AEROSPACE

SAFETY

UNITED STATES AIR FORCE

JUNE • 1961

The
DAEDALIAN
TROPHY
Goes To
PACAF

HAIL, HAIL THE GANGSTART'S HERE!—Page 16

NO TIME TO RELAX

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At the close of 1960 there was good and just reason for flying personnel, supervisors, maintenance folks, support and the fly-safe troops to look back, pat themselves on the back, and say "Well Done." We had just completed the safest year in Air Force history. The accident rate had hit an all-time low of 5.8 major accidents per 100,000 hours of flying. One major command had reduced its accidents by an amazing 76 per cent.

Rates, however, don't tell the whole rosy picture. Destroyed aircraft dropped from 472 in 1959 to 285 in 1960. Fatalities decreased from 375 to 275. Total major accidents fell from 672 in '59 to 426 in '60. In short, the savings in trained personnel, combat aircraft and plain hardware was something to be proud of. And we were.

Nineteen Hundred Sixty One had barely put in its appearance, however, before the accident picture looked not quite so rosy. In fact it looked bleak and still looks bleak. Airplanes were and are being damaged and destroyed too fast. And the loss of aircrewmen was and is tragic. We have searched for the answers. Analyses have been made, and cause factors minutely studied. We tried to isolate a trend so the source of the accidents could be attacked. When we had finished this critical evaluation it proved at least one thing: The aircraft accidents that marred the safety record were preventable—they *are* preventable. We found no new major areas of great difficulty but rather a repetition of well known accident causes. A general letdown seems to be in progress with regard to accident prevention, and this goes across the board: pilots, commanders, supervisors, support personnel and the fly-safe types.

Let me give you a few examples of what I mean by the term "preventable."

- After RON-ing at a Northwestern base, a highly qualified (2000 jet hours) Lt. Colonel and a minimum qualified Major (copilot) started their flight planning. Destination: A California base. And here's where their troubles started.

In making out the 21A, somehow, some way, the copilot entered the distance (244 NM) in the heading column for the second leg. In the distance column he entered the magnetic heading (191°), (Murphy's Law). Sure enough, the pilot picked up the wrong heading and some 30 minutes later they were over the Pacific Ocean. After calling for help they were vectored by GCI to the closest Air Force base. Approach Control cleared the T-33 to descend to 8000 feet. Big Mistake Number Two! The pilot misinterpreted the altimeter presentation by 10,000 feet and wound up at 18,000 instead of 8000. For twenty minutes they floundered around in an attempt to orient themselves for an ILS approach. Needless to say this was an abortive effort and the end result was burning what little fuel they had left. The pilot then made a groping descent in weather, finally breaking out of the undercast about 5200 feet indicated. Field elevation was 4092 feet. Shortly after breaking out, they ran out of fuel and the copilot ejected unsuccessfully from about 400 feet. The investigation showed that he had failed to hook up the zero lanyard. The pilot traded what airspeed he had left for altitude and successfully ejected at 600-700 feet. GCI controllers came in for a share of the blame by their failure to give the pilot all the help they're capable of giving. Now is there any doubt in your mind that this was a "preventable accident?"

- Then we have the case of the two pilots—also T-33—who diverted to *Sewart AFB, Tenn.*, because their destination weather went sour. With minimum fuel they requested a *Stewart (New York)* VOR penetration. This was denied and GCA attempted to vector the T-Bird for a landing. GCA lost contact and voice communications, so GCI gave them a course to the closest airport, Bowling Green, Kentucky. With 30 gallons showing in the fuel counter, the pilot's first landing approach was too long and a go-around was made. On the second approach the pilot flared too soon and then dropped in hard, shearing the nosewheel. While landing technique was the direct cause, it was set up by poor flight planning and navigational procedures plus a lack of attention to details.

- Another case of inattention to details and this one's about a T-28: The crew chief didn't make sure the oil filler cap was secure. The pilot didn't follow any kind of checklist during preflight, consequently, he too missed the loose cap. During takeoff a spray of oil siphoned through the dipstick opening and spread over the windshield. The pilot aborted the takeoff and landed gear up.

- Then we have the accident involving a pilot with 7000 hours of flying time. Officially the cause was *undetermined;* however, the most probable cause was that the pilot misread his altimeter by 1000 feet and on the turn to base leg for a night VFR landing, his aircraft struck the ground. This accident cost us the lives of seven trained crewmembers and two luckless passengers.

While the accident picture is far from bright, it has not yet reached alarming proportions, and it's up to us to make sure that it doesn't. When I say "us" I mean every commander, supervisor, pilot, and maintenance and support person. This whole thing is a function of command. The Deputy IG for Safety can help—just so far—from then on the Commander *has to take over.* If you're a *commander* or *supervisor* you *must* be a *professional* and insist that those you command or supervise also be *professionals.* If you're an "Indian" instead of a Chief, you should have pride in doing the best possible job you can do. If you're a pilot you *have* to be professional or you may end up a dead Indian or maimed. The flying safety officers must be continually alert to spot incidents and hazards, and correct them *before* they cause an accident. In short, we must shake off any complacency that resulted from the outstanding success of 1960. We can do it. Think of it this way. Those of us who don't are good candidates for the statistics column. Come next December I'd rather be a man than a statistic. Wouldn't you?

Major General Perry B. Griffith, USAF, Deputy Inspector General for Safety

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IN THIS ISSUE

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VOLUME SEVENTEEN NUMBER SIX — USAF RECURRING PUBLICATION 62-1

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DAEDALIAN TROPHY WINNERS. The two trophies presented to Air Force organizations at the 27th annual convention of the Order of Daedalians at Kelly AFB, Tex., are admired by (left to right) Maj. Gen. Perry B. Griffith, USAF Deputy Inspector General for Safety; Col. William A. Martin, Commander of the 3500th Maintenance and Supply Group, Reese AFB, Tex.; Gen. Thomas D. White, Air Force Chief of Staff, and Gen. Emmett "Rosy" O'Donnell, Commander-in-Chief of the Pacific Air Forces. The Reese AFB group won the Daedalian Maintenance Trophy and PACAF the Daedalian Flight Safety Trophy for 1960.

JUDGMENT DAY

There was a time in this man's Air Force when a stand ride consisted merely of one of the fellows from the "stand office" dropping by the squadron, and riding with someone on a most casual, easy going standardization check. Just formality—Joe can do it as well as Bill—no sweat—just go along for the ride, write up the paper work to satisfy the Old Man.

But, no more. At least to a SAC B-47 crew, no more. The annual Standardization Evaluation (note "evaluation" not just "ride" anymore) is an occasion just slightly less important than your wife having her first baby. Nowadays, this evaluation is a formal affair done up with several days of examinations, checks on simulators and other ground trainers, and finishing with two or more flights. After all this high-handed business, the paperwork is shuffled, and a "critique," only a little less formal than a court martial, finally brings the evaluation to a close. The crew gives one giant sigh of relief if they passed, and one giant moan (or more) if they failed.

Since this standardization evaluation causes so much

worry and sweat to the flight crews, I've drafted a few simple rules to help you slide through that next annual check with about one-tenth the nervous strain and sweat you expended on your last one. First of all, get a "line" on the exam. Don't bother to study the entire Flight Manual—there's too much in it—and they can't ask you everything in only one hundred questions. All you're looking for is one hundred answers, and who'd have them better than some hot, young A/C (Oops! I forgot. SAC doesn't use that designation anymore. From now on, it's Commander.) who has just finished his annual check? But, hold on, before you grab him by the collar and drag him into the locker room for "pumping."

Let's be subtle about this thing. Invite him over Friday evening for cocktails and steak. Mention that it's real informal, and there'll be a crowd, so maybe he'd better bring his Flight Manual to sit on—you're expecting to run out of chairs. Kind of give him a nonchalant titter (an underdeveloped belly laugh), and mention that since he's just finished his stand ride, he probably has all the exam answers marked, ha, ha, ha. He'll get the point right away unless he's one of those "squares" who actually DO study before a stand ride.

You might add that your copilot will be there, and wouldn't it be nice if his copilot dropped over too? He could bring his Flight Manual with the gunnery questions all marked for easy reading. Remember, keep it informal—bring out your nonchalant titter every now and then—something like ha, ha, ha, ha, ha, done to the tune of a Thompson machine weapon. This way he'll know you're "one of the boys," and just need a little help for that awful stand ride you've got coming up next week.

When they arrive, grab the Flight Manuals and have your copilot standing by on a typewriter to note page and paragraph numbers as you quickly thumb through calling out the red underlined sentences. You can mark your copilot's Flight Manual to agree later on—right now just get the goods. Or, rather, you can have your copilot mark his, and "poop you up later." No point in your doing any more work on this thing than you have to—after all, you're the aircraft commander; you have to worry about your crew first.

If you can't find someone who's just taken a stand ride, the next best deal is to butter up a Standardization Board copilot. Next time you see him in the club at coffee hour, clap him on the back, and bellow for all to hear, "Well, here's old Charley—my old buddy, how's tricks these days old buddy—bet that standboard bunch is running you ragged!" This last remark will let him know you understand how tough it is up at standboard, and that you're sympathetic to him (we all know you're a hard-nosed commander who normally wouldn't even SPEAK to a copilot—you only grunt to your own—but this is a desperate situation).

Invite him over for a beer (don't waste steaks on just a copilot), and pump him real good. Run through the old deal about asking him to help you study, and how you left your Flight Manual in the locker room. Keep the association on a friendly basis, and use both the nonchalant titter and the booming buddy laugh. Keep him happy. Pour gallons of beer down him (beer is much cheaper than cocktails), and, unless

he's passed out, he'll talk. Keep him off subjects like his new sports car, his girl friend, the latest antic of Khruschchev—keep steering the conversation back to those standboard exams. For example, if he says something like this: "Say, did you see that welterweight fight the other night? What'd you think about Jones in that fifth round?" You immediately give out with the buddy laugh, and respond, "Sure, great, fifth you say—fifth section, fifth page? Fifth question: What's the answer—a, b, or c? Best flare plus ten, huh? That the answer? What was the question again, now?" Keep at it—you're bound to score eventually.

If you're field grade (you know, major and stuff

Wherein the author, a former B-47 pilot, offers some pertinent advice on how to cope with the Standardization Board Evaluation

like that), these tactics may not be for you. In fact, you're probably senior enough to walk right up to the standardization chief—you probably knew him when, anyway—and invite him over for those old cocktails and steaks again. Make it formal—after all, his is a responsible position, and he can't let it be known he's "fraternizing" with the ordinary combat crews at anything less than a formal party. Once you get him over, and a little heady with cocktails (pour his double), sneak him over to a corner, and with heads bent together, mutter in a matter-of-fact tone, "Look here, Sam, you and me have been around this Air Force since back when. Why I remember you as a barefoot boy with cheeks streaked with grease from that old OX-5. Let's cut this jazz about standboards, and all that garbage—how 'bout a little help? You know, just give me a few clues here and there. You know I know that stuff—hell I forgot more than some of these kids around here know. How 'bout tomorrow afternoon?" More than likely Sam will get the idea real quick.

By this time you should have a pretty good line on the actual exam questions. Of course, there are questions on other topics outside the Flight Manual, such as special weapons, but, just skip that stuff—it's classified, you know! Surely, they don't expect you to remember that—why, you might talk in your sleep some night! File this little reminder away in the back of your mind as you'll need it later when you fail the special weapons part of the exam. It'll be a real good argument builder. Actually, if you're sharp, all you have to do is start a good argument over the grading of an exam, and you'll have standboard crews coming out of the walls to see what the squabble is. Then, in the middle

of the fight, you can sneak out a back door and grab coffee. By the time you get back, the fight'll be over, and all will be forgotten! Maybe! Anyway, it's a good try.

There are several tactics which may be employed during the actual examinations. If you have studied, and know the answers, complete the exam in utter silence so the others taking it can concentrate, hand it in, and walk out. This will drive the standboard troops batty—wondering how you finished so soon. If you aren't too sure about the answers, or just flat don't know, then the best technique is the ARGUMENT. Standboard copilots are usually assigned to monitor exams, and help explain any question you may not understand. This is a situation made to order for you. As a commander you're more than likely higher in rank than the copilots (if you're a lieutenant, you'd better not try this), so you can harangue, yell, and argue your way through a large percentage of the questions. Keep some poor standboard copilot at your side constantly. Every time he leaves, yell out, "Hey, what is this? Look at this nineteenth question! Boy! What a two-sided question; here, take a look." By this time he's so frustrated he won't really care what it means.

If, in spite of all this, you come up with too many red marks when your exam is graded, yell indignantly, and demand that they "prove" their answers. (They CAN, and very easily, as all standboard questions come right out of the Flight Manual and other applicable publications.) While they're busy thumbing through the Flight Manual to find the correct answer, slip a look at the correct answer as shown on the exam sheet, and prepare a "double meaning" argument something like this: "I know that! Any dumb cluck knows that! But, look at this exam question. You read that question—see if you don't come up with the same answer I did. Any sensible person would mark the question just as I did—GEE WHIZ, WHAT AN EXAM!"

Get the idea? You can expand on that theme almost indefintely. Remember, the primary idea is to confuse them into thinking you ACTUALLY DID know the right answer, but the question threw you off. Don't forget—you can't be meek in this business—the more yelling and arm waving you do, the better. Lets them know you're really worked up about it.

Another good "out" on exams is a sharp copilot. If he isn't sharp, get him that way. Threaten him with a fiery death if he doesn't memorize those exams. Every time you see him reading a comic book, grab it out of his hands, and shove his Flight Manual into his grubby little paws with the exclamation: "Hodges, you'd better know those exam answers TWICE as well as I do! Now, get with it! You understand that, boy?" Here again, yelling helps. Copilots are traditionally scared to death of commanders, and this yelling bit once or twice a day should have him in pretty good shape by the time the standboard exams roll around.

With the exams safely behind you the flights should be no sweat. Especially since, on each and every training mission, you've been doing everything according to Hoyle anyway. Just fly a normal mission, and things will be hunky-dory. Well . . . almost. There ARE a few hints you ought to know about. First of all, bend the ear of your standboard evaluator to no end about what HE WANTS on this flight since it's a standboard ride. (Actually, all HE WANTS is for you to fly the mission as nearly as briefed as possible and forget he's on board.)

Suppose you're a little hazy about one of those minor points you've heard standboard has been really nitpicking lately. It should go something like this: "Sam, my copilot, and I (this lets him know right away you're a close-knit team) have been pulling up the gear just about like the book says, but I've heard standboard wants something a little different . . . uh . . . maybe you could . . . uh . . . clear . . . uh . . . up . . . uh

this . . . uh . . . little point . . . uh?" Anyway, you get the idea—stall around if you're a little hazy. Normally, the standboard troop is a little overworked, and is anxious to get the job over with so you can count on a little help if you kind of keep things nice and slow, and act a little concerned and confused when appropriate.

When you get out to the airplane, exercise your

responsibility as commander. "Hodges, get those chutes in the airplane! Hodges, bring me a water bottle" (this lets the standboard evaluators know you always watch over your personal welfare—mustn't get dehydrated during that two-hour preflight in the hot sun). "Hodges, this is one helluva Form 175!" (This makes the evaluator think you're letting Hodges practice being a commander by filling out the '175, and gives him the impression you trust your copilot with life itself). "Hodges, where are the flight lunches?" "Hodges, zip up that flying suit pocket!" (You're keeping an eagle eye over your crew—right down to their zippers. Man, you're really living!!) "Hodges, checklist!!" (This can be repeated even at the risk of interrupting an ATC clearance, or a line speed check. It shows you really adhere to that old checklist—come hell or high water, or low line speeds!)

About the best procedure (I've tried several) during the preflight is to have a couple of catchy phrases committed to memory, such as CHECKED, LIGHT OUT or CLEAN, NO LEAKS, or FREE AND UNBROKEN, or PILOTS, MAN YOUR PLANES, and so forth. As Hodges is desperately trying to reach the checklist, continually interrupt with one of these catchy phrases yelled out at the top of your lungs. Meanwhile, beat, pound, kick, bend, twist (wear heavy gloves), tear, rip, push, shove, pull, throw, and jiggle everything in sight . . . even maintenance stands. Roughly every five seconds, yell: "CREW CHIEF." This lets the standboard evaluator know you not only have superb command of your flight crew, but the ground crew as well. It will also endear you to the ground crew as they all like to be called "crew chief"—it sounds so authoritative.

About twice during the preflight, and when the evaluator is standing within fifteen feet, hold up a commanding arm, and put on a stern look demanding silence. Then, calmly, and with great dignity, bend down under a boost pump or fuel fitting, and regard it with a fixed stare, and two or three sniffs. Then, carefully draw out your clean white handkerchief (carry one especially for this purpose if you don't use one ordinarily), and wipe off the pump or fitting. Regard it gravely for several seconds, shake your head, and slowly rise to the standing position (get out from under the airplane before you do this). Look the standboard evaluator straight in the eye, and, in a voice appropriate to this deadly situation, state in a strict monotone: "Almost had a bad fuel leak there—it's within the limits however." IMMEDIATELY stride off to your next check point. Otherwise someone might ask you WHAT the limits are! Needless to say, it's that sort of question we're trying to avoid at all costs.

Make the takeoff as spectacular as possible. Scream commands over the interphone at a mile-a-minute pace. Don't worry about WHAT you command them to do, JUST COMMAND SOMETHING. For example, when the gear comes up, say you didn't like the "sound" of it, and ask the copilot to recycle the gear to make damned sure. Should the evaluator ask you later if you always do that, just reply: "No, only on the older models—I've learned to recognize when those up latches on the motor driven, solenoid operated, hydraulically actuated, alternating current monitored, cam locks don't engage fully. When that happens, recycling the gear will always get them up firmly." He'll be as confused as you are after this little spiel, but, if you're lucky, he'll really be impressed with how you watch those minute details.

When the gear and flaps are up, and the bird's squared away in the climb, lapse into a sullen silence. Utter nothing. The furor of the preflight and takeoff are over with, and this gives the evaluator the impression you've got a well-knit crew now settled down to the silent performance of the mission . . . knowing in advance what their jobs are, and able to perform them with no directions from you. When the copilot does have to read a checklist, brief the navigator (you do this too) to utter unintelligible responses. The evaluator can't write up what he can't understand. This is real helpful if someone misses a checklist item. The poor evaluator won't know what's going on, so will assume you're so accustomed to flying together you speak in a foreign-sounding clipped version of ordinary English in order not to waste time and energy. If he DOESN'T assume this—tell him!

If you've been flying the bird any at all, chances are good the actual flight portion won't be much sweat. However, do remember it's a Standboard Evaluation ride, and don't unfasten your seat belt and parachute. And, try not to go to sleep during the celestial portion.

If anything, keep the copilot alert by frequently asking for a "check on ATC." Chances are, he won't know what you're talking about, and he'll probably be trying to shoot a star right over the tail of the airplane (if you haven't tried this, you haven't lived!), but it'll keep him awake, and will really rate with the evaluator—who'll likely be pretty much in the dark by now anyway.

Incidentally, once upon a time, a very nervous type commander asked me for a "check on ATC" right in the middle of a celestial shot. (ATC in those days was Air Traffic Control.) I would have shot him if I could have turned those twenty millimeters around far enough. To say that he confused me would be sidetracking the central issue. He was quite nervous about the ride, and really wanted to make a good impression on the standboard people. I was a young copilot with five years in the back seat, and twice that number of aircraft commanders, and the last thing I wanted to do was impress anybody—commanders *or* standboard! Get a check on ATC? What did the pilot want me to do—call them up and ask them if they were still there?

By the time the landing rolls around you've flown upwards of six or seven hours, and everybody's tired. But, this is no time to slow down. Plan your flight to reserve a final burst of energy for the letdown and landing phase. Perform about the same thing as you did on takeoff. Yell commands left and right, on interphone, and off. Command the copilot; command the navigator; command the GCA operator—JUST COMMAND! This will prove to the evaluator that not only do you command your closely knit crew, you also command about half of the personnel on the ground. (Don't use this technique in poor weather, however, as you'll need the assistance of GCA. (In bad weather keep your trap shut, and follow instructions.)

After parking the bird, go into "the act" again, waving your arms, and yelling at everybody in sight. If the evaluator sticks around to see how you turn your chutes in, and accomplish the debriefing, keep the act going. You may be dead tired, but DON'T FORGET, YOU MUST PASS THIS RIDE.

Be suave at the critique. Lean way back in your chair—cross your legs nonchalantly, inspect (alternately) the ceiling and the nearest window. Any time a comment is made about your copilot or navigator, interrupt your thoughts to give them a reprimanding stare of not to exceed three seconds. When a comment is made about your performance, raise your eyebrows for just the slightest fraction of a second, then go back to inspecting the ceiling and the window.

When the critique is finished the evaluator will, no doubt, lean forward, clasp his hands together, and address you directly with the results. If the ride was unsatisfactory, KEEP YOUR TEMPER. In fact, appear unmoved. This will shake the evaluator no end. Say absolutely nothing. Quietly and slowly ease yourself to a full sitting position—lean forward on the table (there's bound to be one handy), and ask: "I beg your pardon, what did you say?" He will repeat that you flunked the ride and by this time will be so unnerved, he'll quickly ask if you have any questions as he nervously shuffles the papers spread in front of him trying to get them into some sort of order. Consider the wall intently for several seconds—two minutes is more than adequate if you can stand the wait. Then ask: "May I review with you the points of the argument again, please?" If he's normal, he'll quickly run through what he considers to be the failing points. Stop him, and demand lengthy explanations of each.

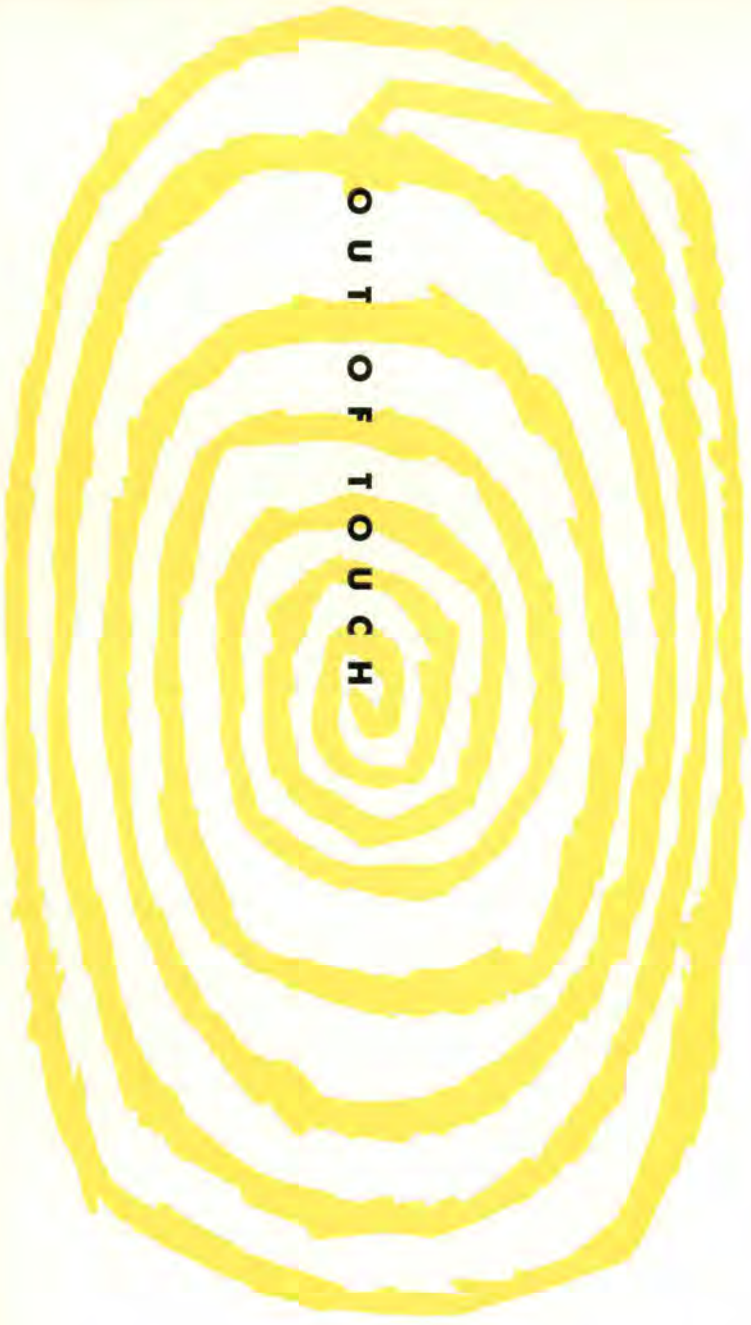
Ask him at great length, how he would have done it. Ask him if he purports to be a better pilot, if he holds himself above reproach, if he considers that the wonderful job you did on the entire mission is indicative of this minor little point he's saying is a failing item? Keep this line of argument and you'll more than likely make some headway.

So, there you have it—a standboard ride the easy way. There IS another way to do it, but I figured you wouldn't be interested. However, I will devote a few lines to this other way just in case you might be slightly interested. It's the "sucker" way of doing it, but really, if you're interested in impressing people, it's the easiest way. First of all you study the books, know the salient points, and understand the *why* of doing it that way. Keep your crew in line—make them know their jobs not just well, but COMPLETELY. Be fair, but don't hesitate to chew a little tail if they goof off—even for a second. This gives them the idea they will have to do their job properly. Chew quietly, but strongly, like a lion. They'll respect you, and, what's more, next time they'll know what they're supposed to.

Fly the bird according to the book. Neither you nor I, nor any man living, knows all there is to know. I didn't write the book, and you didn't either. No one man wrote that book—a whole bunch of individual ideas were compiled over many hours of flying the bird to get the book into its present form. It may be complex, but then, so is the bird, and so is the job. Keep it that way, and fly it that way. Know what you can, and what you can't write down. Keep up with revisions and changes.

Comes the stand ride, you'll walk in, take the exam, walk out. Fly the ride, attend the critique, and come through with a rating of excellent. A lot of people will wonder how you did it.

The real professional knows the book, the job, and the bird. I know because I've seen one or two of these "pros." They were fine people to work with. They demanded respect, and they could be depended on. In the present world situation we desperately need men like that. You can join their ranks if you really want to. Know the book, the job, and the bird. No man living can take a seat ahead of you; you're a real professional. ★



There once was a Hollywood epic in which the hero, a dashing stick and rudder type, had his own homey method of maintaining straight and level flight in the soup. He carried a thermos and saucer on each flight and, when he got into bad weather, he poured some coffee into his saucer, which then became a primitive bank and turn. As the coffee sloshed around it told him the attitude of his craft.

An apocryphal story has it that he shared the idea with a friend who hated to waste the coffee. He packaged the idea, added a needle and a little ball that slid back and forth, manufactured the gadget and has since retired on his royalties.

But back to our hero. He also lived to retire because he recognized that his posterior was not an infallible indicator when he couldn't see the horizon. This is more than can be said for numerous pilots who now reside in the great beyond.

During the intervening years both aircraft and instruments have improved. Man, alas, remains pretty much the same. Endowed with certain physical characteristics, he learns young to trust the impressions sent to his brain by his sensing organs. But when he moves beyond his familiar two-dimensional existence into a third plane, he needs external help to keep himself oriented. This was recognized early in the flying business. Why then, do pilots still fall victim to deadly disorientation that results in their bashing their birds and themselves? The classic answer is that despite the admonishment to "trust your instruments," in a moment of crisis the advice goes out the window and the pilot reverts to depending upon his physical sensations.

Pilot technique and aircraft instrumentation have been refined to the point where we should be able to cope with this out-of-touch-with-reality bit. But accidents are still traced to the pilot's becoming spatially disoriented, especially during critical phases of flight. The list of accidents defintely or probably caused by disorientation during 1959 makes pretty dismal reading: "Lost control during instrument climb"; "Lost control during instrument climb while making radio change"; "Lost control during instrument approach"; "Lost control after entering overcast"; "Lost control during instrument recovery from acrobatic maneuver."

Originally called vertigo, the terminology has been modified to the more accurate "spatial disorientation." They don't mean exactly the same thing, but use either term and pilots know what you're talking about. The most susceptible to this phenomenon, resulting from the three planes of movement of an aircraft and the peculiarities of human construction, are those loners in the single seaters. They have only themselves to rely on, and when the murk gets thick enough to stir they can get into real trouble. Their only recourses are to get out of the stuff or grab the gages and hang on, despite any disagreement with the seat of their pants.

The problem is in getting this message across. Old timers will tell you that experience is the only way, and you can't argue with that. The trouble is that in getting the experience you might get killed. How then, can a pilot get the experience necessary to make him a believer, without running the risk of getting himself killed in the process?

The Tactical Air Command has found a way. With its many high performance single seat aircraft, it is particularly vulnerable to accidents caused or contributed to by pilot disorientation. Borrowing from the well established principles of teaching: tell the student; show him; have him perform, TAC took a three-sided approach. Lectures by the Flight Surgeon and training officers in the Air Force Physiological Training program deal with the human organs having to do with spatial disorientation. These, of course, are the eyes, the middle ear and the nerve endings near the surface of the body.

Equipment, such as the Barany chair, and an excellent movie, "Spatial Disorientation in Flight," demonstrate the effects of disorientation.

Then, the experience factor is added. This consists of a series of inflight maneuvers selected because they correlate closely with conditions actually experienced in instrument flight which produce pilot disorientation.

The maneuvers and their correlation to instrument conditions are described in detail in TAC Reg. 60-13, and were the subject of an article in the September 1959 issue of *Flying Safety Magazine*. Briefly, they are:

- The student closes his eyes while the aircraft is in a straight and level attitude. The instructor pilot then makes a relatively slow entry into a smooth, well-coordinated turn of about 1½+G for 90 degrees. During the turn, while under the effect of slight +G, the student is asked for his version of the maneuver. Without outside visual reference, the normal sensation is that of a climb.

- Same maneuver as above, except that the student is asked his version of the maneuver during recovery. The normal response is that the aircraft is diving.

- Have the student close his eyes, then produce a wings level slight skid to the left. The student normally perceives this maneuver as tilting to the right.

- (Restricted to two place jet aircraft only.) While straight and level have the student close his eyes, then make a smooth, positive roll to one side to approximately the 45-degrees position while keeping the nose level and on a point by blending in stick and opposite rudder pressure. The roll is abruptly stopped and held. Then ask the student for his interpretation of the maneuver, which normally will be a strong sensation of rotation to the opposite direction.

- While straight and level have the student close his eyes. Then start a positive roll toward the 30 or 40-degrees position. As this is positively established, have the student bend his head and trunk down and look to the right and left and immediately assume the normal seated attitude. The instructor should so time the maneuver that the roll is stopped just as the student returns to the normal position.

This maneuver can produce intense vertigo which gives the sensation of falling into the direction of roll as well as downward. The same result can be accomplished by setting up a jet penetration type turn and descent.

- Sensations of climbing or diving can be produced by accelerating or decelerating while in level flight.

The maneuvers became a standard part of TAC instrument training in July 1959. The USAF Instrument Training School incorporated the program into the forthcoming revision of the Instrument Training Manual.

A major reason for the success of the program, according to Brigadier General John R. Copenhaver, Flight Surgeon, Hq. TAC, is the active participation of the base flight surgeons. Another reason is the positive approach taken by the instrument training squadrons.

To get a first hand evaluation of the program from the pilots and medics who conduct it, I recently visited Luke AFB, Arizona. Flight Surgeons Capt. George N. Gorman and Capt. Edward A. Sanders, and Major Eugene H. Butler, Commander of the 4511th CCTR Sq., described the program and their method of handling it. They, and the instructor pilots I interviewed, are convinced the training is good and that it is paying off for the Air Force.

The maneuvers usually produce the desired results. I know all but one of them did for me, when they were demonstrated by Instructor Pilot Capt. Frank M. Drew in an F-100F. The simulated penetration turn and descent was the one that didn't work. This is the most difficult of the maneuvers to perform satisfactorily, and it either produces a very marked reaction or nothing. It seems to be effective about 50 per cent of the time.

After a year in operation the program was evaluated by TAC. In general, the responses were favorable. Aircraft used included practically all of those in the TAC inventory: T-33, Century Series fighters, KB-50, B-66, C-47, C-123 and C-130. The maneuvers were most effective in jet fighters, but results were obtained in the other types.

Although the responses from the different bases varied, and there was some contradiction, the people responsible for the program reported good results and recommended its continuation. Students and young pilots were almost unanimous in the opinion that the program was good experience for them. Many of them had never before experienced disorientation in flight. Oddly, perhaps, some of the more experienced pilots demonstrated more interest than young pilots fresh from flying training.

The program demonstrates that a pilot must learn to rely on his instruments. But more important, it convinces even the most skeptical that they too can become disoriented.

TAC is satisfied that it has something good and that the program meets the objectives established. They are, namely:

- To indoctrinate pilots in understanding the susceptibility of the human system to vertigo or disorientation.

- To demonstrate and explain to pilots some basic causes of vertigo in order that the natural phenomena may be better understood.

- To demonstrate that the aircraft attitudes interpreted from bodily sensations are frequently false and unrealistic.

- To reduce the occurrence and degree of vertigo to a minimum through better understanding of the aircraft motion, head movement and the resultant vertigo relationship.

- To instill greater confidence in relying on instrument interpretation for true aircraft attitude.

- To aid in recognizing and coping with vertigo when it does occur.

Indications are that the program is a success. Pilots are getting real experience without the usual hazards. TAC, it seems, has discovered a way to beat the old theory that you can't have your cake and eat it too. ★ **Bob Harrison**

Ed. Note—For a detailed study of Disorientation and other pilot interference factors, we recommend the publication "Patterns of Interference" prepared by Major Sam E. Neely, USAF, MC. This summary was in a recent FSO Kit; however, additional copies will be available directly from the Office of the Assistant for Life Sciences, Deputy Inspector General for Safety, Norton AFB, California.

One seldom has the opportunity to rescind a decision, whether the decision was caused by an inanimate object or made by you. When the die is cast one must face the consequence. God created man a creature of decision, with the freedom and responsibility to determine his destiny. Man's first decision was a lousy one but let's be charitable and chalk up that mistake to his lack of experience in making decisions. One cannot explain, charitably or otherwise, why man has been making so many wrong calls since then, although the head shrinkers have a multiplicity of terms that describe the elements that color man's decision making mechanism.

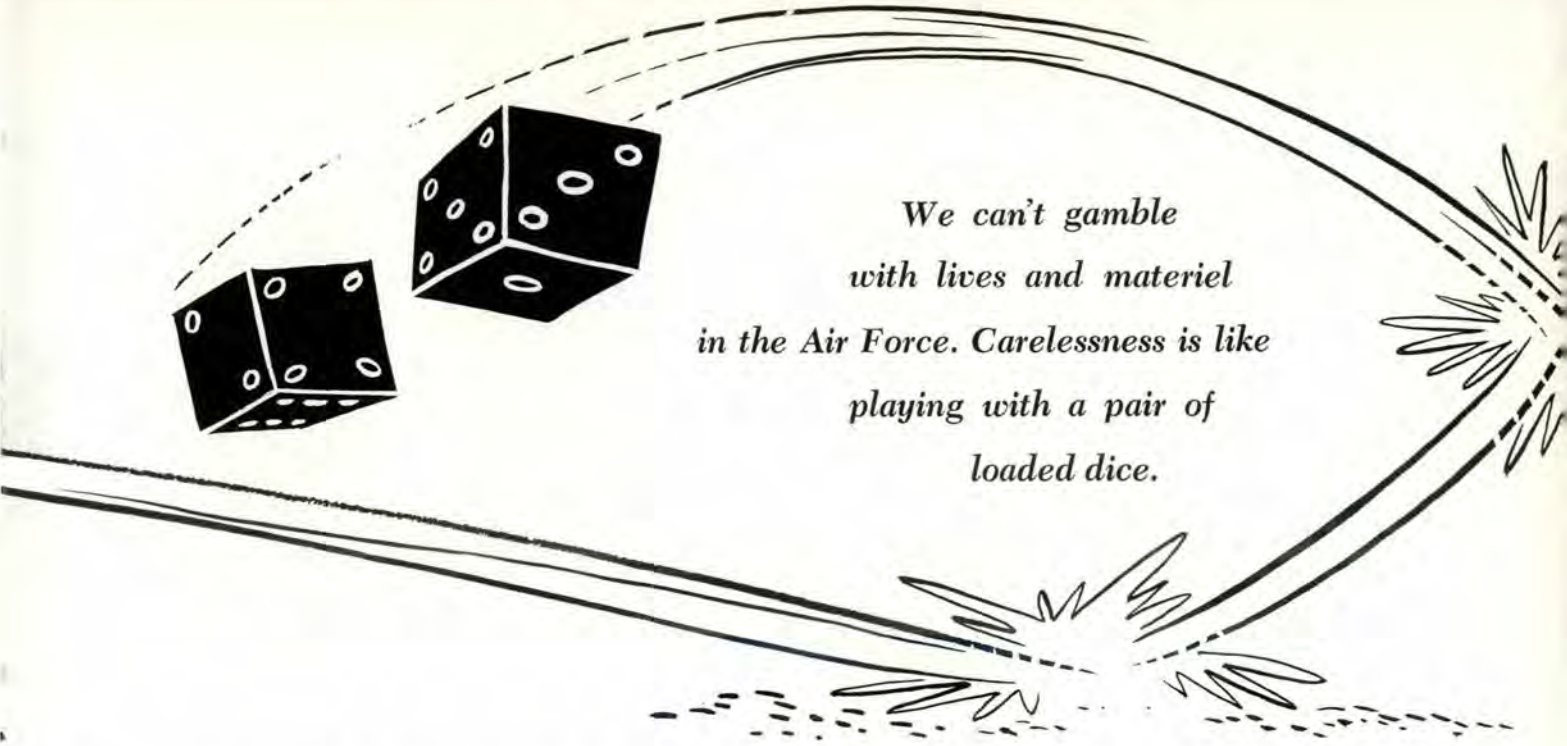
Even if we can't agree on or recognize all the factors affecting man's decisions, we can recognize and laugh at many of the human weaknesses: the absent mindedness of the aged, the stubbornness and bigotry of the unlearned, the closemindedness or the tunnelvision of the learned. The list could be extended to infinity. Some of the human failures are of no consequence because no harm results from them; however, there is one weakness peculiar to all of mankind, regardless of the person's station in life: Carelessness, that thread of certainty forming the very warp and woof of the cloth of life.

Carelessness! A very real and high cost human failure in the operation and maintenance of the expensive weapon systems of today. How many accidents classified as materiel failure are really human-factor instigated? Who can say? Perhaps in many instances accidents have happened because operators and maintenance personnel lacked sufficient training, were not sold on following safe procedures, or, worse still, they knew safe procedures yet were careless and apathetic in their performance. Safety devices are incorporated into our weapon systems to assure safety for personnel and weapon systems. Still the hurried, unthinking, careless person can always defeat any device.

Closely allied to carelessness is unconcern, so closely allied that Webster uses both interchangeably. This human failure is not peculiar to military personnel; it seems to be the philosophy of the American. Look about you today and notice how frequently you observe this attitude on the part of others. You may see it on the part of the shoe clerk who seems not the least interested in whether shoes are sold and often he is downright rude to his customers. Watch for unconcern in the shoppers as they jostle one another and paw through the poor clerk's counter wares. Look for it in the actions of your fellow motorist. In particular, watch for the unconcern of people when repairing, operating, or borrowing property of others. Here the cliché of the doglike behavior of man is really apparent.

The reader has now formed a mental picture of the author: an introverted, persecution ridden bit of human jelly. Wrong decision again. I am really a lovable, jolly exhibitionist who is quite fond of his fellow men. (Nothing wrong with my decision making mechanism.) Yet I must admit that occasionally only my miniature size prevents me from assaulting my fellow man when I see him abusing the property of others. I am most sensitive when this abuse is directed toward my possessions; in fact, when I see anything wasted or marred through abuse, it upsets me. Case in point: I am the proud owner of a beautiful, like new, 1936 Ford Coupe, and I dearly love to have people admire it. Granted, this vintage of auto has numerous protuberances that make dandy foot rests, but must one prop his number 12 brogans on the shiny black fenders? Lack of concern? You bet! And my car now has several scratches on the fenders to testify to the unconcern of people.

Just this morning I reviewed four one-time missile damage reports that were occasioned by carelessness and unconcern. In another instance a missile, launcher, target selection van and hydraulic van were destroyed by the missile range destruct package, when armament personnel installed the destruct package out of sequence and the big bang occurred during the launch checkout. An expensive bit of carelessness. Or look at the missile engine that came unglued because a maintenance troop



neglected to remove all his tools when he left the job site and the engine inhaled a tool after engine start. This type of report is not a rarity. To the contrary, it appears with great regularity.

How can the Air Force afford such waste from a limited budget? I can't say, but I am sure that the budget item for property wasted through carelessness and unconcern must constitute about the same percentage of the Air Force income that the incidental item of my budget represents of my total income. That's a heap. Look at the record:

	1960	1959
Major aircraft accidents	426	672
Fatalities	275	375
Missile accidents	54	10
Missile incidents	143	63
Ground accidents, military personnel, disabling injuries (includes fatalities)	10,303	11,594
Fatal injuries	556	627

What a horrid waste of men and material. Yet, 1960 was the lowest year ever for aircraft accidents. Missile accidents were up because missile inventories were up. What can one say about the unabated though decreasing waste due to ground accidents? Let the fact that we continually run 90 days in arrears in totaling up the bash and smash figures speak for itself. What portion of these accidents was caused by personnel carelessness and unconcern? Without recourse to the statistical slide rule suffice it to say a very good share. How much unreported damage to equipment does the Air Force suffer each year? Who knows? Yet each of us can give personal testimony of waste through carelessness. Although we have had great success in decreasing the number of accidents, we must do better.

Carelessness can be a factor forced upon the operational people by supervisors who failed in programming activities to allow sufficient time for safe practices during exercise of the plan. The commander who switches missions at a moment's notice and then expects subordinates to re-orient aircraft, missiles, ordnance and maintenance efforts toward the new effort within a short deadline is forcing carelessness upon his personnel by shortcut procedures.

The Falcon, Genie, Sidewinder accident/incident summary for 1960 revealed that two-thirds of all missile mishaps were attributed to personnel error. Of these:

- 55% occurred during loading and/or downloading.
- 23% occurred during maintenance or testing.
- 8% occurred during weapon transport.
- 8% occurred during other ground handling.
- 6% occurred in flight.

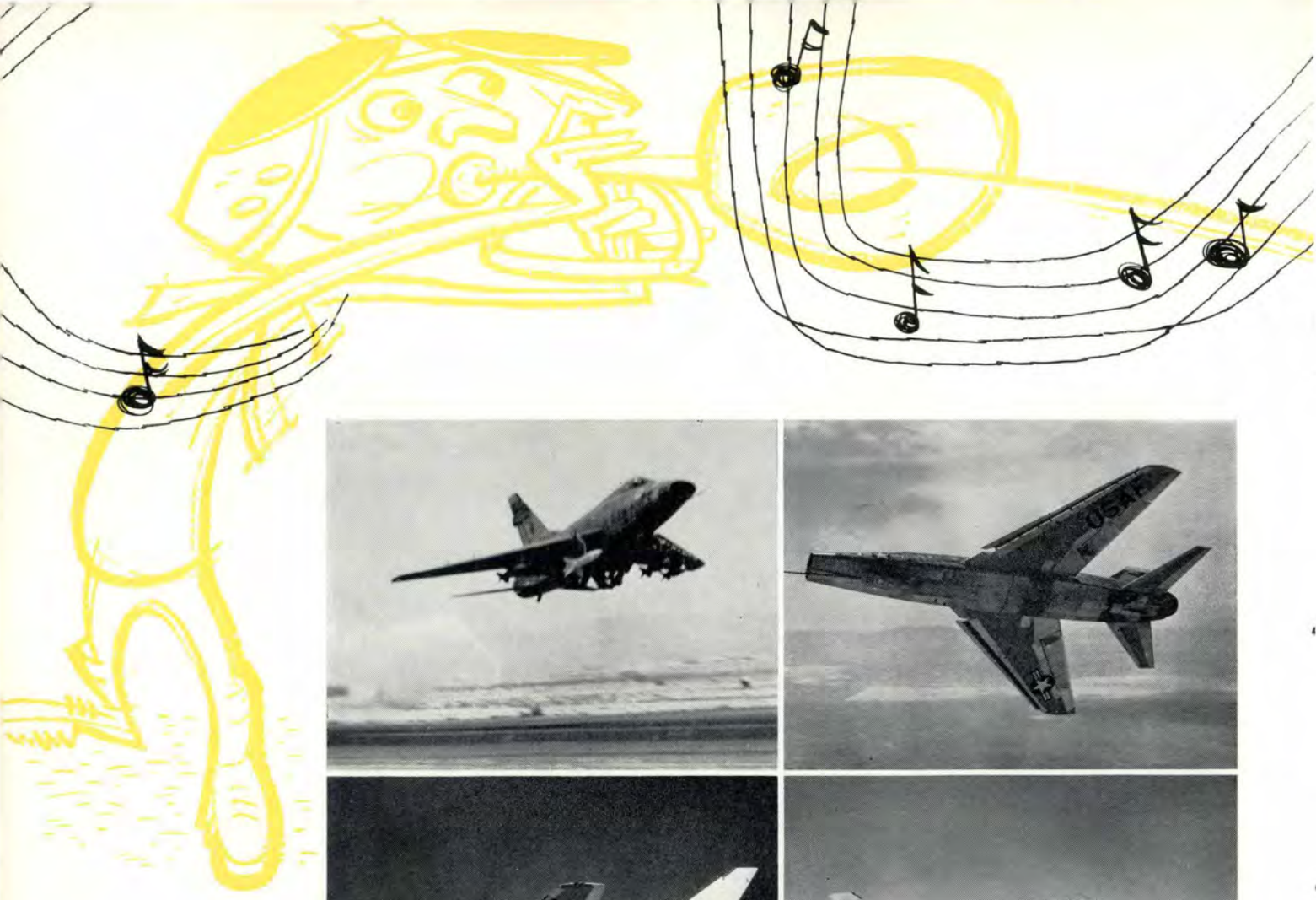
Of the two personnel factors that were apparent in these missile mishaps, 56% were due to failure to follow prescribed procedures, and 44% were caused by careless handling.

Although the cost of air protection is high, we must have it. The cost results from more than the replacement of aircraft and missiles and trained personnel. It also includes everything used by the Air Force in support of the air operation, from the metal staples which fasten this magazine to materials used in each support section of the Air Force. In the final analysis, you and I pay the bill. I, for one, do not mind paying a just bill, but I do complain when the bill is bloated by the grotesque germ of carelessness and indifference.

Aside from the monetary loss to the Air Force there's the waste of our national resources. Contrary to popular belief, the United States does not have an inexhaustible supply of natural resources. The willful abuse of them through equipment wreckage is nothing less than criminal.

We must remember that our every action has a consequence. Assuming that man does function as a thinking, rational being, rather than as a creature of instinct, let us preface our actions with thoughtful decisions, so that the consequence will be beneficial to the Air Force, the country and to ourselves. ★

Major Jesse C. Wilkins, Directorate, Missile Safety Research, Norton AFB, Calif.



F-100

Major Clarence H. Doyle, Jr., Fighter Branch, D/FSR

I received a letter recently from an ANG squadron transitioning from '86Ls to F-100s and wanting to know all about the Century problem areas, accident rates and statistics, plus available copies of accident summaries. This is a good way to start—benefit from the experience of others—and I was glad I could help them. When I got through collecting, thinking and researching, actually I had summarized most of the past and present problems. Maybe the rest of you F-100 users can profit by this same information.

Most of the materiel deficiencies affecting the accident potential of F-100 aircraft are either resolved, in the process of being resolved, or under qualification testing. I should like to point out several important areas that have caused accidents in the past, but which can be minimized or eliminated by good maintenance practices and overall supervision.

• **Flight Control Linkage Separation.** Separation of flight control linkage can cause full deflection of aileron, rudder or horizontal stabilator. These separations are caused by nuts not being installed or improperly installed, following inspections or work on the flight control system. Some common maintenance malpractices in this area involve re-use of fiber self-locking nuts, or failure to insert cotter pins in castellated nuts. The new Dash Six instructions authorized the use of castellated nuts in certain critical areas as a replacement for the original fiber self-locking nuts. D/FSR recommends this procedure, since quality control can more easily detect a missing cotter pin than an improperly installed or re-used self-locking nut. Most confirmed separations have involved full rudder deflection. Pilot reaction has varied from bailout to successful landings. Our position is not to attempt a landing unless the pilot

has first assured himself of adequate control at reasonable landing airspeeds in landing configuration at altitude.

• **Main Landing Gear Trunnion Failure.** New T.O. supplements to the Dash Six require magnaglo inspections of the strut trunnion area after every 12 landings or 12 hours, whichever occurs first, and after each hard landing. Modified struts, incorporating rework to strengthen the trunnion area, are being installed in accordance with T. O. 1F-100-808 at various TAC bases, but we have no replacement schedule for ANG units. We suggest that you acquire a magnaglo capability, if you don't already have one, and indoctrinate pilots to write up all cases of gear shimmy and hard landings.

• **Afterburner Fuel System Failure.** This has been a major problem area for several years. A proposed fix incorporating an inner support for spraybars is currently undergoing qualification testing at P&WA. Most failures occur due to metal fatigue in the pigtail or in the spraybar near the mounting flange. Here, again, adherence to T. O. installation and maintenance procedures is of paramount importance. Many failures have been traced to improper torquing of B-nuts at the spraybar mounting flange, or to carelessness in engine removal or installation, causing nicks in the pigtails which later result in failure. These failures can occur anytime the afterburner is in operation. The most critical time, of course, is during takeoff. The importance of coming out of after-burner as soon as practicable and gaining safe ejection altitude cannot be overemphasized. Even though the fire goes out after coming out of A/B, the possibility of flight control failure still persists. However, if the fire appears to be out and the flight control system appears to be normal after a reasonable length of time, it's the pilot's prerogative to land the aircraft or to take other action he considers appropriate.

• **Brakes.** From a pilot's standpoint, the important thing here is a sound working knowledge of the braking and antiskid system characteristics, and when and when not to turn off the antiskid switch. From a maintenance standpoint, failures have occurred because of improper bleeding techniques after compliance with T. O. 1F-100-715. Correct procedures are contained in T.O. 1F-100-715A. One point of emphasis: Unless it has been relocated locally, the antiskid switch on C models is located on the extreme left of the engine and flight control panel. Unless the pilot is completely familiar with the location and has practiced locating the switch quickly and accurately, an undue amount of time and cockpit concentration might be required to find it in an emergency situation, such as antiskid failure during the landing roll.

• **Drag Chute.** Only those units who have concentrated on finding the cause for each and every failure have reduced the failure rate. Normally, a drag chute failure is not critical in the F-100 aircraft, but compounding this failure with a utility system failure, for instance, can have a deleterious effect, to say the least!

• **Tires.** Care and maintenance are adequately covered in T.Os. However, during Safety Surveys, we've found numerous instances of under-inflation. This is especially critical in hot weather conditions and heavy weight configurations where flexing and heat buildup can induce tire failure. Of particular importance is inflating the tire, while cold, for the heaviest configuration for the day, and *not* bleeding the pressures built-up between flights.

• **Engine Oil Filter Assembly.** Several accidents have occurred because the engine oil filter was improperly assembled. These failures were caused by the re-use of "O" ring seals or misalignment of the pin and slot of the oil filter body assembly, which prevented proper seating and allowed loss of engine oil in flight. Some units have permanently solved this problem by prohibiting the crew chief from changing the filter. The entire pump and filter assembly is removed from the engine and a re-worked unit ready for installation is issued to the crew chief by a specialized section of the engine shop. All disassembly, inspection, and re-assembly is thus accomplished by one or two persons in the engine shop. This procedure assures better quality control and has resulted in no incidents occurring in the units which have adopted it.

• **Pilot Technique.** In spite of pilot education programs, accidents still occur in the landing phase because pilots are attempting to salvage bad patterns. The most critical area is "attempting to land from a high final approach, with minimum or idle power." Another area to be avoided is the "abrupt control movements, especially ailerons, near minimum control airspeeds." This is particularly hazardous when the aircraft is configured with Type IX pylons, which, during yaw or slip, can present a flat plate area ahead of the center of gravity that counteracts the effectiveness of the rudder.

Only the most general areas have been covered here; however, I believe that with the continued emphasis on maintenance and operations supervision, good records will continue and not-so-good ones will improve. ★

Photo Courtesy Walt Disney Productions

Depending on how you look at it, birds are one of man's best friends, or they can be a real nuisance and a deadly one at that. They have been cultivated as food and pets ever since the idea penetrated early man's dim intellect. Conversely, scarecrows and other devices have been employed for thousands of years in a rather futile effort to get rid of certain species.

We can dispense with some types quickly by saying that those whose eggs and flesh we use are welcome, along with all of those whose natural habitat has become the cage in our parlors. Our interest is focussed on those gay and carefree—and sometimes truculent—culprits who seem to resent man's invasion of their otherwise unlimited airspace.

In our attempts to find some way of eliminating birds as a hazard to aircraft we find ourselves in a very perplexing position. We must rid busy airport areas of birds, despite the fact that the birds recognize no boundaries and freely inhabit just about any place you care to mention. Yet, for a number of reasons we can't eradicate the entire bird population. We have to be somewhat selective because all birds are not a problem to us.

In the pre-jet age of piston driven aircraft, birds were more of a nuisance than a serious threat. Although there were serious accidents attributed to bird strikes, the damage usually was confined to an occasional fractured windshield, a clogged air intake, or minor damage to the airframe. Bird versus jet is a fowl of another color. For one thing, the birds find it harder to get out of the way. Then, when bird (flesh) and bird (metal) collide, the forces of impact can be powerful enough to put them both out of business. The law of "path of least resistance" also works and jet air intakes with their tremendous suction can pluck a fowl faster than grandma ever thought possible. Recently a B-52 hit a flight of blackbirds soon after takeoff. Result: both engines on the left side received damage to inlet guide vanes and the first row of compressor blades, plus a dented cowling on the number one engine.

Concern over the bird hazard has caused the government and the airlines to concentrate on solving the problem. The Federal Aviation Agency has contracted with the Bureau of Sport Fisheries and Wildlife to make a study and come up with means of eliminating the bird hazard. A leaflet published by the Bureau, BIRD HAZARD TO AIRCRAFT, discusses the problem and various remedial measures. You can obtain a copy from the FAA. Research, meanwhile, is continuing in an effort to learn more about bird behavior and control.

A number of private concerns are also interested, from the standpoint of producing devices designed to scare birds away from areas where they are not wanted. Some of the devices appear to be effective, but their success over a long period of time still remains to be determined. Idlewild International Airport has installed several of one device for test purposes as have other airports.

These devices include machines that produce a loud noise at regular intervals from shotgun shells or acetylene explosions, firecrackers, skyrockets and Roman candles. One device, the Scare Away, operates on acetylene or on carbide and water, although acetylene is recommended because of its simplicity, cleanliness and minimum amount of servicing. Cost of operation is about 20 cents for a 15-hour day. The manufacturer recommends one Scare Away for every 15 acres of area.

Bird scare devices at Washington National Airport (above) and Idlewild International (below, right) are being tested in war against feathered threat to aircraft. Jet engines are particularly vulnerable to bird ingestion.

Birds, however, seem to become accustomed to the noise even though residents near the airports do not. Studies are also being made of chemicals, electronic and ultrasonic media and sterility-producing agents. Less exotic measures are also being taken. The removal of marshes, swamps and rain pools has helped. Grain fields and berry producing shrubs attract always-hungry birds and should be removed. Tall weeds and brush provide attractive roosting sites and should be eliminated, along with dumps, which practically guarantee a big bird population.

Few birds are high flyers; they generally cruise around close to the ground, rarely above a few thousand feet. An aircraft is in greatest danger during takeoff and landing. An Air Force survey for the period 1956-1959 shows 59 reported collisions, with about half of them occurring below 500 feet. There were no injuries to personnel reported but several aircraft received major damage.

According to another Air Force survey covering the period January 1958 to September 1960, there were 54 incidents and one accident involving birds and Air Force aircraft. The one accident, unfortunately, was a fatal—in which the aircraft was destroyed. It is interesting to note that in 28 cases involving jet aircraft, engines flamed out three times and had to be shut down nine times.

FOR THE BIRDS •

All Air Force bases are not bothered by birds, at least not all of the time. Those with the biggest problem are located in the Atlantic, Pacific and Gulf coastal areas, along the Mississippi Valley and near the Great Lakes. In other words, in most of the United States. Midway, Guam, and Ascension Islands are also for the birds.

The Wildlife Bureau wisely advises not to try to accomplish the impossible goal of a birdless community. Birds, says the Bureau, hang around airfields for one or more of five reasons:

- In search of food or water.
- Roosting.
- Resting or loafing.
- Nesting.
- Passing by, which includes traveling between areas for the first four purposes.

Although a great deal remains to be learned about birds and how to control them, there are measures that can be used to keep the hazard to a minimum. For all birds, but especially the permanent resident type, the airpatch area can be made less attractive. Scare devices can be used and are more likely to succeed with transient types. Control tower personnel should keep a watch and warn aircraft when birds congregate in the vicinity of the runways or traffic pattern. You can obtain technical assistance from your regional office of the Bureau of Sport Fisheries and Wildlife, and you can help the Bureau by sending the remains of birds involved in aircraft strikes to its Bird and Mammal Laboratories. The pamphlet available from the FAA or the Bureau's regional office can give you information on this.

These measures for cutting the bird hazard contain no built-in guarantee. But they may be of help to those bases where the bird problem is serious. There is one other thing you can do. If you find an effective method of dealing with this problem, send it to *Aerospace Safety Magazine* so we can pass the word along. ★

Bob Harrison

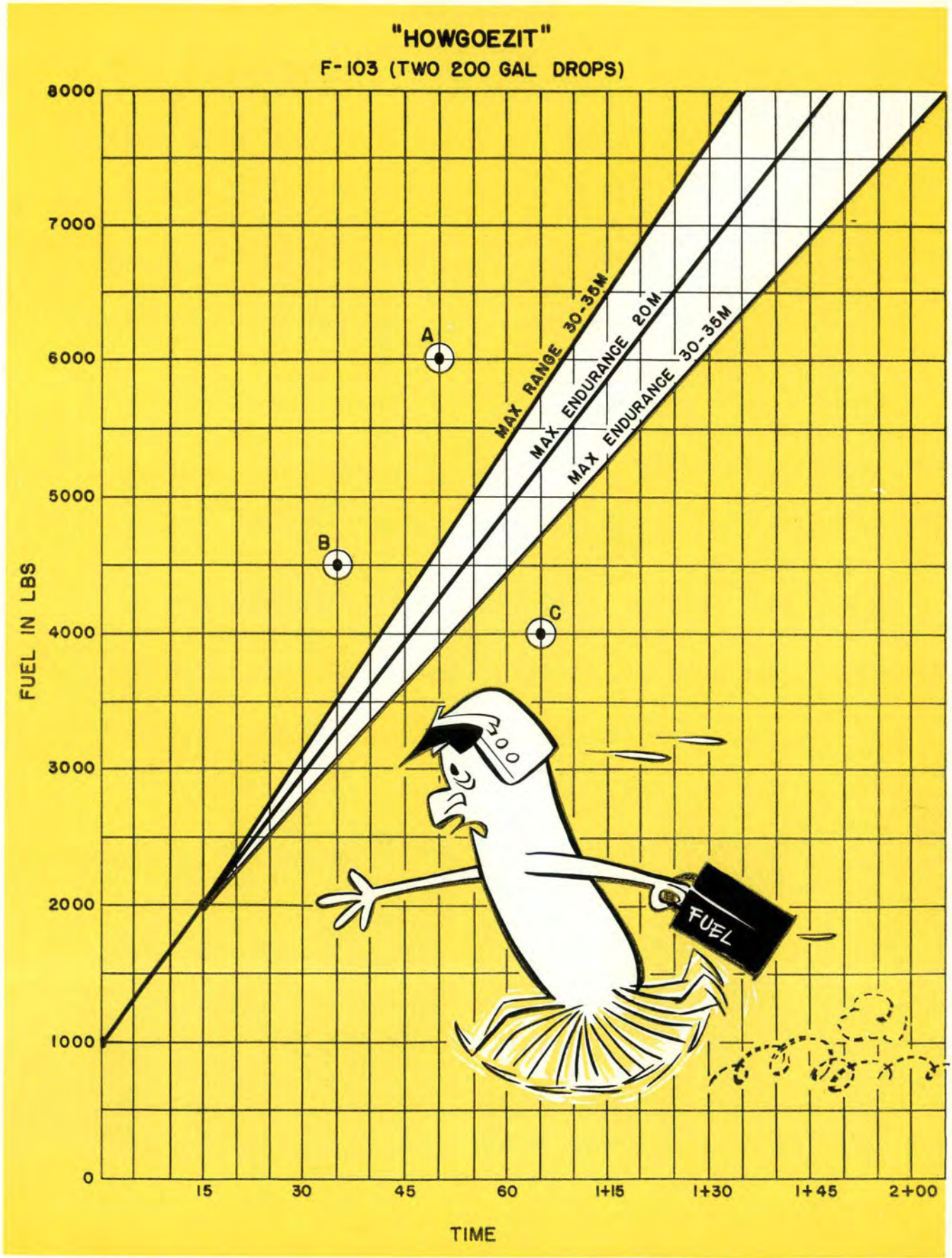
Cdr. James F. (Jeff) Stone, USN, Flight Safety Liaison Officer, D/FSR

Many charts and tables comparing fuel versus time have been devised by organizations and individuals. This information is essential to the fighter jocks and can be a handy guide to all pilots when given instructions to "hold." The first criterion in constructing a "Howgoezit" is the minimum fuel acceptable at landing. It can vary with the conditions of flight—VFR or IFR—and fuel consumption rate of the aircraft. The next criterion should be whether to base the chart on maximum range or maximum endurance. Both may be easily included on the same chart. Due to varying conditions, mileage is not included in the sample chart shown here, however the time shown can be readily converted to distance using known performance during the flight.

The fuel consumption data for the chart may be obtained from the Pilot's Handbook and should be flight tested with several aircraft prior to publication. The performance of the least efficient aircraft should be used as the basis for the chart. The steep slope in the lines to the left is caused by the letdown. This is based on an approach to home base but can be interpolated for a more involved or lengthy approach.

You'll note in the sample chart that 1000 pounds of fuel has been established as minimum landing fuel. The approach will take 15 minutes and consume 1000 pounds of fuel. If cruising cross-country above 30,000 with 6000 pounds of fuel remaining (Point A), by reading across the 6000-pound line, you will see that you can fly an additional 68 minutes, make a letdown, and have 1000 pounds remaining on final.

If on a local flight at 35,000, with 4500 pounds of fuel remaining (Point B), and told to expect one hour delay in landing, by reducing to maximum endurance we can make it and have a couple of minutes to spare. If at 4000 pounds of fuel (Point C) and given the same expected delay, it becomes obvious immediately that 47 minutes is the maximum delay in which a landing can be accomplished. A fuel state of 3000 pounds may be interpreted as 28 minutes maximum range, 30 minutes holding at 20,000 feet or 33 minutes at 35,000. The figures used in this sample chart are not for any known aircraft and should probably show greater spread between the 20,000 and 35,000 maximum endurance lines. The graph shows only that we can provide pilots with information in a readily usable form to let them know "Howgoezit." ★


"HOWGOEZIT"
F-103 (TWO 200 GAL DROPS)
8000
7000
6000
5000
4000
3000
2000
1000
0
FUEL IN LBS
MAX RANGE 30-35M
MAX. ENDURANCE 20M
MAX ENDURANCE 30-35M
A
B
C
200
FUEL
15
30
45
60
1+15
1+30
1+45
2+00
TIME

Hail, Hail, the

You T-Bird jocks who have heard rumors of a gangstart modification can rejoice. The gangstart is here, and you should soon have it in your aircraft. The author, who helped bird-dog it through to reality, gives you the straight poop in the following article. We suggest you save it, frame it, or tack it in the bird because it is the sole source of information for you until the new Dash One comes out.

• • •

"AF Jet 29247. **You are cleared for penetration.** Report leaving flight level 250." Speed brakes out and down you go through the murk. Tops are about 32,000, but the bases are 1000, Vis is good, ILS is on the air and working, so this should be a routine IFR approach for any T-Bird jock. . . . But, what goes on here? The RPM is 60% and dropping. Better open the throttle a little. Ooops!!! That doesn't help a cotton pickin' bit! (So, here's where we depart from the normal script.) Hit the gangstart. Throttle about-mid-quadrant. There comes the fuel pressure, EGT, and now the RPM. The engine is running on the emergency fuel system now, but it runs real fine. So, you just count your blessings and continue the penetration (using a little more finesse than usual in moving the throttle) and make that routine approach we were talking about.

Now, making an airstart on instruments halfway through the penetration turn would be something less than hilarious with just any old T-Bird, but this isn't just any T-Bird—it has T. O. 1T-33A-593 complied with. What is more important is that this T. O. will be complied with on all T-Birds as fast as field level maintenance activities can handle the workload.

I assume that you have all read the articles in the Dec. '60 and Jan. '61 issues of Aerospace Safety regarding airstarting the T-Bird. They should have been required reading for all T-33 pilots. These fine articles gave the ungarbled word on the symptoms of flameout and the best approach toward getting a J-33 fire going "tout suite." They also should have cleared up some of the old wives' tales about the characteristics of the T-Bird during powerless flight, and, we hope, dispel some fears about operating on the emergency fuel system.

The December article promised that the truly automatic airstart was to become a reality in the near future. For all the skeptics who were betting that the mod would get hopelessly entangled in the red tape of approval and procurement, hear this:

- Delivery of the first gangstart kits began in April.
- The modification must be complied with at the next periodic or within 30 days after receipt of the kits.
- Equitable distribution is being made by the prime AMA as fast as the bases can use them.

Here is what the mod actually consists of: A black box on the left shelf in the front cockpit contains the relays. A springloaded (neutral) toggle switch is installed on the instrument panel in each cockpit. Momentary actuation of this switch to the "UP" or "ON" position gives you the following:

- Provides 45-50 seconds of ignition.
- Provides 45-50 seconds of alcohol.
- Turns on the emergency fuel system.
- Turns on starting fuel (if the throttle is stop-cocked).
- Turns on fuselage, wing, and leading edge boost pumps.
- Turns on tip/tank fuel.

Except for ignition and alcohol anti-ice, all the items listed will remain on until the gangstart is moved to the off position. Therefore, if the cause for the flameout can definitely be determined, the appropriate system can be turned on, and then the gangstart switch placed in the "OFF" position. The amber light next to the switch indicates whether the system is "ON" or "OFF." Actually, the gangstart system parallels the various circuits and does not change the function of any of the switches presently installed.

Gangstart's Here!

New addition to T-Bird panel is shown above. Gangstart switch is located on lower left hand side of panel. Modifications will include guard for emergency fuel switch. Black box containing relays is shown in photo below, left. Cover is embossed with wiring diagram. If the circuit breaker is popped the press to test lamp on instrument panel will not light.

Let's say, for example, that a flameout occurred as the result of main fuel control failure. An airstart would be made by actuating the gangstart switch. After the engine began operating normally, the pilot would select the emergency fuel system by turning on the emergency fuel switch. Then, gangstart could be turned "OFF" since there would be no need to continue operation of the boost pumps and the starting fuel. Or, suppose that lapse of memory and the ever present distraction were sharing the cockpit. While climbing out after takeoff you suddenly notice an engine vibration and, at about the same time, you realize that the little red glow on the lower right instrument panel is not a reflection. Instead, it has been trying to warn you for some time that your fuselage tank is running dry. Hitting the gangstart immediately will restore power surprisingly quick, and, in the composure that follows, you can turn on the fuel switches that somehow were overlooked. Then, you can set the power at 80% and turn gangstart off, reverting back to normal fuel system.

Turning the gangstart "ON" at any time during flight produces no adverse effects on engine operation. Therefore, a pilot should not be hesitant in using it if a rough engine is encountered. This is particularly important since the early stages of flameout from fuel starvation produce definite rough engine indications. If gangstart is selected when the first signs of flameout begin, a flameout will be prevented. At high altitudes, let's say 40,000, it is recommended that the throttle be retarded to the 80% region prior to selecting gangstart since the setting of the emergency fuel control might be slightly higher than the normal system at this altitude. The procedure to follow to get an airstart using gangstart is this:

- Select gangstart "ON" (switch "UP" momentarily, observe amber light on).
- Throttle should be positioned to correspond to engine RPM, if time permits.
- If RPM goes below 15% and a start does not occur with the throttle open, stopcock to provide start-

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ing fuel. (Actuate gangstart again to provide new ignition cycle.)

• When engine starts (indicated by approximately 35-40 PSI fuel pressure and a rise in EGT) move throttle to "IDLE," then desired position.

• If it is necessary to go back to the normal fuel system, do so at 80% RPM below 23,000 feet.

The system is really very simple in its operation. Its accessibility and instant operation will make it possible to get a start almost the instant a flameout occurs. For this reason most starts made with this system will be the "low altitude" type where the throttle is never stopcocked. The possible exception to this is the case where the flameout occurs at high altitude. Turning gangstart on above 25,000 creates no particular problem and engine operation may be restored if complete flameout has not occurred. However, even when using gangstart, airstarts after complete flameout usually cannot be made much above 25,000 feet. In such a case, a 180-knot glide to 25,000 feet will provide approximately 8% RPM. (NOTE: If you try a gangstart above 25,000 feet and do not get started, turn it off.) It naturally follows that the throttle should be stopcocked during the descent and the start made on starting fuel by actuating the gangstart with the throttle stopcocked.

Airstarts on this system are very smooth. First signs of a "Light" are a rise in fuel pressure (35-40 PSI) then rise in EGT. The starts are cool with the EGT seldom exceeding 700 degrees. Although it is recommended that the starter be used if RPM drops below 6%, starts without the starter have been made as low as 5%. However, a start which is initiated when the RPM is this low takes considerable time (and altitude) so it is advisable to actuate gangstart while the RPM is high. Of course, the same rules regarding unsuccessful airstarts still apply. If fire warning light, smoke, fumes, or heavy vibration are associated with a flameout and unsuccessful airstart, stopcock throttle and turn gangstart "OFF." Do not attempt another start.

For those who are not familiar with the evolution of the "gangstart," here is the background. Although some of the "fixes" which have been adopted in the last couple of years have reduced the incidence rate of T-33 flameouts, the two basic causes remain. Main fuel system icing is the major cause while fuel mismanagement is as much of a problem as ever. Recognizing the fact that we will continue to have flameouts due to one cause or another the problem was simply how do we get a restart. During the original airstart tests at Edwards AFB, it was apparent that simplification of airstart procedures was a must. The project people at AFFTC consequently developed the "gangbar" approach. In testing the gangbar, they proved that the sequence of the steps in making an airstart was not important if all steps could be accomplished simultaneously. It was from this information that the electrical relay approach was developed and finally tested. Incidentally, you will notice that the gangstart system has no battery override feature. This feature was eliminated in the interest of safety, since its inclusion would cause a serious operational hazard during ground operation. Besides that, on aircraft with the improved electrical system, it is no longer possible to have the battery switch off in flight without being aware of it. Furthermore, the gangstart system is designed so that it cannot be left on inadvertently, since it reverts to off when DC power is shut off. Likewise, there is no ignition override. You must have the ignition switch on the right sub-panel turned "ON." But let's face it, you should have left it in the "ON" position after ground start so it will probably be on when you have need for an airstart.

Normally, a pilot having experienced a flameout and restart would leave the gangstart switch "ON" and land as soon as practical. If this is done, you should remember that the gangstart switch must be turned off when the throttle is stopcocked. The most important thing to keep in mind about the operation of the gangstart on the ground is that it must be treated the same as the emergency fuel switch and the starting fuel switch, i.e., if the engine is running on the emergency fuel system (which will be the case with gangstart on) the engine must be run up to approximately 70% RPM and the throttle retarded prior to switching back to the normal fuel system. Another important thing to bear in mind is the fact that gangstart provides fuel and ignition. Naturally you don't want to have these ingredients without air flow. It subsequently follows that you can't turn the gangstart on with the engine standing still. So, for most normal ground operation, with engine not running, treat it with the same regard as the tiptank salvo button.

Functional flight checks will include an actual check out of the system on the ground. This consists of stopcocking the throttle from 80% RPM and immediately turning gangstart on. Such a procedure is outlined in the T.O. and constitutes a thorough check of the entire system. About the only other check of the system which can be made is to run the engine up to 55%, select gangstart as you would the emergency fuel system, check emergency fuel and boost lights on, and switch back to normal fuel by running the engine up to at least 70% and then turn gangstart off while retarding the throttle. Although you can start the T-Bird on the ground with this system, we don't recommend it as a routine practice for a couple of reasons. For one, it causes undue wear on some components such as the airstart ignition. Most important, however, is the fact that the electrical power requirement resulting from operation of alcohol pump and all the boost pumps can cause a weak APU to falter and result in the starter "dropping off the line." This, of course, means that the start would have to be aborted immediately, the first step being to turn gangstart off. During most operations, a push to test check of the amber light will be sufficient to tell you that the system is "hot" and will do the job if needed. As you know, disconnecting the APU (with the battery off) during emergency fuel system operation causes a switchback. The same applies to gangstart. If this is done at idle RPM an overtemp will probably occur.

"Gangstart" won't put out the cat and will never replace sex, but it certainly simplifies getting the T-Bird started when fuel stops flowing to the burners. You will find that the presence of this switch on the lower lefthand side of the instrument panel lends a certain feeling of security. That kind of feeling that comes with knowing that your first step following a bone chilling silence will probably bring a heart warming rise in fuel pressure, EGT and RPM. ★

BOOBY PRIZE

Our telling anyone how to conduct a ground safety program would constitute a classic case of the blind leading the blind. We are doing a few things here at Vandenberg, though, which might interest safety people and supervisors. The ideas are not particularly new or spectacular, but they have gained some local publicity and for that reason your editor thinks it might be a good idea to describe them.

Back in September, the month that our rates went off the top of the chart, the boss said something about shaping up or shipping out. He had some other thoughts on the subject of safety which he didn't hesitate to express.

One of the ideas he put forth was what the newspapers have since termed "Booby Prizes." These prizes are directed to the major areas of concern in the accident prevention program—private motor vehicles, government motor vehicles, and on-duty injuries. We kicked it around here in the office and finally decided on the forms of the three awards.

The first award is given to the commander in whose unit a private motor accident occurs. For this one we went to a junkyard in town and got an old, beat-up hubcap. We cleaned it up and mounted it on a nice board with the lettering, "We had the last private motor vehicle accident." The piece will fit on a commander's desk, but it's no thing of beauty and it will crowd the desk a little.

The second award is an eighteen-inch section of chrome bumper with a blue handbrake handle bolted to it, marked "We had the last government vehicle accident."

The *pièce de résistance,* however, is the award for "We had the last on-duty injury." This little gem is the biggest hypodermic syringe I could get from the hospital. We mounted this on a board and finished it off with the biggest and longest needle available, bent into a very striking upward curve.

These awards are moved from unit to unit as accidents occur and we believe that their value lies in directing the attention of the commanders to their responsibilities toward accident prevention. The awards, by the way, were dubbed by the Safety NCOIC as "The Order of the Bent Hub-Cap," "The Order of the Broken Brake and Bumper," and "The Order of the Bent Needle." There is no doubt that they do the job for which they were designed. Last week the First Sergeant of the outfit with the GMV award called to ask if we had forgotten that his squadron still has the award. We assured him that we keep close track of it.

As long as we are writing this we might as well tell you what we did last Thanksgiving week-end. On the day before Thanksgiving, at 1330 hours, just off the edge of the parade ground we hoisted a car some thirty feet in the air and dropped it nose first. This was preceded by appropriate publicity and we had a small crowd out to watch the exercise. This stunt was done to demonstrate what a sudden stop will do to a car traveling thirty miles per hour. It's an eye-opener. This was at no cost to the government either, incidentally, because a junk-yard downtown donated the car and a local contractor working on-base donated the use of the crane and crew.

You can't really measure the effectiveness of things like this but we will say, guardedly, that our record seems to be improving slowly.

For Christmas and New Year's, Lieutenant Robert J. Eisenrich, the Ground Safety Officer, organized a "Holiday Roll Call." Briefly, we had the unit safety officers give each airmen a card from the National Safety Council which read "Open Before Christmas." It contained many helpful hints on driving. We had each airman write his serial number on a slip of paper. As this is written, the serial numbers, four of them, are being published in the Daily Bulletin. An airman whose number is published will call this office. If he still has the card in his possession and if he has had neither a traffic accident nor a citation during the holiday period he will be given a $25.00 U. S. Savings Bond. We have four bonds for this purpose.

Did it help? Who knows? But the only accident we had over the holidays was a motor scooter on-base the day after New Year's. We had one near-miss, too, which we caused ourselves. For New Year's we flew a big 10-foot diameter weather-type balloon from the roof of the Base Safety Office. On it we lettered "Happy New Year—Drive With Care—1961." This was all well and good until we heard that one of the chiefs almost had an accident trying to read what it said on the balloon. But then, as they say, "you can't win 'em all."

In reviewing what we have described above we feel we should point out that what we are doing here is a direct result of command emphasis. When the commander, any commander, takes an interest in preventing accidents, lots of other people become very interested in the same thing. This helps. In fact, as most of us know, effective accident prevention is virtually impossible without command support. ★

Major C. O. Cummins, USAF, Director of Safety, Vandenberg AFB, Calif.

A too familiar routine can get a man into trouble sometimes. But when the clouds are on the ground and an engine coughs its last . . .

EXPERIENCE HAS

Everybody engages in Monday morning quarterbacking at one time or another. It's about the most common form of analyzing or rehashing an event that took place yesterday or the day before that. It might have been a baseball game or an aircraft accident. Our discussions happen to involve the latter.

We can also analyze an aircraft accident effectively while sitting in our armchairs, provided we have all the facts available. While this is "after the fact" analysis, and cannot replace "before the accident" prevention, it is effective. Without listing errors in detail, let's keep in mind such factors as "poor judgment," "complacency" or "lack of proficiency," as we review the following three cargo aircraft accidents. What would *you* have done under the circumstances?

The first one involved a C-124 aircraft that was making a night VOR approach to Runway 23. It had been cleared from over the outer marker straight in. The weather was reported 500 feet scattered, 1100 feet overcast, light rain, visibility six miles and wind from 210 degrees, 13 gusting to 22 knots. The aircraft passed over the outer marker at published altitude; the before-landing cockpit check was okay; gear down, 2350 RPM, 20 degrees of flaps, descending at approximately 400 feet per minute, airspeed 140. The Aircraft Commander was in the right seat performing copilot duties.

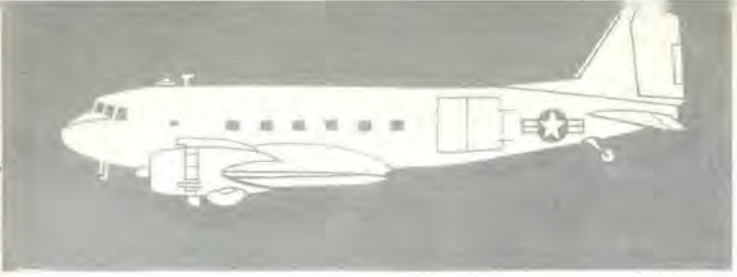
Approximately two miles from the field, the Aircraft Commander mentioned that the approach lights were in sight, in fact shadows were noticed passing near the aircraft. Before go-around power could be applied, the C-124 struck the treetops and was torn apart as result of the impact. Although the aircraft was destroyed, fortunately there were no fatalities.

Both pilots were well qualified in C-124 aircraft. The pilot had approximately 3800 hours total, 700 in the C-124 and 215 in the last 90 days. Immediately, these questions were asked:

- Were the pilots suffering from fatigue?
- Was there an altimeter problem?
- Were the static port heaters operating?
- Was it poor judgment?

The pitot heat selectors control the heat to the pitot heads and static port holes. Investigation revealed that the pitot heat was operating normally. Static ports were damaged however, so it was not definitely determined if heat was reaching them. The review following may warrant an evaluation of our present operating procedure.

During the past 10 years, twenty-four C-124 acci-



NO REPLACEMENT

Major Garn H. Harward, Cargo Br., D/FSR

dents resulted because the aircraft was too low on the final approach.

The next accident involved a C-47, for which a three-hour VFR flight plan was filed for an administrative mission. On the flight plan, the pilot noted: "Weather checked by pilot en route."

The route of flight was over hazardous terrain with a minimum IFR altitude for the entire route of 16,500 feet. (Before we discuss this flight any further, you can readily see what *could* happen, considering the single-engine capability of the Gooney-Bird.) The pilot had been flying T-33 aircraft and was just recently rechecked in the C-47.

The flight departed with 14 passengers aboard. Position reports for the first two hours were made at altitudes of 12,500 feet VFR, 12,500 IFR climbing to 14,500 and then back to 12,500 feet. Was the aircraft VFR or IFR? Aircraft heading during this period was southeasterly. Approximately one hour prior to ETA, the pilot received destination weather: 800 overcast, visibility six miles, wind at four knots. Incidentally, the destination did not have an approved letdown. The last radio contact was "climbing VFR to 11,500 feet."

Yes, it happened! This C-47 crashed on a steep grade, elevation 13,600 feet, 14 miles off the normal route. There were no survivors. The pilot could possibly have changed the outcome of this flight by evaluating the weather en route *prior* to departure; by a 180-turn, or by delaying the flight until VFR weather could reasonably be assured.

The third accident involved another C-47 and this aircraft was on a navigational mission. The pilot had over 5000 hours total, 800 hours in the Gooney Bird, with 24 hours during the past 90 days and 50 minutes in the last 30 days.

There were 13 crewmembers aboard and the aircraft weight was approximately 27,000 pounds. The weather was below published landing minimums, 300 feet obscured, visibility four-tenths of a mile with snow; temperature and dewpoint 32° F, wind 12 knots gusting to 20 knots. Carburetor heat was used on runup and then placed in ram position. The left engine was slow in responding to carburetor heat check, and shortly after becoming airborne it backfired and lost power. The carburetor air was 50 degrees, oil temp 100 degrees, oil pressure was dropping to 40 pounds and a fluctuation of 300 RPM. The engine was feathered on the downwind leg because of the backfiring, loss of oil, and heavy black smoke from the engine. The aircraft made a closed GCA pattern; maximum altitude attained was 950 feet. The minimum airspeed throughout the flight was 110 MPH. Approximately one quarter of a mile out on final, the gear was lowered, with full flaps shortly thereafter.

Touchdown was made with the gear indicating unsafe. Switches were cut and flaps raised. The right gear collapsed and the right wing struck the ground. Although there was major damage to the aircraft, the crewmembers evacuated, without injury.

Some of the questions asked were:

- What was the position of the carburetor heat control on takeoff?
- What was the position of the hydraulic selector handle *after* engine failure?
- By reducing airspeed to 100 MPH could additional altitude have been attained?
- The nearest field with weather above landing minimums was 50 miles away. Was it advisable to make a non-scheduled takeoff under these conditions?

To cope with some of the operational limitations of the C-47, one major command has directed its pilots to compute the single-engine performance for the minimum safe en route altitude. Fuel loads will be adjusted to provide a safe operating weight commensurate with safe reserve fuel. Another command has proposed that the takeoff weather minimum for non-scheduled or CRT flights be the same as landing minimums.

Of course, it would be much easier if some of the recent cargo aircraft accidents could just be forgotten, but since it's our job to prevent similar ones from recurring, "forgetting" is out of the question. In January of this year we had seven cargo type accidents as compared with two for the same month in 1960. Four of the seven this year involved the old reliable Gooney Bird. Perhaps because the C-47 is known throughout the Air Force as "the old reliable," its pilots may overlook the fact that it can still give 'em real trouble. This old bird can kill you just as dead as one of those new super jets can. As in other professions, whenever an individual performs the same routine job for an extended period of time he may become complacent and over-confident in his ability. Too often this results in "poor judgment, followed by disaster."

To restate something we've all heard and read before:

Whether you're a primary duty pilot or the desk jockey accomplishing 60-2 flying, you've got to be on the alert for the pitfalls inherent from *assuming* that every flight is routine.

Experience has no replacement; however, by itself it will not prevent accidents. ★

Who NEEDS PRESSURE?

MSgt. George Weaklim emerges from Navy pressure tank followed by William Biller. Biller kept constant watch while Sgt. Weaklim recovered from decompression sickness induced by high altitude flight at Edwards AFB. Technician (left) monitored chamber controls of Navy compression chamber normally used for divers.

In the flying business some things are pretty well accepted. For example, airplanes can't fly on empty fuel tanks and people can't fly at high altitude without pressure (atmospheric pressure, that is). The trouble is we don't all agree (or understand) at what altitude this pressurization becomes a "must," or, to put it another way, "How high can one go with a faulty pressurization system?"

This question is easier to ask than to answer because of the dual functions of the pressurization system. We'll discuss these in a moment but, first, let's get a good rule of thumb. If there is *any* malfunction of the pressurization system, it is unsafe to get above 25,000 feet on the cabin altimeter.

Now about the dual functions of the pressurization system: A properly functioning one protects the pilot against both hypoxia and decompression sickness (bends). Pressurization is the only protection against the bends but shares responsibility with the oxygen system for hypoxia prevention.

Perhaps the best way to impress you with the seriousness of decompression sickness is to quote the personal account by an NCO who had a close call during a recent aerial photographic chase mission in support of an X-15 flight over Edwards. MSgt. George Weaklim vividly tells of the insidious effects of decompression sickness and how it could happen to any crewmember. Fortunately, the quick and exacting treatment by Navy and USAF medical authorities saved MSgt. Weaklim's life. Here's his story:

"It was a fine, clear day, Tuesday, February 7, right after lunch, and from the rear seat of the F-104, the B-52 with the X-15 slung under its right wing was just ahead and slightly above us. It was six minutes before launch, at 43,000 feet.

"It started with a dull pain back of my neck. I tightened my oxygen mask until it cut into the bridge of my nose. I flipped the selector to a hundred per cent oxygen but the pain continued to get worse. I told the pilot, Captain William J. Knight, of my trouble. He asked if I wanted to go down, and we held on a few minutes until the pain spread into my shoulders and chest, and I said, "Maybe we'd better go down." Tunnel-vision was starting.

"The pilot kept talking to me all the way down. Things were beginning to dim. The tunnel-vision worsened. I lost all side vision and it really was just like looking down a tunnel and focusing at an object down at the end. The instruments in the cockpit were a blur by the time we made a straight-in approach over the lakebed and touched down on Runway 22.

"An ambulance was waiting on the runway near the

Maj. Samuel E. Neely, Asst. for Life Sciences, Deputy Inspector General for Safety

taxi strip, and suddenly I'd never felt more exhausted and beat up in all my life. A fireman helped me raise my foot from the cockpit and get out. My cameras weighed a ton, and someone took them from me.

"I felt much better at the hospital. The pain subsided and I thought, 'Well, I'm going to be all right.' But Doctor Harry Bratt kept me under observation. *They say it was about two hours later when it hit.* I blanked out. The last thing I remember was seeing the two bottles of intravenous anti-shock plasma hanging over me.

"I don't remember a thing about getting on the C-130, or landing at Long Beach, or going into the Navy Compression Chamber, which they use for divers and submariners. I later learned that Major Bratt's recognition of the symptoms and his quick arrangements with the Navy, and commandeering the C-130 from the runway probably saved my life. A Navy medic told me that one hour later I would have been dead.

"The next thing I remember was hearing an eerie voice say 'Take him back down the 168 feet.' A Navy compression chamber is a helluva place in which to wake up. The hollow sound of the voices, the clammy coldness, and the antiseptic white walls all contributed to the weird sensation.

"I was in that chamber for 38 hours, and all that time a Navy rigger/diver was in there with me. His name is William J. Biller, from the Long Beach Naval shipyard, and he had his cot right in there with me. He cared for me like a baby. The doctors were in and out throughout the ordeal, a great deal of which I do not recall. It was all very vague and hazy. But it was Bill Biller's humor that kept me going—man, how he could gripe about everything!

"I went in the chamber at 6 p.m., on a Tuesday, and came out at 8:30 on Thursday. Once I asked Bill what time it was—not what day—but what time. It didn't occur to me that it wasn't the same day.

"I also remember having a great desire for Jello, which the Navy willingly supplied in great quantities. I really didn't start coming around until a couple of hours before they let us out. When they helped me from the compression chamber I was weak and extremely tired.

"I spent the next five days on the Navy Hospital Ship, the complete medical checkup. The Navy treated me like a king, and I enjoyed walking on the deck in the salt air.

"The road never looked so good on the way back, and I've driven it many times.

"The quick thinking of Doctor Bratt and the wonderful efficiency of the Navy personnel saved my life. I'll never forget it."

Concerning the bends, there are several basic points that should be in every pilot's storehouse of knowledge, such as:

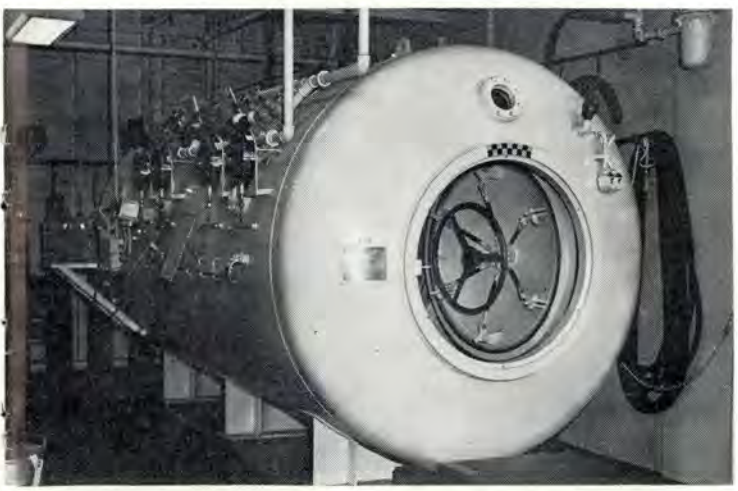
- Cause: Low atmospheric pressure.
- Susceptibility: Everyone — but particularly the stocky (fat) and older (over forty) individuals.
- Prevention: Good cockpit pressurization.
- Treatment: Land as soon as possible, and secure the immediate attention of an aviation medicine specialist (Flight Surgeon).
- Oxygen: Absolutely of no value after symptoms have started. (One hundred per cent oxygen can be used *before* flight for *several hours* with some benefit.)
- Delayed Reaction: Symptoms may disappear after descent to a lower altitude, then reappear hours later.

For hypoxia, there are also similar important points which everyone ought to be familiar with and undoubtedly most of you know them by heart. They are:

- Cause: Lack of sufficient oxygen under pressure.
- Susceptibility: Everyone.
- Prevention: Good cockpit pressurization backed up with supplemental oxygen as the cabin altitude goes above 10,000 feet.
- Treatment: Immediate descent and landing, combined with a switch of the oxygen regulator to 100 per cent.
- Pressurization: Loss of pressurization increases the risk of hypoxia at any altitude over 10,000 feet indicated.

Anyone who has completed a flying training course has been exposed to this information. It is mentioned again because there have been five near fatal episodes recently due to failure to follow the prescribed rule-of-thumb: "Stay under 25 with a leaky cabin." Although at present there are no USAF regulations or directives that prohibit flying an unpressurized bird as high as a pressurized one, good judgment dictates staying under 25. Why? 'Cause you need the pressure—that's why! ★

Photos: U.S. Navy Station, Long Beach, Calif.



Pressure chamber (above) at U.S. Navy Shipyard was used for emergency treatment of stricken Air Force MSgt. Fast action by USAF and Navy medics saved airman's life. MSgt. Weaklim recuperated aboard Navy Hospital Ship Haven.

While June might not be the month to discuss icing conditions, engine icing as opposed to structural icing can be a year-round problem. G. E. Jet Service News tells how you can keep off the ice.

Not long ago we (GE Jet Service News) presented an article on cold weather operation. Most of the information in that article was slanted toward ground operations.

Icing is one of the principal hazards of in-flight operations. Ignoring the problems of ice on wings and other aircraft surfaces, ice in a jet engine inlet can play havoc. It restricts the inlet to such an extent that air flow is reduced, exhaust gas temperature increases, and compressor stalls may occur. Also chunks of ice breaking loose can cause compressor and inlet guide vane damage.

In-flight icing is not peculiar to winter flying but may be aggravated due to the extensive cloudiness during the winter months.

Clouds are usually the key to icing. They consist of droplets of water, usually supercooled. On impact the supercooled droplets freeze and adhere to aircraft surfaces.

Vertical movement of moist air causes clouds to form. As the air rises, it expands and the temperature drops. When the temperature falls below the dew point of water, it condenses and forms clouds.

The super cooling effect, the phenomenon whereby the water remains in a liquid state even though the temperature is below the normal freezing temperature of 32 degrees F, is quite extensive.

The tendency to solidify is dependent upon the size of the water drops, and temperatures may be well below 32 degrees F before freezing occurs.

However, if the supercooled water is disturbed, as by an airplane flying through it, spontaneous freezing occurs. Some clouds do have ice crystals present in their makeup but these are of little danger.

There are two general types of clouds which must be considered—cumulo-form and strato-form.

The cumulo-form clouds are the towering, fluffy, thunderhead type. The strato-form clouds consist of layers and there may be several of these separated by clear air.

Cumulo-form clouds generally have a higher liquid water content than the strato-form clouds do. Because of the way they form, the cumulo-forms have an increasing liquid water content up to about 15,000 feet and then it falls off sharply as altitude increases.

The liquid water content of strato-form clouds shows a general downward trend as altitude increases. The higher the altitude at which strato-form clouds originate, the lower the liquid content.

If an airplane flies through these masses of supercooled water, icing may occur. The amount and type of icing depends, however, upon the outside air temperature and droplet size.

At temperatures below 10 degrees F, icing is not a severe problem. Any ice which may form is of the "spear" or "streamline" type. The formation of this type of ice is usually limited. The ice that does form is easily removed with anti-icing systems and engine damage is unlikely.

Between 10 degrees F and 24 degrees F, ice formation is of the intermediate type. It forms in relatively large pieces, is hard and is the most difficult type to remove with anti-icing. It may cause severe engine damage.

At temperatures above 24 degrees F, ice formations are of the mushroom type. This type is relatively easy to remove but it forms more rapidly than either of the other types. Sections of engine inlets can be bridged in a matter of seconds with this kind of icing.

Aircraft speed also contributes to the rate of ice formation. The icing rate is relatively constant up to an airspeed of about 250 knots. Above 250 knots the rate of icing increases.

Outside air temperatures above 32 degrees F do not preclude icing of engines. Inlet duct icing can occur with OAT as high as 41 degrees F without the formation of ice on the airplane external surfaces. At aircraft speeds below 250 knots, ram effect is low and little heat is generated. Pressure drops occur within the ducts with accompanying temperature drops. Freezing may occur within the ducts because ram effect heat is at a minimum.

Now what can be done to detect and prevent engine icing?

Ice formation on fixed inlet screens and inlet guide vanes of turbojet engines restricts inlet air flow. The compressor slows down, thrust decreases, and the fuel control senses the slow-down. It schedules a higher fuel flow. This causes exhaust gas temperature to climb. Therefore, when flying in icing conditions, suspect inlet ice if EGT begins increasing.

Three major factors, moisture content of clouds, temperature, and air speed, contribute to icing conditions. Change these and icing can be avoided.

- Avoid atmospheric icing conditions whenever possible. This means fly over, under, or around the clouds or fly at an altitude where the moisture content of the clouds is at a minimum.
- If the temperature is in the range of 32 degrees F to 41 degrees F, airspeed should be maintained above 250 knots to minimize inlet duct temperature drop.
- If icing is apparent on aircraft surfaces (temperature is below 32 degrees F), reduce airspeed if possible to slow down the rate of ice build-up; change altitude or vary the course.
- Whenever there is any possibility of icing conditions, carefully monitor exhaust gas temperature. If it starts climbing, you probably have an icing problem.
- Don't forget the engine anti-icing systems. It's much easier to prevent ice formations than it is to remove them after they're there.

Since specific procedures for operating during icing conditions vary among different aircraft, refer to the applicable technical orders for those procedures. ★

THE DECISION IS YOURS!

June is a good month for a vacation and in all probability many of you will be starting yours and perhaps some of you are on the road right now. The following letter by Major General John D. Stevenson, USAF, has a message which is apropos—whether you're driving to a place for your vacation or sharing the freeway with other people who have to drive to work.

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"As I write this I have just finished a telephone conversation with the Hamilton Air Force Base Commander, in which he informed me that three airmen have been killed in an automobile accident. The story is familiar—a souped-up car, high speed, an out-of-control crash. These young men, all under twenty, have taken their lives as surely as if they had put a pistol to their heads or slashed their wrists.

"It has always seemed gruesomely incongruous to me that the young, for whom life can hold so much and for such a long period, are so careless with this precious gift given by God; whereas the aged, with so little of life left, hold on to every moment of it with a fierce tenacity. Perhaps it is because they have taken time to contemplate DEATH. Perhaps we should take a little time to contemplate DEATH; perhaps if we did we wouldn't risk LIFE so haphazardly.

"Outside of the most serious of crimes, death is the one incident of our lives which is irretrievable. Any other act or event can usually be redeemed by time, resolve and effort. Not death. Once achieved there is no turning back; once achieved, everything else, our dreams, our goals, our anticipations all vanish. So for those who have read this far I ask a favor. For one minute—sixty seconds—contemplate death. Do you want it? Are you ready for it? If the answer is 'Yes' then please choose a means of achieving it which won't kill your buddies and endanger some innocent stranger. If the answer is 'No,' act like you want it to be 'NO.'

"The decision is yours."

Major General John D. Stevenson, Commander, 28th Air Div. (SAGE), Hamilton, AFB, Calif.

★ ★

CROSS COUNTRY NOTES

I stopped at Ent AFB the other day and learned that the Medicine Man had ordered ol' Coolstone to take it easy, in fact to get clean away from Operations. Haven't heard 'em say yet that it was "pilot error," anyway I know that our readers and you who read ADC's INTERCEPTOR Magazine join me in wishing the ol' troop a fast comback!

Just wonder how many times you troops have had something happen that flat shook you down to your socks and yet you're the only one who knows about it to this day. This is all leading up to reporting operational hazards.

I've just gone through a 3 month's file of OHR's and some of the stories that have been reported have the same ingredients as a major accident. The point is this: An accident was prevented and the hazard was reported. This put it out in the open so that action could be taken to prevent another occurrence. If they had been kept a deep dark secret, known only to a few, the same hazard could very well have caused a busted airplane and maybe we'd have lost a few of our Air Force people. It takes just a little time to write an OHR and, whether you think so or not, the time is well spent.

Let's look at a few and maybe you'll get the idea. After level-off at 8000 feet, the C-124 Aircraft Commander made a walk-around inspection of the cabin and noticed ether fumes coming from the cargo. The source of fumes was traced to six tool boxes and spare part kits. There were no special handling tags attached to these kits. The kits were opened and each contained 4 one-dozen packages of engine start fluid capsules—a flammable explosive—many of which were leaking. Dash One procedures were implemented to prevent accumulation of fumes in the cabin and all heaters were cut off. Transport Control Center (TCC) was advised of the situation. They advised to jettison material if fumes were accumulating. The crew jettisoned 4 one-dozen packages of capsules. The remaining capsules were removed from the kits and placed in a position to minimize accumulation of fumes if they started to leak. An ATC clearance was requested and received to descend to minimum en route altitude 4000 feet to relieve some of the pressure on the capsules. No further leakage was detected at the new altitude on remaining capsules.

In addition to this unmarked dangerous cargo, the aircraft was carrying a 36,000-pound oxygen trailer containing oxygen gas and one box of radioactive material.

In going through the OHRs the number of reports involving single aircraft flying through formations of refueling aircraft is downright alarming. Take a look at the accompanying chart from the En Route Supplement. Each of the rectangles is a SAC or TAC high altitude refueling area. It's pretty easy to see that you can hardly go across country at high altitudes without flying through one of these areas, but *you don't have to fly through a tanker refueling a flight of fighters.* Remember, they aren't watching for you 'cause they're busy flying some pretty darn good formation. Another thing, the refuelers aren't in a position to take evasive action.

Now it's not the assigned (hard) altitude troops that are causing the trouble since FAA insures positive separation. But if you go whistling through VFR or VFR on top, while FAA should provide "traffic advisories," it's primarily a "see and be seen" concept. At night "see and be seen" can be rather indefinite and this is the time that a number of this type incident are happening.

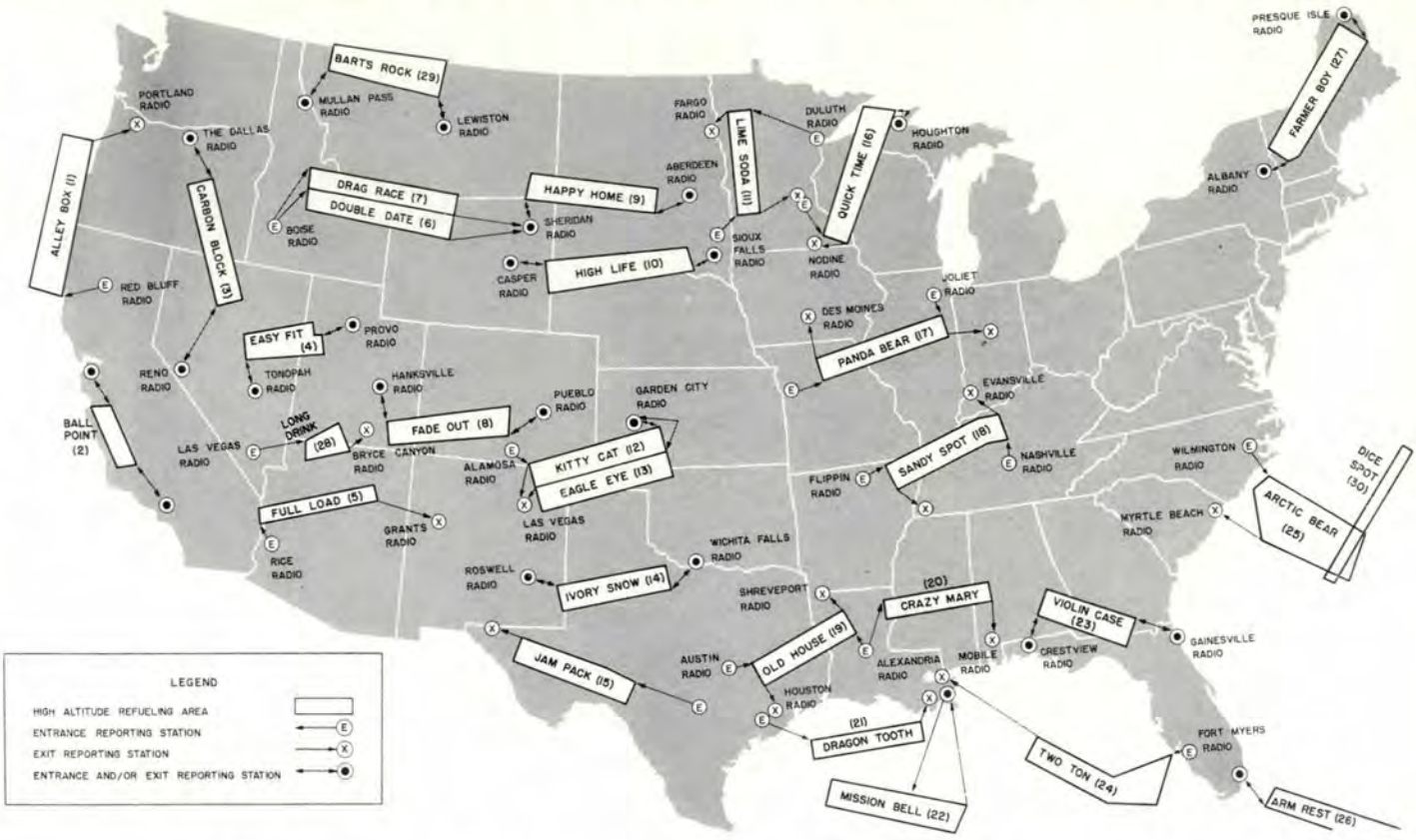
What's the answer? Eventually it could mean that any time you go through a refueling area you would have to have a hard altitude. Or it could mean if you're VFR/Top you divert around the areas. In the meantime, why not make notations on the 21A when you enter and leave one of the refueling areas so you can be particularly cautious. It's also possible to flight plan around a few. You might even consider flying above or below the altitudes at which refueling operations are conducted.

I seem to be on an OHR kick today and just as I thought "thirty" on the high altitude refueling bit, in comes a report labeled "SOHR." It's an OHR all right, but it's a Serious one! It involves an RB-47 (overseas) on a three-hour mission to Moron Air Base, Spain. During takeoff roll, while passing decision speed, the Commander noted he was holding left aileron as though correcting for a left crosswind. Winds were reported variable at less than five knots. Being committed he continued his takeoff, and at takeoff speed was holding approximately one-half aileron. At flap retraction speed he was holding more than three quarters left aileron. As flaps were retracted, normal trim was regained. Takeoff was made as a highly qualified IP monitored the controls in the back seat.

Upon arriving in the Moron AB area, the IP declared an emergency, and another qualified B-47 IP with previous experience in this type of trouble, was placed in the tower. While base emergency procedures were being complied with, the aircraft commander tried minimum airspeed checks. At 20 per cent flaps lateral instability was noticeable. At 30 per cent lateral control was difficult, and the commander decided on a no-flap landing.

Further minimum airspeed checks were made to determine approach and best flare speeds. During one of these checks the right outrigger wouldn't retract. The gear was then lowered and left in the down-and-locked

FROM REX RILEY



position, and fuel was burned off until the gross weight reached 110,000 pounds.

A penetration was made with a familiarization pass at the field with GCA monitor. Anticipating difficulty in raising the nose during flare, the fuel differential was raised to 5500 pounds. With this differential the B-47 was almost in a landing attitude on final approach. During power reduction, little adjustment was necessary to reach landing attitude. When the weight reached 105,000 pounds, with 20,000 pounds of fuel aboard, the aircraft made a full stop GCA. The landing was completed with no problems. The weather was clear, 15 miles plus visibility, light winds 210/10k.

Inspection of the right flap area showed that the right flaperon carriage flap cam assembly was missing. There was no evidence of tampering; however, the following day photographs were made of the flaperon, and the B-47's home base was requested to check its ramp and runway areas for the unit.

The important point here, I think, is that this is a classic example of a flight crew and supervisory personnel doing everything right—from a cool and correct evaluation of the flight emergency to the use of a qualified pilot in the tower who had previously experienced the same problem. Also, if it weren't for the OHR, the problem might have gone unnoticed.

In summarizing, first I'd like to express commendation to the Commander, Colonel Edward D. Edwards, and his IP, Major Everett M. Worthington, for the fine manner in which both handled this B-47 during the emergency. Sometimes even when pilots and their crewmembers do everything right—follow the letter of the Handbook—things go wrong!

Getting back to the OHR, the following recommendation is made: A one-time inspection of flaperon carriage flap cam assembly as per T.O. 1B-47B-4, Figure 7, Illustration B.

A B-57 departed McDill AFB for Kelly AFB, IFR with a hard altitude of 35,000. Fifty-eight miles west of Houston, the B-57 pilot spotted an eastbound T-33 passing about 100 yards off his right wing. The T-33 called San Antonio Center and reported a near miss. Both the B-57 and the T-33 pilots had 29.92 set on their altimeters. Here's the kick: While the B-57 pilot was flying 35,000 feet indicated, the T-33 pilot was flying 34,000 feet indicated. How could this happen? Simple—one or both of the aircraft didn't have an altimeter correction card installed and probably one or both pilots hadn't figured the pressure altitude error inherent to the pitot static system. (The Dash Ones show you how to obtain the correction data.) Don't *you* get caught staring eyeball-to-eyeball at some clown just because you *think* you have a 1000-foot separation.

A T-33 flight was aborted because the tiptanks fed fuel when the switch was off. When the front cockpit electrical panel was lowered, a loose wire was found on the tiptank fuel electrical switch and a pair of needle nose pliers was found lying on the wire handle. It must have been plain flat luck that a fire on an electrical short didn't occur.

It's pretty obvious from letters we've received and listening to pilots arguing the points that the system of filing flight plans, getting weather forecasts and so forth, when departing "P" or "PC" fields isn't understood too well. And you know what? The whole bit is in the En Route Supplement. You have to dig it out though, and you've got to look at more than one section. Let's go over the information you need to know.

• Flights departing "P" and "PC" Fields—File flight plan with FAA Flight Service. If IFR within control zone or area get ARTC clearance before takeoff. If there is no FAA FS on the airport, call the nearest FAA Flight Service Station by long distance telephone collect. Fly VFR to the nearest FAA radio and file flight plan ONLY when unable to comply with the above procedure.

• Filing of Flight Plan—Pilots filing flight plans or arrival reports with FAA Flight Service will do so by visiting or calling an FAA station. Such messages WILL NOT be filed with FAA control towers except when no other means of communication is available.

The following information is required for clearance from non-military airports.

1. VFR, DVFR or IFR.
2. Aircraft identification.
3. Type of aircraft.
4. TAS.
5. Point of departure.
6. Cruising altitude(s) (mandatory for IFR).
7. Route of flight.
8. Point of destination.
9. Time of departure.
10. Estimated time en route.
11. Alternate airport (IFR only).
12. Hours and minutes of fuel on board.
13. Radio equipment data.
14. Pilot's last name, aeronautical rating and instrument qualifications.
15. Highest grade aboard (Col or USN Capt or higher).
16. Remarks "DV honor code, air evacuation load information, and coded data pertinent to control of passengers and/or cargo."

• Closing Flight Plan at "P" and "PC" Fields—Close flight plan with FAA Flight Service through nearest FAA radio after landing. If IFR make certain ARTC receives your arrival message. If unable to close by above method, call FAA Flight Service by long distance telephone, collect.

Now how about getting weather? Sure enough if you look under "Radar Advisory and USAF WX Briefing Facility Chart" the "word" is there.

• Weather Briefing Facility—If USAF weather forecast service is desired, request you utilize military flight service communications, if available, otherwise call "Government Collect" to the USAF Weather Briefing Facility within whose area you are located. This change results from the closing of the Military Flight Service Centers.

USAF WEATHER BRIEFING FACILITY

Location	Phone Nr.
Olmsted AFB, Pa.	Whitney 4-4681 or 4-4682 (Middletown, Pa.)
Maxwell AFB, Ala.	265-0648 (Montgomery, Ala.)
W-P AFB, Ohio	Clearwater 4-2461 or 4-2971 (Dayton, Ohio)
Carswell AFB, Tex.	Pershing 7-7251 or 7-7252 (Fort Worth, Tex.)
Lowry AFB, Colo.	De-3-5560 (Denver, Colo.)
Hamilton AFB, Calif.	Glenwood 4-2461 (San Rafael, Calif.)

So there you have it—almost, that is. What about NOTAMs for your destination and alternate?

The picture isn't too good and it is anticipated it will cause a real problem, particularly for Air National Guard and Air Force Reserve pilots who operate out of non-Air Force bases. Anyway, here's what is available: Each FAA Flight Service Station maintains a NOTAM file for Air Force bases within a 400-mile radius of the Flight Service Center. This service is available on the interphone drop. What if you're going outside this 400-mile radius? FAA says you can get NOTAM information outside this area if sufficient time (?) is provided before departure.

Here's part of a message just received from Hqs: "The present ZI NOTAM system which is outdated, inadequate, thus creating hazardous situations, is being evaluated by a working group. Entire system will be reviewed and applicable directives rewritten enforcing immediate improvements." More about this later.

By now your base may have the most up to date information to improve altimeter accuracy since this program was scheduled for completion a month ago. You'll recall the letter from Hq USAF (page 28, November 1960), and my special item on page 27 of the January 1961 issue. The letter quoted below is a follow-up of correspondence between the 127th Fighter Interceptor Squadron (ANG) McConnell AFB, and the Editor of the TIG Brief, Hq USAF:

"We have received information from the Air Force Logistics Command (formerly AMC) regarding its progress in the program to improve altimeter accuracy in present USAF aircraft. Up-to-date calibrated tables and other information applicable to specific types of aircraft, including C-47, T-33A, and F-86L, have been developed. These will be incorporated in the Dash Two series of Organizational Maintenance Handbooks and in Time Compliance Technical Orders. The TCTOs will direct that the combined altimeter error and static system error be entered on AFTO Form 146 in Card Holder FSC 6610-778-7389 and installed in the aircraft. This will include the C-47 which is not presently covered. The information in the Pilot's Handbook on altimeter settings may be used until such time as the more specific information in the Tech Orders is available. ★

FALLOUT

LETTERS TO THE EDITOR

A Three-Year Safety Record

Our unit's three-year safety record was wrecked recently when a pilot of an F-100A landed his aircraft with the gear in the wells. Two days later I read an almost verbatim account of what transpired in Col. Wilson's article entitled "Free Cure for Expensive Habits" on page 5 of the December issue. To emphasize the similarity of the two accidents, here are some extracts from the report furnished Hq Air Defense Command. I assure you that the information contained in this report was accumulated *before* the pilot or I read your article.

"This aircraft was No. 2 in a flight that progressed routinely to an airbase where a simulated ADF penetration and GCA were completed. Weather en route was excellent; terminal weather was reported as clear, visibility 15 miles, wind calm. Following the GCA, the two F-100s entered landing traffic for a normal overhead approach to runway 34. Landing pattern was to the right. From the flight leader's point of view, the pattern was a normal one, with the exception that his final turn was a little tighter than normal. When he requested tower clearance for a left turn off the runway, he was informed that the turn was approved, and that No. 2 aircraft had landed wheels up. Evidently the No. 2 pilot just failed to lower the landing gear since post-accident functional checks of the gear and warning systems revealed no malfunctions of either. Also, a number of witnesses attested that the aircraft flew down the final approach with the gear up.

"Pilot distractions and other unusual conditions existed. For instance, this accident occurred about 9 minutes after official sunset and while visibility was good, the shade of daylight was such that the pilot had to make a special effort to keep the leader in sight. The dusk factor also caused him to ponder, on the downwind leg, whether to turn on the instrument panel or landing lights. He elected not to use either, but he *thinks* that he reached up and touched the landing light switch. It is adjacent to the gear handle. It also ocurred to him while on the downwind leg that this would be the first time he'd ever landed the '100 without using the drag chute. Another thought was that his leader's pattern was a little tighter than he himself normally flew, and he adjusted his accordingly. The pattern was right hand, whereas all patterns at home base are to the left.

"The pilot believes that he made his base leg transmission of 'gear down, pressure up.' He remembers checking the hydraulic pressure; he also remembers that the tower didn't acknowledge his call. Although this pilot has trained himself to recheck his gear on final, he didn't do it this time. Even as he was sliding down the runway, he *thought* he had landed on the wheels. The unusual swerving of the aircraft was attributed initially to a collapsed gear strut.

"The deficiencies in systems or procedures reported were:

- The landing gear warning horn in the F-100A is virtually inaudible, particularly when combined with the new HGU-4P helmet. (Pilots of this squadron have this type helmet.) The aural warning device in the F-100F is much improved over that in the "A" model.
- The warning light in the gear handle cannot be seen by most pilots without making a definite effort to bend forward to look at it.

"The Board's finding, of course, was that this pilot failed to lower the landing gear. The contributing factor given was that the landing gear warning system is inadequate.

"The Board recommended that the combination of factors responsible for this accident be emphasized to all unit pilots operating the F-100A. Also, that an Unsatisfactory Report be submitted on the landing gear warning horn and light."

I'd like to mention two other points:

- First, my recommendations went further than those contained in the report to ADC.
- Second, the Board's findings differ from mine. Nevertheless, I still feel that the pilot just plain forgot to lower the gear.

The preceding paragraphs, while reporting an ironical coincidence, primarily are intended as a lead-up to an enthusiastic indorsement of your random counter idea. It's inexpensive, which helps, and is so simple that it should work. Its value would be increased if control tower personnel were required to ask for the gear code in the event the pilot did not voluntarily transmit it.

I hope these comments may prove useful.

Maj. Ivan B. Holloman
AF Sr. Advisor, Connecticut ANG
Bradley Field, Windsor Locks, Conn.

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Free Cure for Expensive Habits

After reading the article "Free Cure For Expensive Habits" in the December issue and seeing how much confusion could arise out of using such code numbers, the idea for the following seemed to be less confusing to use:

Why not incorporate in conjunction with the gear warning horn and indicator system, a flasher light, that would flash an indication before the pilot of an unsafe gear when making an approach? He would be more apt to realize the warning light meant something wasn't right even if his mind was on the check being made over his earphones. It's worth a try anyway.

L. F. Gallagher
Quality Control Inspector
Wright-Patterson AFB, Ohio

So far, nearly everyone likes the MA-1 system, particularly for the later Century models. Some, however, believe the flashing light would work better than the steady light in present systems. While all major commands have officially commented on the use of code numbers in the selsyn windows, the system hasn't actually been enthusiastically endorsed, command-wise. The next step then is, who'll be first to initiate the requirement for older aircraft?

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Old D-Rings, New T-Handles

Reference is made to the article on page 5 of the February issue concerning replacement of the D-ring on the automatic seat pack parachute with the new T-handle. The article states that a person with large fingers or wearing gloves might inadvertently become semi-permanently attached to the new T-handle with flying ripcord. This is because the new design has two large holes which are for attaching the zero lanyard, but look like finger holes.

I would like to suggest that this new T-handle be redesigned so that a small hole is provided for attachment of the zero lanyard. This minor change might eliminate the risk of the mistake mentioned above.

William B. Bovard
36 White Birch Avenue
Fairview, Mass.

Can't agree with you, Mr. Bovard. The primary reason for the two holes in the T-handle is for quick and easy hookup of the zero lanyard. Making the holes smaller might interfere with this process, and this we don't want! Just a few days ago a T-33 pilot had to go at 400 feet. He did—but without the zero lanyard hooked up. He was killed. The front seat pilot got another 100 or so by zooming, had his lanyard hooked up and received only minor injuries.

NOW AVAILABLE

Movies

Flight and missile safety, emergency aircraft procedures, search and rescue scanning techniques are some of the subjects depicted in AF films now available for loan through the Film Library Service. The address: Air Force Film Library Center, 8900 South Broadway, St. Louis 25, Missouri.

- FTA 495a. A 9½ min. black & white film about RF-101 emergency procedures involving engine failure on takeoff, fire warnings and so on.
- FTA 492c. A 10 min. black & white film depicting emergency procedures involving C-124 aircraft—engine and prop malfunctions.
- FTA 493a. A 15 min. black & white film about Pilot's preflight inspection of C-123B aircraft.
- FTA 493b. A 10 min. black & white film about C-123B aircrew emergency procedures.
- TF 1-5256b. A 19½ min. color film covering basic principles of two-fighter and fluid-four formations.
- FTA 443a. A 10 min. black & white film showing safety precautions involving transportation of the ATLAS Missile.
- FTA 500. A 15½ min. color film on airlifting the ATLAS in C-133B aircraft.
- FTA 447. A 9½ min. color film showing how missile checkout equipment is tested for proper operating condition.
- SFP 645. A 23 min. color film of missile safety at Vandenberg AFB.
- TF 1-5362. A 7 min. color film of systematic scanning and sighting during search operations. Also available is a 26 min. color film showing the following outstanding USAF activities:
- The X-15 climbs 136,500 feet.
- Capt. Joseph Kittinger bails out from gondola at 102,800 feet.
- Discoverer 14 capsule recovered in midair.
- SAC holds bombing, refueling, navigation and electronics countermeasures competition.
- TAC holds bomb-strike exercise (Mobile Yoke).
- MATS hauls record lift of troops and cargo to Puerto Rico.
- Minuteman mobile train makes test run.
- The U-2 flies high altitude sampling mission.
- ATLAS makes record flight of 9000 miles.

*U. S. GOVERNMENT PRINTING OFFICE 571218