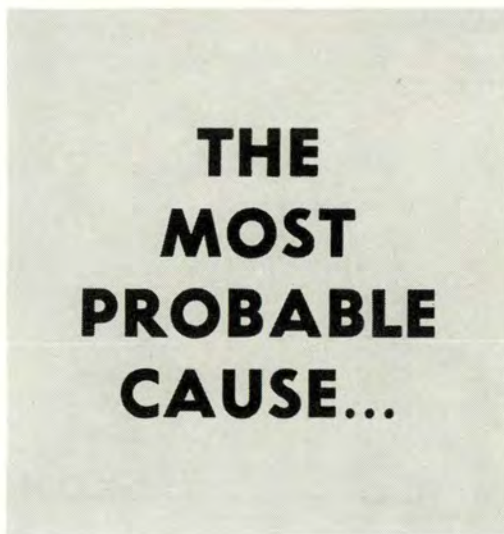


N O V E M B E R

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FLYING SAFETY

U N I T E D S T A T E S A I R F O R C E



**THE
MOST
PROBABLE
CAUSE...**



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The Editor's View

Flipping back through the pages of history, one cannot escape the fact that time after time, battles were won and lost by reason of knowledge. The memoirs of some of our most illustrious leaders during World War II point out that due to our lack of knowledge (military intelligence), much of our early effort in the war was unsuccessful.

Even worse than not having the information we needed, we often did not use what we had. The picture was painted, but nobody looked. Or if they did see it, it was with vision blurred by lack of experience in interpretation. Why bother with the past? To learn the truth—so that we can appreciate today and—by understanding what we have learned—live in tomorrow.

Probably one of the most valuable lessons that can be learned is to make the most of every piece of equipment and every bit of information that will aid us in maintaining and improving our combat potential. Most of us will readily admit that, as of now, we do not.

World War II took a little longer than it might have because intelligence that was available, was not used. Aircraft accidents happen almost every day for the same reason. For example, there is an ominous parade of aircraft accident reports which proclaim the fact that pilots fail to use more than one navigational aid when others are simultaneously available. And the failure to know and the failure to act, especially when combined, create a staggering obstacle when the chips really go down. Such is too often the problem in those instances which are cryptically referred to as a "case of an overwhelmed pilot." There is no denying that pilots can reach that state, especially with equipment such as is coming off the assembly lines of today. This was recognized some years ago by the designers of one of our larger machines, and the thought disturbed them. They said that the pilot of their aircraft should have at least the training required for degrees in aerodynamics, electrical engineering and propulsion, combined. While the security of our nation demands that we equip ourselves with this sort of vehicle, definite compromises must sometimes be made as to ideally qualified operators. On the other hand, if we continue to live and operate this highly complex equipment successfully, we are forced to obtain the knowledge which we lacked at the beginning.

The point being that knowledge of equipment, facilities and objectives, while not a substitute in itself, can go far in the way of giving basis for experience and background for judgment. A combination of the three will all but eliminate the ogre of "the overwhelming situation" and "the most probable cause." The only factor remaining is that of physical limitation and this is the area for the designer. He must design within this boundary. We have to learn to live and operate within the very edge to which he is forced to design.

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May I Ride . . .

The Strategic Intelligence School trains Attaches for duty with American Embassies abroad, for the Army and Air Force. It is an Army school with Air Force participation.

We would like to reprint your article entitled "May I Ride With You?" carried in the July, 1954, and August, 1957, issues of FLYING SAFETY.

Col. Kenneth W. Holbert, USAF
Chief, Attache and Staff Tng Dept
Strategic Intelligence School
Washington, D. C.

Be our guests. This story is one of lasting interest and wide popularity. There is even a Chinese version now.

★ ★ ★

Major Rex Riley

Our attention has been called to an article published some time ago in the Popular Science Monthly on your Cartoon Strip "Major Rex Riley" and the help it has brought to the Air Force.

Our company is engaged in the preparation of training aids, pilot's handbooks and other training materials for some of the major aircraft manufacturers. We would greatly appreciate receiving some back issues of this "strip," since we feel it would help to stimulate ideas as well as serve as an accurate reference file.

Corydon M. Johnson Co. Inc.
Bethpage, L. I. New York
By: Richard W. Snow

Much obliged for wanting to help! We can't overdo it.

★ ★ ★

Pile of Sawdust

I read your magazines every time I see one and think that they are the best magazines on safety printed in the Air Force. I have an idea that will save many lives. This is it. Place a large pile of sawdust in the middle of every Air Field and when the pilots get into trouble they can climb out on the wing and jump off into the sawdust, thus saving life and limb if not the machine itself. Sawdust is cheap and may be had for the asking at any hobby shop or from many pilots' heads. If this idea is worth anything to you you may send the check to this address.

John N. Dreary
2130 "O" St. N.W.
Washington, D. C.

Maybe you've got something there! Any takers? Glad to find a market for this stuff between the ears.

Crash Landings

Several months ago you published an article concerning suggested methods of making crash landings. Operations personnel of the Brazilian Air Force have expressed a desire to read and translate this article, but a copy cannot be located in our files. If you have one available, could you please forward it to this headquarters so it can be passed to the personnel of the Brazilian AF?

U. S. Air Force Section
Joint Brazil-U. S. Military
Commission
Det 20, 5500th Foreign Mission Sq.

Thanks for your interest. Check September issue, page 26, for more of same.

★ ★ ★

A Fresh Look at an Old Problem

I've read with interest your brief report on the T-Bird accident, attributed to ice in the low pressure fuel filter.

The appalling thing about the whole affair is the ignorance of the pilots of this hazard. This situation should be emphasized in all T-Bird indoctrination programs. Many T-33s based in the South never carry alcohol. Many bases throughout the U. S. do not have a supply of alcohol. A pilot cannot comply with procedures outlined in the Dash-One unless he is furnished the essential materials.

Capt. John D. Riley
Hq Iceland Defense Force

How about it, supervisors?

★ ★ ★

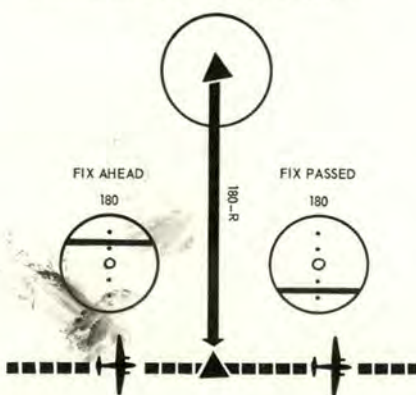
VOR Intersection

Ever notice any confusion in the cockpit when working a VOR intersection? Try this: Always set the radial that defines the intersection into the course selector window. Now, if the needle is deflected to the same side as the off-course station that forms the fix, your intersection is still ahead. If, after tuning the station, you find the course indicator needle off center to the opposite side you have passed the intersection.

Standardization on this procedure makes it easy to visualize your position in relation to the fix, particularly if the ID 250 (RMI) is on the blink.

1st Lt Jack Searle
3550th CCTS, Moody AFB.

Thanks, Lieutenant. Most helpful!



File Thirteen

A pilot of an F-102 aircraft climbed through 36,000 feet with afterburner, made a slow turn and a supersonic dive to earth. Most probable cause—Hypoxia. . . . No evidence that accidents from this cause are decreasing. One command alone logged 43 reports of hypoxia during the first six months of 1957. Walk-around checks should include inspection of liquid oxygen filler valve to assure that it is in the *buildup* position. . . . Pilot dies of heart attack while flying a T-33. Most probable cause: Nitrogen bubbles entering bloodstream from fatty tissues around heart when subjected to high altitudes. See FLYING SAFETY, April 1956. Weight can be deadly. . . . A new procedure for the control of air traffic above 24,000 feet MSL has been published in the Radio Fac Chart. This means a big change is coming up. Earlier message stated "on or about 1 November" but kickoff date has been set back to 1 December. . . . Topside is concerned about increasing mid-air collision hazard due to jet aircraft descending on airways in excess of recommended IFR penetration speeds or excess rate for the particular aircraft. Slow it down and clear below before you go. . . . Despite the fact that we've had ten less mid-air collisions this year than at the same date last year, the picture is still on the grim side. . . . Accent is more than ever on the ability of pilots to meet full qualifications for their specialty all the time. . . . Recent emphasis by word from The Pentagon to Flying Evaluation Boards, through commanders, is: "Get Tough." . . . One night flight every four months won't hack it. . . . Budget battle has delayed publication and distribution—or had you guessed? . . . Hear about the C-121 pilot who was unable to effect prop reversal due to "foreign objects" on the throttle quadrant? Major damage when he ran off the runway. Murphy Junior's law says, "If it can get in the way, it will." Keep it clean. . . .

til December,

Vernon R. Smith

Col. H. G. Moseley, Chief, Aero Medical Safety Division, Directorate of Flight Safety Research.

RECENTLY AN ELEMENT of two fighter aircraft was making an instrument approach to a strange airfield. It was night and very dark. The element leader let down to 3500 feet and was in a 30-degree bank onto final approach when he suddenly became quite confused as to his direction. He immediately brought his aircraft back to level flight, regained his sense of direction and again kicked into the 30-degree bank to complete the turn onto final. At this point he was surprised to find his cockpit illuminated by a bright flash of light behind and below him.

That flash was caused by the wingman's aircraft when it struck the ground and exploded. Result—scratch one wingman.

No one ever knew exactly what happened, and lacking final proof, it might eventually have been relegated to the limbo of "Cause Undetermined Accidents." The evidence in this case, however, pointed straight to one of the most vicious killers that is free in the skies today.

This enemy—this annihilator of pilots and crews—is all the more dangerous because of the pseudonyms and aliases by which it is identified. Generally, it is termed as *Vertigo*. It is also called "Spatial Disorientation" and sometimes identified as "The Leans." Some survivors have simply stated that they were attacked by "Monumental Confusion." But no matter what you term it—and for simplicity we will call it *Vertigo*—it is a good thing to become acquainted with. And if you are a pilot, you'd better know all about it; know what it is like, what brings it on and how to avoid it. This is fundamental if you want to survive.

To understand *Vertigo*, one must understand a little about three of man's special senses: sense of vision, of pressure and equilibrium. The latter two demand most of our attention because it is upon them that *vertigo* preys. These senses of pressure and equilibrium are quite remarkable. Without them we would be completely helpless as soon as darkness sets in. If we did not have these phenomena which give us information about our position and direction, we could only move about in daylight. As it is, however, we can walk in complete darkness or even bend or turn and progress to distant points in an upright and balanced position.

The sense of pressure lies within our muscles, skin and to some extent within our joints, and tells us the direction of the force of gravity. In other words when we stand, the pressure we feel on the soles of our feet and within our legs tells us that our feet are on firm ground and that we are standing upright. And no matter what position we are in, these pressure senses tell us the direction of up and down. In some diseases where these senses of pressure are destroyed, the individual has to be led by

hand when it is dark, otherwise he would stumble, fall and be unable to right himself again.

Our sense of equilibrium is even more remarkable. It is governed by what is called our vestibular apparatus. These are small special organs which are constructed a good deal like a set of gyros and are set within our skulls, one within the bones by either ear. (Fig. 1.) These human gyros are filled with fluid. When we turn, the fluid lags a bit like water in a wine glass when you twirl the stem. We are able to feel this lag and it tells us we are turning. Similarly when we stop turning, the fluid which by now has started to move continues to flow for a moment. This is quite important because as you turn rapidly the flow in the vestibular gyros gets to moving rapidly too; and when you stop suddenly this continued flow of fluid makes you feel strange. It may make you dizzy, and it may make it very difficult to walk straight. Every child who has wound himself up in a swing, unwound rapidly and then tried to walk, can tell you about these sensations. Such dizziness caused by the too rapid movement of fluid in our vestibular gyros is a tremendous factor in the cause of *vertigo*.

This would be of interest but of no great importance if we remained on the ground. Very few pedestrians or sleep walkers get into trouble because of their senses of equilibrium. In flying, however, the senses of pressure and equilibrium are subjected to strange and unusual compromises. They can become so misled and so confused that they give the pilot completely erroneous information concerning his direction or orientation. Hence, the term *disorientation*.

Consider first of all the simple sense of pressure which we feel with our skin, muscles and joints, and which tells us which end is up. These senses simply measure gravity and as gravity pushes down, where we feel the most pressure must be straight down. However, almost the only type of gravity which man has known from time immemorial has been the gravitational pull of the earth, and therefore man has been conditioned to believe that the greatest gravitational pull must be straight down toward the center of the earth.

But in flying, one continually changes the direction of gravity. If we turn the aircraft and hold it in a turn the greatest degree of gravity is directed toward the periphery of the circular plane we are establishing, and here is where our senses of pressure get confused. To these senses, the greatest pressure we feel should be straight down, not sideways, and our brain receives a continuing series of messages telling us we are sitting straight up and down, exactly like we would be in a chair within our home. If we close our eyes while in such a turn, or if it is dark or cloudy, we can not help but believe these messages, and when we open them again and



The inner ear is located in the head approximately as shown and is about the size of the black dot.

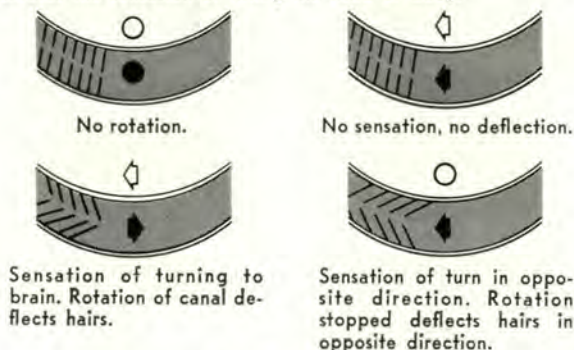
Each canal and the common sac is completely filled with fluid. Into the ends of each canal, project small sensory hairs which are deflected by any movement of the fluid in the canal, and which are responsible for the sensation of turning in any of the three planes or vectors thereof.

As the head is rotated, the canal in that plane of rotation will move with respect to the fluid in it. Since this fluid has inertia, the resulting deflection of the sensory hairs will cause a sensation of turning.

Enlarged, the actual structure is similar to drawing. The semi-circular canals are circular tubes lying at right angles to each other in the planes shown.

The static organ is located in the bottom part of the common sac, and consists of delicate sensory hairs projecting upward, on which rest small crystals.

The load borne by these sensory hairs changes in the head with every change of the head with respect to gravity, and this creates the sensation of tilting the head or body.



Sensation of movement to brain.

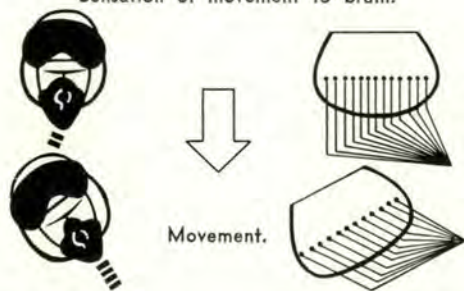


FIGURE ONE

see that we are really in a 90-degree bank, it is difficult to believe our eyes.

In fact, there was one accident not long ago where two pilots flying jet fighters at 30,000 feet at night became separated in a cloud. When they emerged, one pilot noticed the other aircraft upside down above him. It was only subsequent to the accident when he compared notes with this other pilot that he finally realized that it was he himself who had been upside down. This all happened because he inadvertently rolled through the cloud and heeded only the gravitational pressure that continued to press on the seat of his pants. He admitted that his instruments were acting strangely.

However, it is the vestibular gyros which can confuse us most of all. When we turn or roll or whirl or otherwise

agitate the fluid in these gyros, the messages our brain receives become most garbled. And hence the rest of the story of the upside down pilot we just mentioned. When he fell out of his unnatural position, he was thrown into a spin, and although he brought the aircraft out of the spin on several occasions, he immediately went into another spin. Finally noticing the altimeter unwinding at an alarming rate, he decided, with considerable justification, to leave his topsy-turvy aircraft which appeared to be bent on his destruction.

But, it was not the aircraft which was trying to destroy him. In fact, the aircraft was functioning properly and only responding to the unreasonable kicks and thrusts he was delivering to the stick and rudder. What was bent upon his destruction was our old acquaintance Vertigo. In this case the pilot first became confused through his sense of pressure, but then when the fluid in his vestibular gyros began to whirl he was thrown into a series of overpowering and false sensations. When he would come out of a spin his organs of equilibrium would tell him that he was still spinning but in the other direction, and in trying to correct for this, he would spin again, and so on ad infinitum. He was truly a victim of "monumental confusion."

However, one does not have to spin an airplane to get vertigo. Even turns, dives and climbs, if they are sharp enough or prolonged enough, can stimulate our sense of equilibrium to a degree where we may become confused. And here lies another consideration of utmost importance. Our vestibular gyros are not simple little organs. On the contrary, they are remarkably well constructed and are able to pick up several different sensations. For example, they sense turns to the right or left, feel movements of up or down or back and forth, and even respond to the sensation of dropping. In other words, they tell us whether we are turning, twirling, somersaulting, slithering or falling. It is quite possible to stimulate several of these varying planes of our vestibular apparatus at the same time. And this can lead to rather tragic results.

About a year and a half ago, FLYING SAFETY published an article concerning pilots who dove their fighter or interceptor aircraft into the ground immediately after attempting to change UHF radio channels. In this maneuver, they had to turn their heads to the right and look down toward the rear of the right console. If their aircraft was also in a bank when they turned their heads so sharply, they started the fluid moving in several planes of their vestibular apparatus. Then when they looked forward again their senses were so severely compromised that they were actually incapacitated for a few seconds. If you do not believe this is possible, just sit on a piano stool, turn your head sharply to one side or simply tilt it back about 60 degrees, then have a friend twirl the stool around about five times in ten seconds while your head is still sideways or backwards. After the fifth turn, stop suddenly and bring your head sharply forward. Many people who have tried this have actually and involuntarily thrown themselves sideward off of the stool. If you were trying to fly an aircraft at this time, you would find yourself completely incapacitated.

Having the head turned or tilted forward or back while the aircraft is in a sharp bank is probably one of the worst situations a flyer can put himself into. This indicates that it is quite important to keep your head straight

and level while you are in a sharp turn, otherwise you will start so many of your vestibular gyros twirling that confusion is almost inevitable.

However, all pilots who fly will encounter various sensations which arise from the unusual stresses and strains which flying puts upon their senses of pressure and equilibrium. Major General Harry G. Armstrong, in his book "Principles and Practices of Aviation Medicine" describes the following false sensations of flight. They are of tremendous importance.

- *Unperceived Motion.* The organs of equilibrium are fairly insensitive to gradual changes of direction, so that in blind flight there may be motions of the airplane which are not sensed. The average person can be tilted about 10.6 degrees downward or 24 degrees upward without being aware of any change. Also, the body must be rotated with an acceleration of more than about two degrees per second before such motion is sensed. As a consequence in blind flight the airplane might dive or climb at a fairly steep angle and bank or turn at a fairly high rate without there being any sensation of any change from straight and level flight.

- *Sensation of Climbing While Turning.* In a fairly sharp horizontal turn the banking of the airplane is not usually sensed, but there is an awareness of the body being pressed more firmly into the seat as a result of the centrifugal force. As a consequence, the sensation is that of a zoom upward, and is interpreted as such, and the natural reaction is to push forward on the stick.

- *Sensation of Diving During Recovery from a Turn.* During recovery from a turn, the pressure of the body on the seat is decreased which results in a sensation similar to that when the airplane is nosed over from level flight into a dive. As a consequence, in blind flight return to level flight creates the false sensation of diving, causing a tendency to pull back on the control column and resulting in a steep climb and possible stall.

- *Estimating the Degree of Bank.* Because the amount and rate of bank of an airplane, in going into a turn, is below the threshold of the organs of equilibrium, the degree of bank attained during blind flying is usually underestimated. This causes the pilot to bank too steeply in going into a turn, and to overcorrect in a return to level flight which results in a bank in the opposite direction.

- *Unperceived Banks.* Under ordinary circumstances, if one tilts the body sideways, this can be easily sensed since the pull of gravity on the body makes us aware of this tilt. In an aircraft turn such a sensation of tilting does not exist because the body is acted upon not only by gravity but by centrifugal force and the resultant of these two forces acts in a line perpendicular, not to the earth, but to the transverse axis of the airplane which creates a sensation of sitting erect.

- *Sensation of Opposite Tilt in a Skid.* If an airplane skids during a turn, the centrifugal force on the body no longer acts perpendicular to the transverse axis of the airplane, and there is a sensation that the airplane is banked in the opposite direction from its true position.

- *Optical Illusions from Clouds.* When flying between cloud layers which are not exactly horizontal, the clouds are used as a horizon and the airplane is flown at a corresponding tilt away from its true level attitude.

- *Sensation of Diving Beyond the Vertical.* If in a very sharp turn or in a spin, the head is suddenly turned down-

ward, as might occur from looking at an object on the floor of the cockpit, the vestibular apparatus of the inner ear is acted upon by two distinct rotary motions at the same time, with the result that there is a sensation of falling forward. Thus, the airplane feels as though it had suddenly nosed downward beyond the vertical, and the natural response of the pilot is to pull back on the control column which, in a spin, only aggravates the situation.

This type of motion, i.e., when an active movement of the head is made in a plane at right angles to a plane of passive rotation, is known as Coriolis acceleration. This may take place, for example, during a spin if the pilot should meanwhile move his head up or down. If the head is moved (turned) downward during a left hand spin, the resultant sensation is of rotation to the left and downward and the falling reaction is to the right and downward. When present, the Coriolis reaction usually produces marked vertigo and is especially dangerous in aviation for that reason.

- *Sensation of Reversal of Rotation.* If, in blind flight, any rotary motion persists for a short time and is then either retarded or stopped, the fluid in the affected semi-circular canal continues to rotate and creates a sensation of rotation in the opposite direction. Thus, after a recovery from a spin to the left, there is then a sensation of turning to the right, which the pilot attempts to correct and thereby causes the airplane to spin again to the left.

In view of such compromises, one might well ask, "What can a poor pilot do?" Fortunately, Vertigo—though a ruthless deceiver—can be shaken off when it first attacks, providing you muster enough resolve to ignore its false messages. And this means believing your instruments more than you believe your senses.

To quote again from General Armstrong, "Most of the time spent in learning instrument flying is nothing more or less than learning to ignore the false sensations from the organs of equilibrium. No one ever learns instrument flying who has not been thoroughly convinced that the sensations are always wrong whenever they disagree with the instruments."

However, when Vertigo strikes hard it may be almost impossible to ignore the confusing messages that our brain is receiving. Thus, it is best to avoid Vertigo insofar as possible. Here are a few simple points that will give you reasonable immunity:

- Always remember that your instruments are more reliable than your sensations.

- Know the false sensations of flight and be ready to identify them.

- Instrument flight is one condition where it pays to have your head "up and locked." The more you look around the more likely you are to tumble your vestibular gyros.

- Remember that your wingman has only you to guide him. If you lose him in the soup, Vertigo will try to take your place.

- Lastly, and most important of all, keep ahead of your instruments. If you can eliminate surprise, you can pretty well eliminate attack. However, once you lose your horizons, be they real or artificial, you are in for a running battle with a most treacherous adversary. And this is one battle you cannot afford to lose. ▲

Getting to Know You

Bob Hoover, Test Pilot, North American Aviation, Inc.

EVERY FIGHTER PILOT enjoys lazily rolling an airplane or buzzing close to a cumulus buildup. At least, if he doesn't, he should. This desire should be an inherent part of his eagerness to fly. We all know, however, that aerobatics serve more purposes than the mere satisfaction of a whim.

One of the quickest ways for a fighter pilot to become familiar with, and feel at home in, his airplane is to practice aerobatics for a few hours. There is no greater confidence builder. A good tactical pilot will always be a better one if he is not dismayed by some unusual attitude.

A pilot learns the basic fundamentals of aerobatics in flying school. From that time until he hangs up his oxygen mask or retires from fighter flying, his schooling continues as each new fighter comes along.

An old timer once said that if a fighter pilot can survive the first visit to his home town and overcome the natural urge to beat up the neighborhood, he might live to a ripe old age. Even so, it never ceases to amaze us when we hear of a good fighter pilot getting clobbered because he rolled too close to the ground or didn't have quite enough altitude for recovery from some low-altitude maneuver.

With the exception of the LABS maneuver (and well-planned flight demonstrations with a purpose, such as demonstrating the over-all airplane capabilities), nothing is gained by doing aerobatics near the ground. Very few pilots have gotten away with low-altitude aerobatics without a world of practice beforehand—at altitude. Some excellent pilots have bought the farm trying to duplicate a maneuver which they saw another pilot perform at low altitude. They overlooked one important factor. The pilot who performed the maneuver successfully must have put a lot of thought and a great deal of practice into his aerobatics.

Split "S" maneuvers and steep dive angles have killed many first-class pilots who did not project their thinking ahead of the airplane. I've heard pilots boast of split "S"-ing a given

type of airplane from a particularly low altitude. An inexperienced pilot hearing this comment may attempt the same maneuver without consideration for an entry airspeed or the G required on recovery which is an all-important factor. With a lot of practice and entry at a very low airspeed, as well as a complete knowledge of the airplane handling qualities, a pilot may be able to perform a split "S" at very low altitudes in most airplanes. But what is the advantage?

A few years back when the F-86s were new in the Air Force, a pilot about to check out in the airplane asked what altitude he should try loops for the first time. An old head spoke up to recommend 25,000 feet. Here was an experienced pilot who must never have attempted a loop at this altitude. Otherwise he would not have made this recommendation.

Why was he wrong? The greater the altitude, the less G we can pull. This is because G is a function of the density of the air, which decreases with altitude.

As a result of this phenomenon, many pilots have inadvertently whiplashed or hammer-headed into a spin while attempting a loop. After recovery, they wondered how this could happen with so much airspeed upon entry. The point to remember is this: You can get into trouble by attempting aerobatics too high just the same as you can when you are too low.

In each new and faster airplane, there is a question of the usefulness of aerobatics in individual combat or dog-fighting. At the outbreak of World War II, many pilots with limited experience thought that dog-fighting had died with the close of World War I. Yet, a lot of airplanes were shot down in World War II during a good old all-out dogfight.

Once more, when the F-86s were scheduled for Korea, people said that the closing rate would be so great with this airplane that individual fighting would be very unlikely. Yet, this air war produced an impressive 14 to 1 kill ratio in favor of the F-86 team over the MIG in fighter-to-fighter combat. However, with a large



increment of speed increase over a previous model airplane, we do find ourselves with less time on the target and with a shorter period of contact with the opponent.

When the F-100 was first flown, many pilots felt that aerobatic maneuvers would be difficult to execute because of its supersonic speed and tremendous rate of climb. By now, most people with an interest in the flying world are aware of the excellent aerobatic show being performed daily in the F-100 by the famous Thunderbird Team. This show is one of the most impressive flight demonstrations I've ever seen.

But we all must remember that proficiency in aerobatics requires an awareness of our own limitations as well as those of the airplane. Above all, it requires the use of common sense. Don't try forbidden or restricted maneuvers. And don't attempt aerobatics in your airplane without knowing the limit load factors.

Each and every airplane, whether fighter, bomber or trainer, has been designed to a specific set of limit load factors. The limit could be 3G, as for some bomber designs, or 7.33G, which has been considered the limit on most fighters. These limit load factors are for straight or symmetrical pullups. If G is applied in a rolling turn, the load factor limits in order to realize its potential for the design mission.

Sure, aerobatics are good. But, when you perform aerobatics in your airplane, remember this: You must

- Know your airplane.
- Know its limitations.
- Know your own limits. ▲

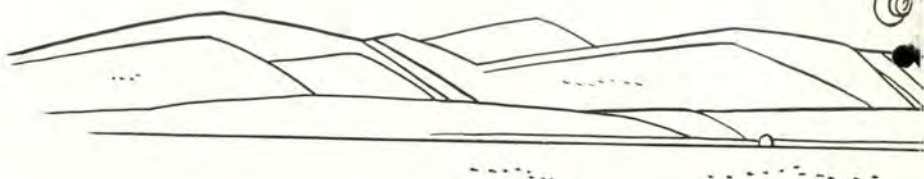
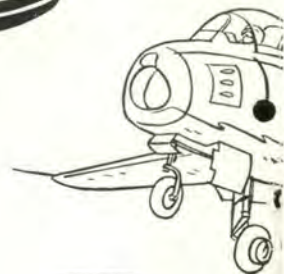
This was only a short trip. Yet this '86 driver admits that he made six mistakes. FLYING SAFETY MAGAZINE is grateful to him for this contribution. It may help other pilots.



TIPS FOR TIGERS

(or)

CARELESSNESS CAN BE COSTLY



ANOTHER SENIOR PILOT and I had attended a meeting at Hamilton Air Force Base, up near Frisco. He was from Phoenix and my home base is Tucson. We were both driving F-36s, and on our return trip we landed at George for fuel. Since he was going to Phoenix, and I to Tucson, we filed separately but briefed to get some night formation, with me on his wing until we reached Blythe. Then I would dog leg to Tucson, and he would go on to Phoenix.

Our birds were clean, and we estimated takeoff at 1805, just at dusk. The engines were started and we taxied out, but were delayed for about ten minutes for some landing F-102s.

Takeoff and climb were routine except that I didn't remember the exact time of takeoff, after our delay. (Mistake Number One.)

I had some trouble maintaining close formation but kept the lead ship in sight even though the lights on the ground and the bright stars did force strict attention.

I didn't tune in my bird dog be-



cause I had confidence in the lead pilot and I intended to head for Tucson when he made a position report over Blythe. I never heard this position report so I concentrated on flying formation. I called him once for a reduction in power and immediately caught up. However, he never received this call because his radio had gone out. It was just a coincidence



that he reduced power. He also could not make the position report which was my cue to head for Tucson. I followed faithfully. (Mistake Number Two.)

The lead was proud of me, thinking that I knew his radio was inoperative and would go via Phoenix and call for him to inform the tower of his muteness.

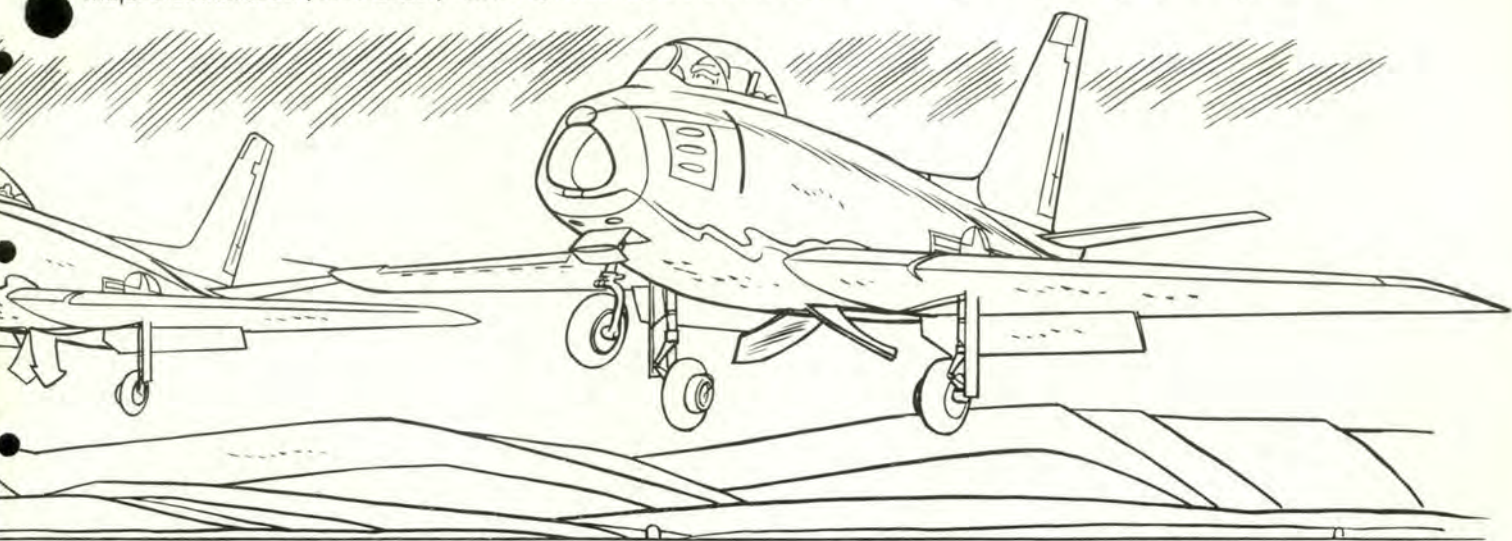
I paid very little attention to the ground and as I saw city lights approach, thinking it was Blythe, I began my dogleg toward Tucson. (Mistake Number Three.) Instead of Blythe, we were approaching Phoenix. Had I looked, I certainly would have known by size alone. I turned on my bird dog to Tucson and had some trouble seeing the dial. My

flashlight, which I had checked the day before, was dead. (Mistake Number Four.) I identified the station. It was about 20 degrees to my right and unstable which was correct for about 135 nautical miles off. I checked the time. For the next ten minutes I admired the darkness and clearness of the Arizona nonrestricted sky at 38,000 feet msl. (Mistake Number Five.) Since I should have seen the gay lights by now but didn't, I returned my bird dog. It came in clear, and the needle steadied about 120 degrees to my right. I didn't believe it. (Mistake Number Six.) I switched channels and called the nearby radar site to say that I was in the Gila Bend area and wanted a steer to Tucson.

I maintained my heading, squawked and re-squawked on several different modes, and when positive identification was established, they told me that I was 110 nautical miles northeast of Tucson. My fuel showed 85 gallons. I was given information on distance to Winslow. I asked for winds at 38,000, and since they were in my favor toward Tucson with its long runways, I chose Tucson. I wasn't familiar with Winslow anyway. I could hardly believe the headings which they gave me. But I followed their instructions . . . the first correct thing I did!

They kept check on my ground-speed, altitude and fuel. They were worried as to whether or not I'd make it. But they weren't nearly as

Major Norman L. Box, Air Advisor, 152d FIS, Arizona Air National Guard



worried as I was by now. I went through my ejection procedure, which came easy. Dark and alone—80 nautical miles to go, with 60 gallons of JP-4 to go on. It looked real bad. I tried to wean the J-47. I thought of stop cocking, riding the wind and then restart for landing, but the darkness changed my mind.

As I could see the distant lights of home, my fuel gage was nearing the peg. I was at idle and descending. I declared an emergency with the tower which gave me a choice of either direction on the long runway. I knew that I had the field made, but in what direction, I wasn't sure.

The empty peg was supporting the fuel gage needle. I was high and had to open speed boards—not recommended below 50 gallons. When they

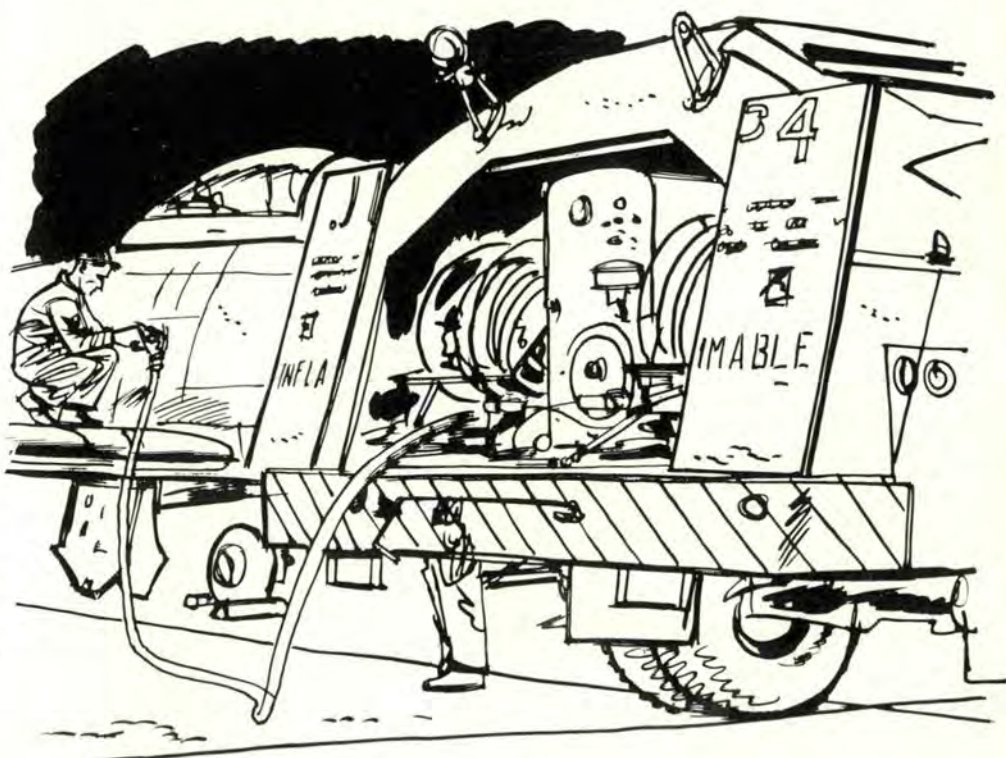
opened, the fuel needle flicked. I thought I had flamed out, however I still had power. A 90-degree turn was made on final and good old terra firma was felt and the landing was completed.

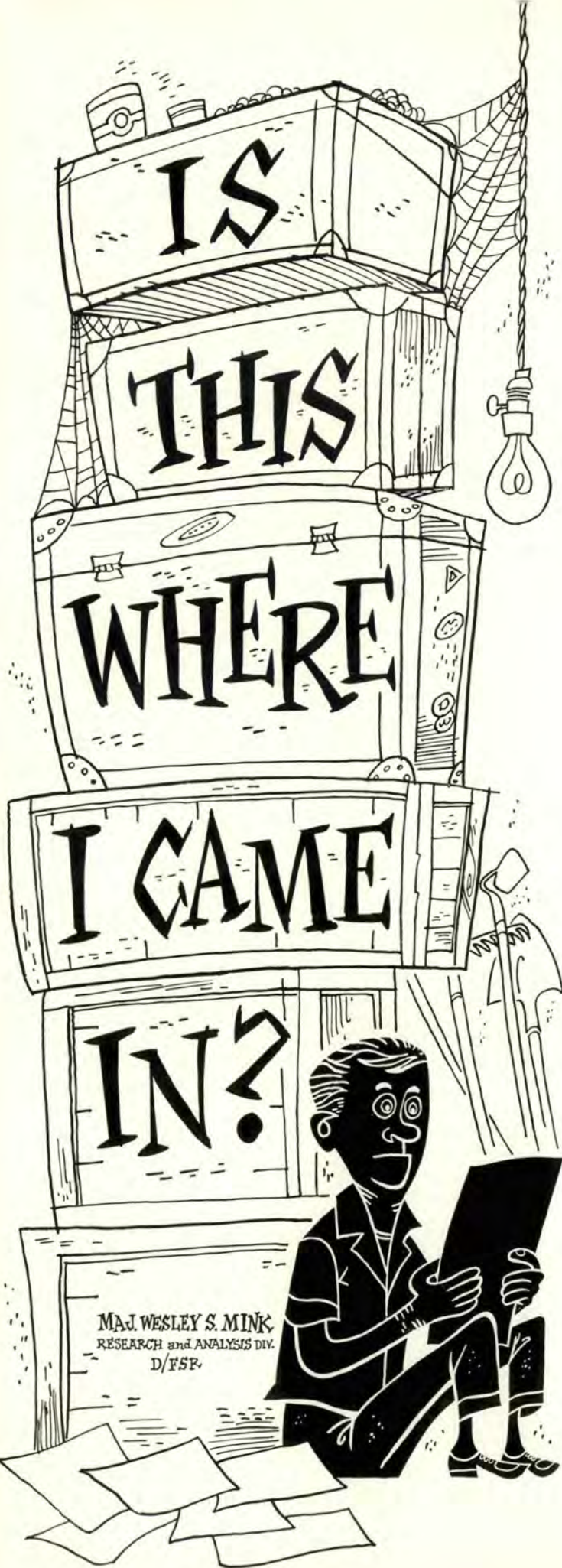
I taxied in and parked. Was sort of nervous, too. In Ops I was informed that Flight Service had inquired about my being overdue about 25 minutes.

Flight Plan was closed and a "thanks" rendered to the radar site

for the "save." And I went home.

In reminiscing, it was easy to see the numerous, so-called "little mistakes" I made that developed like the proverbial snowball into a serious situation. At no time was I lost—I knew I was over Arizona somewhere. When the aircraft was serviced, it took 431 gallons, and holds 435. This is much too close for comfort on a dark night. I do not recommend this type of procedure. Believe me, it's not easy on your constitution. ▲





SWEETIE AND I got to barbering the other night about who said what to who before we were married and then she got down to cases. Certain promises were made to her, she said. And these promises were made before she agreed, she said, to walk up the aisle. These promises, it suddenly seemed to her, had been forgotten since those glorious years when we were young. Or why was she locked up here in this steaming kitchen all day long? And so on. And so forth. It looked for a while as if I might lose the argument.

Then I remembered some evidence I had tucked away. So I left. While Sweetie went back to the dishes in the kitchen sink, I crept out to the garage. There, piled on top of one another, are various boxes, old trunks and bags with which we pack our stuff and move from station to station in our pursuit of Sweetie's happiness and my career. Underneath everything else is my first battered footlocker, the one in which I used to keep everything in the world that belonged to me—until I got married to Sweetie, that is. And I guess it would still hold everything of mine, except the little woman. And even that might not be such a bad idea sometimes. But that isn't here and it isn't there. The fact is, I was pretty sore. So while Sweetie went on mumbling over the kitchen sink, I tore the bags and boxes down and dragged my footlocker out beneath the one bare bulb in my garage. There I could still read where it said, "2d Lt."—(Oh, those were the good old days!) The lock was rusty now and the hinges squeaked, and a few qualms rose from my half-forgotten youth as I lifted the lid and sniffed the traces of smuggled Chanel and broken fifths, foot powder, chocolate bars and cigarettes. There was a whiff of G.I. mothballs too and the scent of a packet of Sweetie's prewar letters—those famous letters written before we began to fight. It was these that I wanted. If I remembered rightly there were certain notes—Well, Sweetie, herself, had made some promises. If I could find the letters I had in mind, I'd go back in the house again and Sweetie could literally swallow her own words. For all I cared she could choke on one or two of them.

But about that time I came on a couple of opera tickets from Dijon and some Vichy francs, together with certain photographs I should have burned, and a tear-stained letter signed "*Yours, Christienne.*" I hastily tucked these indiscreet reminders of the gaiety days into the garbage can. Then I went back to root out the vital evidence. That's when I found four carefully folded sheets of yellowing paper neatly titled, "Flying Safety." I was immediately intrigued.

I forgot for a moment about the letters. I sat down on the concrete floor and began to read.

Flying safety is my business now and, in a way, it always was. Right now I happened to be assigned to the Analysis Branch in the Directorate of Flight Safety Research. But long ago, when these yellowing papers were first written out at my request, I was commanding officer of a fighter training unit in Abilene. That was in 1943. My job was to see that pilots, who were even younger than I, were taught the finer points of the fighter's art. And even in those departed days, flying safety was built right into the regular course.

It was a must in those days when we were turning out pilots almost as fast as they could be taught that casual salute, with which we greeted those senior officers we happened to know and like. We wanted to make our stu-

dents really aware of the problem itself so I used to demand a paper from each of them on flying safety. This paper I'd found in my footlocker was one of the best. That's why I'd kept it. It was good in 1943. Maybe it is still good today. Maybe, in fact, it's a little too apt to pinch our shoes these days, although a dozen years and more are gone since it was written by an astute and obviously browned-off fighter pilot who had yet to fight, and who wanted to be prepared for the very worst.

So although the honeymoon may be over for Sweetie and me, and although planes may be flying faster and going higher now than they were then, flying safety is here to stay. And some of the things this boy unerringly fingered whilst he was teed off, still in his fledgling days, are still too true for comfort.

"In the past year," he began by noticing, "safety rules and flying regulations have grown tighter and tighter . . . but the many restrictions on flying have not wiped out the tremendous expense, loss and tragedy of numerous accidents."

Well, I had to buy that. And I couldn't quite put the paper down. "Each month's accidents," I read on, "contribute to new flying restrictions and each restriction is now being seen by some to reduce the efficiency of our training program. These gaps left in our training will eventually lead the way to new mishaps. We have the old vicious circle. This gives each accident new meaning. . . ."

It certainly does, I thought, still sitting on the cold, cold floor. And maybe this boy was laying down an argument we don't care to follow now.

Who wants to think that in leaning backwards to keep our student pilots out of trouble, we've simply kept them in? But maybe we have. And maybe it's wrong to try to sanitize the hazardous business flying can be, to make flight deceptively oversafe for student pilots whose basic approach to flight is being formed. Maybe this student of mine was right when he went on to say that since he knew he'd run into trouble when he flew for keeps, he'd just as soon have a chance to do the same sort of hazardous flying now, in training, while he had time to learn.

"The whine of a siren," he went on to say, "brought us out of the barracks one afternoon. We gathered in groups outside the doors and searched the horizon for a cloud of dust or a column of smoke or any other indication of what had happened. From our appearance, we might have been an accident conscious crowd. Not exactly. Our first thoughts should have been with the pilot, the plane and the causes, and so on down the line. But they weren't. We were something different from an accident conscious crowd.

"*We were a record conscious crowd.* 'Another one for the books' we thought. With each mishap we could feel our grip loosen on some of the more unconventional yet more instructive training missions and maneuvers still available to our fighter wing. We could see the colonel pacing the floor, losing a few hairs. We could see tomorrow's poster with our wing's percentage tube towering over the others. We could picture some little quip at the bottom about winning first place again, designed to spank us gently and arouse our fighting spirit. We could see the unscarred hand of the First Air Force reach out and pluck another ribbon from the air. So far so good. Nothing wrong with competition. It spurs us on.



... "Let's walk over and see the Colonel lose a few hairs."

"But here's the trouble in our training program. Everybody, except a few wives and mothers and maybe the chaplain, looks at an accident as just 'another one for the books.' The whole setup is record conscious. They take the accidents and add them up and segregate them and compare them to last month's accidents. They work them over as intelligence men work over an enemy code. Finally, they find an answer, the same old answer, which will cut down on today's mishaps. It comes out in directives of, 'No more this!' and 'No more that!' Very simple. The best way to have a clean slate is not to fly at all.

"But the training eliminated from the course last year is a lost art as far as many of our trainees today are concerned. Because of this, they are not as precise and cannot be as experienced. The step taken last year, designed to cut down accidents, may well have backfired and made for a higher rate today. It may also be breeding future pilots who won't be as well equipped to cope with out of the ordinary situations they're bound to meet in the air. . . ."

Well, this boy was writing about a state of affairs that existed years ago when we were in a hurry to build up for war. In the rush to get ready, perhaps we did make some mistakes. But have things changed as much as we like to think they have? Isn't it possible that we still sometimes take this same negative approach to training? Don't we sometimes punish the pilot who commits an error by withdrawing his right to learn? Isn't that just what you do when you rule out as being unsafe for him now the kind of hazardous flying on which he may one day have to depend for his life? I wasn't so sure as I read on.

"Another aspect of the situation," my onetime student wrote way back in 1943, "is the outlook the pilot has



These pictures and cover pictures have one thing in common—airplanes get “broken” just as easy today as they did in the “good ol’ days.” The reasons for the breakage don’t change much from year to year—carelessness, lack of proper instruction, foolhardiness and all the rest. Yes, sir, an oldtimer easily could say, “This is where I came in!”

towards accidents. Normally he has his own record in mind. He is proud to say, if only to himself, that he’s never had an accident, never been awarded a ‘pilot error.’ He doesn’t expect to have an accident or to be the cause of one.

“But when we arrived at this school we were unintentionally made to believe that accidents were expected of us. More than once we were given the same old speech, telling us that we were just out of school and would have to watch out for every little thing. Just because we were graduated didn’t mean we were accomplished flyers, we were told. Nobody knew this better than we. We didn’t feel hot or even lukewarm. We knew we wouldn’t break any records. But since they said that we were just out of school and then indirectly told us we would probably mess up here and there, in accordance with all the accident records and knuckle head tricks of former classes, we began to believe them. The men making these speeches inadvertently instilled in our minds the idea that accidents from a group like ours were as plentiful and cheap as dimes in inflation. A good many of us would make mistakes simply because we were just out of school. We tried not to accept the idea but psychologically it was hard not to. We got the feeling that our accident, if we were to have one, would only be one of many and wouldn’t stand out to mar the record about which we were all so much concerned.”

There, I thought, is a classic example of the negative approach. And isn’t it too familiar even now? Don’t we still too often grind into the pilot’s mind the corrosive idea that some accidents are inevitable? And don’t we do this with the very words with which we hope to prevent more accidents? Strange as it seems, we probably do. And how do you help a sad situation like that to change? My student had an answer.

“It might be a good idea,” he modestly suggested, “to remind new pilots that they have enough flying time or skill to master the new airplane without too much trouble. Otherwise they wouldn’t be here. For that is what the students believe. It fits in with their ideals and doesn’t help to break down their morale.”

Now who can argue with that? And having thus warmed up, my student then went on to describe with a good deal of glee the pilot we still have with us, that misbegotten candidate for oblivion known to the trade as Mal—Mal Function, that is. And here he was back in 1943, one of the “Boneheads,” my student called him, one of those boys, “who fit right into the smouldering roles created by Hollywood. Born to be pilots because of their ‘perfect pilot attitude,’ which, as Hollywood puts it, is a big happy-go-lucky smile backed up by a little brain. These boys can push stick and rudder with the best of them. When they are looking they can see. And if only they’d keep a constant flow of activity in the vast space between the earphones, their triumph would be complete.

“The popular Air Corps hero has always been a fine stick and rudder man. On the way up to his girl’s house

he inspects the under sides of bridges. He gives the windows in every town the vibration treatment. He comes in low and our heroine doesn’t see him until he rounds the barn. She swoons and he rolls up to a safe altitude before making another pass. All this is part of our hero’s life which the movies like to show. But no Hollywood producer could use our hot pilot when his tachometer drops back to zero and he sets ‘er down in some pea patch, then reports prop failure. Or the time when his generator really does go out, then his radio and finally his prop. No trouble shooter, our hero! He’ll burn it up before finding out the existence, the cause or the remedy of his trouble. When he does happen to make it back to the field, our hot friend will invariably set it down three points on the spot. Landing ‘completed,’ he breezes down the runway and off the end into the soot. We find him now in that most unorthodox and embarrassing three-point position, one point being the nose of the ship, the crowning touch of all, a taxi accident.

“And these are the accidents, the most unnecessary and uncalled for, that bring the thrusts of the ax wielders at home and in Washington too, still closer and closer to the heart of our training program. . . .”

Stunned, I folded the faded sheets and put them away. It’s true, I thought, that we’ve gotten away in the main from prop failures now. We have flameouts today. And maybe we don’t have so much of that good old barnstorming type of carelessness. But isn’t this hot shot pilot with us still? And isn’t it true about the ax wielders who rise to lop off a few more precious hours of training each time we give them a good excuse, like a pilot who never should have gone into the ground, but who publicly did? Have we really changed our course since Junior found us so far off the beam ‘way back in ‘43? Or isn’t it true that we’ve somehow preserved and perpetuated some of our worst mistakes?

To tell you the truth, I didn’t quite know the answer to that when I’d finished this yellowing paper and filed it carefully away. Without even bothering to clean up the mess I’d made or to turn off the light, I walked back into the house. I was badly shook. All else forgotten, I smiled at Sweetie and kissed her a fond goodnight. I kissed her good morning, too—my mind still grinding around the circle laid out the night before. Record Conscious! I moaned to myself as I shaved, gaps in training lead the way to new mistakes. Negative approach! Withdrawing the pilot’s right to learn. Inevitable accidents! No accident should seem inevitable and no young pilot should ever be given that excuse! That’s a good way to perpetuate our worst mistakes. That’s all that is!

By this time I had trimmed my chin right down to the mandible and discovered again that blood is red. That’s what comes, I thought, of not keeping your mind on what you’re trying to do. Then I went back to wondering again. Was that boy right or was he wrong? Times have certainly changed, I had to admit, but leaping from one fresh cliché to another, have we kept up to date?

I still don’t know. Do you? ▲



strikes..... **OUT!**

Lt. Col. F. S. Spiegel (MC), Office of The Surgeon General

It is neither the intention of the author nor the editors to suggest that any pilot should be "grounded" merely because he has had three—or any specific number—of accidents. On the other hand, it is most necessary to consider the facts in each case in the cold clear light of truth and to act in accordance with the best dictates of conscience. Take the following as a "for instance."

THIS IS THE record of the military career of an Air Force pilot. The facts were obtained from official files including effectiveness reports, investigations, board proceedings, correspondence and other documents contained in the officer's personnel records file. The case history has a moral which might be overlooked if the story were presented in stilted military phraseology and construction. Names, places and dates have been omitted for reasons which will become obvious as the narrative unfolds.

The principal subject was born in the deep South, of average parents, about 30 years ago. His family life and childhood were not unusual. He graduated from high school at the end of World War II and enlisted in the Army Air Forces shortly thereafter.

Medical records reveal that he was involved in a motorcycle accident while an enlisted man and that he had sustained a painfully bruised right knee. Far more seriously, he was unconscious "for over 24 hours," according to the record which is very sketchy and incomplete.

Six months after the accident, in an original "64 examination" for aviation cadet training, there is a notation

in the medical history of the accident and injuries. The statement is made that the soldier was knocked momentarily unconscious.

The next physical examination of record was accomplished for pilot rating and commission, approximately a year and a half later. Here no mention is made of an accident, and except for childhood disease, he "denies all else." Review of all subsequent physical examinations and medical records reveals no reference to a motorcycle accident or associated injuries.

While an aviation cadet, this individual was involved in an automobile accident, consisting of a collision with the rear of another car which resulted in injuries to himself and three other persons. Although the cadet had been drinking, he was not considered intoxicated. He stated to the investigating officer that he was traveling no faster than 45 or 50 miles per hour. The investigating highway patrolman estimated his speed at more nearly 70 mph. The base report of investigation of this accident is quoted:

"In view of the lack of conclusive evidence indicating gross negligence on the part of subject airman (sic), it is believed that the doubt must be resolved in favor of subject airman. No more than simple negligence is established by evidence in the case." Result—line of duty, not due to misconduct.

He graduated, was rated a pilot and commissioned a Second Lieutenant shortly after the accident described above. He finished about five weeks after his class. He was assigned to a tactical squadron and was eventually checked out in F-80s. Four months after reporting to his first assignment, he became lost while flying alone. He made a wheels-up landing in a cornfield, due to fuel starvation, as a result of flying the reciprocal of the homer heading given him by the tower. He either neglected or forgot to refer to his magnetic compass and did not use the radio compass.

He appeared before the Flying Evaluation Board as a result of the investigation of the accident. The Board recommended that he be restored to flying status and that he receive additional training until his instrument proficiency met the standards required of F-80 pilots. Pilot error was established as the cause of this accident.

Five months later, the officer was involved in another major aircraft accident, and two months later, another. All three accidents were in F-80s. His second accident consisted of his flying into the target during air-to-air fighter gunnery training, and the third was a night landing in which he landed short of the runway. Each accident caused major damage to his aircraft. Accident Investigation Boards concluded that "pilot error" was a major factor in each instance.

Three months after his third accident, and less than a year and a half after graduation from flying school, he was required to appear before a Flying Evaluation Board upon instructions from Headquarters, USAF. Air Force Regulation 62-4, in effect at that time, directed that all rated pilots who were involved in three major aircraft accidents, were to appear before a Flying Evaluation Board.

The Board was to review each accident, review the pilot's training and experience, consider all evidence and make a recommendation regarding the retention of the individual on flying status. The Board in this instance found that the officer had been involved in three F-80 aircraft accidents in which pilot error had been the major

factor. Three flight commanders in his squadron testified, however, that they thought he was qualified to continue flying the F-80.

The Board in its findings noted that this officer was slower than the average pilot in developing judgment and technique in flying this type of aircraft. Consequently, it recommended that the present suspension from flying be removed and that he be restricted to piloting other than jet fighter aircraft.

This recommendation was concurred in by base, subordinate and major command, but Headquarters USAF returned the proceedings for reconvening of the Board. Restricted or limited flying status is contrary to USAF policy. The reconvened Flying Evaluation Board was instructed to comply with the instructions outlined in AFR 62-4, to recommend that the officer either be returned to flying status or that he be suspended. The Board recommended that he be suspended from flying status for lack of flying aptitude. The Central Flying Evaluation Board reviewed the proceedings and concurred in the recommendation.

At about that time, the officer—still a Second Lieutenant—was separated from the service under the provisions of AFR 36-26, reduction in force. During processing for release, he requested retention in the Air Force in an enlisted status. It was determined that the highest grade in which he could be enlisted was that of Corporal. He did not pursue this course any further.

A short time later, he applied for and was appointed in the Air Force Reserve, his orders noting "Pilot on-fly-status." He performed several two-weeks active duty tours and ultimately was assigned to a major command headquarters as a Mobilization Day Assignee. His promotion to First Lieutenant was delayed because of low efficiency index scores.

After a few months, the officer requested reinstatement to flying status and, based upon his anticipation of favorable action by a local Flying Evaluation Board, he made application for recall to extended active duty as a pilot on flying status. His command wrote a strong letter, endorsing the request for recall. During the three-year period that he was in the Reserve Force, he had flown twin engine aircraft, occasionally T-6s, and no jets.

A Flying Evaluation Board was convened and reviewed all accident reports, investigations and board findings, including those of all previous Flying Evaluation Boards. This Board, after due deliberation, recommended that the officer's suspension remain in effect since no new or significant evidence had been submitted which refuted the findings of the board which had suspended him for lack of flying aptitude.

In addition, the Board stated that "the three accidents in which this officer was involved created a pattern indicating momentary lapses of judgment." The Board proceedings never left the base, however, since the convening authority did not approve of the findings. It is stated in the record that the reason for disapproval was due to administrative errors and submission of additional evidence on behalf of the respondent. Nowhere are these administrative errors identified or alluded to.

The Flying Evaluation Board was reconvened. It was reconstituted, consisting of a different panel of officers, except for the recorder. Additional evidence on behalf of the respondent consisted of a witness who had been

in the officer's squadron when he experienced his accidents, and a letter from another officer in the squadron. The testimony presented did not appear to dispute the decision of the original suspending Flying Evaluation Board.

From reviewing the verbatim record of the reconvened board, it appears that several members were more impressed by the personality and appearance of the witness than what he had said. The witness was a much decorated, much publicized Air Force ace, who stated he had not had much close contact with the respondent and did not remember many of the particulars of the accidents or subsequent events. He did recall, however, that the officer had been in the old squadron and did remember that there was some question about "people having it in for him."

The Board recommended that the respondent be returned to flying status, since, "in each accident in which he was involved, there were mitigating circumstances over which he had no control, that he possesses inherent flying ability required of a jet fighter pilot and clearly demonstrates that his judgment is normal for an officer of his experience." The proceedings and recommendations of this Board were approved by the convening authority, the same base commander who had disapproved the previous findings.

The officer was returned to flying status within three weeks and was recalled to active duty as a fighter pilot on the same date.

Approximately four years have elapsed since the date of his recall and his demise. He had been checked out in F-89s and had received additional training. The circumstances of his last accident, in which a radar observer was also killed, raised a question regarding the propriety of the reconvened Flying Evaluation Board which returned him to flying status.

Investigation of the accident revealed that the aircraft crashed at a steep angle when in the landing pattern due to a change in the center of gravity of the aircraft and resultant alteration of flight characteristics occasioned by a faulty wing and tip tank fuel valve—creating a wingheavy condition. It was surmised that the pilot was not aware of his problem until he had reduced airspeed since no emergency had been declared. Neither the control tower personnel nor mobile control had been apprised of any inflight trouble. It was pointed out that the pilot may not have been able to cope with the emergency, due to indecision and inability to evaluate the situation and take corrective action immediately.

In reviewing this case history, one gets the impression that the officer fell into the much debated-about "accident-prone" category. The findings of the Flying Evaluation Board, that a pattern indicating momentary lapses of judgment had been demonstrated, would have prevented this accident, if upheld. The recommendation, however, was disapproved for nebulous and questionable reasons. Personalities and emotions have no place in flying business, and even less in the deliberations of Flying Evaluation Boards. Decisions must be dispassionate and based upon fact. Flying safety and mission accomplishment can not be jeopardized or compromised by personal feelings, friendship or sympathy.

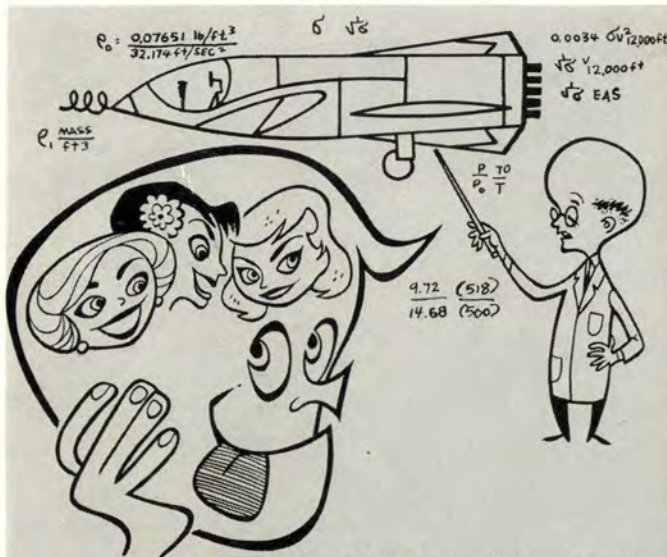
There was no necessity for the Air Force to lose a well-trained, experienced radar observer; a half million dollars worth of airplane, and four years of additional training—and the life of this man. ▲



Care to join us for some plain and fancy aerobatics? It's easy and it's fun—as long as you play by the rules—and as long as you know what you're doing and how to come out of the act. There may even be a trick to getting into it. This little doll learned both, but not without long hours of hard practice. The practice must be directed toward specific achievement, as well as based on good sound theory. Bob Hoover has some sound words on the theory. The goals are fairly well outlined by the tactical operation of your type of airplane—or the one you're going to fly. The story is on page 5.

MAL FUNCTION

"Apples fall," so Newton said,
"Where they can find convenient head."

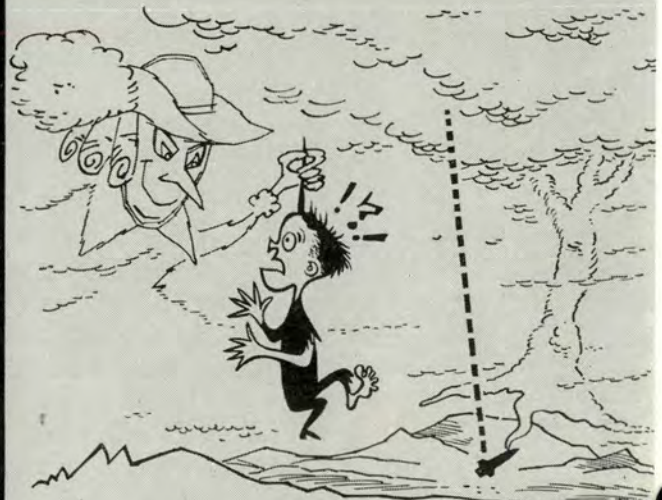


Now aircraft are a different breed,
They fall 'cause pilots do not heed.



Old Mal is just the case in point,
He flies with head that's out of joint.

"The checklist's not for me," he bawls,
As over cockpit edge he crawls.



Because he by-passed Newton's laws,
He's chosen "Mister Most Probable Cause."