourself that it's not the thing to do.

Single-engine proficiency is like money in the bank—it's there when you need it. Why not invest in a chunk of it yourself on your next flight?

What's tha HOLDUP, Bud?

By 1ST LT. HERBERT S. LAYDEN
Olmsted Flight Service Center

PILOTS HAVE BEEN HEARD to complain that they have had to stand by for as long as 12 minutes while awaiting Flight Service approval of a change en route. They were convinced of the inefficiency of Flight Service.

I don't have figures on the lag between the time a pilot calls requesting a change en route and the time it takes to get Flight Service approval, but I'll wager it averages out between three and three and one-half minutes.

A lot of readers will sit up after that statement and begin a "there I was" story. They have my sympathetic ear but I'll stick to my wager. I, too, can tell many "there I was" tales. One time I circled Casper, Wyoming for 15 minutes awaiting Flight Service approval to land. Another time, I got 30 minutes extra flying time waiting for Mitchel Airways to get Flight Service to approve my change to Newark, New Jersey.

Delays of that sort were more common when Plan 62 was first put in operation, and although they still occur occasionally, the average delay today of two or three minutes is necessary to process the request.

One of the principal reasons that pilots must stand by or wait for Flight Service approval is that Flight Service personnel are usually tracking down overdue aircraft. The Olmsted Flight Service Center has handled as many as 15 overdue and "lost" aircraft in a single day. The answer to why these aircraft are unreported is simple. The pilots failed to turn in their arrival report (the yellow copy of the Form 23). Calling the tower and requesting that they cancel your flight plan will not always result in a canceled flight plan. Often other matters arise both in operations and in towers and your request becomes unimportant for the moment.

It may require a few minutes' time on your part, but if you definitely complete your flight plan, and that means *handing the yellow copy of the Form 23 to the dispatcher*, you and other pilots will not have to wait so long for Flight Service approval the next time you fly.

A project has been started that it is hoped will eventually eliminate the comparatively few delays now experienced. The new set-up will provide direct communication between Flight Service and the aircraft. In addition to cutting the time required to relay information between Flight Service and an airways station, this would have other obvious advantages over the present system. One of the most noteworthy of these is that a pilot desiring information pertinent to his flight or change en route, etc., would have direct communication with another pilot. (All Flight Service operations personnel are rated pilots.) There is a certain satisfaction in knowing that the man you are talking to is also a fly-boy. Then too, it would eliminate the middle man. No matter how capable the AACS G/A operator is, he is still another link in the human element chain.

An example of middleman difficulty occurred recently while a B-26 was on an IFR flight plan from a field in the Washington, D. C. area to Maxwell Air Force Base. Olmsted Flight Service Center issued an advisory (through airways) that the radio range at Maxwell was inoperative, and suggested that the pilot proceed IFR to Craig, then VFR to Maxwell. The advisory included the weather at both stations. The pilot landed at Craig and wanted to know why he had "been ordered" there. Either the airways operator hadn't given the advisory verbatim or the pilot had misunderstood the message.

This is not meant to criticize the airways personnel. They do an excellent job, and many have contributed to the safety of aircraft by their alertness, but flights like that to Craig illustrate the desirability of eliminating the middle man.

The new plan certainly has merit. It is akin to another plan or two being considered to increase efficiency in communications, but as far as it is known, it is the only one wherein the pilot will have direct radio contact with Flight Service. It is not the first to contain the pilot-to-pilot feature. Pilots can talk directly with a weather forecaster, many of whom are pilots also. The airways stations with this weather information set-up are listed in the back of the Radio Facility Chart. Many pilots have expressed satisfaction with this arrangement.

Major Alonzo M. Ormsby and Capt. F. R. M. Kirkby, the project officers for this plan, believe that pilots will approve of the new arrangement. Any plan that lessens confusion, increases safety, and promotes pilot convenience is, of course, desirable. At any rate, it should avert another occasion such as the time approval was issued for a change en route after the plane had already landed; or the times Flight Service has received a request through one airways station and been required to send the answer through another station 40 or 50 miles away. That, admittedly, is the type of annoying delay that still occasionally occurs and which direct pilot-to-Flight Service communications should prevent.

The first of March 1949 was set as the tentative date to try out the new system of direct communication between Flight Service and aircraft, but tentative dates on a project of this size are dependent on so many factors that they are subject to change. Latest plans call for a trial period through Langley Airways and Olmsted Flight Service. So if you are flying in the Langley area after it is finally installed, get on the horn and give us a call. The only way we can truly evaluate this project will be dependent on the number of pilots who use it. And when you get where you're going, don't forget to file your arrival report.

PENNANT WINNERS

FLYING SAFETY AWARDS LAST QUARTER 1948

B-17	
Green Pennant—Topeka AFB, Kansas	AMC
White Pennant (2 Stars)—Robins AFB, Ga.	SAC
B-25	
Blue Pennant—Mather AFB, Calif.	AFTRC
Green Pennant—Mitchel AFB, N. Y.	ConAC
White Pennant—Peterson Field, Colo.	SAC
B-26	
Green Pennant (1 Star)—March AFB, Calif.	ConAC
White Pennant (1 Star)—McClellan AFB, Calif.	AMC
B-29	
Green Pennant—Walker AFB, N. M.	SAC
White Pennant—Muroc AFB, Calif.	AMC
C-45 (T-11, T-7, CQ-3, F-2)	
Blue Pennant—Hamilton AFB, Calif.	ConAC
Green Pennant—Long Beach Mun. Arpt., Calif.	ConAC
White Pennant—Selfridge AFB, Mich.	ConAC
C-46	
White Pennant (1 Star)—Tinker AFB, Okla.	AMC
C-47 (C-53)	
Blue Pennant—Lowry AFB, Colo.	AFTRC
Green Pennant—Lackland AFB, Texas	AFTRC
White Pennant—Brooks AFB, Texas	ConAC
C-54	
Blue Pennant (2 Stars)—Kelly AFB, Texas	AMC
Green Pennant (1 Star)—Brookley AFB, Ala.	AMC
L-5	
Green Pennant—Biggs AFB, Texas	SAC
White Pennant—Marshall AFB, Kansas	ConAC
F-47	
Green Pennant (2 Stars)—Eglin AFB, Fla.	APG
White Pennant—Dow AFB, Me.	ConAC
F-51	
Blue Pennant—Turner AFB, Ga.	ConAC
Green Pennant (1 Star)—Stewart Fld., N. Y.	ConAC
White Pennant—Otis AFB, Mass.	ConAC
F-80	
Blue Pennant—Not to be awarded—No rate is 25% lower than overall rate.	
Green Pennant (1 Star)—Brookley AFB, Ala.	AMC
T-6	
Blue Pennant—Williams AFB, Ariz.	AFTRC
Green Pennant—Newark Mun. Arpt., N. J.	ConAC
White Pennant—Hill AFB, Utah	AMC
MISCELLANEOUS	
Blue Pennant—Brookley AFB, Ala.	AMC
Green Pennant—Carswell AFB, Texas	SAC
White Pennant—Clinton County AFB, Ohio	AMC

see RED but see SAFELY!

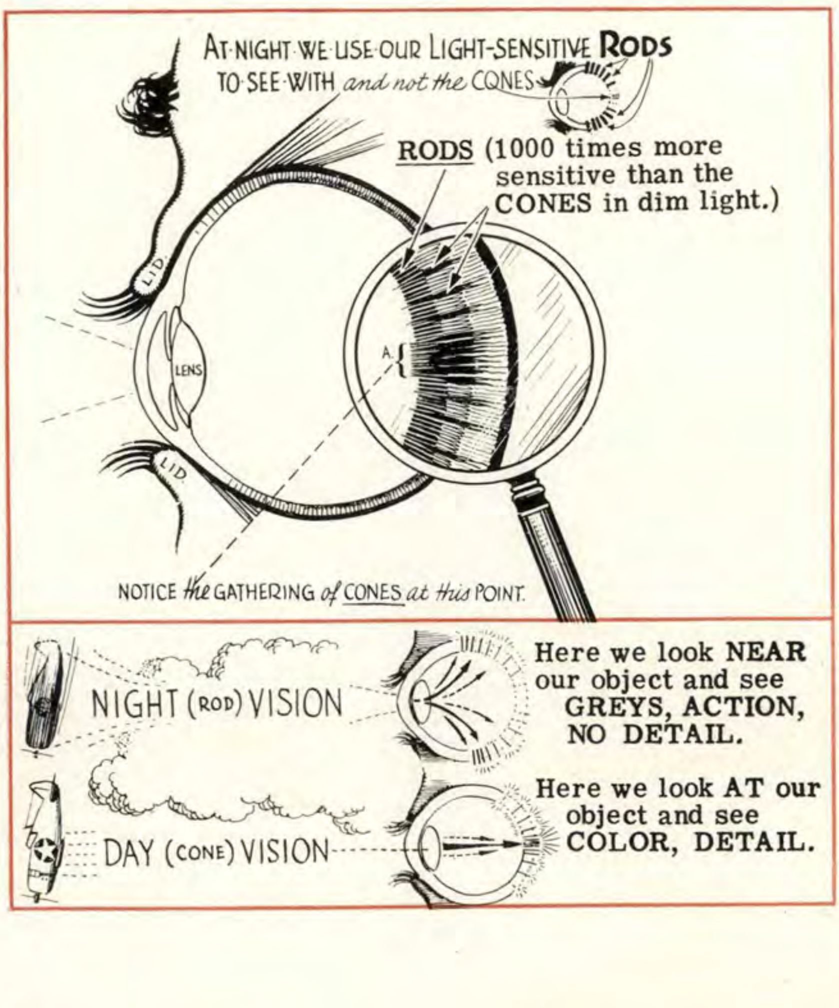
SOUNDS ODD DOESN'T IT? For you usually think of "seeing red" as describing anger. However, various tests conducted recently seem to point to RED as the safest color for cockpit lighting.

This seemingly strange conclusion comes as the result of a series of tests conducted to study the human factors in aircraft instrument lighting. These tests were carried out by a group of psychologists of the University of Rochester who are working in conjunction with AMC.

The initial experiment was started to study the relationship between dial reading performance and the color of the illumination provided. In other words, to find out what color of cockpit lighting would allow the pilot to attain maximum readability of the instruments and yet maintain the highest degree of dark adaption for observing the surroundings outside of the cockpit.

This business of dark adaption will be clear to anyone who has ever turned off their dashboard lights while driving a car in order to see the road ahead more clearly. What causes this? It seems that the human eye is composed of two different types of sensory elements known because of their shape as "rods" and "cones."

These rods and cones transmit what they "see" in entirely different manners. Each cone tends to have an individual connection with the optic nerve, whereas rods generally group together and large numbers of them will use a single optic nerve fiber.



NOTE

Want to try this red cockpit lighting? AMC says that there is a stock of 21,000 little pen-type flashlights, equipped with red filters, on hand in Air Force supply. The flashlight is light weight, easy to handle, and is apparently well-liked by pilots who have used it. A sliding button on the lamp head makes it adjustable for either red or white light.

If you are interested, information necessary for requisition is: AF stock Class 08-A; stock number 7700-518590-6; nomenclature "Lamp Assembly, Flashlight, Type A-6B (Penlight), Specification number 94-32378-B."

Because of this teamwork, groups of rods can cause visual impulses to be carried to the brain from extremely dim light. However, cones working alone must have lots of light to transmit vision impulses.

And there's where the catch comes. The human eye, marvelous device that it is, will not function instantaneously when illumination is suddenly increased or decreased. Nor will it work with dull or bright light at the same time, which explains why the motorist shuts off the interior sources of light. By doing this he reduces his rod-controlled night vision by stimulating the cones with glare or bright light from the outside.

The motorist can take such a risk—black out his instrument light and take a chance that the engine is running properly—with comparative safety. The pilot cannot. The safety of his plane, cargo, and passengers depends upon his ability to see his instruments and controls and interpret them correctly. Hence, all the furor about adequate and safe cockpit lighting.

The possibilities of colored light for instrument, cockpit, and similar illumination problems have commanded considerable attention in recent years. Part of this interest has stemmed from the well-known fact that monochromatic illumination—such as that from a sodium vapor lamp—offers certain advantages in seeing small, near-threshold objects, especially at low levels of illumination. Most of it, however, arises from problems pertaining to the achievement and maintenance of satisfactory levels of dark adaption.

This last fact is what brought red into the picture. Studies pointed out that the rods, the night vision "receivers," are relatively insensitive to red lights or the longer wave lengths of the spectrum. However, the phosphor lights in common use in most cockpits today emit light which is composed to a considerable extent of short and medium wave lengths which are most damaging to dark adaption. Also, fluorescent lighting has produced complaints of various types such as apparent fuzziness and "floating" of the display on long-continued observation, as well as fogging of vision due to spilling and reflection of ultra-violet light.

On the other hand red lighting is not without its problems. One is the fact that filters used to produce red light necessarily absorb a large percentage of the total visible energy flux which is emitted by the lamp source. This means that in order to achieve a satisfactory brightness level on instruments it is necessary to use relatively powerful sources—with the problems of space, heat dissipation, etc.

It may also be found that a few pilots might complain that although red light helped them to see outside it also hurts their eyes. This would mean that these pilots had marginal vision in the red bands of the color spectrum and thus their eyes would have to work too hard in dim red light. This would mean simply that such pilots were slightly color blind in red. However, this can be overcome by providing a lighting system adjustable to whichever degree of intensity that is most suitable to the pilot.

In consideration of these facts tests were conducted to determine the answer to three important factors in this new approach to cockpit lighting. These were: (1) the study of illumination levels to determine the safest degree of light; (2) how the use of sharp "cut-off" filters would relate to the amount of power necessary for their efficient use; and (3) to determine whether the red-orange-yellow region of the spectrum would produce sufficient light flux and dark adaption for safe cockpit lighting.

As a result of these tests, two main conclusions were drawn. Dial reading performance was much more accurate at higher degrees of light level and especially when red light was used, but regardless of what color illumination is used dial reading efficiency is considerably inaccurate at low levels of light.

The ultimate goal of all of this work is, of course, the maintenance of dark adaption while still providing sufficient illumination for efficient instrument reading. Present findings seem to point to red as the color to do the job, so don't be surprised if you enter your plane one of these days to find the cockpit "painted red." It won't be all of your warning lights on at the same time, it will just be another step towards safer flying. However, until that day comes there is one important fact to be gained from all of this study that teaches a good lesson for even the present lighting systems.

DON'T be like the motorist and dim your interior lights too low to attain better dark adaption. You can't afford the risk, for even though you may get better dark adaption you decrease the efficiency of your instrument reading. Always maintain a degree of brightness that assures you good light for reading your instrument panel even though you may have to sacrifice a little of your dark adaption.

WELL DONE

TO

AVIATION CADET F. A. HOLCOMB

Goodfellow AFB, Texas

FOREMOST AMONG THE safeguards in the pretakeoff line of defense against air mishaps are topnotch maintenance, good equipment and sound briefing procedures. Of even greater importance in actual flight is the pilot's faculty for clear thinking and skilled reaction.

In the course of a preflight check at Goodfellow AFB, the radio mechanic was summoned to another job and left a T-6 airplane before completing one "minor detail" of maintenance. Not realizing that the plane was scheduled for immediate flight, he left the snap fasteners on the marker beacon receiver unsafetied. The receiver is situated so that its dislocation could allow it to jam between either rudder and the center bulkhead of the airplane.

Aviation Cadet F. A. Holcomb climbed this T-6 to 8000 feet to practice rolls, Immelmans and loops. A few of these maneuvers and he found that his rudder was jammed to the right just outside the neutral point. His repeated efforts failed to restore freedom of rudder movement.

Prospects for a safe landing with no rudder control are not too good for even a veteran pilot. Cadet Holcomb had logged 100 hours.

With controls crossed to maintain a straight course, he called the tower and explained his difficulty. Lt. Col. Elkins Read, Jr., commanding officer of the school group, and Maj. Charles B. Covert, director of flying, took off immediately in two T-6's to observe the cadet's airplane for signs of external rudder damage. Assembled in the tower in a matter of minutes were Col. James E. Roberts, base commander, Maj. William E. Riggs and Maj. Claude E. Tabor, Jr., assistant directors of flying.

Colonel Read and Major Covert reported that they could detect no external defects in the rudder linkage from a closeup, air-to-air examination. Officials in the tower reasoned that some piece of equipment in the rear cockpit had become loosened and jammed the right rudder bar.

In selecting a method for possible dislodgment of the obstruction to the rudder, the maneuver recommended had to be one which would pose minimum danger of a spin from which recovery could not be made without rudder control. That eliminated the loop.

An aileron roll to the left seemed the best bet. Cadet Holcomb was instructed to climb his airplane to 10,000 feet, roll the plane to the left to an inverted position, and to check again for freedom of rudder movement. If the right rudder remained stuck, he was to complete his roll to the left and try another test.

Following his intructions Cadet Holcomb entered his roll to the left, stopping it in the inverted position. Once again he jockeyed his rudders. This time, they moved freely!

Realizing that their charge was still not altogether "out of the woods," with a dislodged piece of equipment in the rear cockpit, his tower advisors instructed him to make a series of gentle maneuvers to line his plane up for a long, straight approach to the field.

Landing successfully, with no injury to himself or damage to the airplane, Cadet Holcomb added credence to the old flying safety adage, that "a clear head is better than a clear sky."

Accurateness of his advisors' diagnosis of trouble is also justifiably a matter of pride.

WHO'S GOT IT?

THANKS TO SHOULDER harnesses, both pilots are alive after their T-6 cut through trees, shed its wings and empennage, and crashed in a marsh. One had two broken arms and some severe lacerations. The other had a serious eye injury and multiple contusions.

The pilot in the rear seat was practicing instrument flight with the seat lowered as far as it would go. He was not under the hood. An F-80 flew across the bow of the T-6 at its altitude of 1200 feet and the front seat pilot called this to the attention of the pilot in the rear. Just after he looked out to see the F-80 go by, the rear seat pilot felt the stick shake from side to side and assumed that the pilot up front was taking over. Actually, turbulence from the passing F-80 had wobbled the controls. He released the controls and put his hands up over his head. However, nothing was said over the interphone and the front seat pilot did not pat his head to indicate he had the controls. The T-6 went into "what appeared to be a well-coordinated nose-down turn to the left." NO ONE WAS FLYING IT!

The rear seat pilot decided that the other pilot was making this fairly radical maneuver in order to observe something on the ground. He was slightly worried when they got quite close to the ground, but since the plane was leveling off and the engine was running smoothly, he didn't question the maneuver. Just then they struck the trees.

Neither pilot had observed established procedure for the exchange of flight control.

THE WORD IS ATTITUDE

BY THE FLYING SAFETY COMMITTEE, USAF INSTRU

THE DAY BOMBS FELL on Pearl Harbor, instrument flying, as it was then practiced by the Air Forces, became antiquated. The 1-2-3 or "needle-ball-airspeed" method, developed in the early 30's, was soon lost in the war-accelerated approach to modern aerial warfare. It became readily apparent that what was adequate for the planes and types of flying done 10 years before would never suffice for new planes and new concepts.

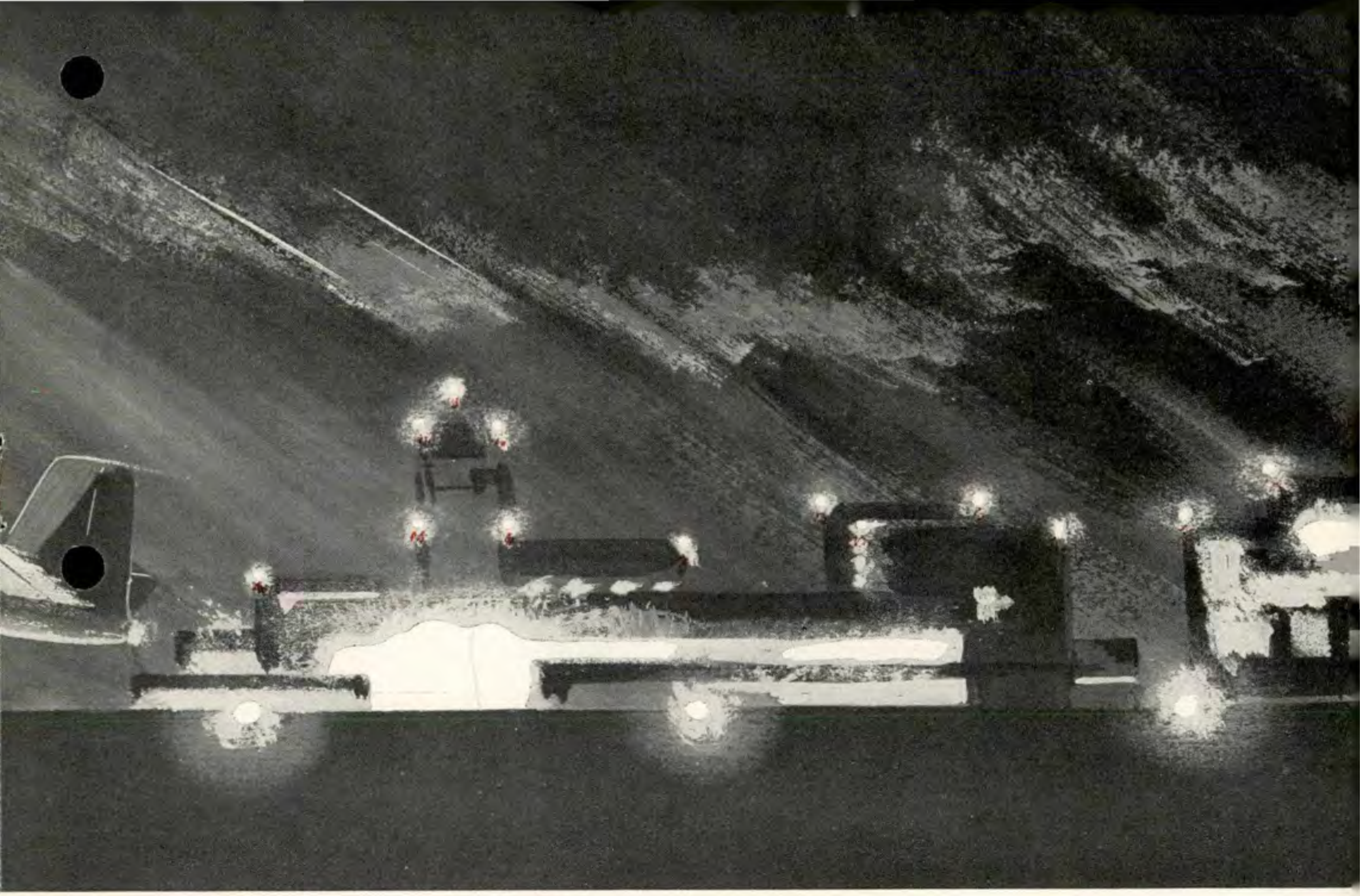
At the advent of the war, regulations permitted instrument checks to be taken in a link trainer and a satisfactory orientation beam problem was held to be conclusive evidence that a pilot had earned an instrument rating. Considering the problems of instrument flying that would undoubtedly be met in the war, such a system was insufficient. The Air Force set out to remedy the situation.

As a result of intensive research on the whole subject of instrument flying, the full panel system of attitude flying was incorporated into the training program. Today *attitude* is the key to the whole problem of instrument flight.

When a pilot is flying contact, he controls the attitude of his plane by observing the relation of the nose and wings to the natural horizon. He lowers and raises the nose and banks the wings to achieve the desired flight attitude by reference to the horizon.

Attitude instrument flight is simply contact flight brought inside the cockpit. The pilot flying by reference to flight instruments in the cockpit can determine the attitude of the airplane by observing indications on the instruments which give him essentially the same information obtained by visual reference to the earth's surface.

The pilot uses exactly the same control techniques when flying attitude instruments as in visual flying. Therefore, the student of attitude instrument flying is not required to learn a different method of controlling the airplane which was true of some of the other methods of instrument flying. The largest single learning factor of attitude instrument flying



MENT PILOT SCHOOL, BARKSDALE AFB, LOUISIANA

is that of using the flight instruments to determine the attitude of the airplane.

This attitude instrument flying method includes three major steps, the first of which is instrument coverage. This process of scanning each instrument is termed "cross-checking." Experiments on cross-checking have shown that a pilot whose instrument flying proficiency is at a high level looks at each instrument much more often than does the pilot whose instrument flying proficiency is at a lower level. Many times the lack of precision in instrument flying can be traced to slow and inaccurate cross-checking. Common faults in instrument cross-checking are (1) omitting an instrument entirely from the cross-check, (2) placing too much emphasis on a single instrument, and (3) gazing too long at the wrong instrument.

An example of improper cross-checking is illustrated in the case where the pilot is attempting to reduce the airspeed and hold straight and level flight. As power is reduced, he observes the manifold pressure gage closely to make the proper adjustments, but neglects to observe the instruments that will give indications of a deviation from straight and level flight. This failure to observe the proper instruments sufficiently could very well be the underlying cause for a poorly executed maneuver of this sort.

There is no definite order to follow while checking the instruments. The order in which the instruments should be checked depends on the type of maneuver to be executed. First impressions indicate that requiring the pilot to observe many different instruments would result in a more difficult and complex operation. However, the task of controlling the aircraft by reference to instruments is greatly simplified when more information regarding the attitude of the aircraft is obtained. Obviously, more information can be obtained if more instruments are used.

The second major step in the attitude instrument flying method is instrument interpretation. Experience has shown that this is the most difficult step to learn in attitude instrument flying. When mastered, instrument interpretation will contribute to efficient and accurate instrument flying techniques. Some instruments, because of facial design, are very difficult to interpret in terms of the attitude of the aircraft, particularly the needle and ball instrument. Precision instrument flying is impossible if the instruments are not interpreted properly.

In learning instrument interpretation, it is important to understand the construction and principle of operation of each flight instrument. This understanding reduces the difficulty of learning to use the instruments and usually results in higher standards of proficiency. Accurate instrument interpretation requires a full understanding of the instruments showing the wing position and nose position relative to the earth's surface, and the relation of the instrument indication and the actual attitude of the airplane. If the position of the wing is to be determined, the indications of the artificial horizon, the directional gyro, and the needle and ball should be observed. If the position of the nose is to be determined, the airspeed indicator, the altimeter, the vertical speed indicator and the artificial horizon should be observed. Remember that the indications on the flight instruments should be interpreted in terms of the attitude of the airplane at all times.

The third and final step is airplane control. In the first flying instruction a student pilot receives, the instructor continually calls his attention to the relative appearance of the horizon and the wings or some other reference point on the airplane. The student pictures the appearance of the nose on the horizon in a climb. He gets the angle the wings make with the horizon in a steep bank, and the control movements he makes are a result of responses to changes in the attitude of the airplane.

In this primary training, the natural horizon and reference points on the airplane are the student pilot's so-called instruments. When he moves the controls of the airplane, he must read the position of the airplane attitude from these so-called instruments before he will know what control pressure to use. Then he coordinates the controls to place the airplane in the desired position. Correct control pressures are used because in all his contact flying the relation between control movements and airplane attitude with respect to the horizon has been emphasized very strongly by the instructor. Instrument flying, then, is essentially visual flying, substituting the instruments (airspeed indicator, altimeter, turn needle and ball indicator, artificial horizon, directional gyro and vertical speed indicator) for the so-called instruments (earth's surface and various points on the airplane) used in visual flight. There is no difference between the control movements necessary to produce a given attitude; similarly, there is no difference in the thought responses leading to these control movements.

Aircraft control is broken down into four coordinated steps which are (1) pitch control, (2) bank control, (3) power control, and (4) trim. Pitch control is achieved by controlling the movement of the fuselage about the lateral (wing) axis. Bank control is achieved by controlling the angle made by the wing and the earth's surface, or the movement of the wings about the longitudinal axis (fuselage). Power control means simply the control of the power plant to achieve the desired rate of climb or descent.

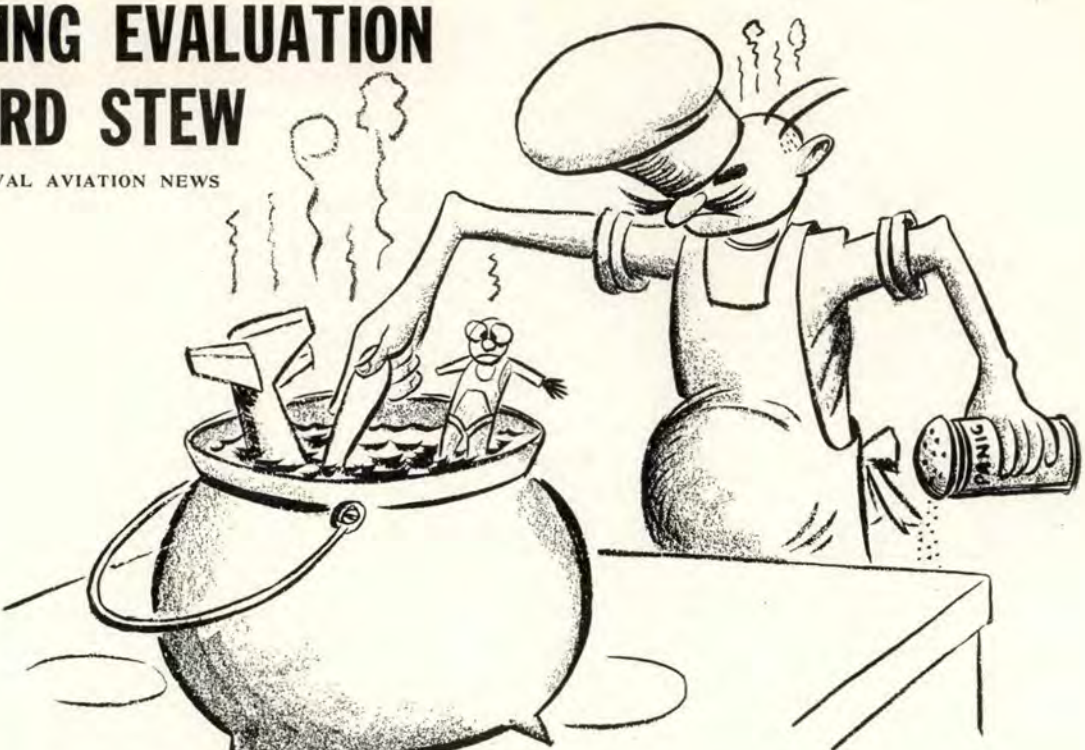
Trim control is achieved by relieving all possible control pressures after the desired attitude has been attained. Precision instrument flying is very difficult when pressures must be held manually to achieve and hold a desired attitude. Therefore, trim control must be exercised to relieve as many control pressures as possible. It must be borne in mind that pitch, bank, power and trim control are performed in a coordinated manner, and the breakdown shown here is only an analytical treatment of the subject of aircraft control.

Much has been said about relaxation while flying by reference to instruments. The point is brought out here to serve as a reminder. Good instrument flying techniques are difficult to employ when the individual is tense. Tenseness usually arises when maneuvers and procedures are executed that require a large amount of activity. It can be detected when control movements are erratic and abrupt, and when pressures are held on the controls in opposition to the trim. A suggested procedure to overcome tenseness on the controls is to grasp the controls lightly and trim the airplane to hold the desired attitude with a minimum of control pressure.

The pilot who is not a proficient instrument pilot is not long for the Air Force. The Air Force, to continue to be effective as an all-weather striking force, must maintain a high level of instrument flying proficiency. As a result of research and training in the system of attitude flight, instrument flying has come of age in the United States Air Force.

FLYING EVALUATION BOARD STEW

A LA NAVAL AVIATION NEWS



APRIL IS A FINE MONTH for the Flying Evaluation Board Stew, a dish which is particularly easy to prepare during spring months. Although the recipe varies with different cooks, here's one formula that seems to be very popular. Like other culinary treats, this stew can be ruined by too many cooks, so don't let a good weather officer, a smart operations officer, or a flying safety officer help out. They'll only foul up the formula.

Ingredients

1 aircraft, high performance type
1 pilot (pick a fresh, hot one)
3 hours fuel
1 point of departure
1 compass heading (approximate only)
1/2 ounce common sense (may be omitted)
1 well-aged aeronautical chart
2 or 3 pinches of panic
10 bunches static
1 parachute
Fog, rain, snow, darkness to taste
4 or 5 well-worn alibis

Directions

For best results don't cook this up until about an hour and a half before sunset. First place the fuel and the well-aged aeronautical chart in the aircraft. (Caution: Choose the chart carefully. A correct, up-to-date chart may cause the recipe to fail.) Then quickly blend in pilot and parachute, being careful to avoid any briefing. Place this mixture on approximate compass heading for destination and allow it to simmer gently for 1 1/2 to 2 hours. Wash and drain the static and add small sprigs of it every few minutes. Pour in the rain, snow, or fog to taste, and stir in a generous portion of turbulence.

When the pilot is thoroughly done as indicated by rosy color, moisture on brow, and rapid breathing, prick gently with a fork and sprinkle in a pinch or two of panic. With a large spoon skim off any remaining fuel, and place the parachute ripcord in pilot's hand.

The dish is now ready to serve. After stirring for a second or two with a brisk rotary motion, remove pilot and parachute from mixture. Pull ripcord. If parachute functions, convene flying evaluation board and serve pilot on a warm platter, using the well-worn alibis as a garnish. If parachute does not work, start over again with fresh ingredients.

Famous Last Words

The Board has decided you lack the brains
Required to fly our high-priced planes.
Turn in your wings, your helmet, your boots
We wish you success in civilian pursuits.

B-29 DITCHING

Ditching of any multi-engine airplane presents many problems, and the various proposed methods for accomplishing successful ditching are equal in number to the problems involved.

First of all, the airplane commander should have his ditching procedure down pat. Second, he should insure that his crew and passengers are fully briefed on what their duties and responsibilities will be before, during and after the aircraft is ditched.

However, according to some fliers, ditching isn't always the answer. They propose bailing everyone out over as small an area as possible. This method, although advantageous in some isolated cases definitely has its disadvantages too. The question is: Are the advantages of bailout as great as the advantages of ditching and of having the crew and equipment all together?

Here are some facts from a recent study which will shed some light on the controversy. "Ditching vs Bailout," as regards the B-29. During the period 1 November 1945 through 31 December 1948, three B-29's were ditched and three were abandoned over water.

The tallies for the ditched B-29's were: Out of 27 personnel involved, six were killed, two received major injuries, three received minor injuries and 16 were uninjured.

Now let's consider the bailout tallies: Thirty-five persons were aboard the three B-29's that were abandoned over water. All bailed out. Two received fatal injuries, one received major injuries, nine received minor injuries and 23 were uninjured. These figures as compared to those for the ditched B-29's seem to settle the argument in favor of bailing out, *but* let's consider the conditions first.

Here is what happened as each B-29 was ditched. One B-29 was ditched in heavy seas with very little control. The impact was that of a crash rather than a ditching, the left wing striking first or at the same time as the nose. The plane broke up and sank in a few seconds. Four of the five people in the rear compartment escaped without difficulty. The right scanner in the rear compartment did not know how he escaped nor did the engineer and radio operator remember how they got out. However, it is believed that the nose of the airplane broke up and they were thrown clear. Of the seven men who left this B-29, six survived and the seventh floated away. The other five occupants went down with the airplane.

Another B-29 was ditched in Lake Meade, Nevada. The airplane on a low-level mission first struck the water inadvertently while in nearly level flight at an IAS of 230 mph, knocking off Nos. 2, 3 and 4 engines. The pilot pulled the B-29 up to an altitude of approximately 200 feet to dissipate the airspeed and then ditched at an IAS of 150 mph. The B-29 remained relatively intact and floated for about 15 minutes. The crew got the life rafts out and inflated without difficulty. One crew member received a broken arm during the ditching. The other four occupants were uninjured.

The other B-29 was ditched in approximately three feet of water just off shore of an island. Final approach was made with full flaps and IAS of approximately 100 mph as the B-29 was very light (almost out of gas). Contact with the water was made tail low at 95 mph and the airplane came to rest in a normal attitude. All 10 men aboard were uninjured.

In one of the three B-29's abandoned over water, the pilot was killed because of insufficient altitude and time for his parachute to open. One other crew member received major injuries and the remaining nine received minor injuries. The crew landed close to shore and were able to swim and wade to the beach.

All members of the crew of the second B-29 bailed out successfully. A few of the men landed on shore and the rest landed in the water and were picked up by surface craft. One of the men who landed in the water died later of exposure. The others were uninjured.

VS. BAILOUT

The third B-29 was abandoned 350 miles out to sea. All 13 crew members parachuted successfully and were in Higgins boats dropped by Dumbo B-17's two hours after parachuting. The B-29 had been in radio contact with a Dumbo B-17 during the emergency.

On a quick comparative basis, irrespective of some prevailing conditions, these facts indicate that bailing out offers the crew the best chance of survival. However, it is stressed that in all three instances of bailout, the conditions were almost ideal. Two occurred close to shore and, in one of these cases, surface craft saw the men bail out. The third B-29, although 350 miles at sea, was in contact with a Dumbo B-17 at the time of the bailout. One Dumbo dropped its boat to the crew 20 minutes after the bailout and a second Dumbo dropped another boat 30 minutes later.

Of the aircraft that were ditched, one had two engines inoperative and the propeller of one of the dead engines would not feather. The seas were heavy and control was difficult. Because of the crash type landing, the airplane was badly broken up and sank in a few seconds.

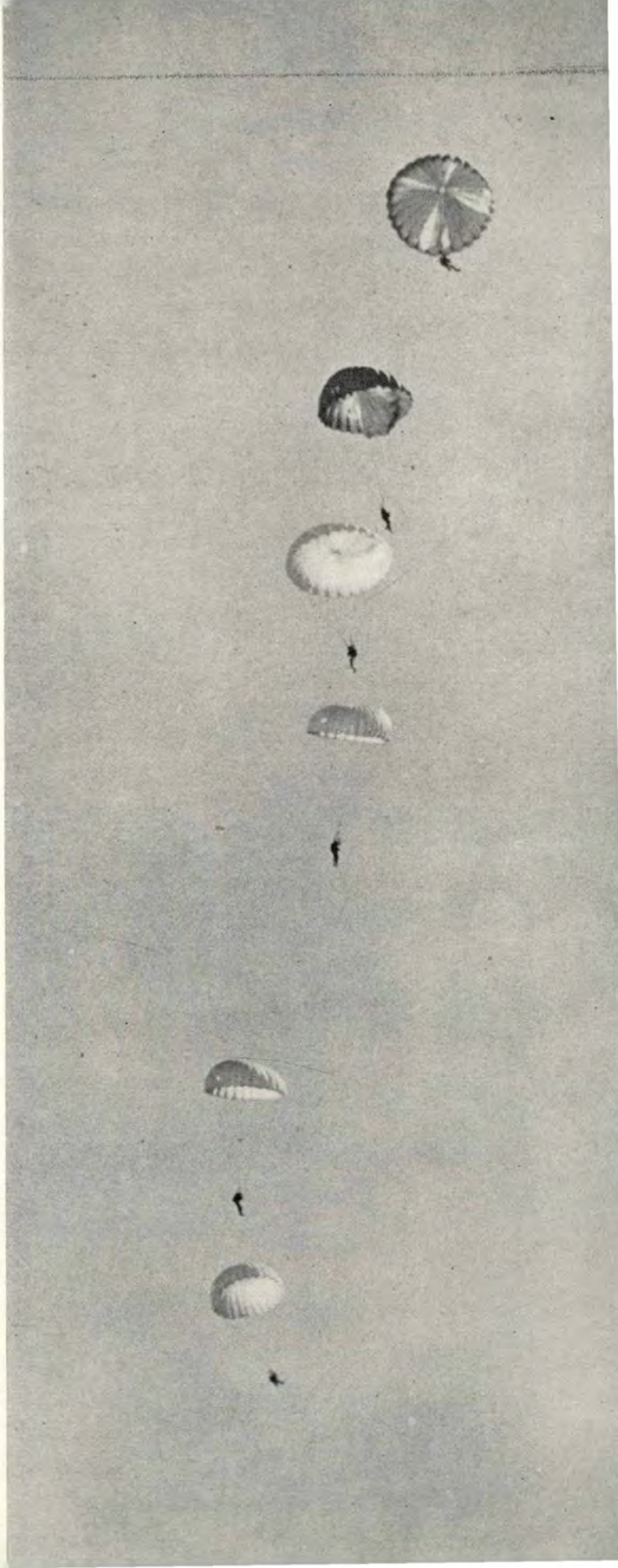
The second airplane was ditched under more ideal conditions even though the initial impact caused extreme excitement. Control was good, water smooth, and the airplane stayed afloat for about 15 minutes. This gave the crew ample time to get out sea survival equipment and inflate life rafts.

Ditching of the third B-29 was well planned and was executed without difficulty.

Thus, it is believed that under ideal or ordinary conditions, ditching should be favored. Not only will it keep the personnel together so they can be more easily seen during a search, but it will also give them access to more and better equipment, thereby enhancing their chances of survival.

As the six B-29 emergencies discussed here have proved, the success of the ditching or bailout depends a lot on the preparedness of the airplane commander and his crew. This can be accomplished only by unrelentless training and discipline and applies not only to the B-29's, but all other airplanes as well.

Remember, it's a little late to be briefing your crew on ditching procedures once engines start cutting out or catching on fire!



Violation!

Some people recall the moment they stood in front of a justice of the peace as the biggest thing in their lives. Others, having mellowed with age and experience, reminiscingly wish that the j. p. had been out to a ball game when they knocked on his door.

This is the story of an Air Force reserve pilot who falls in the latter category. He stood before the bench of the local justice of the peace and heard the cash register ring out a $50 fine and $5 costs.

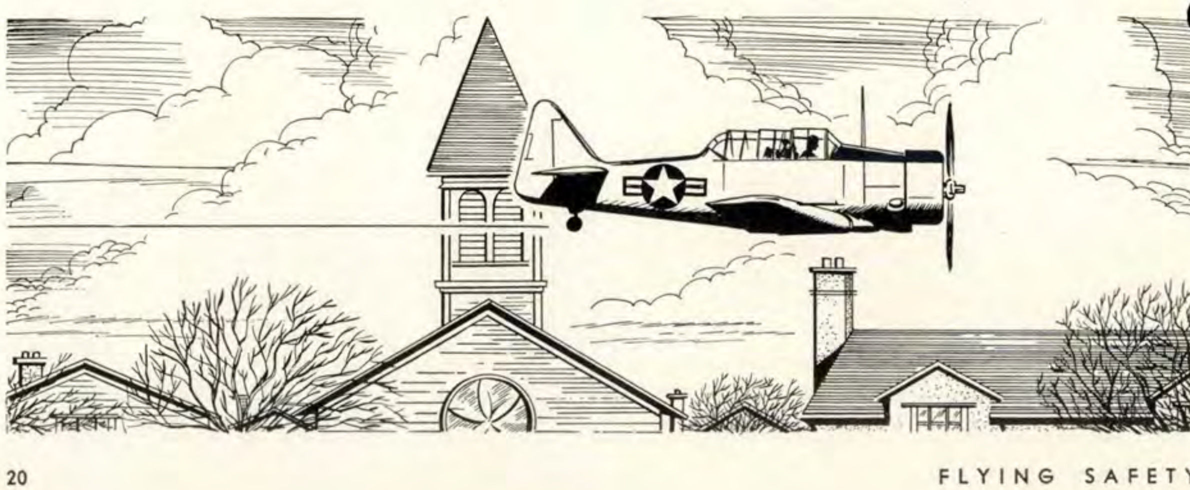
It all happened when the reserve pilot, one of the many who get their flying in on Saturdays and Sundays devoting the rest of the week to civilian pursuits, decided to dust his family off in a T-6.

He made out a local clearance, affixing his signature thus certifying that he had read, understood and would comply with all provisions of Air Force Regulation 60-16 and specifically the paragraph of a local regulation which prohibits aircraft of that unit to fly below 1500 feet above the terrain at any time except in the traffic pattern.

It must be said in his defense that he did comply with the regulation which stated that aircraft would not fly closer than 500 feet vertically nor closer than 2,000 feet horizontally to an overcast or cloud formation. The strict compliance with the regulation prohibiting cloud exploration may have been prompted by the fact that the weather at the time of the alleged violation was CAVU.

The T-6 made a normal takeoff and was next observed flying back and forth over the pilot's home town at an altitude estimated at less than 100 feet. The witnesses to the buzz job were for the most part familiar with airplanes. One witness, an ex-pilot, caught the number on the bottom of the wing as the airplane disappeared behind a church steeple. An old lady wearing bifocals caught the buzz number on the side of the T-6 from a distance of two city blocks. The enraged citizenry notified the local gendarmerie of their unanimous disproval of the reckless and dangerous manner in which the airplane was being flown.

The local cops met the pilot at the airport and promptly escorted him to the home of Marrying Sam. The $55 tab by Sam was just the beginning of this pilot's troubles. The commanding officer of the reserve unit concerned extended a personal invitation to the pilot to meet a flying evaluation board to find out whether this officer should be disqualified for flying duty as a result of his serious and willful violation of flying regulations. It didn't take the board long to decide his fate. He was told to pick up his marbles and go home and stay there.



MEDICAL SAFETY

COLDS

WITH THE SHORTAGE OF aviation medical examiners and flight surgeons, all airmen must be on the alert for physical or mental conditions that might directly or indirectly lead to injury or death.

During the war the Air Force was fortunate to have on duty with each squadron an aviation medical examiner or flight surgeon. This medical officer was there to prevent accidents by carefully checking the flier's mental and physical condition, manner of living, his job assignment, the number of combat missions, etc., noting as carefully as possible any apparent mental or physcial trauma—looking for danger signals. This is prophylactic medicine —not waiting for the complete breakdown. In most cases this was highly successful and of great benefit to the airmen whether or not he decided to make the Air Force his career or become a civilian.

Everyone is aware of the present shortage of doctors in general and flight surgeons in particular. The Air Force no longer has the number of flight surgeons needed. All are working many many hours overtime. However, there is something that you can do to ease the present situation and that is to take the trouble to hunt up the base flight surgeon whenever you have any doubt in your mind that your physcial condition may not be up to par.

Take for instance the man with a cold. The average person knows when he has a cold and he also has a pretty good idea of how he feels, but he may not know his exact physical status, that is—just how sick he is. Now this man has been instructed to fly a certain mission the following day. He has a fair idea of what the mission will involve, that is, what type of flying—acrobatics, straight and level, etc. His best bet is to look up this already overworked flight surgeon and get his advice as to the danger involved in the proposed flight. When this is accomplished he should take the flight surgeon's advice.

Take this same man with a cold. But this time he flies. He does not feel quite up to par but the flight is uneventful until after he lands. That's funny, but his ears begin to hurt and a few hours later they really hurt. Then it becomes no question as to whom he should see, nor does he care what late hour at night it may be. He is in trouble—acute trouble.

He has developed an aerotitis and this can be very uncomfortable. When the flight surgeon sees him, he is a picture of dejection. He cannot understand what happened. He never had any trouble before. How was he to know that he had lymphoid tissue in his throat; that this same stuff swelled up when irritated by a cold (infection) and simply cut off his escape valve between the middle ear and his throat; that this increased pressure irritated mechanically or physically a very delicate inner and middle ear mechanism?

You can still be a he-man and ask the flight surgeon for his advice. It may be inconvenient to you at the time but may save you serious trouble, and the flight surgeon much work, at a later date. Don't take chances physically, know what you are doing.

And also remember that just because you are not 40 years old and don't require an annual physical examination, you don't necessarily have the green light, physically speaking.

LT. COL. WENDELL P. HARRIS, MC
Chief, Medical Safety Branch

BONING UP ON THE BONES

A coordinated study by the National Bureau of Standards and the Naval Medical Research Institute is now under way which takes into consideration the mechanical properties of human bones and their behavior under shock and impact loads. Victims of serious crashes have been kown to walk away without injury, whereas seemingly trivial accidents have resulted in casualties caused by slight blows to certain portions of the body. Human and monkey bones have been used in actual structural tests, some in compression, bending, and even torsion. Tuckerman optical strain gages were used to measure results. Preliminary datum indicates that bone may be considered an elastic brittle material having about one-fourth the compressive strength of cast iron and more than twice that of hickory wood.

PIGTAILS ON A STRATOLINER

Not until 1939, was large-scale research organized to devise a means of reducing precipitation static. In 1944, the Navy had developed a discharger consisting of a cotton wick saturated with a glycerine compound, which was mounted in an aluminum tube that extended downwards and backwards from the trailing edge of wings and stabilizers. Flight and laboratory tests were all favorable, but the tube projected down like a sore thumb and was constantly getting knocked off. The aluminum tube has been replaced by one of a flexible plastic material and the cotton cords have been sufficiently mineralized to become mildly conducting. An airplane equipped with an array of pigtails can maintain radio communication through interference conditions several times as bad as one not thus protected.

VOR TESTS

Further information on the new VOR ranges (detailed story in March issue, FLYING SAFETY) released by the CAA reveals that these new air navigation aids are proving to be "gratifyingly accurate and precise." Flight checks conducted at a number of the stations now in operation disclosed many of the improvements in the system.

The margin of error inherent in any new electronic device has been narrowed steadily in the case of the omnirange. The inherent error in the range

itself is two degrees or less at any point on the compass. The better receivers have maximum error of one degree or less and are steadily improving.

In the case of commissioned CAA ranges, the combined errors of the range, the receiver, and effects caused by surrounding terrain are held to less than three degrees for more than 95 per cent of the area surrounding the range.

Standard procedures for use of omniranges under instrument conditions now have been developed. These provide for 24 flight paths for lateral separation of aircraft in the coverage of each omnirange, with a separation of 15 degrees between paths. This separation permits a wide margin of safety under all operating conditions. Under visual conditions, of course, additional flight paths are available.

At present there are 240 omniranges in the United States, of which 26 have been commissioned. Lack of aircraft for the comprehensive flight checks necessary for commissioning has been a bottleneck in the program. Additional aircraft have been modified for use in flight-checking, however, and the commissioning program is now getting into high gear. In addition to the 240 ranges now built, 83 others are in the final stages of radio installations, and 67 other VHF ranges of a different type eventually will be modified to omniranges.

Although it has been reported that the omniranges commissioned by the CAA exceed by a considerable margin the standards established by the International Civil Aviation Organization, work is continually being done to provide even greater accuracy in these navigation aids.

PAMPHLETS AVAILABLE

Are you a "I-never-have-tried-it-and-I'm-a-little-leary-about-it" guy when it comes to parachutes? Could you be an aerial gunner who'd like to know how to live to be the great granddaddy of all gunners? Or perhaps you're a pilot stationed in the cool Aleutians. If you are any one of the three, we may have just the thing you need.

Stashed away in our office bomb-bay are a few tall stacks of three little pamphlets entitled "Aleutian Sense," "Gunnery Sense," and "Parachute Sense." They were published by the Navy Department during the war for the use of Navy personnel. However, even though the war may be over and you're not in the Navy, you'll find these little books are chuck full of a lot of good, solid common sense on the respective subjects. You may find that they've got just what you've been looking for to take the rough edges off those few unanswered questions that have been hanging around.

If you can use one, just drop a line to the Editor, FLYING SAFETY, Inspector General, First Region, Langley Air Force Base, Va. We'll see that you get a copy while they last.

RAIN REPELLENT

A newly-developed repellent maintains windshield transparency on jet fighters in moderately heavy showers at speeds up to 400 miles per hour. Tests show that untreated portions of the windshield were only opaque under the same conditions. Transparency of treated surfaces reduced with speed but at 450 mph in heavy rain, visibility was adequate for "safe flying."

One commercial operator reported that the repellent was particularly effective in maintaining windshield transparency on flying boats in salt water operations and helps prevent salt deposits.

The application of the paste on jet fighter windshields is relatively easy and takes only about 15 minutes. The job can be accomplished by any line crew personnel.

Flying Safety BRIEFS . . .

20 MEN IN ONE RAFT

The Pacific Division of the Military Air Transport Service is window shopping for life rafts. The eye catcher so far has a 20-man capacity, and is more than three times the size of earlier models. It was designed for "Stratocruisers" on the Pan American Airways' over-water flights. But because the companies using the huge airplane on commercial flights hadn't begun trans-oceanic service, the raft was loaned to a C-97 crew at Fairfield-Suisun AFB to be tested. The C-97 is the military version of the Boeing "Stratocruiser."

In spite of the new raft's gigantic size when inflated, it folds into a package no larger than the average housewife's laundry bag; about the size of a serviceman's duffel bag. When inflated and in the water it appears to be two large circular rafts, one on the other, with a rubberized fabric flooring suspended between the two. Actually, however, a cutaway section of the raft shows that the "tube" is constructed like a figure "8." With the flooring suspended between the two halves the life raft has no "top" or "bottom." It may strike water either side up and be boarded immediately.

When an airplane ditches, its life raft is thrown clear of the plane. A rip-cord device many feet in length, is provided on the new model, and enables someone aboard the plane to inflate the raft from a distance. By using the cord, the raft may be pulled to the stranded plane's occupants to let the non-swimmers climb aboard.

Occupants of a ditched airplane are afforded

many comforts in the new raft. For instance, there's a bright yellow canopy which provides a roof overhead, can be used to catch rain water for drinking, and at the same time enables searchers to spot the contrast against the sea. In a box aboard the raft survivors will have fishing equipment, first aid kits, rations, a sea water distilling unit, sponges, repair equipment, an inflation pump, a bailing bucket, sea anchor, heaving line, survival equipment, a knife, flashlight, whistle, compass, Bible, rope, mirror, and flares.

If final tests meet expectations, the Air Materiel Command of the Air Force will be asked to make it standard equipment on each of MATS' sky giants.

FIGHTER PILOTS USE CELESTIAL NAVIGATION

Fighters can be safely guided over long reaches of water by celestial navigation, and without escort by heavier airplanes.

This was proved recently by the Strategic Air Command's 27th Fighter Wing, led by Col. Cy Wilson. In the copilot's cockpit of the commander's F-82, 1st Lt. Wesley L. Hudelson, group navigation officer, had installed an astro-compass on special mounts. Included in his equipment were an A-10-A sextant and a folding charting board to compute the group's course.

The group's over-water practice missions were flown from MacDill AFB to Puerto Rico, to the Canal Zone, to Jamaica and then to Carswell AFB, Texas. With the exception of routine position reports, no contact was kept with ground radio stations for navigation purposes. Longest leg of the Caribbean flight was 1600 miles.

Although celestial navigation over water is practical for the two-man fighter, the Twin-Mustang pilots believe it would be impractical for a single-seat fighter unless the plane was equipped with autopilot.

SEARCH FLIGHTS SAFELY FLOWN

The Air Rescue Service at Biggs Air Force Base has completed one year of flying without a major or minor aircraft accident. The period of record is from 1 February 1948 to 31 January 1949, with a total of 4792 hours flown in 11 different types of aircraft by 15 pilots. The monthly average is nearly 400 hours.

Of the total time flown, an estimated 70 per cent was at an altitude of less than 800 feet, while the different aircraft were on searching missions.

PILOT'S RESPONSIBILITY

Exactly how much authority does the man in the airport traffic control tower have over pilots proposing to take off? Just what is the significance of the "clearance" the controller may give the pilot?

Tower operators have authority to clear aircraft only with respect to traffic conditions, and in providing weather information they are simply furnishing assistance, but have no authority to prevent a plane from taking off because of weather.

The ANC Handbook on "Procedures for the Control of Air Traffic," jointly issued by the CAA, the Air Force, Navy and Coast Guard on 1 May 1948, makes this very plain. It sets forth:

"A clearance issued by an airport traffic control tower . . . is authority for a pilot to proceed only insofar as known air traffic conditions are concerned, and does not constitute authority for a pilot to violate any provision of Air Force, Navy or Civil Air Regulations . . . The mere fact that the pilot received a traffic clearance for the flight does not relieve the pilot of any responsibility whatsoever in connection with a possible violation of Air Force, Navy or Civil Air Regulations."

The airport traffic controller has more than enough to keep him busy in his task of moving a heavy volume of planes in and out of an airport without collision. It would be placing an impossible workload on the controller to expect him to see that every plane he clears is airworthy and is flying in accordance with its particular operating limitations as to weather.

Control tower operators are being directed to report obvious misuse of radio channels by pilots.

The controller will continue to furnish all possible information to assist the pilot to fly in compliance with regulations, but it must necessarily remain the pilot's ultimate responsibility to determine whether he should make a particular flight.

Cross Feed

FLYING SAFETY OFFICERS IDEA EXCHANGE

DRAINING FUEL SUMPS

Although there are no instructions in current publications in regard to the draining of fuel sumps subsequent to each full servicing, it is the opinion of flying safety officers at Wright-Patterson AFB that after a few servicings while on cross-country flights, the water level in the fuel tanks will reach a dangerous level if the sumps are not drained after each servicing.

At this base we require that the sumps be drained after each servicing to prevent freezing of fuel lines and selector valves. This procedure was begun after a T-6 accident that resulted from a frozen fuel selector. Also, a recent B-25 accident, in which the engines quit and the crew bailed out, was apparently caused by fuel starvation after the lines froze. This plane had two full servicings before the crash and the sumps had not been drained after either refueling.

It is definitely known that a large amount of condensation will occur when flying through extreme temperature change and air with a high humidity content.

This information is submitted in the hope that it might come to the attention of other bases and be given further study as a potential new technical order.—CAPT. PETER L. COFFIELD, *Flying Safety Officer,* Wright-Patterson AFB.

SURVIVAL KITS

A crash landing in the Rocky Mountain area in winter presents substantially the same problems of survival as in the arctic. Thorough indoctrination in cold weather survival has been an item of major attention at Lowry AFB. Chances of being found may be greater in the Rockies, but the crew must survive in practically arctic conditions until found, with considerably less training than arctic crews and with practically no survival equipment other than what they can furnish for themselves.

Accordingly, a complete cold weather survival course was conducted for flying personnel at Lowry, including thorough familiarization with the contents of survival kits. However, it was not possible to obtain survival kits for permanent installation in aircraft assigned to this base so improvisation was necessary. In line with Air Rescue recommendations, all flying personnel were strongly encouraged to wear the correct clothing for winter flights over the Rockies and to carry a strong pocket knife, matches, and a candle. Air Rescue considers the candle a must, since a lighted candle in a small snow house will keep the temperature above freezing.

A small fire-making kit was improvised by Lt. Robert J. Craig of Lowry Flight Service Center. The case is made from an aircraft sparkplug container, sealed with paraffin wax to make it strong

and waterproof. Inside are fitted a quantity of matches, each with the head covered with wax, and a candle. The waxed head reduces any possibility of friction within the case and also makes it easier to strike in a wind, since the wood burns more fiercely after ignition. The paraffin wax-soaked container, torn in strips, makes the best possible tinder for starting a fire.

This simple kit has met with enthusiastic response, and we hope to be able to furnish one to each crew member to be carried in his flying suit, and six to each aircraft.—MAJ. JOHN G. WILLIAMS, *Flying Safety Officer*, Lowry Flight Service Center.

TEST FLYING CAN BE SAFE

The flight test section at Mobile Air Materiel Area, Brookley AFB, has completed four years of test flying without so much as a scratched wingtip or a nicked prop blade. A total of 1701 different airplanes were flown, many of them several times in order to complete the requirements before delivery to the receiving organizations.

Among those flown during the 48 months ending in February 1949 were: 398 C-47's, 334 B-25's, 199 B-29's, and 350 trainers including T-6's and and T-7's. Also flown were varying numbers of the C-46, B-24, F-61, B-26, C-54 and B-17. Even one ancient B-18 was test-flown within this period of time and, more recently, helicopters and F-80's.

These safe flights are attributed to two primary factors. First, the depot overhaul and maintenance has been supervised with the goal in mind of eliminating mechanical failures. Secondly, the care and planning on the part of the test pilots before and during each flight was never relaxed.

The achievement was worth the effort, and it proves that if one particular group of pilots and maintenance men can team up to stop accidents, then the same efforts applied by other groups will contribute to safer flight. — MAJ. LEWIS H. WALKER, *Flying Safety Officer*, Brookley AFB.

JATO ASSIST

Because of engine trouble, a C-47 from the 3345th Technical Training Wing, Chanute AFB, was forced down in a wheat field some distance from the base. The pilot landed the plane wheels down, and there was only minor damage to the leading edge of the left wing caused from the plane coming to rest against some trees bordering the field.

The feasibility of dismantling the plane and carting it out was overruled because of the danger of damaging the plane structurally, which could hardly have been prevented. The plane required two engine changes and a small patch on the leading edge to be flown out of the field. Because of the short field and soft ground, however, this would have been hazardous. The flight might have been delayed until the ground was frozen over, but still the short field presented conditions not conducive to safe takeoff.

To insure a safe takeoff and flight to the home base, it was recommended that the plane be flown out with JATO assist. Headquarters, Air Materiel Command, advised there were no portable JATO units suitable to C-47 type aircraft, but they agreed to construct a unit to be used in the operation. The portable JATO unit was installed and the plane was flown out with the greatest margin of safety.

Incidentally, the same airplane, equipped with JATO, was used this past winter in the rescue of stranded airmen on the Greenland ice cap in the North Atlantic.—CAPT. CLARENCE J. EDEN, *Flying Safety Officer*, Chanute AFB.

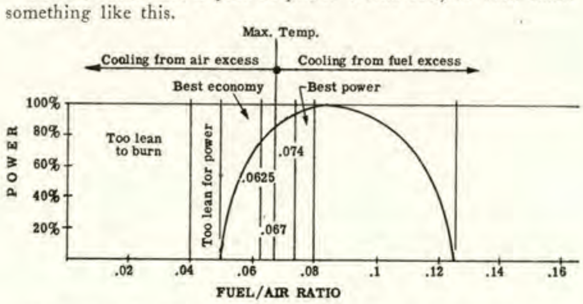
LETTERS TO THE EDITOR

Editor's Note: We have received several requests for clarification of the reasoning behind the leaning procedure used during the C-45 cruise control flight described in the March 1949 issue of *FLYING SAFETY*. Following is the explanation given by the author.

DEAR EDITOR:

The procedure recommended in the handbook is, of course, the one which should be generally used. That is to set up the cruise settings that are going to be used, then pull propellers to full low RPM position and lean manually 'till a 25 to 50 RPM drop results, then position propellers to desired RPM. The result is that by doing this the fuel/air ratio is decreased below a chemically correct mixture for complete combustion with an accompanying loss in power. Substantially the same thing can be done by leaning for a drop in cylinder head temperature.

You will find that a plot of power versus fuel/air ratio looks something like this.



The fuel/air ratio required to produce best power is from .074 (lean best power) to .08 (rich best power). The best economy will result at a point where the ratio of power to fuel/air ratio is maximum (tangent of the curve through o/o point) which is normally about .0625. Maximum heat of combustion takes place at a fuel/air ratio of .067. A mixture of less ratio will reduce the combustion temperature by the presence of excess air; likewise a greater fuel/air ratio will reduce the combustion temperature by the presence of excess fuel.

It can be readily seen from this that a mixture for best economy will give a lower temperature than a mixture slightly richer. This fact can be shown on carburetors equipped with automatic mixture controls. However, variations from proper settings and effect of power enrichment devices, etc., usually prevent a conclusive demonstration, so don't get trapped.

There is the theory. And you can no doubt see why I say that I wouldn't recommend the practice for general usage. It is easy to lean too far and get too big a power loss even to the point of loss of an engine, and altitude variation of only a few hundred feet can make that difference.

MAJOR CLARENCE W. PORTER, *USAF*
Hq., Air Materiel Command

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DEAR EDITOR:

On a bright sunny afternoon not so long ago, I was copilot of a C-47 which had just taken off from Mitchel AFB, and was climbing on course with a heading of 270 degrees to reach our assigned altitude of 7000 feet. I had just switched fuel tanks from the right and left mains to right and left auxiliaries and had started to refer to the radio facility charts. Visibility was good, ceiling unlimited, and a full load of gas and passengers were aboard.

The plane was in the hands of the pilot, so I began to figure ETA's and headings between range stations with no thought to the operation of the airplane, when suddenly the right engine began to backfire and cut out. The sudden explosions so near to my side of the plane scared the daylights out of me, so I was a little slow in reacting. However, I switched the right auxiliary to right main, threw on the right booster pump, and pushed the mixture to rich. The engine caught immediately and proceeded to purr right on. I then switched off the booster pump. The crew chief had been back at the navigator's seat writing in the Form 1 and he immediately came forward and asked about the trouble. I told him what had happened, so he asked me to switch tanks again. I did so and he switched on the right booster pump. The right engine continued to function for about a minute when the fuel pressure began to drop off again. Before I could switch tanks, she began to cut out once more. I switched to the right main again, and the engine caught and kept running. We tried switching to the right auxiliary about five times, and each time the same thing happened—the engine kept cutting out. The right booster pump seemed to keep the pressure up for awhile, but it always dropped off shortly.

Here is the pay off. The crew chief then explained to us that on pre-flighting the airplane that morning he was unable to drain the sump on the right auxiliary tank. This C-47 had been parked outside on a hardstand for about five days prior to our flight and subjected to several days of sleet and snow without any pre-flight being done nor any "daily" performed prior to our flight. The right auxiliary sump would not drain because ice had formed in it, and this same ice had probably clogged the line to the pump so no fuel could pass.

We had anticipated landing at Wright-Patterson to drop off a passenger, but because of our reduced fuel supply, we stopped at Lockbourne AFB and refueled before continuing. While at Lockbourne we tried to drain the right auxiliary sump, but it was still frozen. The ground temperature was about 25 degrees. Our next stop was to Craig AFB and en route there at 7000 feet, we tried the right auxiliary twice with no luck. Ground temperature at Craig was about 70 degrees, so after a lay over of an hour the sump thawed out and we were able to use the right auxiliary tank thereafter without trouble.

The important thing is that the crew chief did not write up the frozen fuel line in the right auxiliary tank on the Form 1A, and consequently we thought it was OK. Imagine our embarrassment if we had taken off on the right auxiliary tank instead of the main. The engine might have functioned on that tank for about 30 seconds, just long enough for the fuel in the lines to be used up, and then we would have had engine failure on the right engine. With a full load as we had aboard, it might have been disastrous. Needless to say, this pilot will test every tank for proper functioning on the ground during the pre-flight check from now on. And also needless to say, we let that crew chief know of our feelings on the matter. It was written up on the Form 1A too.

MAJOR CHARLES D. MORAT, JR., *USAF*
Hq., First Air Force

Major Morat's observation and experience agree with the contention of the Flying Safety Officer at Wright-Patterson AFB (see page 26 of this issue).—Ed.

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DEAR EDITOR:

I insist that there are many concrete factors that make up the entire picture of flying safety. If we were to delve sufficiently into this complex subject, I believe it is well to go back to one's training when a small boy to really cover the subject with the importance that it deserves. After all, discipline is really the foundation of flying safety, and that discipline should begin when the mother and father train the young child. I would not like to get out on the end of a limb and have someone saw it off, but at this stage of our development, I am reasonably sure that the cause of 90 per cent of our accidents can be attributed directly to the lack, or complete absence, of discipline.

I have always enjoyed the FLYING SAFETY Magazine since it has been published. I read it monthly from cover to cover, as I believe it keeps us older pilots "on the ball" and reminds us that we don't know it all and can learn quite a bit from the experiences of younger pilots.

COL. H. O. BORDELON, *USAF*
Hq., Alaskan Air Depot

WHY?

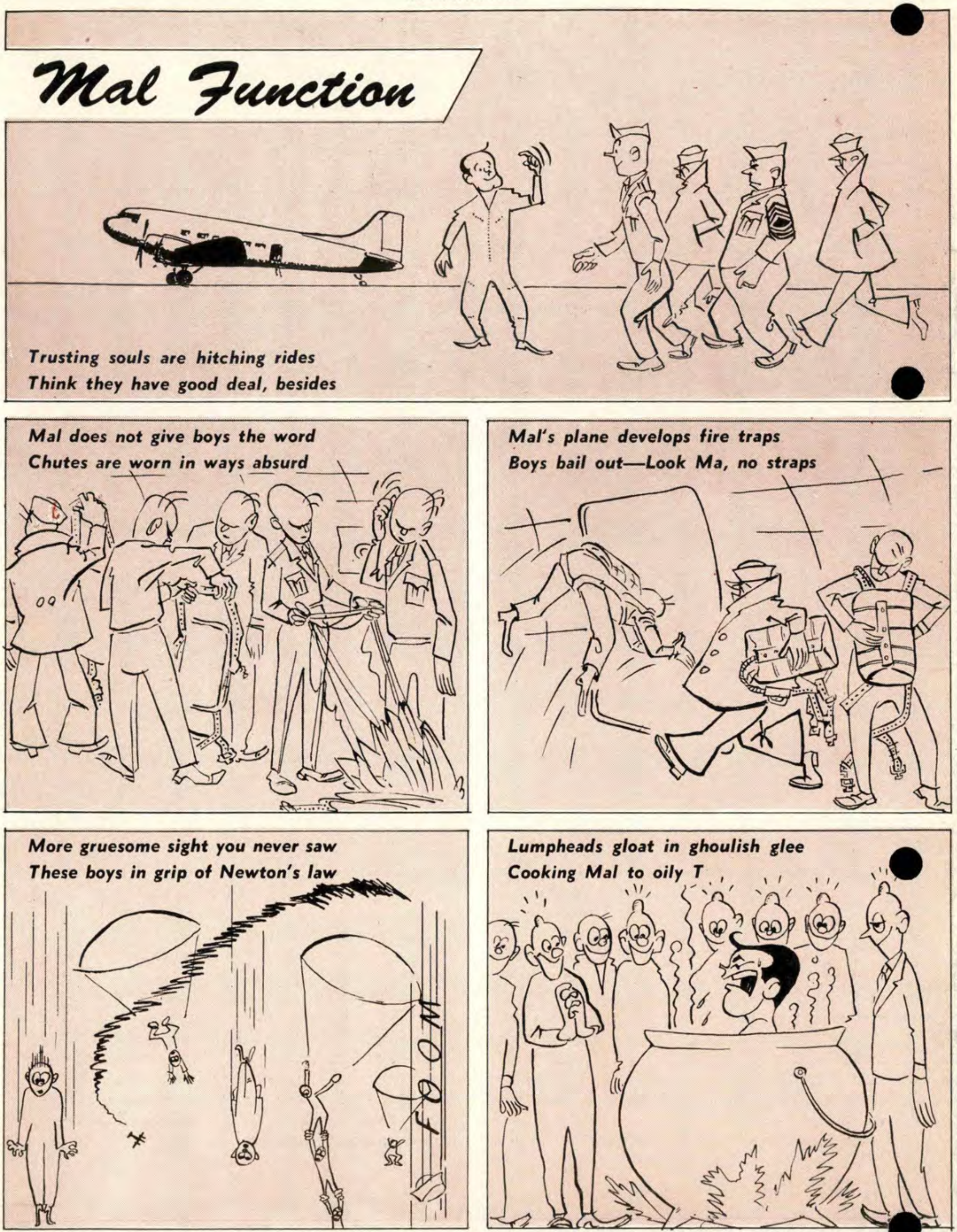
THE AIRPLANE PICTURED above had been flown in on a GCA approach. The landing had seemed normal although the touchdown had been long and fast.

Toward the end of the landing roll, the pilot attempted to use the emergency brake system when he found that the right wheel grabbed while there was no apparent braking action from the left wheel.

When a second attempt to use the emergency brake failed the pilot hit both brake pedals simultaneously. The C-54 veered sharply when the right brake grabbed again. Then the nosewheel collapsed.

An inspection of the brake on the left main gear revealed that the clearances were excessive, resulting in a very weak braking action. After the brakes were bled and the clearances set to the normal limits the brakes checked normally.

The emergency system was found to be inoperative because the linkage on the pilot's control was loose and the copilot's control handle was so far corroded that it was impossible to move it manually. This corrosion was responsible for the failure of the air brake to function properly. Why was there an excessive clearance in the brake tolerances prescribed for this C-54? Why was the condition of the emergency brake linkage and control handle overlooked on recent inspections?



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