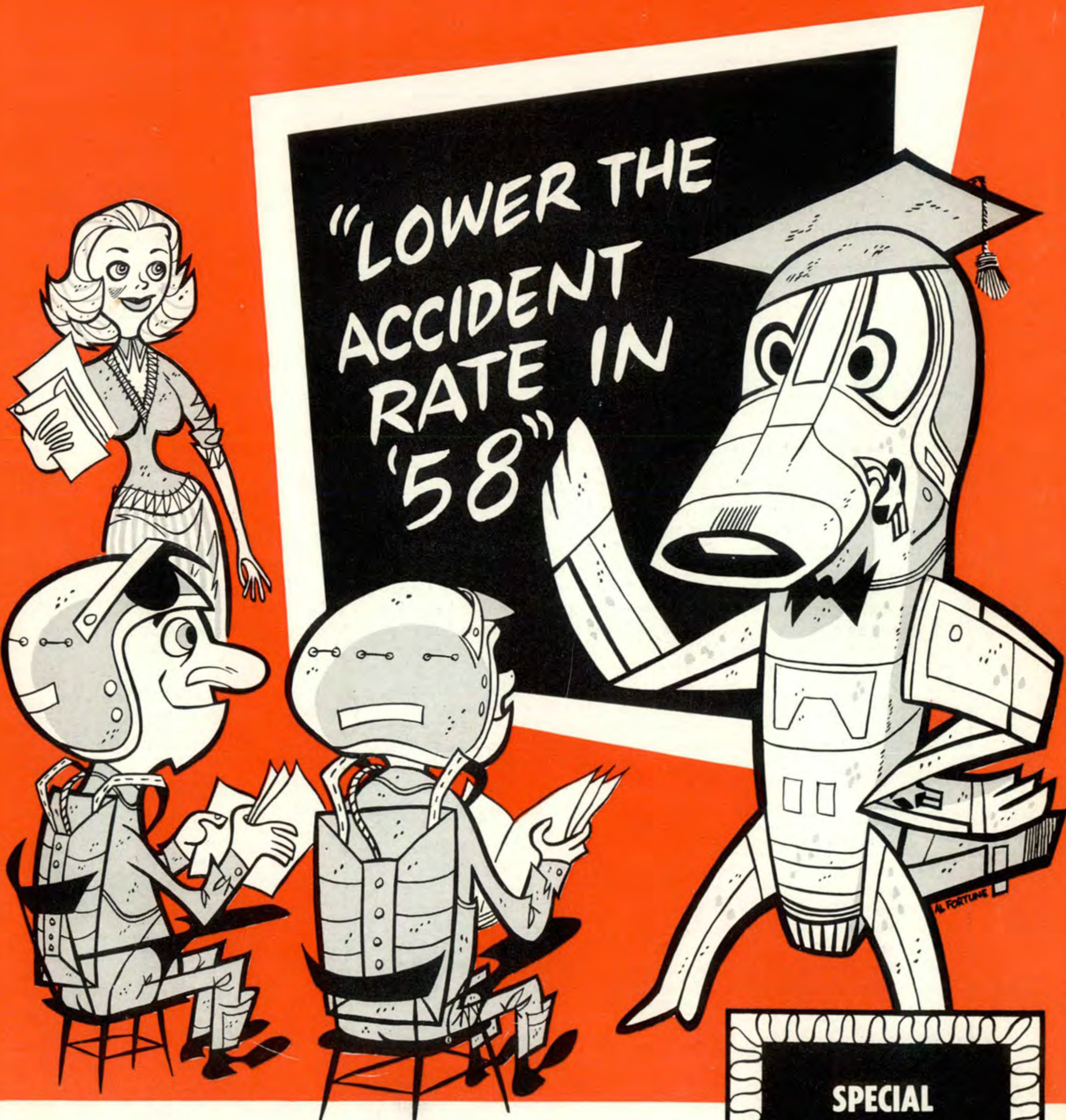
MAY 1958

FLYING SAFETY

UNITED STATES AIR FORCE



EDUCATION

SCHOOL DAZE • SCHOOL DAYS • DEAR OLD GOLDEN RULE DAYS • SCHOOL DAY

SPECIAL SUPPLEMENT PAGES 15 TO 30

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The winner of the Daedalian Trophy for the year 1957 has just been announced as FLYING SAFETY goes to press. The winner: The Continental Air Command, CONAC had the lowest adjusted accident rate of any major Air Command, flying more than 100,000 hours. Computation was made in accordance with AFR 35-4. Full story next month. . . . Dr. Thomas F. Staton, author of the lead article in this Education issue, is no stranger to the officers who've attended Air University since 1946. For my money his appearance at the rostrum was an occasion for rejoicing. I knew that I could count on an enjoyable and highly informative 50 minutes when he strode onto the stage. You should find some good items for thought in his welcome contribution. . . . The T-Bird is still very much with us. Lockheed has just reported another Air Force order. . . . Here's a reminder that hail can do a lot of damage in a couple of minutes. A fellow who tested it recently ran up a bill of $613.20 in ninety seconds. The weather portion of Form 175 warned of a ¼-inch hail, above 6000 feet. Our bright one chose to climb right through the stuff. . . . Wasn't bad enough that we had 39 taxi accidents last year. Already have a classic case of 'wingtip meeting utility pole,' while the driver of a big iron bird had a fixation on the Follow Me vehicle. Will we have to start towing these guys to the parking area? We still have pilots and mechanics taxiing behind other aircraft in runup position. Two badly bent aircraft this year. Strictly a common-sense item, yet it happens. And some pilots still don't believe that frost on a C-45 can spoil a takeoff. The last one who tried it ended up on his belly in the overrun. He didn't even bother to use all of the runway—just took off from the intersection.

Remember the Rate!

Vernon R Stutts

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The Inspector General USAF
Department of the Air Force

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The Inspector General USAF
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CROSS FEED

LETTERS TO THE EDITOR

Esprit de Corps—

I've been following with interest and approval the current flying safety program. During the past twelve months I have read all of every FSO kit and have listened to three presentations by General Caldara.

There is, I think, a state of mind that is a prerequisite to an accident-free flying unit. You have hit all around it but no one has tied the loose ends together. I would describe it as having all the troops want to avoid accidents. One can talk about personal survival. Some pilots will always risk their own neck. One can preach dollar costs. Some pilots will never fully comprehend that 'Uncle Sugar' does not have a bottomless sugar barrel. There is one thing that we all fear and that is the pointed finger from our buddies. . . "You! Ruined or almost ruined the record of the best unit in the Air Force!" True, all pilots should have pride in the Air Force. Let's face it: The Air Force is just too big for that. Therefore, it is up to the Commander to instill 'Esprit de Corps' (if you will) in the pilots assigned to fly with his organization.

I have noted that units with a low accident record have one thing in common. Pride in *their* unit. They don't need a Flying Safety Officer or program as such. Each man from the Commander to the newest "troop" knows he is a cog in the unit's machinery. Each man is afraid of what his buddies will think if he fails. Before you know it, everyone's a flying safety official. They *want* flying safety.

Lt. Col. Bill E. Myers
AF Adviser, 197th FIS
Arizona Air National Guard

• • •

Lt. Col. Riley

My sincerest congratulations on the promotion of Major Rex Riley to Lt. Colonel. His career has been brilliant in the promotion of Flight Safety and in his new position the Air Force will benefit immeasurably in the years to come. Isn't it wonderful what can come out of a bottle of ink?

M/Sgt. T. O. O'Toole
Operation & Service News
North American Aviation Inc

• • •

"Supersonic Sid"

I wonder how many other crewmembers have found out the hard way that survival equipment generally thought of as being "almost as good," in fact, a suitable substitute for a standard item, wasn't any good at all? We have one such incident for the record. It's about plain ol' matches, an ordinary but essential item.

Since the standard matches "Ordinary Water Resistant, Spec. MIL-M-1512," were not on hand at the time of this particular flight, normal kitchen matches had been dipped in ordinary candle wax for waterproofing and were included in the MOD-A-1 Survival Kit.

Things seemed okay and we all lived in our "Ivory Tower," believing that we had fire-making capability should the need arise.

The need did arise. Our intrepid "Supersonic Sid" was forced to jump one day. He landed in four feet of snow just ashore from Lake Superior in January—real cool, but lucky. "Sid" was unhurt and there was plenty of firewood. He had his survival kit complete with the "reasonable facsimile" matches, and for good measure, a full pack of cigarettes! All seemed well—but for one thing: Thirty matches in a row wouldn't light.

For some reason, ordinary candle wax fused the chemical heads on the matches and—well, they were useless.

Capt. Charles K. Black
507th Ftr Gp (ADC)
Kinross AFB Michigan

P. S. Fortunately, now "Supersonic Sid" was found and picked up by rescue helicopter within an hour and a half, and "mentioned" the faulty matches.

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High Drag Strip

I've just read the article in your March issue about the B-58 that ran off the side of the runway and passed over the storm drains, yet there was no damage to the aircraft. The survey team did a good job in pointing out a way to prevent an accident, and in this case, saving a valuable aircraft and its men.

This article made me think of a suggestion of using a high drag strip at the end and off the side of each main runway, for stopping such runaway aircraft. This method has recently been installed on the "Ridge Route" (Highway 99) for stopping heavy trucks that have lost their brakes.

A short section of road angles slightly off the main highway and is spread evenly with what appears to be light gravel, at a depth of six to twelve inches. It acts like a heavy drag such as the B-58 aircraft in the dirt.

It is possible that the damage to the aircraft would be less than that of any arresting gear, or no arresting gear at all.

Maj. Harry E. Olsen, USAFRes
San Leandro, Calif.

• • •

Check 'em before takeoff

After reading a Crossfeed item by T/Sgt. Chancellor in the October, 1957, issue, I was left with the impression that it is normal procedure to check the jet publications after you are airborne. He writes, "A pilot will go out to his aircraft, make his check, climb aboard and take off. When he checks his Pilot's Handbook, and finds one or more pages missing, maybe he wonders what has happened."

To me, I have no sympathy for any pilot who should check his publications after he is airborne. This is slightly ridiculous to say the least, but it is true to a great extent that we have jet pilots flying extensive IFR missions who forget this vital procedure or those who are too assuming.

A more psychological approach to this problem would be to have the pilot check his publications *before* becoming airborne as part of the preflight check. This may be nitpicking but it is as the Sergeant pointed out, a tremendous problem maintaining the publications within the aircraft.

The importance of checking these publications is still prevalent and the duty and responsibility not only lies with the crew chief but should be the respective pilots' SOP in flying any mission, local, cross-country and otherwise. Not only a check of the publication but also of the date of that publication is as important in performing a safe flight as any other part of a pilot's checklist.

In view of the present austerity program, all pilots taking the charts out of the aircraft should have the unpleasant task of replacing them, both financially and physically. These people can be found by good pre-flight and post-flight inspections.

Incidentally, there are only two handbooks containing instrument approaches in the jet aircraft, East and West Jet Letdown Charts or the Jet PHACUS. We have no low-altitude approach charts available in jet aircraft.

1st Lt Jimmy C. Brown
3557th CC Tng Sq (Academic)
Perrin AFB, Texas

You're so right, Lieutenant. Those "assumptions can kill ya'." Perhaps you've read about L-R-R-H in the April books?

• • •

Wrench Slinger

Musing of Maintenance Minds!

Aircrews fly for a year without accident and receive a Flying Safety Award. This is "good-goes" under the heading of Morale. It is recognition. Aircrews perform valiantly under adverse conditions, exercise due caution and follow proper procedures, Good Show! Everyone knows this is flying safety.

Comes the flying safety meetings, the word is spoken: "Everybody, repeat, Everybody is a part of flying safety. Especially maintenance, how could these birds fly if maintenance doesn't doctor up the sick ones?"

Now this is said without fear of dissension, and maintenance types are the last to argue the point. But how about the old adage. "An ounce of prevention is worth a pound of cure?" A good, sharp wrench slinger does a little research and finds the sore spot. Out goes the UR so that other organizations will have the answer in time to stop potential accidents.

But what happened to our morale program of recognition? As a maintenance man for Lo! these many years, I'm still waiting to see the first Flying Safety Award for Maintenance people. How come?

Capt. Vahan Chapian, USAF
Maintenance Officer
1004th Fltline Maintron
Andrews AFB.

You needn't feel left out, Captain. Actually the Bi-annual Flight Safety Awards are issued to units as a whole and this, of course, includes all Maintenance personnel. We don't believe there is a pilot in the Air Force who doesn't acknowledge his debt to the men on the line. None of the outfits publicized as award winners could have made the team without a superior maintenance history to back it up.

An educational adviser believes that there are three quirks of human nature that make the job of education for flying safety difficult. First, there's a tendency to . . .

Go For Broke

Dr. Thomas F. Staton, Educational Adviser, Air University.

There are three quirks of human nature that make the job of education for flying safety difficult. These quirks cause a large portion of flying accidents. To be effective, any program of flying safety must take these quirks into consideration. It must direct its efforts toward counterbalancing their suicidal tendencies, rather than merely putting out adequate information on principles and procedures.

The first of these suicidal quirks of human nature is: Men tend to be prouder of their willingness to take a chance, to "go for broke," than of their caution, conservatism and carefulness.

During my early days as Educational Adviser with Air University I got around. For two or three years I did not keep a room on a permanent basis at all. A closet off my office held my clothes. VOQ's at different bases were my home. My laundry was scattered from Tyndall to Randolph, from Maxwell to Wright-Pat. I picked it up and left more as I made my periodic visits to do any educational advising that was wanted.

This was during the time immediately after WW II when pilots were pouring back from overseas, hot from combat, and, often, impatiently waiting to return to civilian life. Any spare man with wings who happened to be around a base was my pilot on a flight to my next destination.

I had some interesting experiences on some of the several hundred flights I made under those circumstances. I remember these three.

The time we aborted three times with the same A-26 for mechanical failures. The last abort was due to an electrical fire that broke out an instant after we became airborne. We triumphantly made our flight on the fourth trial, all in the same morning.

Another was the time all flyable planes were evacuated on a hurricane warning except one, in which a volunteer pilot slipped me out the next morning, dodging the storm. This enabled me to give two lectures at different bases the same day.

And then that Sunday morning the pilot showed up weak and shaky from what I judged to have been a hard Saturday night. (The flight was long enough for him to be in pretty good shape by the time he would have to land that A-26, I figured.)

I am bound to have had other types of experiences, too; times when I said, "Uh Uh. I'm not going up in THAT weather!" Times I decided to stay over until the next day when I learned that if I flew today my pilot would be making his first flight in a C-45. But those experiences are vague, fuzzy. I can't remember the ones where I played it cautious nearly as vividly as the ones where I took the devil-may-care attitude, "If you think you can fly it, I know I can ride it with you!"

You can confirm the universality of this quirk by examining your own pattern of thinking and feeling. When a bunch of pilots are shooting the bull, how often do you regale the group with stories of the times you cancelled a flight because of weather. Then, about the number of times you tell about flying 'er in when even sparrows were walking?

There is a tendency to glorify the cowboy more than the store clerk, the fullback more than the Phi Beta Kappa, and the man on the flying trapeze more than the man who wrote the music for his act. These are all examples of this same human tendency to romanticize the risk-taker more than the man who figures ways to avoid the risk.

In their hearts, men feel some pride in being so sure of their ability or so casual about death that they will play Russian Roulette with a plane when they really want to get somewhere. Impelled by a sense of duty, a love of life and a regard for their families they will, on occasion, let discretion have the better part of valor. But they do not remember those occasions with the affection they reserve for the times they brought 'er in, with a 100-foot ceiling, 1/16 mile visibility and no GCA!

The consequence: Caution and carefulness have to compete against a subconscious tendency to regard them as a form of timidity unworthy of a military man.

Suicidal quirk number two is: Men tend to use their powers of logic and reasoning to find justification for the things they want to do rather than to determine what is best to do. As a pilot struggles to resolve the conflict between a knowledge of what is the safest thing to do and what he is inclined to do, he may undertake to think the problem through to a best solution. But because of quirk number two, his thinking is not so much to determine which is the most sensible thing to do (he already knows that) but to figure out a way of making what he wants to do, seem sensible.

"Tomorrow is Jimmy's birthday. My job keeps me away from him too much anyway. I'm a pretty poor father if I won't fly when I'm a little tired to get to his party." "We've got to trust our NCOs if we expect them to assume responsibility. If I trust my crew chief so little that I have to check the plane myself, I'd better get a new crew chief."

Both these instances display irrational self-justifications, but man in the aggregate can be called a rational creature only by the most generous interpretation of "rational." Any psychologist will confirm this fact. Basically, man is a creature of emotions, feelings, impulses and unrecognized urges, all kept under precarious control by a flimsy bridle of intelligence, rationality and logic, and the painful whip of authority and social pressure.

Education which goes no deeper than his intellect will assuredly guide him and influence his behavior in matters on which he has no especial feeling one way or the other. But when man's basic nature, his fundamental urges and strong desires, pull him toward one decision and his education inclines him toward another, all too frequently he will go with his feelings. He will tend to go with his natural inclinations unless his education has gone deeper than intellectual awareness of what is right and wrong, and produced in him a profound emotional loyalty to the facts and principles he learned. This is one of the jobs of flying safety education.

The third widow-producing quirk in human nature is the fact that: Men will risk losses out of all proportion to possible gains if they feel that through their skill and luck they can probably avoid the loss. At a time when any form of theft involving more than a few pennies was a gallows offense in England, pickpockets industriously plied their trade among the crowds which gathered to watch the execution of thieves. They would risk their lives for a few pennies because they figured they were so clever they would not be caught. Silly?

How about the motorist who cuts sharply in front of an oncoming car to save waiting ten seconds to make a left turn? How about the pilot who didn't bother to pick up a bailout bottle because he didn't intend to fly above 30,000 feet? In all honesty, he is highly unlikely to need it, but if he is not afraid of appearing old-womanish or if he doesn't talk himself into believing that precautions are not really necessary, a few seconds' effort may save his life.

Then there is the pilot who knows his landing approach is a little off, but figures he can make it without going around again. A few minutes of flying time is saved if he succeeds. If he fails—scratch one pilot. No gambler would buck odds like that when he could so easily make the more favorable to him, but people do with their lives.

My observation and study convinces me that the Air Force Flying Safety Program leaves little to be desired in the accuracy and completeness of its information and guidance. Its methods of disseminating information and publicizing safety procedures also impress me as being about all that could be asked for.

And yet accidents resulting from violations of principles of flying safety do happen.

Why?

In light of the extensiveness, intensity and thoroughness of the Air Force's educational program, I do not believe for one minute that half of the violations of flying safety are due to ignorance. My study has led me to the conclusion that the majority of accidents due to pilot error are caused by pilots failing to do what they know they ought to do, not by their ignorance of what they ought to do.

Is there a commander anywhere who has not asked himself despairingly, upon reading the report of investigation on one of his men killed through violation of flying safety measures, "WHY did he do it? He KNEW better. Why? Why? WHY?"

If they know better and still do it, why, indeed? The answer: Human nature's three suicidal quirks. He knew better, but he'd rather take a chance than risk seeming "chicken." He knew better, but he talked himself into doing it that way because he WANTED to do it that way. He knew better but he thought he would be able to get by and wouldn't take the trouble to do it right.

Any program of flying safety education that is to be effective must be designed in light of those three quirks in the nature of man. Just educating people as to what is the safe, the proper, thing to do is futile if the education does not reach down into the emotional structure of the person. It must create a "safety prejudice" so strong and so ingrained in his nature that it outweighs the three combined quirks which are nature's prime fool-killers.

Here is a psychologist's proposal for deepening flying safety education below the intellectual level. It's a proposal for creating an emotionalized attachment to the principles and procedures of flying safety instead of mere mental awareness of them.

• *Commanders:* Make it obvious to your pilots that flying safety is one of your pet hobbies. There are officers who will knock themselves out trying to read every nuance of the Old Man's mind in preparing a memo for him.

Uniform discipline is difficult to pin to a specific result.

An immediate respected authority is effective in flying safety.

They will go to any extreme to avoid giving him reason to criticize or reprimand them. Yet, they'll sometimes disregard flying safety measures as if their lives were of the lightest importance to them.

If pilots know their commander is red hot on the subject of flying safety they become more safety-conscious. For instance, the Old Man posts a pilot roster-flying time calendar on the bulletin board, and has every pilot's distribution of flying time each month regularly recorded thereon. He conspicuously stops every day to check the pattern of flying time of his pilots. This will practically eliminate the end-of-the-month, do-or-die-no-matter-what rush to get in minimums.

If flying systematically and regularly is important enough to the Old Man for him to go to that trouble to keep up with it, it will seem important to his pilots. If he makes it obvious by his own example and his conversation that he observes every feature of flying safety, his pilots will be less self-conscious and more conscientious about taking those precautions.

If he occasionally talks approvingly about someone getting reamed out for a violation of flying safety it will sometimes do more to deter a young hot-shot pilot from the carelessness of youth than the possibility of death would.

During the height of the Nazi air attack on England, PUNCH carried a cartoon of a woman saying to her husband, "Henry, close the blackout curtain. An Air Raid Warden might see our light." This was a shrewd commentary on how much more effective is an immediate, respected authority than a remote fate.

Commanders are respected. If they demonstrate respect for flying safety, the men who respect them will acquire a deeper and more powerful respect for flying safety.

• Commanders, Operations Officers, Inspectors—everyone having anything to do with the subject: Make adherence to principles and procedures of flying safety, an end in itself.

There is a fine point of psychology involved here. Let's say that flying safety is taught *only* as a means of avoiding accidents. A pilot violates a flying safety procedure and suffers no ill effects from it. So, the whole program of flying safety becomes a little less important in the conscious or subconscious mind of that pilot. When we flout a law and get away with it, we respect that law a little less in the future.

Remember this quirk in human nature. People will try to get away with things despite the terribleness of the penalty for failure if they think they can probably get away with them. On the other hand, only children, emotionally immature people and psychopaths do things for which punishment is known to be quick and sure.

Therefore, I suggest as tight control measures as are practicable to apprehend any violations of flying safety. A pilot climbing into his plane without making the prescribed external check. . . . A violation of specified procedures in bringing a plane down, where unusual pilot skill prevented trouble . . . this time. Carelessness in making a weather check, even though nothing ill came of it. . . . If such things are done enough times, accidents will result. Therefore, doing any of them one time should be cause for swift, positive, punitive action.

This is not a new idea. Anyone knows that unshined shoes and being out of uniform does not necessarily injure the accuracy with which an air crew puts bombs on the target. But, the long-range, cumulative effect of slack uniform discipline becomes injurious. Therefore, uniform discipline is emphasized as an end in itself, because it is important, even though its importance is hard to pin to a specific result.

The long-range result of violations of flying safety provisions are inevitable and terrible. But the results are so long-range that they are, by themselves, insufficient deterrents. Give flying safety the prestige accorded proper wearing of the uniform. Punish violations because they are violations, irrespective of whether or not any ill results could be pinned to the specific violation.

• Commanders: Educate wives in how they can help their husbands live longer. A fine balance has to be maintained here. Wives need to be educated in how they can contribute to their husband's safety in flying. But, they should not be put into the position of helping their husbands decide how to do their jobs.

Much of their education necessarily has to do with how to make their husbands' flying easier on him. So, care has to be taken to insure that they do not get the idea that the whole program of wife education is a propaganda campaign aimed at making life easier and happier for the Lord and Master.

Officers' wives generally have too many meetings to attend already. However, I believe that a monthly meeting for pilots' wives, publicized as being for the purpose of explaining how pilots' wives can help their husbands fly more safely, would draw big attendances. Ideally, the wife of a senior officer should prepare herself on some aspect of flying safety for each meeting, make the talk and handle discussion and questions. Properly done, I believe this would be more effective than the best speech a man could make.

This series of orientation meetings, which should be continued indefinitely as personnel rotate, should cover such areas as:

Wives should be educated in how they can contribute to their husband's safety in flying, but should not be put into the spot of helping them decide how to do their jobs.

• The relation between emotional upset and accidents. Industrial psychologists have found that a worker who has had domestic trouble, or is otherwise under an emotional strain, is several times as likely to have an accident as one who is in a happy, peaceful frame of mind.

• The importance of flying regularly, rather than crowding a month's flying into a day, in minimizing the likelihood of accidents.

• The importance of unhurried preparation for a flight, and avoidance of feeling pushed for time when making a flight or coming in for a landing.

• Basic concepts and procedures in flying safety, to the end that the wife is able to listen intelligently to her husband's talking about the subject, and give him encouragement and support in observing its principles.

• Actual examination of aircraft to develop understandings of their husband's tools of his trade, problems and precautions.

Such things as a regular Wives' Page in FLYING SAFETY; a base safety newsletter aimed at wives; and a flight in a military plane with explanation of safety precautions which should be taken, are more far-fetched ideas of ways to enlist the active support of wives in flying safety. Commanders should never forget that a wife exercises great influence on a man. They should give the distaff side corresponding recognition in the overall program of flying safety education.

• **All experienced pilots**, especially senior and command pilots: Discipline yourself to glorify taking precautions and idealizing flying safety, both by your own example and in your conversation. This will require real self-discipline, because as was pointed out earlier, the human tendency is to romanticize the risks we took with debonair nonchalance.

We like to look back on the sublime thrill (rather than the spine-freezing fear) we felt when matching our skill against the bony fingers of death. We like to intimate that when we were young sprouts like our listeners we had adventures which they do not have the nerve even to dream about.

It is all very much a part of human nature, but what does it do to the ideal of flying safety of those youngsters? If stars and wreaths on wings mean anything at all they mean that the wearer is one whose experience commands respect, and whose ideas and attitudes on the subject of flying should be heeded by younger flyers. Such prestige carries with it a moral obligation to exercise influence in the right, not the wrong direction.

Above all else, you prestige pilots, do not tell with dramatic casualness or pseudo-rueful pride of your narrow escapes and brave carelessness. And above all else, don't wind up with an apologetic postscript to the effect that that was very foolish and your listeners should not do such a thing. Take a psychologist's word for it—recounting your own (or some other hero's) wild experience and winding up with an admonition for your audience not to try that, constitutes a dare, not flying safety education!

If you have a sincere interest in flying safety education, talk about the lengths to which you go to achieve flying safety. Leave out the thrilling accounts of how you violated it but got by through your nerve, skill and presence of mind. Just accentuate the positive. Hammer away eternally on the fact that your star or wreath means just one thing. You have acquired sense enough to know how to play it safe and how important it is to do so. Cultivate in the minds of those younger flyers the idea that old hands will measure their flying sense and ability as much by their conscientiousness in observing all rules and procedures of flying safety as by anything else.

The life you save may be that of your own son, following in his Old Man's footsteps.

• All flyers: Use your intelligence and knowledge of what you ought to do to consciously offset the effect of the three suicidal quirks in human nature. When your feelings tell you, "Don't be a worry wart. Are ya' an old woman or a pilot?" Ask your mind, "Disregarding that name-calling, what is the sensible thing to do?"

When you have an inclination to do something that is not exactly according to the rules, consciously try to think of all the reasons you shouldn't do it instead of kidding yourself into thinking it is really sensible. Then honestly weigh each side of the issue. When it is a question of saving a little time or effort balanced against the possibility of losing your life, ask yourself if it makes sense to go into the situation without doing all you can to better the odds in your favor.

All these practices constitute self-education in flying safety. In the last analysis, everything else in this article is only a gimmick to get *you*, each individual flyer, to personally accept the principles and procedures of flying safety in *your* life. You won't become a safer flyer just because the Old Man watches the flying roster; because you are punished for flying safety violations; because your wife is safety-conscious or because other flyers idealize flying safety.

You will become a safer flyer only by permitting your attitudes and practices to be changed by the things they do. If you consciously try to change yourself into a safer flyer you will have a lot better chance of being around to watch your kids grow up than if you just remain passive and depend on others.

There is no such thing as flying without risk. It is just a matter of how little danger with which it can be done. *(Ed. note: For that matter, statistics show that more people die in bed than anyplace else.)* When you take off, your life is in your hands, not the hands of flying safety officers. It depends on you. And the same is true of flying safety education; you are in command of your own education. You can't be educated as a result of what someone else does, but only as a result of what YOU do.

Safety makes sense. Risk makes widows. It is as simple as that. If you take a chance and get by, no one has gained much. If you take the chance and DON'T get by, your wife loses, your children lose, the country loses. Come to think of it, you lose, too. ▲

At Little Rock AFB, an aircraft was not considered "cocked" until all essential personal equipment and survival gear were aboard, ready for instant takeoff.

Cocked

It is a time-worn, American proverb that reads, "It is better to be safe than sorry." And yet, this ancient maxim has as much, if not more, relevancy for us today as it did for our ancestors.

In today's high-performance aircraft with the accent on speed, it has become necessary to initiate a complementary accent on safety.

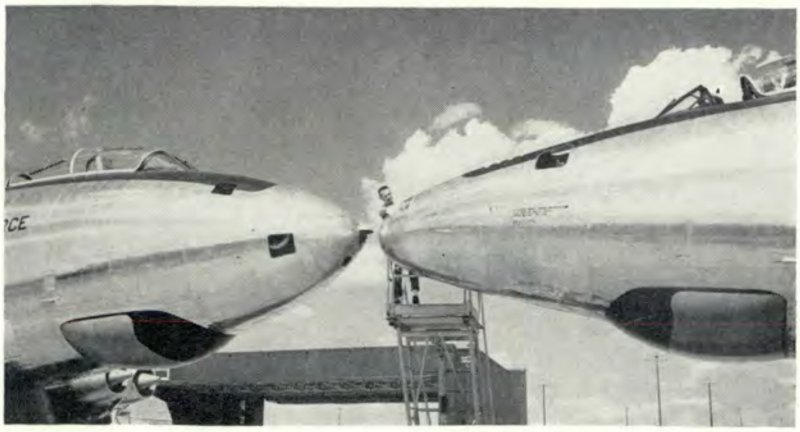
Safety is an integral part of every successful mission. Where the five-minute preflight is now only a memory, exhausting hours of preflighting and planning are reality. This attention to detail and precision is inspired partly by an increased emphasis on safety.

At Little Rock Air Force Base, Arkansas, an alert test was recently completed to determine how rapidly an alert force could be launched after simulated national emergencies.

The authorities realized that speed and safety in launching the complicated B-47 and RB-47 were not always mutually compatible, and instituted several safety precautions that would bring speed and safety into closer coincidence. The truism that undirected haste could lead to confusion and chaos in the rapid launching of an alert force was accepted from the start. And yet it was firmly believed that organized and directed haste was in harmony with mission success and safety.

Official SAC alert test checklists were used during the test. Crews were instructed on their proper use and after lengthy preflights, the aircraft scheduled for alert were "cocked" by use of these lists. No items of safety were disregarded, and the aircraft were ready to fly at a moment's notice. An aircraft was not considered "cocked" until all essential personal equipment and survival gear were aboard. Signs were displayed on the entrance ladders of alert aircraft, signifying that these aircraft were "cocked," and that only the alert crew assigned to that aircraft could enter. With these precautions, crews could "jump-off" instantaneously, confident that their aircraft would be ready and safe.

High performance aircraft have necessitated 'round-the-clock accent on flying safety.



for Safety

★
Brig. Gen. Joseph J. Preston, USAF
Commander, 825th Air Division

During an alert, crash trucks from the fire station were dispatched to stand-by near the alert aircraft. On certain types of alert the field was closed for landings and takeoffs to prevent normal traffic from interfering with the alert in progress. Much confusion and possible safety hazards were thereby avoided before they had a chance to materialize. When an actual fly-off alert was conducted, the faster B-47s and RB-47s took off before the KC-97s to preclude the possibility of a jet over-running a tanker.

For the safety of maintenance personnel. The B-47 alert parking area was arranged with aircraft facing nose to nose. This alert parking area was kept independent of the KC-97 parking area. Crew chiefs and wing-walkers, therefore, could not inadvertently back into a spinning KC-97 prop while directing a taxiing B-47.

Maintenance alert crews could not always provide crew chiefs to operate ground power units during the alert period as they were required to train and supervise in other maintenance work. Less experienced personnel would operate these units at times during an alert. Special courses were conducted on the proper use of ground power units so that these airmen would be aware of precautions necessary and of the dangers involved. Special training was also conducted in ground crew preflights.

As a safety aid in night scrambles, the entrance hatch light switch on the B-47 was left in the ON position.

Alert crews received a comprehensive weather briefing each morning. When a scramble occurred the forecasters reviewed the weather situation and notified the alert force commander. If a significant weather change were forecast, the alert force commander received detailed information for transmittal to the crews.

The alert force commander would check the NOTAMS on possible alternates and destination, and would relay this—along with the latest weather—to a SAC control room along the briefed route of the launched alert force.

At a pre-planned point along the route the alert aircraft would call the SAC control room for the information. Hourly weather monitoring made it possible for these crews to have the latest weather at their disposal.

Immediately after an alert sounded, the tower notified the control rooms of current takeoff data: Temperature, dewpoint, pressure altitude, wind velocity and direction, and runway in use. This current information was made immediately available to the crews, who then recomputed their takeoff data on the basis of the latest information.

The alert crews were assigned weapons carriers for transportation during their tour of alert. Base speed limits were strictly adhered to, and no traffic safety problems ensued. An air policeman was stationed at the vehicle entrance to the flight line to direct the heavy traffic at these times. Crews were briefed not to jump on or from a moving alert truck. After the crews reached the alert aircraft area, maintenance personnel would park the weapons carriers away from the aircraft area. This eliminated possible taxi accidents.

It was recognized at the outset that personnel fatigue was directly related to accident rate. Therefore, programming plans insuring time off duty were established, and this contributed significantly to the safety record. Time spent on alert duty was held to a minimum required, and only normal workloads were imposed during regular duty time.

Crews were briefed continuously on the importance of safety. Flying Safety Officers applied themselves with renewed aggressiveness. Accident reports of particular concern to B-47 and RB-47 crews were posted in conspicuous places. Files were kept on all past accidents, and crews were strongly encouraged to take advantage of these files.

During this test there were no ground or air accidents and no incidents compromising safety were recorded. Repeated emphasis on safety greatly enhanced this record. ▲

Official SAC alert test checklists were used during the simulated emergency.

During test there were no ground or air accidents—no incidents occurred.

Ol' Rex is concerned about the decreasing number of reports of near-accidents received during the past few months. Perhaps there are fewer to report. If you were fortunate enough to avoid a "could have been," you just might help some fellow pilot by sharing your experience in the form of an Operational Hazard Report as per AFR 62-7. Let's have 'em!

Getting pilots to save themselves by using the equipment at hand seems to be a world-wide problem. As our friend from The Netherlands found out, there is no substitute for a good training program on the use of emergency equipment. After you have read the letter which is reprinted below, I know you'll agree.

There's nothing new or startling in this letter which we've received from Maj. T. J. A. Lamers, Flight Safety Section, R.N.A.F. He's simply applying a well known principle of education—practice. It is showing good results for him. My guess is that it will do the same for any unit. Maybe it's time for a spot check of crewmembers in your outfit. "Flying Safety programs, like savings, like research, if postponed until needed come much too late."

• • •

"Under the heading, 'Survival Training' (FLYING SAFETY, Crossfeed, June '57), Major W. H. Moore wrote about his shocking discovery concerning pilots who thought they knew their safety equipment but after all in an emergency, proved not to be too sure about its management. How right he is! He mentioned 40 per cent of the pilots not making the grade. Well, we in the R. Neth. A.F. found that at least 50 per cent were lacking in this respect, though all pilots had a fair theoretical knowledge. They did not openly confess it, but their knowledge was rather vague. All of them had been instructed at ground school by their betters and later on, as operational pilots they got periodic refreshers at base level.

"Dinghy drill was given in local swimming pools but more often than not, the best swimmer and the keenest clown did the actual work while the rest of the squadron thought they learned all they ought to know by laughing, shouting and looking on. Finally, we strongly doubt if these betters were really so much better.

"Now Major Moore requests more articles on this subject in FLYING SAFETY. I take this opportunity to compliment you on a really top-class magazine which we read from cover to cover, as no one working in the field of accident prevention can afford to miss your articles. But from experience we have found that in the sequence of actions from ejection to pick-up, it is only by means of automatically handling the safety equipment that precious seconds are saved, fatal mistakes and omissions are avoided. Often these seconds and mistakes mean just the difference between life and death, where a sure hand overrides the panicky mind. This we found can only be achieved by training.

"So a Pilots Training Center was organized. All pilots go through a one-week, 16 working-hours-a-day course. That week they live a self-supporting existence not unlike a bushman, getting hardened and inventive. They are trained by medical, physical and technical instructors. Every piece of safety equipment is actually handled by the pilots. British and American types of ejection seats are taken apart to see for themselves how everything works. All possibilities of escape with different speeds and attitude are discussed and principles learned by heart. Swimming lessons are given, and pilots proving a low standard are recommended to the C.O. for further training with a nice possibility of being grounded from flying duties until . . . or else. Every pilot is given dinghy drill until he can make a recorded time of one minute from jumping blindfolded from the tower to his sitting in the dinghy. Nearly every newcomer, on entering the course, demonstrated how many pilots, even experienced ones, mismanaged their equipment — fastening lanyards wrongly, parachute slots worn too low on the body and seat belts too high, the one covering the other, and so on).

"Several actual escapes have since been carried out, two of them including sea rescue. One F-84F, on an air-to-ground napalm mission, hit the beach in a flat position, the pilot being blinded by smoke and dust from earlier hits. This pilot pulled up as far as he could, the uncontrollable aircraft meanwhile rolling to starboard. Ejection was made in split seconds, at low altitude and halfway inverted. He was lucky in that the week before he had finished his P.T.C. course and in his report he stated that without this instruction he never could have made it.

"Four other pilots also stated that thanks to this instruction in automation and also the fact that they were thoroughly familiar with their equipment had helped them considerably in coming down safely from disabled aircraft. (Collisions.)

"The gist of this certainly too long letter (excuse me) is that when you, Mr. Editor, eventually provide us with articles about survival information, we will gladly use them as extra instructional matter for our P.T.C. instructors. But we hardly believe that pilots will absorb printed information so intensively that it will benefit them in an emergency because we don't believe in cool thinking when one's whole world goes haywire. Then, we believe, training is the best asset.

"We should add that after the first six months of running weekly courses, the class average was only 63.2. So there still is plenty of room for improvement. ▲

Dear Rex:

I was cleaning out the desk drawers the other day and came across some stuff I'd written for a base flying safety publication. Probably isn't any good, but I understand that budding journalists never succeed on their first attempt at a best seller! So I'm sending it on to you--for laughs, publication or for file 13. 'Most everyone I know is getting real avid about reading the latest poop in FLYING SAFETY. You people are really doing a bang-up job!

Here's what I wrote:

"All through flying training school, all through transition schools and all through annual instrument and proficiency checks we have been drilled in the need for careful flight planning. Common sense and good judgment decree the value of studying NOTAMS, Letdown Charts and so on. Back in the good old days however, I must have been pretty hard to convince. Three times I encountered problems that proper planning could have prevented. Luckily, my experience and good fortune pulled me out, but not before I'd suffered much embarrassment.

"I certainly remember the first time. I cleared from Omaha to Scott, VFR. I wasn't at all concerned that there were no maps in Omaha to cover the route. Since the weather was clear I could see no need to go airways. The Fac Chart showed that the course was about 110 degrees. I pushed the throttles to 51 and away we went. At the usual 20 and 30 we made pretty good time. No checkpoint worries 'cause we knew we couldn't miss the Mississippi. The only trouble seemed to be that the river had some unrecognizable bends in it. We concluded that the radio compass was not reliable and that we were North of our course. So, we turned South and saw Memphis a little while later. I did a fast 180 and made it to Scott with a couple of hundred gallons left. I sneaked into Operations, tossed the old Form 23 on the deck and tried not to hear the remarks nor to see the smiles and the shaking heads.

"The other two embarrassing moments resulted from not checking over the Letdown Charts. Runway 2 at Geiger Field and Runway 2 at what is now Fairchild look identical from a few hundred feet and half-a-mile, especially if you don't notice that they are both on the same range leg and only a minute or two apart. You guessed it. I wanted to land at Geiger and landed at Fairchild!

"I was very proud of myself one day as I made an almost perfect range letdown on Orly Field in Paris. The French tower operator told me to land on Runway 26 left. At least, I think he said 26 left. That was easy--there was a big wide one on my right and a narrow one just slightly to my left. Of course the visibility was at its usual less than one mile. I failed to see my Commanding General's C-54 parked at the far end of that between-runways taxi strip that I landed on. He saw me, though!

"Flight planning and reading the Letdown Charts could have saved all sorts of embarrassment for me. Of course, I could have pranged too! Since I've taken my share of good-natured ribbing after each of these foul-ups, I'd just as soon you wouldn't use my name. Okay?"

★ ★ ★

"What's in a name?" It's the lesson that counts. Let's hope that others will learn from yours.

Engineers tell us that three major factors govern deceleration of jet aircraft.

The Shortest

Deceleration of jet aircraft depends upon three major factors. These are:

- Speed at touchdown.
- Tire-to-ground friction.
- Aircraft drag and thrust.

Speed at Touchdown—The energy stored in an aircraft at contact with the ground is directly proportional to the square of its speed. It is this energy that must be dissipated to bring the aircraft to rest. Landing at a speed of 10 per cent above the stall, the aircraft will have a kinetic energy of 21 per cent above what it would have if it landed at the stall speed. Similarly, landing at a speed of 20 per cent above the stall, the aircraft kinetic energy will be increased to 44 per cent above that for landing at stall speed. Landing at 30 per cent above the stall, the kinetic energy is increased to 69 per cent above that at stall speed.

What does this mean in terms of actual landing distance required? Assuming technique and aircraft configurations being the same with a normal deceleration applied by the brakes, then if an aircraft requires a stopping distance of 2300 feet at 100 knots, at 120 knots the distance is increased to 3300 feet; at 130 knots the distance is 3900 feet and at 140 knots, the distance necessary to stop is increased to 4500 feet. The following table is a recapitulation of the above data:

Landing Speed	Kinetic Energy Factor	Actual Test Stopping Distance (Feet)	Required Per Cent Increase Stopping Distance
Stall	1	2300	0
1.10 Stall	1.21	2700	18
1.20 Stall	1.44	3300	44
1.30 Stall	1.69	3800	65
1.40 Stall	1.96	4500	96

Tire-to-Ground Friction — The magnitude of the retarding force available from the brake, tire and runway combination is dependent on a number of factors. These are:

- Tire size, shape, tread and pressure.
- Type of runway—concrete, macadam.
- Runway cover such as rain, snow or ice.
- Brake capacity and operation technique.
- Wheel vertical load and wheel-skidding velocity.

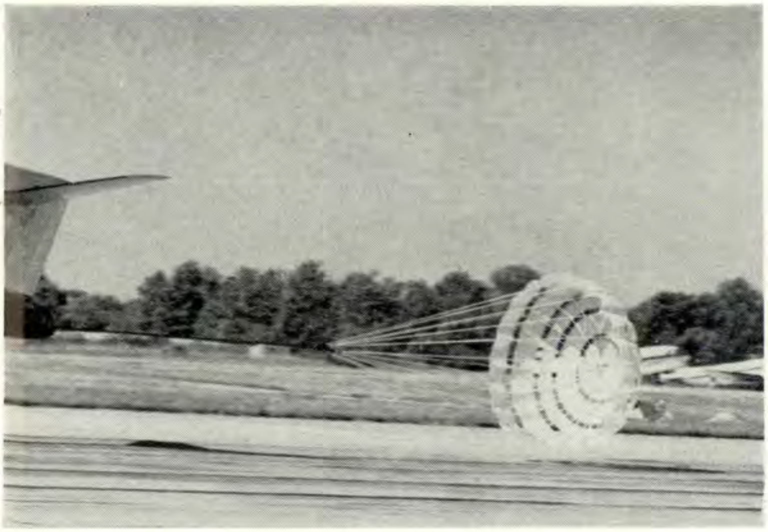
It is necessary that the factors mentioned in the first item above are as specified in the pertinent tech order, in order to utilize the maximum braking efficiency furnished by the tire.

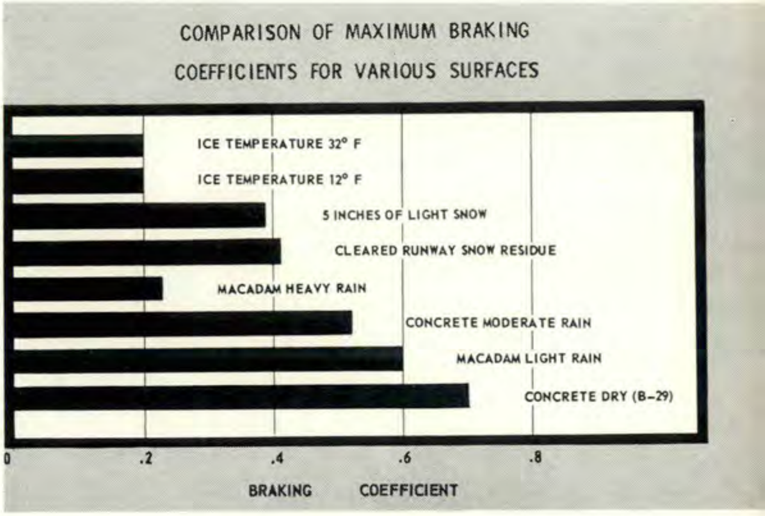
The coefficient of friction is the ratio of the friction force to the vertical load on the wheel. Zero skid corresponds to free rolling velocity, whereas 100 per cent skid is present with a locked wheel. When the wheel begins partial skid through brake application, the friction coefficient increases until a maximum value is reached. It then decreases to a value at full skidding which is appreciably lower than the maximum. The maximum friction coefficient occurs just after the beginning of the partial skidding condition. A comprehensive series of tests was conducted by the National Advisory Committee for Aeronautics to determine maximum coefficient of friction for various runways and surface conditions.

Another factor that determines how much of the friction potential available at the tire is actually developed, is the brake capacity. Approximately 20 per cent reduction in the stopping distance can be made available by providing higher capacity brakes which would allow continuous braking without overheating. However, this advantage is limited by the fact that the brake should not have greater capacity than the tires can utilize as a friction force.

Distance . . .

Sydney D. Berman, Engineering Branch, D/FSR.





Larger capacity brakes are of no advantage for icy, rain or snow-covered runways where the coefficient of friction is low. This is because the friction force is the product of a coefficient of friction and the load on the wheel.

The load on the main wheels is an important factor in determining the decelerating force exerted on the aircraft. By increasing the load, the friction or decelerating force is increased. One procedure for increasing the load on the main wheels during an all wheel contact ground roll is to relieve the load on the nosewheel by using up elevator without raising the nosewheel off the ground.

Another way is to raise the flaps as quickly as possible after contacting the ground in order to decrease the lift on the wing. Experimentation has shown that a decrease of approximately 10 per cent of the stopping distance is available by moving the elevators to the UP position. Retracting the flaps just subsequent to ground contact decreased the stopping distance approximately 11 per cent for full travel flap retraction time of five seconds, and six per cent for a retraction time of ten seconds. However, this is not true for the entire range of coefficients of friction. At the extreme low values of coefficients of friction corresponding to very icy and slick runways, there is an increase in stopping distance resulting from raising the flaps. This is because the increase in the decelerating force resulting from the increased vertical load on the main wheels is more than compensated for by the decrease in aerodynamic drag, due to flap retraction.

Aerodynamic Drag and Thrust—In addition to the aerodynamic drag associated with flap retraction, there is a question as to the proper aircraft attitude technique to use in obtaining the shortest ground run distance, i.e.

1. To keep a nose-high attitude angle for some distance down the runway, lowering the nose and then applying brakes, or

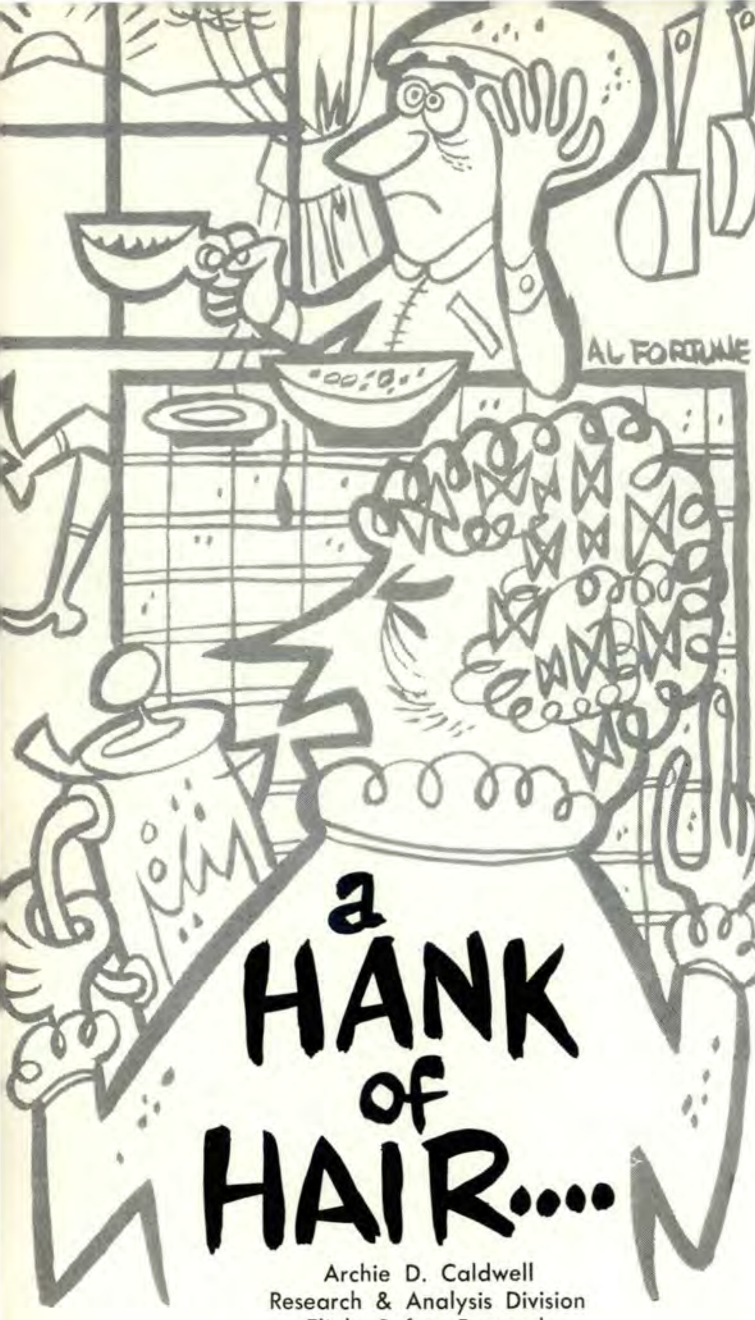
2. Nose the aircraft down to the three-point ground attitude as soon after touchdown as is possible and applying brakes.

From a series of calculations based on wind tunnel model characteristics for various types of jet aircraft, including the delta wing configuration, a shorter stopping distance is provided by nosing the aircraft down into the three-point ground attitude as soon as possible. However, there is an exception to this for extremely icy runway conditions or poor brakes. For these conditions, maintaining the nose-up attitude for as long as possible will result in a shorter landing distance.

Residual thrust of the order of six per cent for aircraft landing on very slippery runways can increase the stopping distance approximately 12 per cent. For runways other than those yielding low coefficients of friction, the effect of the residual thrust is not too important.

To summarize: The shortest stopping distances will be obtained by,

- Maintaining tires in accordance with applicable aircraft tech orders.
- Landing with as low a speed as is consistent with safety.
- Changing the aircraft attitude to the three-point ground attitude as soon after touchdown as possible, except during extremely icy runway conditions when it is best to maintain as high a nose attitude as possible.
- Increasing the load on the main wheels immediately following an all wheels contact by (a) moving elevators to the UP position; (b) retracting flaps, *except* during extremely icy runway conditions when it is best to leave the flaps down.
- Maintaining minimum residual thrust during landing roll, particularly on very ice runways. ▲



a HANK of HAIR....

Archie D. Caldwell
Research & Analysis Division
Flight Safety Research

It was early of a morning. Sunlight slanted across the breakfast table in a typical Wherry kitchen. Actually, it wasn't all-the-way typical for this one belonged to Captain Chauncey Z. Chumley, his ever-lovin' wife and brood.

Chauncey, who had been a classmate of C. R. Terror's, was looked upon by many as being the world's greatest aeronaut. Many others disagreed, C. R. Terror included. Mrs. Chumley was on the fence. Living with Chumley was difficult, at best, without decisions to further complicate matters.

Mrs. Chumley refilled the coffee cups.

"Chum, you're not eating your oatmeal."

Chumley stirred his coffee, looking out the window, all the while.

"Chum! You are not eating your oatmeal!"

Chumley returned to reality.

"Quite, old girl. Thinking about that wonderful new flying machine. Chaps on the flight line are getting it ready for my first flight. Must confess I'm a bit excited. First time up and all that, you know."

"Well, you can't fly a Piper Cub on an empty stomach. I'll admit the ten thousand would come in handy, but we'd have to hire someone to police up the lawn and all that. Besides I mix a beastly martini."

"Fret not ol' girl. I shall boom the house to let you know I'm airborne. Bully, what?"

"You crack one teacup in this house with your sonic booms and I'll wrap your swagger stick around your head. And—stop that miserable attempt at being David Niven about to fly a Spitfire."

"Aw, Min, I . . ."

"And another thing," the ever-lovin' interrupted, "I don't recall your spending a great deal of time with the questionnaire last night. And the checkout sheet is still where you left it. You told me yourself that the MTD doesn't begin 'til next week. How do you know you can get off the ground in this wonderful new machine?"

"A wing, my dear, a tail and a hank of hair—they're all the same. Show me the runway and the throttle. Am I not the world's greatest aviator?"

"Terror says you can't be trusted in the right seat of his Ford convertible."

"My Dear, Terror is a lecherous old goat who pulled mobile control for Orville and Wilbur. He knows, and I know, I can fly the containers these new birds come in."

"Okay Buster, you'd better get a move on, you're due at the flight line right now. Oh, say, what drawer is the policy in?"

"Third drawer, left hand side, pet. I must away!"

Mrs. Chumley watched her errant spouse crank up the XK-140. She heard the squeal of tire and the throbbing of engine, as Chumley shot out of the driveway. "That's my boy," she said, as she strolled to the desk, checked the third drawer, left hand side. She smiled.

Captain Chumley screeched to a skidding stop in front of base ops. He hurried through the building to the flight line, where many gallant men, clad in Air Force blue, were busily prepping the new and wonderful machine for whatever.

There it sat. Thin, short, swept-wings. Long, large fuselage. New, shiny Air Force insignia—the ultimate in jet airpower.

A master sergeant saluted smartly as he addressed the Wing CO.

"Here comes Captain Chumley now, sir. And I must confess he does look dapper!"

"He's late, Sergeant. Boys from Information Services have been here since six-thirty."

Chumley, aware of the importance of the mission, strode quickly to the fore.

The salute was a joy to behold.

"Captain Chumley reporting, sir. Would have been here sooner but—

The Colonel gave him a quick scan.

"Chumley, you have oatmeal on your chin."

A whisk of Chumley's pocket 'kerchief rectified the problem.

"Chumley, you know the bird?"

"Yessir."

"About that emergency hydraulic system. What happens if the normal doesn't put out enough pressure to

maintain control?"

"No sweat, Colonel. A wing, a tail . . . you know, I can fly the box it came in."

"Knock it, Chumley."

"Yessir. I'll put on a little show for you after I burn a little out of the tanks. Maybe a boom or something."

"Don't do me no favors, Chumley. Just drive it around and see how it handles."

"Yessir."

Chumley sprinted to the aircraft, just as he'd seen the fellas do in the ADC movies. He climbed into the cockpit, waving nonchalantly to the assemblage. He turned to the sergeant, who happened to be the reg'lar unowhat.

"Sarnt, how do we start up this dude?"

"Beg pardon, sir?"

"Come now, Sarnt. You know—start the torch, light the blower, stoke the fire. How now?"

" 'Scuse me, sir, thot you knew. Automatic start switch ON, wait until the RPM comes to. . . ."

"Never mind, Sarnt, got it all down in my head." Chumley tapped his forehead with his index finger. "Let's see, now switch ON. . . ."

KERWOOM—whisssshhhh!

"You rushed your sequence, Captain. We'll have to write up an over-temp. Are you familiar with the rest of the procedures?"

"Rawger, laddybuck. I always say, 'A wing, a tail, you know.' They're all alike. Flown every bloody one of 'em."

"Excellent, sir. Oh, sir, please don't try to taxi until I can get the pitot cover off. I'll grab it and then pull the chocks. Good luck, Captain Chumley."

"Thank you, lad. Now, get off so I can get into the blue before the repack date on my new chute comes due. . . . Inkstand tower, this is Strawman-two-one. Gimme taxi-takeoff for this wonderful new machine."

Tower came up with normal excellent information. Chumley rogered all over the area as he shot out to take-off position, leaving a small trail of smoking rubber.

The crew chief peered at the runway through interlocked fingers.

"He's starting his roll now, Colonel. Didn't look like he had time to pull his pre-takeoff checks."

The Colonel refused to look. "Sergeant, tell the Captain to report to my office when—and IF—he comes down. I'd like a word with him on some of his procedures and. . . ."

"Colonel, look at that nose-high attitude! Looks like he's slow. He's not accelerating at all!"

The Colonel turned just in time to see the wonderful new machine rolling down the runway, end over end, shedding parts, and—at last—Chumley.

A highly efficient crash crew scraped up various parts of the good Captain and deposited them at the station hospital. The also highly efficient medics patched and sewed and stitched and had a semblance of a man in shape for his first visitor—a rather apoplectic Colonel.

"Please, Colonel, he's conscious now. Not too many questions though. He's not well."

"Thank you, Doctor, I shan't be a moment."

The doctor came closer.

"Colonel, you should do something about that hypertension. Your face is all flushed, sir. Why don't you stop in and see me on your way out?"

"You may have a customer, Doc," said the Colonel, as he strode into the quiet room.

"Well, Chumley, that was quite a show you put on last week. We thought you might take the easy way out, but no such luck."

"Nossir, Colonel. Man of Steel, you know. How's the wonderful new machine?"

"Most of the G-File's in pretty good shape, Chumley. One of the sergeants at the salvage yard thinks the clock may be usable. We scraped up the rest for Class '26. Now, mebbe you can explain, in 25 words or less, just what happened."

"Well sir, after a thorough preflight, I got in and made a normal start. Then, I taxied. . . ."

"Come now, Chumley, mustn't tell those little white lies, must we?"

"Nossir. Well, sir, everything was just dandy on the roll until I started to lift the nose off. Then, the nose came up and hit me in the face. The wonderful new machine would'nt accelerate as well as the old '80s. I might have

had a loss of power. Yessir, that's it, a loss of power. Yessir, that's it a loss of power. Guess we better get the UR boys to work on that one. Anyway, the crosswind drifted me off the side and I headed for the boondocks. I tried to hold it, but the next thing I knew, a nice young fella was extracting sand and gravel from various parts of the old phizz."

"Chumley, your story touches my heart. I've been looking over your flight folder and I couldn't believe what I saw. You hadn't filled out a questionnaire; you hadn't completed any formal training; you hadn't bothered to talk with anyone. I don't even think you'd looked at the Dash One. Chumley, just how in the name of old Sam Langley did you prepare yourself for this miserable attempt at flight? Don't you know. . . ."

"Sir, I checked with the reg'lar crew chief, he told me. . . ."

"Chumley," the Colonel continued, burying his fingernails in his palms, "Don't you know that the Air Force spends millions of dollars in maintaining a staff of qualified personnel to help knuckleheads like you, check out in new machines. We've got tech order writers, test pilots, flight safety folks, dozens of others—all dedicated to one job—showing you how to fly and fly safely—the wonderful new machines."

"Yessir, Colonel, but I thought they all. . . ."

"I know, Chumley, you thought they all fly the same—one is like the other. Well, let me tell you something, Captain. . . ."

"Colonel," Chumley interrupted, "I always say, 'A wing, a tail, a hank. . . .' "

"Chumley," the Colonel bellowed, "If I ever hear you say that again, I'll wrap your swagger stick around your thick neck."

"You'll have to wait your turn, sir."

"CHUMLEY!"

"Sir, your hypertension, sir. I distinctly heard the doctor. . . ."

"Right you are, Chumley, right you are." The Colonel ran his hands through his hair. Then he lit a cigarette. "All right, Chumley, let's proceed. There are no less than a dozen ways by which you can acquaint yourself with a wonderful new machine. But, no—you know it all. You couldn't ask questions. You couldn't take the time to read. You couldn't talk to the pilots who were imported from Big Thunder AFB—who've been flying the machine for the last seven months.

"You couldn't even be bothered to check with the tech reps. You didn't bother to visit the Fly Safe officer, who gets the latest word on the new birds. No Chumley, you just couldn't be bothered. Well, let me tell you something. If you ever get out of this traction gear—and if I don't see to it you're made the garbage disposal officer at Cape Romanof—you may be permitted to take the formal training course which has been set up for every member of your squadron. Then, you're going to have to show me that you know every system, switch, knob and tube on the machine before I let you near one."

"That's deucedly decent of you, sir. Decent, indeed!"

"I think that by now you understand that anything less than a 100 per cent complete knowledge of any airplane will not—and cannot—be tolerated. The Air Force cannot afford to expend one each airplane for every one each pilot to check out in. We must share and share alike, Chumley. What we try to do is to let you play with the machine for a while and then let some of your friends play with it for a while. It's the American Way!"

"I shall begin a new chapter in my book of flying, sir. I shall bring the aeroplane back to the aerodrome and let the other chaps have a go at it, sir. Actually, it sounds like a bully idea."

"We're awfully happy that you approve, Chumley, and do me a favor will you?"

"Anything, sir, just ask me, sir!"

"Knock off the David Niven bit, will you? That went out with the Spitfire movie." The Colonel turned to go as the Doctor came in.

"You'll have to leave now, Colonel, we've got to get this man back on his feet. The nurse is bringing in his lunch now. By the way, Colonel, about that hypertension. . . ."

"All right, Doctor, as you wish. See you in your office in five minutes."

"Yessir. All right, Chumley, sit up a bit more straightly there. Lunch is coming right up. We're serving oatmeal today!"

"Doctor?"

"Yes, Captain Chumley."

"Just a spot of tea for me, if you don't mind." ▲

Down

THRU THE CENTURIES

This special section is presented primarily for the fighter pilot of the United States Air Force. There is no doubt however that some of the principles set forth by the authors will apply to the jet bombers and cargo aircraft now in use or coming soon.

It is no secret to most of us that, performance wise, there is a steadily narrowing gap between the various types of aircraft in the inventory.

We call your attention to the fact that these articles, though written by men generally acknowledged to be "experts," are necessarily personal opinion. These pilots have absorbed much of their know-how from others—the capable pilots and engineers of the various manufacturers. Their recommendations deserve our respect.

• EDITOR'S NOTE

At the same time it must be remembered that the Pilot's Handbook is the final authority for operation of any aircraft in the Air Force and the procedures outlined therein are still to be observed. We don't believe that you will find many discrepancies in this respect.

It is interesting to note that all of these fighter pilots agree that the days of the 30-second pattern are gone. The Century series "hot pilot" will remain that way only as long as it takes the crash truck to get to the scene.

Landing the Century Series Fighter

Colonel Frank K. "Pete" Everest, USAF

From my experience in flying the F-100, '101, '102, '104 and the '105—as well as commanding an F-100C Fighter Day Squadron—I've concluded there are many "tricks of the trade" not outlined in the Handbooks, that may be applied in getting these Century-type aircraft on the runway.

To start with, it is highly important that a well qualified instructor pilot brief his transition pilots on the "how" and "why" a particular airplane reacts as it does. In our outfit, for example, no matter how much F-100 time a newly-assigned pilot has, I personally brief him on the characteristics of the F-100C. In an effort to clarify certain peculiarities of the "C," I point out such items as high static stick forces, slow response rates at traffic pattern speeds and so on. Further, since most of the Century series types have high wing loadings, very little, if any, ground effect is realized; therefore pilots must not rely on ground effect to break their glide and/or flare the airplane for them. This, of course, requires a longer, flatter approach than that used in previous fighters. No more the 30-second pattern. It's nearer to five minutes!

Also, because of the slow response rates and the heavy weight, the pilot must start his flare earlier than normal. And if his sink rate is fairly high he may have to flare with power application, for even though you may change the pitch attitude, this will not necessarily reduce the sink rate; therefore power must be added to overcome the inertia of the sinking mass.

The same applies after touchdown. Pilots must be aware that they have a heavy mass of metal, traveling at a high rate of speed (150 knots), and if immediate and correct action is not taken to stop its forward momentum, sooner or later something will have to give.

The following techniques would apply to land most of the Century series fighters I've flown. You enter "initial" at 300 knots, 1500 feet above the runway. At the "break," open the dive brakes to slow to 250 knots, maximum gear-down speed. Very little, if any, power adjustment is necessary, since the throttle is already retarded to maintain the 300 knots initial speed.

After completing the turn onto downwind, lower the landing gear, retract dive brakes and recheck utility system pressure in order to assure that the brake pressure is available after landing. Check gear down and locked before turning base, and reduce speed to 210 knots.

Turn base and maintain 210 knots until *after* completing turn onto final. Fly final at 190 knots with use of throttle and come in "over the fence" (2000 feet from touchdown point) at 170 knots. At this point, flare is started by easing back on the stick and, if necessary, adding power. The pilot should never abruptly yank stick back to flare, for he will usually overcontrol and start porpoising. Shortly after flare is made, the dive brakes are extended and throttle chopped to reduce speed for touchdown (150 knots). If there is a gusty wind and/or crosswind, power should be maintained until after touchdown so that in case of any difficulty, power may be applied immediately.

Immediately after touchdown, allow nosewheel to lower to the runway, then engage nosewheel steering, deploy drag chute and start braking action.

For night landings the same pattern and speeds apply, with the possible exception of extending the downwind to permit a longer final approach. It is strongly recommended that, if available, GCA be used on all night landings. GCA approaches are, average-wise, more accurate than most pilots can consistently fly. With the higher approach speeds there is less time to accurately judge height and distance from the touchdown point, thus GCA is definitely an aid. It is SOP in my squadron to fly GCA approaches at night.

To conclude, the Century series are definitely more difficult to fly than earlier fighters but are not beyond the capabilities of those fortunate pilots selected to fly 'em. Plainly, it is this: The Century series are less forgiving than the earlier fighters. One could "slop" an F-86 or an F-80 around the pattern and still get away with a chuckle or some kidding from fellow pilots. Not so with the Centuries! If you slip and nick yourself shaving in these birds, it's likely to be the jugular vein you've nicked, and you're in serious trouble.

Just play it cool. If you don't like your approach, take it around—and around—and around, until you hit an approach that you like. There's no hurry, especially when you have close to a million dollars worth of equipment in your charge—not forgetting your life and limb! ▲

Colonel Frank K. "Pete" Everest is one of USAF's leading fighter and test pilots. Following some outstanding airmanship during WW II, "Pete" went to work at Wright-Pat as a test pilot and was among the first to test America's first manned rocket ship, the Bell X-1. Since then he has about flown 'em all—to name a few: The X-1A, XF-92, X-3, -4, -5; XB-52; F-100, '101, '102 and '104.

100

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Robert W. Fero, Engineering Test Pilot
North American Aviation, Inc.

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Recent landing incidents in F-100D and F aircraft have indicated a need for a review and re-emphasis of the landing procedures and certain pertinent related airplane characteristics. Here's what a North American Engineering Test Pilot has to say about landing the F-100.

The procedures for correctly landing an F-100 are, of course, outlined in detail in the Flight Handbooks. However, let's start with a summary of the normal landing procedure for an F-100F airplane at a gross weight of 23,800 pounds, which corresponds to 1000 pounds of fuel remaining. Remember that the speeds quoted will vary with gross weight. The proper speed for any weight can be found in the Confidential Supplement to the Dash One.

• Following entry into the pattern, slow the aircraft below 250 KIAS and drop wheels and flaps. When flaps are extended, raise the speed brakes if buffet level is objectionable. Complete the landing check-off list.

• Fly the base leg at 190 KIAS and adjust pattern and power to control rate of descent to about 1500 fpm. This will require about 83 to 87 per cent rpm. While lining up with the runway, reduce speed to 165 KIAS and regulate power to control rate of descent to less than 1000 fpm.

• Fly a "smooth, flat" final, reducing speed and regulating power as necessary to arrive at the desired touchdown point at 140 KIAS. Reduce power to idle. After touchdown, raise flaps, engage nosewheel steering, deploy drag chute, and immediately start braking as necessary.

Several items involved in this technique should be amplified:

Several factors influence the recommendation for using a smooth, flat approach. First, if an approach is smooth and flat, airspeed control is generally improved. Great emphasis must be given to the use of proper touchdown speeds, and thus airspeed control during approach is important.

Second, by using a relatively flat approach, the rate of descent is held to a reasonable value. Relatively low rates of sink, coupled with good speed control, insure an approach with sufficient speed and power to flare the airplane. North American's flight tests have shown that the recommended power-on approach speeds are more than sufficient to flare the airplane from a 1200 fpm rate of sink.

Flat approaches also minimize the necessity of demanding excessive airplane rotation to flare and generally make it easier to judge the flare. If a smooth approach is made, the necessity for abrupt last-minute corrections is minimized. This is an important factor in avoiding "stick stiffening" and flight control system failure lights. (These points will be discussed in more detail later.)

Another obvious advantage of the smooth, flat approach is that because higher power is required, greater flexibility in playing the approach is afforded the pilot. The engine is in its best acceleration range, and rapid engine response is available if it is necessary to correct sink rates or to go around.

If speed brakes are used during the landing approach in conjunction with the flaps or alone, the airplane buffet level is increased. The flaps alone provide sufficient drag for a flat approach at relatively high power so that the use of speed brakes in the approach is not necessary.

Extending the speed brakes after touchdown provides some drag. The speed brakes must, however, be retracted to make a successful barrier engagement. Their use is a matter of operational procedure.

Raising the flaps immediately after touchdown increases the load on the landing gear. This allows the brakes to develop more torque before the tires skid, which, in turn, allows more effective operation of the braking systems and provides a higher airplane deceleration.

You should be prepared to start braking immediately after touchdown. This eliminates any time lag in decelerating the airplane in event of a drag chute failure. The brakes should, of course, be used as necessary.

Maximum braking is achieved by smoothly applying brake pressure until anti-skid cycling is felt and then relaxing pedal pressure slightly. The maximum pressure that does not result in anti-skid cycling should then be held until the airplane is stopped. This requires an increase in brake pedal pressure as speed decreases.

Drag chutes have been flight tested at touchdown speeds up to 180 knots without failure. The effects of service

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Bob Fero, Engineering Test Pilot for North American since 1955, served in day and night fighter squadrons in the U. S. Navy. Bob also served as an instructor and project pilot at the Test Pilot Training Division of the NATC. In 1952 he won the top gunnery award in the Atlantic Fleet Gunnery Meet. He has flown 43 different models of aircraft, including all of the F-86 and F-100 series.

usage (i.e., runway abrasion and aft fuselage heat effects) can lower the chute strength to the point where failures may be encountered at speeds below 180 knots. However, with properly inspected chutes, no failure of this type should occur at normal takeoff abort or landing speeds.

"Snapping" the chute handle out sometimes causes accidental chute jettisoning. Therefore, you should pull the chute handle steadily; don't snap it. Drag chute modifications which will eliminate this type of failure and greatly increase drag chute reliability have been included in late F-100s and have been proposed for retrofit.

Some pilots hesitate to use recommended touchdown speeds for fear of touching the tail skid. The tail skid was installed for the express purpose of protecting the airplane from serious damage in the tail area during normal landing. Occasional contact of the tail skid is to be expected in any group operating the F-100 in the prescribed manner. The tail skid is not expected to protect the airplane from damage during landings which involve excessively high sink rates.

At landing airspeeds, airplane response is sluggish and more stabilizer deflection is required for the same airplane reaction. Therefore, because of the sluggish airplane response, it is possible to over-control the stabilizer without over-controlling the airplane. Over-controlling the stabilizer under these conditions can make demands on the stabilizer actuator which are close to the maximum stabilizer rate available. When an instantaneous demand is higher than maximum available rate, the control stick "stiffens" or "locks up" momentarily. This does not mean that the stabilizer has stopped moving, but rather that it is moving at maximum rate and yet the pilot is demanding an even higher rate. Recovery from this condition is instantaneous. "Stick stiffening" or "lock up" can be avoided by flying a "smooth, flat" final approach.

Stick stiffening comments will probably be more numerous on the F-100F than on the "D." This is because a change in the center of gravity and weight in the "F" require a greater stabilizer deflection for trim at the recommended landing speeds. This requirement of more stabilizer deflection, combined with the nonlinear, stick-stabilizer gearing (where smaller stick motions produce larger stabilizer deflections) makes it easier for the pilot to over-control the stabilizer.

Over-controlling the flight control systems can also cause illumination of the flight control system failure warning light. While it is possible to experience stick stiffening and illumination of the warning light simultaneously, the two occurrences are independent of each other and can occur independently. Warning light illumination is due to the No. 1 hydraulic system pressure bleeding down to the point where the warning light comes on. This is not serious, since the No. 2 flight control system provides ample control. It is, however, disconcerting to the pilot when it happens.

Flight tests have demonstrated that at low RPM, the No. 2 flight control system displaces more fluid from the actuators than the No. 1 pump is supplying. This results in No. 1 system pressure bleed-off. Under these conditions, the No. 2 system pump still supplies the necessary flow and pressures to provide the maximum stabilizer rate. These complaints generally disappear as pilots learn to make smoother approaches in the airplane.

Some pilots are reluctant to use the recommended touchdown speeds because of stories they've heard or films they've seen on an accident at Edwards AFB which intimate that violent pitch-up could be encountered on the F-100 at low speed. This is in error.

A stick force lightening does occur about 5 KIAS below the recommended touchdown speed. If stick force lightening is encountered, normal flying techniques should be used, as the occurrence is not dangerous. Simply continue flying the airplane. Do not under any circumstance "jam" the nose of the airplane down, as this can cause porpoising.

Porpoising also can be induced by excessive touchdown speed, excessive rate of descent, misuse of flight controls, or a combination of all three. Investigation of ten instances of porpoising encountered in the Air Force showed that every one included a touchdown speed at least 15 knots above the recommended speed and in one instance, 40 knots above the recommended speed.

If touchdown speed is too high, the nosewheel can strike the ground first, bouncing the airplane into a nose-high attitude. If the pilot then pushes forward abruptly, driving the nose gear into the runway again, the entire cycle will be repeated.

On landing from an excessive rate of descent, a bounce landing on the main gear can change airplane pitch attitude abruptly and can set off a porpoise as in any airplane. Again, porpoising will not be encountered if the recommended touchdown speeds and techniques are observed.

The "smooth, flat" approach at the recommended speeds and rates of descent will provide better engine accelerations and wave-off characteristics, will ensure an ample speed and power margin for flare, will minimize stick stiffening, and will give the pilot more precise control over his touchdown point and speed.

Using the recommended landing procedures, North American's pilots have consistently demonstrated landing distances less than 4000 feet and, under ideal conditions, less than 3000 feet. Flight data show, however, that an increase in landing speed of 10 knots results in an increased ground roll of 20 to 25 per cent.

Don't be afraid to use the Handbook-recommended approach and touchdown speeds when flying your F-100. They are based on practical conditions for the service pilot and if used will prevent unnecessary tire and brake wear as well as reduce the number of embarrassing barrier engagements.

Remember: Ten knots too fast at touchdown means approximately an additional 1000 feet of ground roll. ▲

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Donald H. Stuck,
McDonnell Aircraft Corporation

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Statistics show us that a large percentage of aircraft accidents occur during the landing phase of flying. Two contributing factors that weigh heavily on these statistics are:

- Psychological attitude during the landing phase.
- Lack of pilot familiarity with the aircraft in the landing configuration.

As you enter the pattern for landing, it is only natural that you are looking forward to the termination of the flight. That cup of coffee and a smoke will taste good after a one and one-half to two-hour flight involving no small amount of mental and physical strain. This is no time, however, to be looking too far into the future.

The landing you are contemplating is indeed inevitable, but whether or not it adds to accident statistics rests in large part on your preparation and alertness on this very important phase of flight. The cost of the present day weapons system plus the value which you place on your life and career demands that you really be on your toes. Remember, your flight is not complete until you have shut down and climbed out.

Aircraft contractors can go just so far to make flying enjoyable to you and profitable to Uncle Sam. They can give you performance and reliability—the Voodoo's twin engines deliver 30,000 pounds of thrust to power an aircraft whose takeoff gross weight is about 40,000 pounds. The Voodoo's flight control system is designed so that the airplane can be commanded precisely in its operational mission with ease and light control forces throughout its

entire performance envelope. They cannot, however, change any basic laws of physics or aerodynamics. No matter how fast the aircraft is or how easy it is to fly, there are certain facts relative to gross weight and wing loading which must be respected by the pilot.

The Voodoo flys well in the landing pattern and is a very easy airplane to land normally or on single engine; however, three basic techniques which apply to any high density, high wing loaded aircraft also apply to the Voodo. Here they are:

- Fly shallow final approach angles.
- Hold recommended approach speeds and do not allow rapid bleed-off of airspeed until after the aircraft has been completely flared out.
- Do not allow high rates of sink to build up at any time.

The only purpose of a landing pattern is to get the airplane in a position where it can be landed. The initial approach, downwind and base legs can be varied slightly due to base policies, terrain and so on, but the final approach is a fairly standard slot regardless of which airdrome you land on.

Your base leg should be positioned such that the wings level portion of the final approach is at least one to two miles. This gives a fair amount of time to make slight adjustments on final prior to flareout. Although the aircraft feels light and flys easily in the pattern, don't forget that at landing conditions you are still flying over 15 tons of aircraft. This fact naturally precludes any "wracking around" at final approach speeds. This same one to two-mile straight-in portion of the final approach should represent about a two and one-half to three-degree glide slope.

This glide path should feel familiar to you since the GCA and ILS glide slopes are set to these figures. The reason for a shallow glide slope is quite simple—a given amount of energy is required to flare the aircraft. The heavier the aircraft or the greater the change of direction (steeper final approach) the more energy is required. The 170 knots that you hold on final approach represents this energy which you require to flare out with 3000 pounds of fuel on board and is predicated on flareout from a three-degree glide slope. The adjustment of five knots increase for each additional 1500 pounds of fuel which is required by the pilots operating instructions is the extra energy required to flare out with the added weight of the extra fuel.

Steeper final approaches are not recommended because there is a marked increase in energy required to flare the aircraft from steeper finals, meaning higher than normal approach speeds plus a greater chance for error in pilot's judgment during rapid flareouts from steep approaches.

The Voodoo can be landed easily at extreme gross weights as long as Handbook-recommended speeds are observed. Since fuel accounts for over one-third of the takeoff gross weight of the aircraft, it can be easily seen that landings can be accomplished at a wide variety of gross weights.

The basic handbook rule is 170 knots for 3000 pounds of fuel remaining and add five knots for each extra 1500 pounds of fuel on board. Therefore, if landing were required with 12,000 pounds of fuel remaining, the final approach speed should be 200 knots. These recommended speeds, in addition to giving the aircraft a flareout potential, provide the necessary speed to prevent high rates of sink from building up.

If speeds are dropped below those recommended, the aircraft will develop a given rate of sink because the flow across the wings is not sufficient to produce the necessary lift to sustain the gross weight of the aircraft along the desired flight path. This situation in a high gross weight aircraft is more critical than a steep final approach since here too you need energy to flare the aircraft. In this low speed case, there is not even enough energy to keep it flying along the desired glide path, much less flare it out. The corrective action is of course, power to regain your airspeed. More important, the preventive action is *hold recommended airspeeds.*

You will find that a normal final approach will require roughly 80 to 82 per cent engine rpm with the speed brakes in. All jet engines show better acceleration chracteristics in the higher RPM region and the Voodoo is no different. Keep engine RPM up where power will be immediately available to you. From 80 per cent engine RPM on up the engine response is excellent so it is recommended that engine RPM be kept in this range until after flareout.

The speed brakes of the Voodoo are variable position with no pitch transients imparted by their action. They are also very effective and provide an excellent method of speed control on final if engine RPM is set slightly on the high side and small amounts of speed brake—in and out—are used to maintain speed. The final can also be easily flown with speed brakes fully out and speed controlled with power alone. Whichever you desire—don't pull those throttles 'way back until after you've flared.

Let us assume now that the aircraft is ready to flare out from a normal final approach. During the actual flareout a small amount of G loading is naturally imposed on the aircraft. This calls for more lift from the wings and consequently more drag. The more abrupt the flareout (from a steeper final), the more lift and drag produced. This drag manifests itself to you by unwinding the air-

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Don Stuck joined McDonnell Aircraft as Experimental Test Pilot in April, 1957. Prior to that time he worked in Flight Test at Wright-Patterson AFB for three years. He joined the Air Force in 1942 and served two tours of combat in fighter aircraft. He flew the P-47 in the Pacific Theater in WW II, and the F-86 in Korea. Don has more than 3000 hours of fighter time, and over 4000 total.

speed indicator.

The Voodoo's gross weight is high and consequently the drag produced during flareout will be relatively high causing a rapid bleed off of airspeed during flare unless you prevent it. This prevention takes the form of engine power. If final approach power is left on during flareout, airspeed bleed off will be minimized.

So here is the final, simple but important rule in landing any high gross weight aircraft. Leave power on until after the aircraft has been flared. After the flare has been accomplished, retard power to idle, extend speed brakes fully and hold a slight nose-high attitude. The airplane will take care of the rest. As airspeed starts to bleed off a slight rate of sink will build up and the aircraft will kiss on the runway for a good landing every time. Good aerodynamic braking qualities, a drag chute and anti-skid brakes add up to short, safe landing rolls.

The Voodoo flys well and all systems are available on single engine. Aerodynamically, the aircraft only knows airspeed and it doesn't particularly care whether it gets it from one or two engines. You, as a pilot, want to be more careful about proper speed because you only have half the normal power to get you out of trouble if you get into it.

There is more than adequate power on single engine to stay out of trouble. As a matter of fact, with a 12,000-pound fuel load, a go-around can be accomplished on single engine military power at any time prior to flareout. About the only difference the Handbook specifies for single engine is to add 15 knots to normal final approach speeds and fly final approach without flaps, extending them just prior to flareout.

During single engine patterns it is advisable to keep engine RPM above 85 per cent at all times, using intermittent speed brakes for airspeed control. In this way chance of any inadvertent airspeed bleed off is minimized and power is always immediately available.

In all phases of your flying, know what your aircraft will do and what you should do with it. There's a lot of weapons system represented by the Voodoo. If you fly it right, you'll have the pleasure of high performance and Happy Landings. ▲

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Richard L. Johnson, Test Pilot
CONVAIR

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Operation of twelve tons of high performance airplane from an 8000-foot runway in various conditions of wind and weather requires careful attention and planning. Landing such vehicles is a problem, as witnessed by the Century series accident rate during the past two years.

The purpose of this article is to review the recommended procedures for landing the F-102A and to pass on additional hints and general views which will aid the pilot in coping with the eccentricities of the "Dagger." Although a bit premature, it is interesting to note that the information presented applies to the F-106 "Dart," which will soon make its appearance in the field.

The normal landing pattern approach speed of the F-102A can vary over a wide range; however, the most desirable speed range is from 300 to 325 knots IAS. At the break, altitude should be 1500 feet above field elevation and speed brakes should be extended if desired. Thrust should be reduced to obtain desirable gear-down speed. At no point in the pattern should less than 75 per cent rpm be maintained to assure sufficient engine response in the event of a go-around.

The downwind leg should be flown at 230 knots IAS and altitude maintained at 1500 feet above field elevation. Prior to turning base, extend the landing gear and check for a safe indication. As the turn-on to base leg is started, a descent should be established and airspeed should be allowed to reduce to 180 knots IAS (minimum) on the base leg.

Descent should be continued through the turn-on to final and final approach speed should be a minimum of 170 knots IAS. If airspeed becomes excessively low, a high rate of sink may develop, resulting in a hard landing. Normally, approximately 85 per cent rpm will be required on final approach to maintain sufficient airspeed.

During the flare, thrust is reduced to idle and touchdown is made with approximately a 15-degrees attitude at a minimum of 135 knots IAS. The nose should be lowered gently to the runway at about 100 knots IAS. Maintain directional control with rudder, brakes or nosewheel steering. Rudder control is available down to about 70 knots and nosewheel steering should be used below this speed.

During the final approach under cross-wind conditions, a "crab" is the most effective means of correcting for drift; however, a combination of "crab" and "wing-down" may be used if the pilot so desired. Touchdown while in a mild "crab" is safe and the momentum of the aircraft will align the longitudinal axis with the direction of motion as the wheels contact the runway provided contact is sustained. This is not the time to touchdown "hot" so as to precipitate a series of "skips."

The drag chute, if used, will attempt to turn the airplane into the wind, however, the rather large side area of the extensive nose portion of the airplane creates a counter torque which cancels the turning effect of the drag chute. It is perfectly safe and sensible to use the drag chute during crosswind operations.

For a minimum run landing, fly a normal traffic pattern and approach. When about three seconds from touchdown, pull the drag chute deploy handle. The chute will deploy just prior to touchdown and will yield maximum effectiveness. Cut power at touchdown, lower nose immediately and begin maximum braking.

The traffic pattern presented in the Pilot's Handbook shows that the descent begins while turning from downwind to base. The object is to be wings level with a sensible rate-of-descent at about 100 feet above the ground when 2000 feet from the end of the runway.

Some Air Force commands require a level turn from downwind to base at 1500 feet above the ground. This is compatible with the airplane as long as the pilot considers that he now must lose about 1500 feet of altitude during the remaining 90 degrees turn and subsequent straightaway. To attempt to accomplish this with a tight pattern will require a power-off, wrapped up, descending turn which may generate a requisition for a pilot.

If the turn onto base is to be made at 1500 feet, the base leg should be about a mile and a half from the end of the runway (for the impatient ones, about 45 seconds from base to the end of the runway) to allow for a sensible rate of descent during the approach.

Many squadrons have adopted a policy of flying normal approaches which are similar to the ILS glide slope. Although it is agony to some of the "warm" pilots, it is more practical and safe than the old hard, break and tight turn, high rate-of-descent type approach. It is practical since it lends consistency to the approaches and makes for better ILS approaches under actual instrument conditions.

The use of speed brakes during such an approach is optional. The advantage to an operational squadron using speed brakes is that it permits an approach at high power, thereby affording a wingman more control.

The proper landing attitude is between 14 and 15 degrees nose-up. The pilot can judge this by the position of the end of the nose boom relative to the horizon. The average pilot in a normal position will observe that the end of the nose boom is on the horizon at 14½ degrees with the wheels on the runway. The airplane should not be landed at higher attitudes than 15 degrees. At an airplane attitude of 18 degrees the tail cone will contact the runway with the struts partially depressed.

Stability, control and general feel of the F-102A is excellent in the slow speed range. The controls are effective and stability is positive below the recommended touchdown speed of 135 knots. The excellent low speed controllability is a characteristic of the "Delta" wing. This characteristic may permit the pilot to slip well onto the back side of the power required curve during a power-off approach. For this reason pilots should adhere to recommended approach speeds and associated power settings.

The recommended approach speeds as presented in the Handbook are generous and will afford a safe approach at heavy landing weights. The practice of adding five to ten knots for security will cost the pilot a thousand feet of runway during the "float" which will follow a flare that begins at higher than the recommended speed. Remember, an accident at the far end of the runway is also an effective means of removing an airplane from the Air Force inventory.

In summary, the F-102A is a high performance, heavy, pleasant-flying, honest airplane. Adherence to the following general rules will aid you to accomplish the landing portion of your mission in comfort and safety.

- Adhere to recommended approach speeds.
- Tailor the final approach to a glide path of about three degrees.
- Make all approaches power approaches.
- Avoid landing attitudes above 15 degrees.
- Use the "crab" or "crab"-and-"wingdown" for crosswind landings.
- Deploy drag chute at or just prior to touchdown. ▲

Dick Johnson, Project Officer of the '102, has been with CONVAIR at Edwards AFB, Calif., since 1953. During World War II he served as a fighter pilot in the Mediterranean Theater for 17 months. In 1945 Dick joined Wright Air Development Center and during this assignment, he flew virtually all USAF aircraft in the inventory, including the XF-92 and the X-1 rocket.

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A. W. "Tony" LeVier and Louis W. Schalk, Jr.
Lockheed Aircraft Corporation

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Several weeks ago I was asked by FLYING SAFETY to write an article on how to approach and land the F-104. At first this request caught me off guard, and I was about to say, "Heck, approach and land it like any other 'bird' in the Century series." On second thought, however, I realized that each new aircraft designed and built would obviously have flying characteristics that would differ from one type to another. Then, when I sat down to think it out realistically, I said, "Sure—and I believe that I have a new twist which might be even more beneficial than a lot of graphs and figures!"

But before I launch into a dissertation on the art of flying an airplane, and particularly how to get it back in one piece, we should set up some ground rules to go by. First off, if you haven't actually flown the F-104A, I highly recommend that you erase all the wild rumors that you may have heard about the "bird" to date.

Secondly, if you have flown it, but for one reason or another have certain reservations about it, please allow me to get my two-bits worth in before you pass final judgment. Thirdly, you may even say to yourself, "Yah, look who's talking—you're a test pilot. We're just poor First or Second Johns, and perhaps fresh out of flying school at that." Wrong attitude, men, all wrong! I've gone through this same fracas with Air Force pilots since 'way back when your Colonel was a nice young First Louie like you. The rumors, gossip and scuttlebutt are the same old stuff—"same song, second verse."

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Tony LeVier has been flying for Lockheed since 1939, his present job being the Director of Flight Operations. As test pilot he flew the "initial" flights of 23 different airplanes, including the F-80, T-33, F-94 and XF-104.

Lou Schalk has more than 1000 hours in test flying. He has flown 30 different jet fighters and also has headed the major test programs on the F-86H, '100C and '101A.

During my flying career, testing new aircraft seems to have played the most important part, and in the case of military fighter types, eight have been first flights, including subsequent Phase I testing, to determine if we had a "bird" or a "turkey." I have found that generally the approach and landing is the one thing that pilots are first to question. "What's she like to land?"

I've been faced with this question many times myself, but unfortunately there never was anyone around who could "clue me in." So, with this lack of information I would gather as much technical data as possible, sort out the good from the doubtful, and build up a kind of imaginary "handbook of instruction."

With all the available knowledge on hand we would then conduct what are generally called taxi tests, including skip-offs if enough runway length were available—sort of an unofficial first flight but darned good flight test qualitative data on how she is likely to behave on takeoff and landing. Naturally, our testing at Edwards Air Force Base, with 12 miles of dry lake bed, makes this sort of thing a cinch.

I made the first flight on the F-80A early in 1944. It was the hottest thing in the world at that time. Pilots everywhere were eager to get their mitts on this new kind of flying machine, but with little understanding of the correct way to operate the jet, some of the hottest pilots were a bit baffled because of such things as—

- Higher wing loading
- Four times greater adverse effect on power because of temperature rise
- Deficient fuel controls
- Very inefficient engine operation at low RPM
- Lack of propeller wash for low speed lift and control.

All this put together spelled out lots of trouble and, although the approach and landing still appeared to get top honors for, "How do you do it?" I honestly believe the takeoff was actually more difficult and hazardous than the landing. Yet the approach and landing was cause for the lion's share of accidents between the two and still remains the leader even today.

With the exception of not enough thrust to get flying speed, or the pilot being too impatient to attain same, very few takeoff accidents have been caused for other reasons. In the case of approach and landing accidents, the real troublemakers have been "we—the pilots," and this has been caused by a lack of understanding of the basic problem at hand.

Here is the way I look at it: Actually, a takeoff is always more hazardous than a landing. You are starting from scratch; the aircraft is heavily loaded, generally; not much runway is left to abort once you are well underway, and even after you're across the fence there's not much to go on from a safety standpoint until several hundred feet of altitude has been reached.

On the other hand, the landing is to be the culmination of a flight. The aircraft is at its lightest weight which is certainly better than being heavy. Perhaps you have flown across country, over part of an ocean or even a desert, none of which would make a very good place to land. The engine has run smoothly for the entire mission, except for the part over the ocean, but once again (with land in sight) she smoothed right out.

You have spotted the base of your destination with the exact amount of fuel previously calculated. You feel real good because things have worked out thus far as you had planned. You've cleared in with the control tower and have the necessary information to prepare you for your approach and landing. No other aircraft is in the area.

You enter the traffic pattern as prescribed, just like you have done it a thousand times. You're on the "initial" at 300 knots and make a left break into downwind. Speed has been reduced and the landing gear and flaps have been lowered. You believe the engine RPM has been adjusted to provide the proper speed for the base leg and final, which is a descent. But—for some gawdawful reason the aircraft either overshoots or undershoots. Net result: "One pranged aircraft."

Why? I say "improper use of the engine," i.e., too much or too little thrust to maintain reasonable airspeed along a glide slope compatible with the particular aircraft you are flying.

I used to hear this all the time, "Gotta' land with my engine in idle to assure myself that I can make it if it should conk out"; or, "I'll add 10 knots for the wife and 10 for each kid on all my landings."

Frankly, men, the above self-styled procedures went out with high button shoes.

Several years ago I had the pleasure of attending an Air Force-Industry Flying Safety Conference at Norton Air Force Base. One of the principal points on the agenda was that which dealt with the enormous loss of aircraft as result of approach and landing accidents. Not the emergency variety, but just the plain, normal everyday kind. Such things as accelerated stalls on the break and during the base leg, took an appalling toll in men and machines. And, of course, undershooting and overshooting were right in there for their share of the spoils.

Having been active for some years in dealing with such problems, I was asked to address the conference. After a few brief pleasantries I stated that it was a small wonder more pilots and aircraft don't "buy the farm." In the Dash Ones for most jet planes, it is clearly stated that no stalls will be attempted below 15 or 20 thousand feet, and spins and certain other aerobatic gyrations will be terminated above, say, 10,000 feet.

Now, gentlemen, I ask you, if a pilot racks an airplane into a fast and tight break on the "initial" and chops the power at the same time, isn't that in violation of the SOP on stalls, spins and acrobatics? Certainly in some cases it is. Traditionally you have been doing it that way. But you must recognize that aircraft have become heavier and hotter, and to provoke a stall or spin at the initial approach or base leg altitude is just plain suicide.

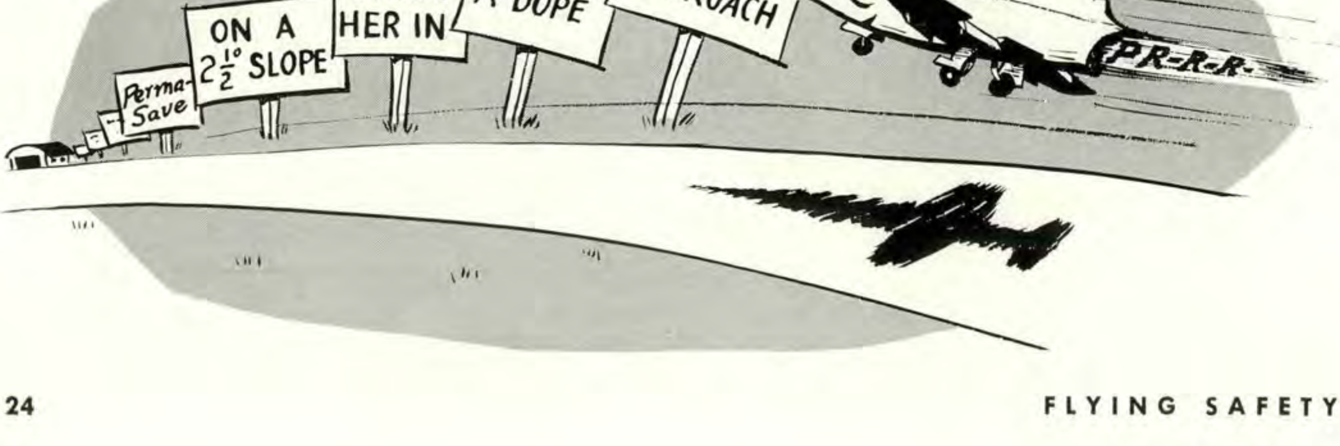
Solution: Simple. Cut out the tight breaks. Don't chop the power into idle. Make a longer flatter power on final approach. In other words, set yourself up for a good safe landing. NOT for an obituary.

Well, what do you know, most of the guys at the Conference bought the idea. But some raised a beef. Fighter pilots gotta' be "Tigers." They gotta' do it this way or that way. To hear 'em holler, you'd think they were being restricted to 10-degrees banks. Nevertheless, approach and landing accidents did take a decline.

But now after several years have slipped by we have entered the supersonic age for sure. I don't believe pilots are racking 'em in so tight that the eyeballs pop out, or chopping the throttle into idle on the break. What they still do, though, is carry excessive speed when it is not necessary, or too little when it is necessary. The latter comes into the picture during the base leg.

For such things as *indicated speed, height above ground, rate of descent, wind drift effect on position relative to the runway, weight of aircraft* and *power being carried*—each will have an important part to play at the tail end of your flight. You can deviate a little on one or two, but to deviate on all of them at once can, and usually does, result in trouble.

LeVier says, "Set yourself up for a good, safe landing—NOT for an obituary."



This Navy Exchange Pilot has had it hacked from the beginning.

For the last two or three years there has been a very extensive effort by all concerned to figure ways and means to reduce the frequency of approach and landing accidents. The changes in SOPs that I have seen are certainly in the right direction and should bring considerable relief, but unfortunately the rate for approach and landing accidents still gets top billing.

During the past several months I have discussed this major safety of flight problem with many pilots. They've been officers of all ranks with a wide variance in flying time. As for jet experience, they fell between 400 to 2500 hours. Surprisingly enough, several of the pilots stated that no matter what system or SOP you dreamed up, there were those privileged few who thought the right way was the wrong way (and that their system worked best), and generally you couldn't get through to that kind until it was too late anyway.

Well! This sort of conversation shook me up a little. I couldn't believe that military pilots—having had the finest flight training possible and with adequate indoctrination into any new model aircraft—couldn't enjoy a reasonably safe and sane existence. However, with this general feeling among leading military pilots, the picture began to clear up.

Some military pilots in command positions apparently fail in many instances to properly instruct, supervise or —in simple military language—produce "air discipline" among their men. These are harsh words for a civilian to use but the time has come to call "a spade a spade."

In my tours of military bases throughout the country, time after time I've seen formations of fighters taxi out, take off, join up, fly a mission and return to the break point in formation, and up to this point represent the very highest in efficiency and air discipline. Then, in the pattern, four complete individualists cut loose. One too high; one too fast; one too slow, and one S-turning to keep an interval. And all too many times, blown tires or landing accidents to mar what was up to the break, a perfect example of precision flying.

Let's review a few facts. Generally speaking, the Air Force has been making steep approaches for so long that this is still reflected in the Dash One covering the landing pattern phase. In studying the recommended landing patterns for several Century series I have found that much is left to the judgment or imagination of the pilot. Surprisingly enough, some of the information will encourage dangerously steep final approaches. It is up to each individual pilot and pilots in command positions to see that air discipline and proper techniques expected in military flying are exercised in the landing pattern.

In one respect my position here at Lockheed is exactly the same as that of a Group or Wing Commander in the Military. It is my responsibility to Lockheed, and to the customer as well, to see that our flight crews are properly trained, that they come up to certain minimum standards of flying skill, and that after all is said and done, they maintain "air discipline."

This is not an easy job for anyone. But it's a job that has to be worked on constantly.

Let me tell you about two accidents that occurred with Century series aircraft. They are typical of the kind of accidents that shouldn't happen but they did. The first pilot got to tampering with the numbers racket—and of all things, the dead engine landing procedure. He wanted to see if he could lower the altitude. The first few times worked fine but because of lack of experience, he failed to recognize soon enough that his last attempt from 9000 feet was from too low an altitude, and he was trapped.

He was in the last half of the base leg. In tightening up on his turn, his speed dropped off. At this point he should have given the whole thing up but instead, he lowered the nose to regain speed. This was the crowning blow. By the time he recognized his mistake it was too late. He crashed with the engine wide open. Miraculously, the only injury suffered by the pilot was his pride. The aircraft was junk.

The other pilot was flying the same type plane. However, in his case the approach for landing was a normal 360 degrees overhead and probably done according to the book except for his base leg and final. Observers on the ground made mention of his unusually tight base leg and they stated that when the aircraft was last seen dropping below the trees, the sink rate looked excessively high. Well, it was—and again—with full power on, the aircraft struck the ground some 500 feet short, bounced onto the runway, and ended up with major damage to the undercarriage and lower structure. The pilot's first remarks were, "Guess I busted an airplane."

But why did he bust an aircraft? He later stated that he couldn't understand what happened. He was carrying 190 knots, just what the book says. Obviously it was the tight base leg. His sink rate *compounded itself several times*, and even though there was information available to warn him of impending danger, he failed to recognize it soon enough to take corrective action. This is usually the case with most accidents. The guy really didn't want to prang an airplane—and least of all, himself.

Let me compare a simple base leg maneuver to that of a low altitude Split-S turn. Everyone knows that the point of no return in a Split-S is half way through. The airplane is vertically nose-down. You can't back up to do it over. You have committed yourself to a maneuver that is absolutely "unforgiving."

If the rate of descent on the final approach is higher than normal, the flare should have begun higher and farther from the field.

Okay, you've all heard of some poor soul buying the farm, doing a Split-S. Perhaps you've come close to busting your fanny doing one yourself. Now, I say that the *base leg* of an approach for landing is nothing but a modified *Split-S*.

Some pilots have actually done Split-S turns to a landing for fun at air shows. It's really a great thriller. The only difference between these two maneuvers is that a greater sink rate, increased speed and higher G are experienced in the Split-S. The bad part of the base leg and final is that you must *reduce the altitude and speed* of your aircraft to the *absolute minimum*.

You must regulate these diminishing values very skilfully in order to touch down on the "spot." We all know this is quite true and, looking back at some of our hard landings, we may have tried to make an excuse to cover up our little mistake while deep down in our hearts we knew we just plain "goofed."

Probably all of us who fly have started a turn at a given altitude and power and continued to tighten the turn as the speed has bled off. If you continue with this procedure, the turning radius gets smaller and smaller until finally the airplane reaches maximum lift and stalls. At this point the aircraft suddenly breaks away from this very small circular flight path.

If the plane doesn't spin, it almost immediately assumes a very large turning radius. It would take a "defense calculator" to produce on-the-spot turning radius information of such a maneuver. Okay, agreed. Now, take this same turn at altitude and borrow half of it for our base leg. Throw in the added impetus of a descent and it should be obvious even to a "blind man" that the *base leg and final approach is a real red hot maneuver*.

We must, then — as a necessity — produce a final straight-in approach up to perhaps 6000 feet out from the runway threshold. The slope of this final approach will be between two and three degrees. Start tampering with this by increasing the glidepath angle and you stand a darned good chance of getting caught at the point of no return. Chances are your throttle has been retarded to compensate for the steeper angle, but you are unaware that the turning radius necessary to flare just "ain't there"—and the results are obvious.

Perhaps at this point we should look at the graph on this page, showing the effect of descent angle on landing approach. I had a hard time trying to figure out the best way to present this information on one graph and after finally working out the details it certainly reminded me of plenty of times when I trod on thin ice.

Let's start with the recommended flight path of approximately two and one-half degrees. Note that you are in the gray area which practically guarantees a safe touchdown. Nevertheless, as you descend and get closer to the runway, it can be seen that because of the previously mentioned diminishing values up to touchdown, you actually get quite close to the impossible *red* area.

As we increase our descent angle and enter the heavy dotted area, it tells us that a flare can be accomplished only if you apply power. This is the area where many pilots have been operating during approaches; and this accounts for most of those nasty, hard, crunchy-type of controlled crashes because as you blissfully descend on just a mere six-degree slope, you drive right smack into the *red* area. You're trapped, and at the point of no return.

The odds are real high that you will bust an aircraft. But that's not all. Take the 12-degree slope—it doesn't look or sound steep, but the results are usually a real blown-up "crash." As we drive downhill on a 12-degree slope, our judgment must be razor sharp in order to apply power and start the flare at not less than 325 feet above the ground to avoid a crash, and I would suspect that anyone on a six- to 12-degree slope "ain't" exactly sharp at the moment.

Carrying extra speed along any of the many glide paths will usually result in overshooting the intended spot, and precious runway will be sailing by beneath you. This procedure generally produces the blown tires, overheated brakes, barrier engagement and so on. Sometimes the results are just as bad as a real good crash.

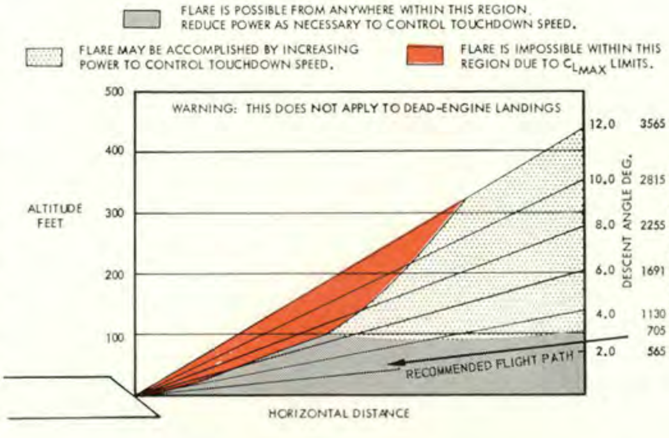
So why add knots on top of what is already best by test? About the only thing that would require you to add knots to a normal approach and landing speed would be adverse weather conditions, such as strong, gusty winds. In this case you would never add more than half of the gust velocity or total gust effect. If you have an emergency you would, of course, revert to your emergency procedures, but here again most of the landing accidents occur when everything is hunky-dory.

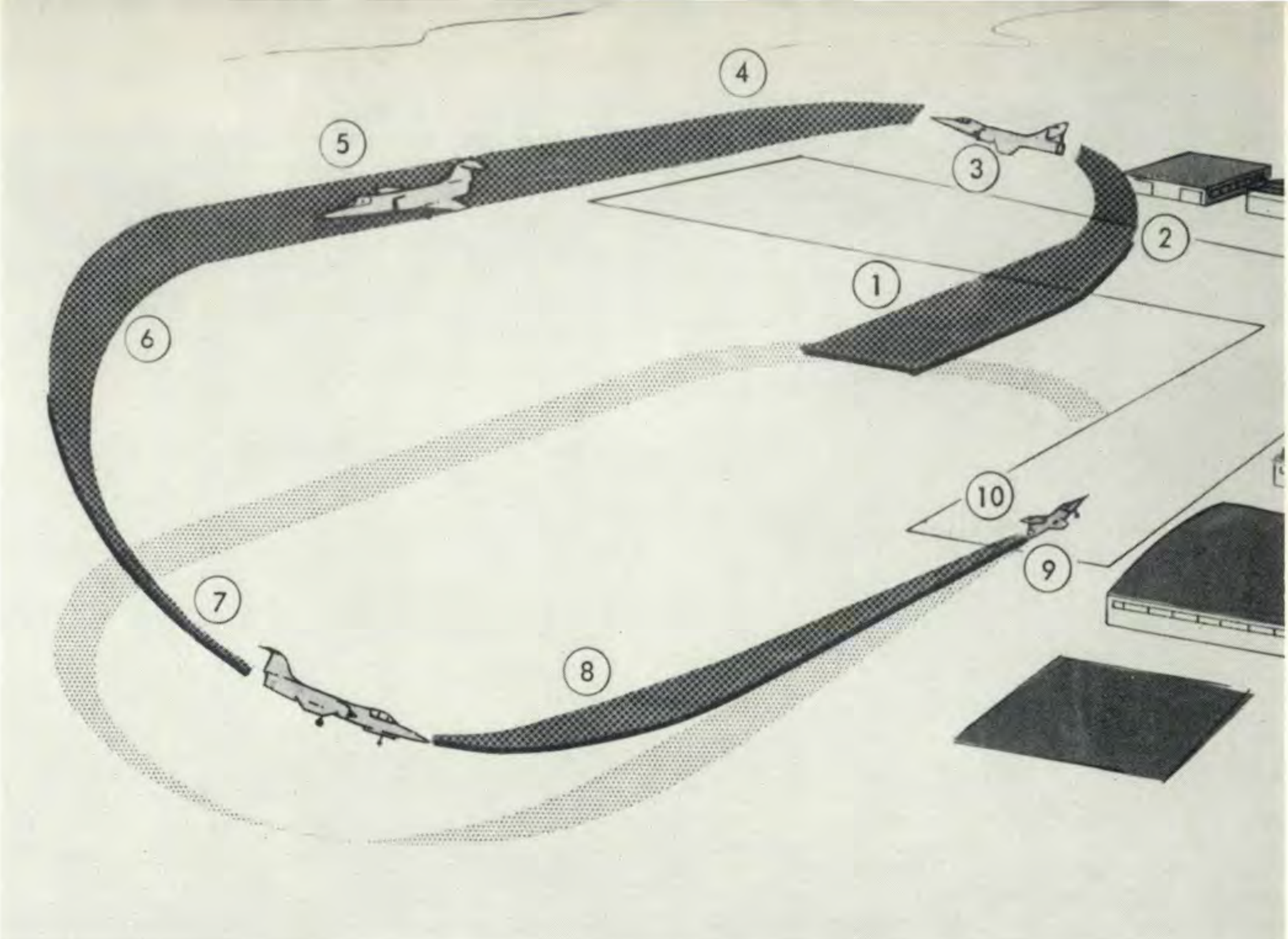
And now I believe you would be interested in reading what Lou Schalk has to say about the F-104A.

POWER is the key to the difference between landing the F-104 and the breed of fighters prior to the Century series. With the low aspect ratio of the Century series, we must take a fresh look at our approach technique. The simplest way to analyze the extreme difference in power effect is to remove all of the power and see what has happened to the high key altitude for a dead engine landing.

It is 15,000 feet above the terrain in the F-104. The F-104 will lose that altitude when completing a 360-degree turn without power. On top of all this we keep the gear retracted until after the flare is initiated to keep the rate of sink from becoming even higher. In the normal pattern from 1500 feet, the altitude reduction is bought with the addition of power.

Let's ride around the 360-degree overhead approach. The break speed is 300 knots primarily to allow us to lower our takeoff flaps at the initiation of the break. This





Here's the way to do it: 1. Level pitch-out at 300 kts IAS at 1500 ft., approximately 86 per cent RPM. 2. Lower flaps to takeoff position. 3. Fly crosswind at 280 kts, 1500 ft., approximately 86 per cent. 4. Roll out at 260 kts, maintain 1500 ft. on downwind, approximately 86 per cent. 5. Increase RPM to approximately 87 per cent, lower gear and check indicators, 250 kts. 6. Turn onto base leg at 220-240 kts, 1500 ft., approximately 87 per cent. Turn onto final, lower flaps to land position and slowly increase RPM to approximately 88 per cent. 8. Roll out on final, 600 ft. from end of runway and 300 ft. above field, 180-190 kts, 88 per cent. 9. Start flare 160-170 kts, approximately 89 per cent. 10. Touchdown at 145 kts, bring throttle to idle, engage nosewheel steering after wheel touches. Deploy drag chute.

will give us the desired maneuvering ability up to the gear-down speeds of 260 knots without buffet. The first 180 degrees of turn is made with approximately 2G. The airspeed is allowed to bleed off to about 250 knots just prior to turning base at which point the gear is lowered.

I'm usually carrying approximately 86 per cent rpm at the break, and when I lower the gear I make my first power change. Instead of reducing power, I increase it by a couple of per cent to offset the drag of the gear.

Continuing on to base leg we keep the airspeed between 220-240 knots until we have about 60 to 90 degrees of turn remaining until final approach. At that point the landing flaps are lowered. Here is a second point where the drag has increased, and a further increase in power is required.

As the airspeed drops below 190 knots we should have completed our turn and be on the straight-in final approach.

Concern as to our position from the runway and our altitude should be non-existent if everything has gone right, for we have introduced ourselves to the GCA glide path with approximately two and one-half degrees of approach angle and have the familiar presentation of the runway from a GCA approach. We then point the pitot boom of the aircraft at the end of the runway and drive down final approach. As proficiency increases we try to control the airspeed bleed-off to reach 160 to 170 knots prior to starting our flareout at the end of the runway. If we reach 160 prior to that point, we add power and hold speed. If we see our speed is not dropping from 190 fast enough we reduce power slightly. (The 160 to 170 figure goes up with rough air or formation landings.)

During flareout we gradually reduce power until we simultaneously reach the idle power position on the throttle and touchdown point at 145 knots. The nose is immediately lowered, nosewheel steering is engaged, and the drag chute is deployed. If we want to turn off in less than 5000 feet, we apply wheel braking.

If you really want to stop short, here's what to do. Flare in front of the runway and hold the aircraft off until 140 knots. Touch down on the end of the runway and as you lower the nosewheel, deploy the drag chute. Initiate braking and hold it until you stop. This will produce a ground roll of approximately 2500 feet, but it takes practice to develop the technique. Build up from the safe side, both on touchdown speed and braking. The strangest part of the F-104 pattern is the technique of power control during flareout to hit the landing spot. When you hit the idle power position on the throttle, the airborne phase of the mission is over and you had better be in shape to touchdown.

There are two new features in the F-104 that makes the landing pattern different. Wind tunnel studies on a Gillette razor blade revealed that very little lift could be obtained at low speeds, but supersonically this was the airfoil that gave the least drag. With both leading and

Chopping the throttle to idle position creates an immediate 25 per cent loss in lift when using boundary layer control.

trailing edge flaps, an airfoil is born that is more favorable for low speed handling. Consequently, the break speed is 300 knots to permit lowering of takeoff flaps at the beginning of the maneuver.

The second feature is the boundary layer control. It comes in automatically with the extension of the landing flaps and is not too obvious to the pilot. Its lift contribution is roughly equivalent to the lift increase obtained by going from the takeoff to the landing flaps. The landing flaps and the boundary layer control combine to produce a reduction of the angle of attack by three degrees at 180 knots as compared to takeoff flaps. Air is bled off from the engine and blown over the trailing edge flaps adding energy to the boundary layer and delaying flow separation. The energy is dependent on the mass air flow which is dependent on the engine speed which accounts for the recommended flat approach angle. (Or, in other words, a rose is a rose is a rose is a rose.) The flat approach is primarily recommended to require a minimum rotation for flareout and make it easier to land the aircraft. Because of the power control in the flare, the approach and touchdown speed should be close together.

It might appear that a logical way to analyze the boundary layer control would be to chop the power to idle at touchdown speed and see what happens. However, this is not entirely true—things happen all right, and the original theory is true that as your engine speed decreases so does the boundary layer control effect. But this is somewhat more than hidden by the effect of reducing thrust. First try this: Stabilize with the takeoff flaps at 90 per cent power at 10,000 feet gear down; chop the power to idle and hold your altitude. The ensuing result is the reason for the capital letters at the beginning of my part of this article. This is why we slowly reduced power in our flare. The power effect is primarily why the aircraft falls out from under you in the flare if the power is chopped. The airspeed falls off so fast the pilot can't keep up with it.

There is still margin left even at 140 knots touchdown. I won't tell you at how low a speed I have touched down for it is not recommended and not for use. I have yet to hear of anyone's stalling the F-104 in the traffic pattern. The first one who does will undoubtedly be absent for postflight comments.

IMPORTANT—The important thing to remember is that a long flat two and one-half degrees slope produces a very desirable sink rate which will result in the best spot landings you have ever made.

Tips

• The shaker on the stick is your stall warning. The intensity does not change regardless of how "deep" you fly into it.

• Don't use speed brakes in the pattern. When carrying power all the way, you need just that much more with speed brakes out.

• When changing power, do it gradually. Torque effect at low speed in the F-104 can be quite noticeable.

• Engage the nosewheel steering upon touchdown. Then, the day you touch down in a cross-wind, any yaw from the drag chute will be easily controlled by the nosewheel steering with little extra effort on your part.

• One more pitch—because of the name of this magazine—Always put your gear down before landing. It is possible to land the F-104 wheels up too; in fact, it has happened. ▲

105

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Henry "Hank" Grady Beaird, Jr., Republic Aviation Corporation

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Statisticians have told us that approximately 44 per cent of the difficulties experienced in jet fighters have occurred during landings, and 79 per cent of these were during non-emergencies. After giving some thought to this, I should like to describe landings of the F-105B. Named "The Thunderchief," it is a big, powerful airplane and a powered approach is very desirable. It is an extremely "honest" airplane throughout its velocity-load range as well as in the traffic pattern.

A normal pattern can be started from any speed on the initial approach. The "four-leaf clover" type speed brakes are so effective that deceleration control is magnificent. The leading edge flaps can be lowered while approaching the runway on initial. The high landing gear extension speed (275 knots) also helps with its decelerating effect. Base leg speed should be 210 knots.

On the final approach the trailing edge flaps can be lowered. A not-too-shallow approach can be made in

what I call a semi-carrier type fashion. This requires from 80 to 85 per cent rpm to maintain 190 knots during the final. The flare can be made as the power is reduced to idle, holding an over-the-fence minimum of Dash One recommended speed for aircraft weight.

Touchdown will average 160 knots, with approximately an eight-degree angle of attack. The drag chute can be deployed and the angle of attack can be maintained. However, to stop on average length runways—anticipating drag chute failure—the nosewheel should be allowed to touchdown as the chute is used. Steady moderate brake pressure should be held until the aircraft reaches taxi speed.

This is in conjunction with holding the stick back to shift weight to the main gear and to make use of the drag from the big stabilator which travels 25 degrees nosedown. This should stop the big bird in less than 3500 feet. If the drag chute does fail to open, the length of landing roll will average 6500 feet, with a 160-knot touchdown speed at altitudes comparable to Edwards AFB.

Loss of the utility hydraulic system should cause the pilot little concern. The trailing edge flaps are electric and the landing gear has an accumulator to release the uplocks. The leading edge flaps cannot be operated but they are scarcely effective during a normal landing. Over-the-fence speed and touchdown speed should be those recommended in the Dash One. The wheel brakes should be applied and held until the aircraft has been stopped, since the emergency brake handle must be pulled to select an emergency hydraulic accumulator.

If for some unusual reason the entire electrical system were to go haywire (and this would mean the battery has failed along with the primary DC system), this airplane can be landed easily at slightly higher speeds. Here again, the speed over-the-fence should be Dash One airspeed since trailing edge flaps are not available, and the power should be reduced slowly during the flare. Touchdown will be at 170 knots.

If for any reason the aircraft must be landed at a higher speed, the drag chute should be actuated immediately upon touchdown. It is safe to deploy the chute at 200 knots and will only slightly damage the chute at 225. The chute diameter is 20 feet, and if it is used at these higher speeds, the result is practically a flattened nose against the windshield.

Having more experience here than I care to boast about, I'd like to describe a landing on prepared surfaces without the landing gear. Such an occasion should never arise, but according to somebody's law, "If it is possible to malfunction, it will." Using full leading and trailing edge flaps, the approach should be extremely flat. (In my particular case the canopy was jettisoned after touchdown; however, it can be jettisoned in the air.)

Over-the-fence speed must be 200 knots and the power should be eased back slowly as the aircraft is touched down at 195 knots. The drag chute should be deployed immediately. Landing slide will be approximately 3500 feet. I might add a comical note—it doesn't do any good to push on the wheel brakes, as I did. It doesn't help at all. The powerful lateral and directional controls can be used to hold the aircraft straight and wings level almost to a complete stop.

All of the above-described landings apply to the clean airplane or one with two empty 450-gallon fuel tanks.

In the case of flameout landing, the tanks should be jettisoned. My experience here is limited but the few approaches I have made have ended in successful and unsuccessful landings. The final method to be used has not been determined because of the few tests completed.

If the 360-degree type of overhead (high key) can be followed, the pattern speed should be 250 knots, landing gear down. Flare can and has been made at 225 knots but there is little margin for error. If a runway of near 10,000 feet in length is available, a flameout landing is feasible.

With shorter runways, I do not advise this type of landing. High key altitude is 15,000 feet above the runway; low key at 8000 feet, and final 90-degrees of turn approximately 3000 feet. Naturally, the pattern can be entered at any of these points with the proper altitude. The trailing edge flaps can be lowered during the final approach. Flare should be started at 200 feet above the runway. Touchdown can vary from 200 to 170 knots, depending upon aircraft weight and configuration.

If the high key altitude happens to be below 15,000 feet—and no lower than 12,500—the glide speed should be 250 knots but the pilot will have to maintain a steep turn to the final approach, practically aiming the nose at the point of intended landing. Glide speeds of less than 230 knots do not result in good landings—I know from experience!

To generalize a bit: The F-105 has no "unfavorable" characteristics during landing. It has no yaw or directional problems. It will not pitch up. It should not be landed slower than the speeds I have listed since the ventral fin may drag the runway, and the angle of attack is unusually high.

Crosswind landings can be made under most any conditions by holding the upwind wing down to touchdown. The rudder is very effective while taxiing or during landing roll.

Every pilot will soon learn to respect the ease of landing the 'Chief. I wouldn't want it spread around, of course, but I think it's downright easy. ▲

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Hank Beaird came to Republic Aviation in 1951, as a Production Test Pilot, and was assigned to its Experimental Flight Test Division at Edwards AFB in 1954. He began flying in 1943 with the Army Air Forces, and flew 20 combat missions in the Pacific during World War II. After the war, Hank attended the University of Alabama and graduated with a degree in aeronautical engineering.

this ▶
or
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The landing phase of flight continues to be our largest accident producer. In 1957 41 per cent of our jet accidents occurred during this phase. For non-jets the figure is even more, 46 per cent. This special section was presented to encourage an individual professional approach to this problem. Remember—the flight isn't completed until the wheels are chocked.

SOS

SUICIDE OR SAFETY

Those of you old enough to remember Lew Lehr and his monkeys as an added attraction in the local movie house will also recall that his closing remark was, "Monkeys is the cwaziest people."

Sometimes I think that we would be justified to include some pilots in this category. I don't know of a breed of cat that has more utter disregard for his own safety and welfare than a lazy guy in a cockpit. Repeatedly you find him strapping himself to a mobile gasoline dump and hurtling off into the ambient enevelope with only a hazy awareness of proper emergency procedures. Some of them apparently believe that the red border around some of the pages in the Dash One means, "Stop! Don't read any further."

You find others to whom a checklist is a completely strange document. Why is it that a man will risk not only himself but the welfare of his whole family and a sizable chunk of the nation's economy just because he is too lazy to commit a few brief paragraphs to memory? Or to even keep the paragraphs handy on his knee so that he may refer to them if things somehow don't go according to plan? You tell me!

It isn't difficult to find some 'for instances' in the files of the DFSR. As a matter of fact, any Air Force officer who has been around for a few years doesn't have to go outside his own experience to recall numerous instances of man's inhumanity to himself.

Just recently I picked up a little billet-doux in the form of a preliminary report to an accident. Here's what I saw: Pilot experienced flameout on go-around from touch-and-go landing. Aircraft touched down on overrun, continued through the perimeter fence, across the highway and into a plowed field. Cause? Fuselage tank empty with 259 gallons remaining in the fuel system. Why? You tell me!

Or, here's another gem: This is about a lad who did everything just right during a forced landing in the F-100. That is, he did everything right except for coming to a dead stop after the deadstick and allowing the ground crash crew to check his aircraft. Instead, he elected to make his heroic deed really stand out by allowing his airplane to coast through a turn off the runway right up to the ramp and parking area. By this time he had bled off all the pressure in the utility hydraulic system and required the assistance of the hangar door and another airplane in his path to bring his steed to final rest. The fact that this is clearly brought to the pilot's attention in the Dash One was obviously not enough for this busy, busy lad.

In contrast to the aforementioned types are the pilots who will be around to collect the old pension fund as a result of knowing what to do when the "moment of truth" arrives. These are the ones too, who usually do that extra little something at the right moment to save themselves and equipment. This "extra little something" is usually possible because they are so welldrilled in the normal emergency practices that they have the time remaining for one more try before bailing out. Consider the pilot in the following report of an unusual occurrence in an F-100:

"On final approach at 80 per cent rpm, engine flamed out. Successful airstart was accomplished on the emergency fuel system and aircraft landed without incident." Now there was a man who wasted no time running through possible actions. He knew what to do and he did it.

And here's another in the F-100:

"While on initial checkout, a pilot experienced loss of number two flight control system. A check revealed that number one system was operating normally and a straight approach to base was made without further incident. First ride—but he knew what to do and he did it."

Well, the records are full of data about pilots who knew what to do and who are hoisting a mug at the bar with the gang. But the records also contain information about those who were just too darned lazy to take out Dash One life insurance.

Maybe the answer is Command Action. You Commanders! How often do you quiz your pilots on emergency procedures? It's a lot easier than writing letters to next-of-kin. Suicide or Safety? It's a simple choice—but it can be deadly. ▲

The HERCULES Story

If experience is the best teacher, what happens when an Air Force outfit welcomes (?) a new bird into the inventory? Where does the experience come from? Who's doing the educating and who's getting educated? A maintenance man certainly can't go and talk to the reg'lar crew chief, nor can a young birdman go and talk to an old-timer with hundreds of hours under the old blue belt. They just ain't no such animals!

So where do you go to find out the word?

A case in point is the arrival of the Lockheed C-130 Hercules in the USAF inventory in December 1956. Since the day that the first "bird" touched down at Ardmore AFB, Oklahoma, pilots and crews have flown the four-engine propjet more than 15 months without an accident. Naturally, an enviable record such as this didn't just happen—it was caused!

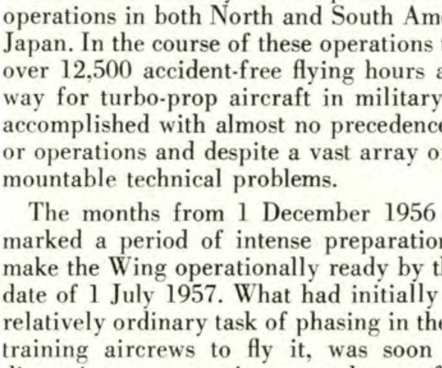
(A detailed account of how the maintenance personnel of the 463d Troop Carrier Wing (M) prepared for the arrival of the "Herky" appeared in the March 1957 issue of *The Aircraft Accident & Maintenance Review*, entitled "Training for the Big One.")

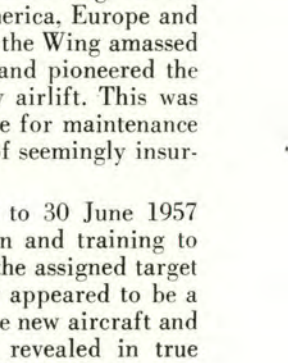
The problems were many and varied, as they always are with a transitional period. We have taken excerpts from a comprehensive report, written by personnel of the 463d which sums up, quite bluntly at times, the problems which were faced and overcome.

"The Hercules was inaugurated into Air Force operational service during the period 1 December 1956 to 31 December 1957. In this time the 463d successfully demonstrated its versatility in troop carrier and cargo airlift operations in both North and South America, Europe and Japan. In the course of these operations the Wing amassed over 12,500 accident-free flying hours and pioneered the way for turbo-prop aircraft in military airlift. This was accomplished with almost no precedence for maintenance or operations and despite a vast array of seemingly insurmountable technical problems.

The months from 1 December 1956 to 30 June 1957 marked a period of intense preparation and training to make the Wing operationally ready by the assigned target date of 1 July 1957. What had initially appeared to be a relatively ordinary task of phasing in the new aircraft and training aircrews to fly it, was soon revealed in true dimensions as a proving ground type of operation.

There were no precedents for stock levels, special tool requirements and maintenance procedures. Logistics support from outside sources was not in all cases clearly defined. In many instances, because there was no knowledge of how the C-130 and its major components would stand up in operational service, logistics support was insuffi-





cient or lagged far behind planned schedules.

Maintenance of the new turbo-prop engines presented numerous problems and requirements which could not be solved by the lessons learned previously from conventional reciprocating engines or jet power plants. Consequently, the entire maintenance complement of the 463d had to be retrained for the turbo-prop engine.

There were matters which the Wing could solve with time and experience. At the beginning of the period, however, there was little or no experience available Air Force-wide, and only seven months time for basic learning. The first of July was the cut-off date for orientation measures. After that the Wing had to be ready to accept a combat-ready role in troop carrier operations.

Plans for procurement of support equipment and spare parts had been prepared by other agencies long before the first C-130 was assigned to Ardmore. Training and operations schedules were established in the 463d, based on that expected logistics support. Actual experience after the first aircraft were received on 9 December 1956, proved that the unique nature of the C-130 was an overwhelming factor that could not be ignored in any pre-planning.

that some of the items were untried while still others were not even in existence, the taks in this area fall into their true perspective. For instance, test equipment for the T-56 power plant, including the portable runup stands, required almost complete reorganization of the inspection functions in field maintenance. The C-130's power section and gear assemblies require testing as a unit *prior* to installation in the aircraft.

The entire materiel effort was enormously complicated by numerous design problems encountered in the aircraft. During the period, there have been 936 URs submitted on the C-130, including over 200 recurring major malfunctions or components failures. A few of these of greatest importance, were on the fire warning indicators, the hydraulic boost pumps and nose gear strut assemblies. Over 100 URs resulted from actual failures during flight. Generally, mechanical and design difficulties associated with the new systems in the aircraft accounted for 30 per cent of the out-of-commission rate in December 1956, and have accounted for an average of 26 per cent of out-of-commission aircraft since then.

Design modifications, factory quality control measures, and increasing familiarity with the aircraft eventually

Until the arrival of the C-130, a new airplane had never experienced an accident-free year. Three Wings now are flying the Hercules operationally, here in the U.S., and overseas.

For instance, wear-out and replacement rates reached levels that were unanticipated because of lack of experience with the turbo-prop. Consequently, the established supply tables in categories II and III quickly proved inadequate. In an effort to provide required stock levels and parts consumption, three C-130s were committed to a "shakedown" program of intensive operation designed to fly each aircraft 600 hours by 1 July 1957. The results would be indicative of a seven-year period of operations and, it was hoped, would reveal vital logistics data and potential trends in operational capability, maintenance requirements and required supply support.

This was the first concrete effort to obtain such data from experience and proved of immeasurable value in establishing long-term support requirements for the C-130. In this respect the Wing reversed normal procedures by supplying to outside logistics agencies information that is normally obtained from them before operations begin.

In a related area, test and support equipment items and their use raised more problems. When it is considered

blended in to neutralize part of the effects of the design deficiencies. During the first six months, lack of time in which to accomplish the adjustments simply prevented modifications or "fixes" from ever remotely approaching the rate of the URs. In addition, there were never sufficient trained personnel to provide a broad leavening of experience among the maintenance teams until the latter part of the year.

The flying time generated represents an overwhelming exposure of weak or malfunctioning items to operational fatigue. Therefore, rather than decreasing, the maintenance problems increased. Engine changes, alone, indicate a trend increasing far out of proportion to the number of aircraft assigned. The eight changes in May equalled the total for all previous months of operation; 23 engine changes in June gave fair warning that materiel and maintenance problems were on a drastic upward trend. For the entire period there were 117 engine changes.

At the inception of the C-130 program there were no qualified turbo-prop engineers or mechanics in the Air Force. And there were only about 20 pilots who were

Since the first '130 entered the inventory in December 1956, more than sixteen months have gone by without an accident. Naturally, this record just didn't happen—it was caused.

During tests, the '130 cut a 14-inch groove in the sands at Eglin.

qualified to fly aircraft powered with such engines. The maintenance and flying training requirements necessary to support operational use of the C-130 were unknown.

Of greatest importance, latent or potential hazards arising from improper or unskilled use of the new power plant were matters of conjecture. The stability of the massive pressurization system and its vulnerability to human error were only partly known. These circumstances placed the Wing in the position of having to establish its own training and safety programs for all personnel who would be flying or servicing aircraft. The situation was eased somewhat by the initial orientation training conducted by Lockheed for a limited number of personnel. However, programs still had to be developed which would be adequate to meet all the operational demands of a tactical Troop Carrier Wing.

Because of operational programming and 18th AF commitments, it was felt that the entire training program should be operating at peak efficiency, no later than 30 May 1957. As it appeared initially, meeting that target date gave the Wing one month during which a minimum number of crewmembers could attain a proficiency level sufficient to assume a large part of the training burden. It also afforded the only period during which the entire training program could be tested against sample operational requirements of the scope to be expected under normal conditions.

Mobile Training Detachments (MTD) classes at Ardmore AFB bore the first major brunt of the training effort. In December the C-130 MTD graduated 11 pilots and engineers in its initial class. These men were immediately committed to flight training, with a view to developing as many instructors as possible from among them. In January 1957, the first class of 16 navigators was graduated, after training in the use and application of the radar navigational aids with which the C-130 is equipped.

Specialist training began that same month and continued through 15 June 1957 at an accelerating rate. In February, room was made for personnel from the 18th Air Force. By 15 June 1957, 395 pilots and engineers, maintenance supervisors and specialists had been trained in the MTD. These men all had a dual responsibility after graduation; they were required not only as instructors, but also were critically needed for full time support of the flying program being developed.

By 21 January 1957, a C-130 Flight Simulator had been installed and staffed at Ardmore and the first class of 13 pilots and engineers began training on that date. Ten officers from that class were selected and trained as flight simulator instructor pilots and were rotated in that assignment, three at a time, for the full period of the simulator's operation. Through 10 June, 143 pilots and engineers were turned out, each with a minimum of 30 hours of training in the simulator.

By 10 June 1957, sufficient Ardmore personnel had been trained so that classes were devoted solely to personnel from other bases. This result was reached only by operating the simulator 12 hours per day, six days per week until the early part of May, when a shortage of copilots manifested itself.

To meet that situation, operations were increased to 15 hours per day and remained at that level throughout the summer. The sustained effort and time expended in the simulator program accelerated training by approximately two months and released much-needed personnel to meet the rapidly expanding flying schedule.

As originally planned, the Wing was to have 33 qualified aircrews trained by 1 July 1957, if the aircraft assignment schedule was to be met on time, month by month, and if sufficient number of aircraft could be counted on to support the flying program. First, the C-130s were not received at the scheduled rate. One out of three scheduled was received in December. Three out of a scheduled five arrived in January; five out of eight in February; and by 31 May 1957 when all were to have been received, four were still lacking.

Inflight emergencies, constituting very real and serious hazards, became known to the aircrews soon after flight training began. Some of them were magnified by rumor and speculation and could very well have become extremely detrimental to morale. Despite that—and because of the enthusiasm of the crewmembers—training proceeded at a pace that finally outstripped the scheduled rate. The first five crews completed training in January.

Then followed nearly four months of almost constant severe weather, tornadoes, floods and other unseasonable conditions. No crews finished training in February, and

The Hercules has demonstrated its global capabilities on flights to Pacific Theater.

only one in March. But in April and May, when weather conditions were at their worst, 22 crews completed training.

With seven crews trained by 10 June, the 1 July 1957 goal of 33 was reached and surpassed. All that remained was for assigned aircraft to be modified for personnel drops and for the aircrews to finish personnel drop training. By 1 June 1957, the Wing was combat-ready in those missions which the C-130 was capable of performing.

Personnel shortages in the materiel field were acutely felt throughout the first six months of the period. The C-130 requirements, plus the normal base-wide requirements, made austere management and efficient supervision critical at every phase. The number of maintenance and supply personnel was severely limited and widely committed.

Added to the normal requirements of the base were large school quotas to prepare men for work on the C-130 and the inspections and maintenance required on forty-eight C-119s which were being readied for transfer to the 9th Air Force and to CONAC.

Even before the 463d Wing was operationally ready, it was providing highly skilled crews to demonstrate the C-130s outstanding military capabilties. It logged 495 highly successful flying hours during November in support of Air Proving Ground Command's Phase VIII operations. Conducted under field conditions at North Auxiliary Field, South Carolina, these operations subjected the C-130 to rigorous tests of its electronics and communications systems.

It also subjected the 463d to a searching test of its operational mobility, a test which it passed without a mishap of any kind. This was the first instance of a C-130-equipped unit to move into the field on short notice and operate successfully under combat conditions.

It was the acid test for both the aircraft and the men, and may be said to be the C-130's coming of age as a full-fledged member of the Tactical Air Command team. This was confirmed by Exercise ALL AMERICAN, in December 1957. During that joint exercise, the 463d's crews logged 402 accident-free flying hours under conditions of simulated combat.

In December 1957 the 463d sent three C-130s out to the Pacific area—two flights to Hawaii and one to Japan. On the latter mission, the crew flew nonstop from Japan to Hawaii, in 10 hours and 45 minutes. These two flights proved beyond doubt that the C-130 could operate effectively throughout the Far East and that high speed tactical airlift was available on relatively short notice.

By the end of the year, C-130 overwater flights across the Atlantic had become a matter of course, with the 463d's having accomplished eleven ferry missions to USAFE. These flights were accomplished on schedule and without mishap in 175 hours of flying time. They established the unquestionable reliability of aircraft and crews on the cross-Atlantic run and paved the way for all future flights of the C-130 to USAFE."

"Herky" flew nonstop from Japan to Hawaii in ten hours 45 minutes on a routine flight.

And that's the way it was for the 463d. It had a job to do and did it. The hard work, sweat and midnight oil-burning will never be known in total. The experience gained has proved to be the best way of teaching others. As mentioned in the report, 463d personnel trained crewmembers from other units.

Here are some excerpts from a letter by Capt. Lloyd S. Elmore, Flying Safety Officer, 314th TCWg (M), at Sewart AFB, Tenn. (Most of the training involved Sewart personnel, since the 314th was next on the list to get the Hercules.)

**The 314th became operational in the C-130 turbo-prop aircraft on 1 December 1957 and since that time has been performing missions both in the U. S. and overseas. It's a new type of operational aircraft, and many of the problems involved are not understood by pilots of other aircraft. These problems are also new to personnel of the control tower, ATC, or transient alert and maintenance, at the many bases into which we're required to operate. And a knowledge of these factors by all the personnel mentioned is of utmost importance to the safety of everyone concerned. Here are some of the hazards or limitations to watch for:

- **Constant speed engines and props.** The engine turns at basically a constant speed of 13,820 rpm and the prop 1106. This causes a terrific prop blast, especially when the throttles are in advance of the ground idle position.

One accident has already been attributed to taxiing through the prop blast of the C-130, even though the damaged aircraft was approximately 200 feet behind! Extreme caution must therefore be exercised when taxiing in the proximity of the Hercules when its engines are running, and taxiing *behind* it—better just stay away from it!

- Limited turning radius. The C-130 is not adaptable to static turns as are many aircraft in our inventory, thus transient alert personnel should use caution and preplanning when directing this airplane into close or limited parking areas. The tandem-type main landing gear can be easily damaged if the aircraft is forced into too tight a turn. The minimum turn pivot point is between the engines on the inside of the turn, so the radius of turn must be a minimum of 90 feet between the pivot point and the outboard wingtip.

- High fuel consumption. The C-130 is powered by four Allison T56-A-1A turbo-prop engines, which is basically a jet engine driving a propeller. The fuel consumption therefore is considerably higher during all operations than for recip engines. This necessitates expediting traffic clearances during all phases of ground and flight operations.

During ground operation the C-130, with its constant speed engine, uses an average of 12 to 14 pounds of fuel per minute for each engine. This total ground operation consumption is approximately twice that of the jet fighter aircraft below the Century series. Most stations expedite jet takeoff clearances but appear to be unaware that the C-130 also has a high fuel consumption on the ground. Additionally, the C-130 is highly adaptable to, and is authorized to perform penetration type letdowns from high altitudes. This is another means of expediting the movement of C-130 traffic and, in turn, improving its operational capability.

• Exhaust blast. While the C-130 is a prop-driven aircraft, there's an appreciable amount of jet thrust (726 inch pounds from each engine) which presents the same exhaust blast hazard that is found in any jet engine. In addition, the C-130 has the gas turbine compressor (auxiliary power plant), a small jet type engine located in the left wheel well that also produces an exhaust blast hazard. The gas turbine compressor is used during all engine starts and frequently on engine shutdowns and during other types of ground operations.

• Foreign object hazards. The C-130 again presents the typical jet engine damage hazard that is found in all jet type operations. The engine inlet ducts are mounted higher from the ground than most jet engines, however, with the prop blast to stir up debris, the possibility of engine damage caused by foreign objects is very great.

• Skin damage to pressurized aircraft. Although many aircraft in the inventory are pressurized, this is not true of most aircraft with the cargo handling capability of the C-130. This makes it most important then for maintenance personnel to take all precautions to prevent surface or structural damage that could cause a "blowout" at altitude.

• The C-130 soon will become operational in the European and Far East areas and the turbo-prop aircraft definitely has a future in the U. S. Air Force. With this in mind, it is believed that the world-wide education requested above would help to minimize hazards and in turn increase the safety of the C-130 and other turboprop aircraft at other than the home base.

Ardmore crew had "tough duty" demonstrating '130 at Paris Show.

Okay, we've seen how one outfit did it. Then, we learned about some of the quirks which need looking into when a C-130 "comes to call." We've asked Lockheed to give us some informal comments about the safety record—a word to the wise, so to speak. Naturally, its Georgia Division is pretty proud of the role it played in the overall program. Here's what was sent us and it's just as informal as the day is long:

. . . All this leads up to a point. This safety record is surely indicative of the high caliber of training received by C-130 operational and maintenance people. Service School training, MTD instruction, OJT programs, along with classroom instruction and first-hand information on each base, from D/SR, Lockheed, Allison, Aeroproducts, and Bendix factory representatives, to name a few, have paid off.

It seems like a decade since the first formal C-130 schooling was started; actually it was in May 1955. They got into the field a little over a year later. Ardmore received the first airplanes and this safety record reflects their activity. One of our men at Ardmore says:

"To put a large number of C-130s into this operational activity and have as few difficulties as this base has had, speaks well for the folks who've planned the initial training and carried it through. This training business doesn't stop after the first few months of airplane operation. It's a never-ending process at each base. We, at Lockheed, strive to have our representatives spend at least half of each day in instruction work. As a result, the men at this base know their airplane—how to operate and maintain it. . . ."

And a representative at Sewart, has this to say:

"Naturally we think we've got the best crews in the business, both from an operational and maintenance standpoint. Like most places, Sewart has a lot of comparatively new personnel on the job, along with some oldtimers. After these men complete their training instructions and cushion that with some time on the airplane, they can't be beat. Even then the training isn't finished. We reps continue classroom instructions and OJT to pick-up the transfers and other base personnel who are newly assigned to C-130 work. That's the answer to your fine safety record—knowing how and doing it right, the first time."

Both men have a right to feel the way they do. These two bases alone accounted for nearly 20,000 hours of C-130 flight time in less than a year and a half since the first Hercules delivery.

A recent part of that flight time was spent in the transfer of C-130 prime AMA responsibilities from Sacramento to Warner Robins. Better than a million pounds of materiel and equipment were carried aboard C-130s on that long hop from California to Georgia. That's a lot of hauling in any man's Air Force. Again, safety records were high. Although things have pretty well settled down at Ardmore and Sewart, other bases are just getting into C-130 training activity. Some training activities consist of formal classroom instructions; others are more informal in nature.

Speaking of informal instructions, these factory reps come in real handy when you find yourself faced with that old dilemma, manpower requirements. Granted, there is nothing like sending all the troops to school to end up with some well trained manpower. But everyone has to admit, there's an Air Force to be run meanwhile. The answer? Spare as many troops as you can to get the full training treatment, but back this up by taking further advantage of the factory reps on your base.

"Experience," they say, "is the best teacher." And yet, experience is not a teacher at all. But it is the world's best training aid. It is true, however, that "The experienced are the best students." That's why retraining is of such vital importance. And that's where the rep comes in, for he is always on hand to conduct this retraining.

While a man is on the job he has problems. Every day he has problems. It is through retraining that he gets the answers. It is during retraining that he can best relate the instructor's examples to the real situation. Any good instructor will tell you that the best student is the one with experience. They ask the most questions and they retain more. For they alone have seen and made mistakes.

It's the combination of training, experience and retraining that has produced the Hercules' safety record. And it is only through this combination that the record can be maintained and improved." ▲

Splash Department . . . accident briefs

An instructor pilot and his student were flying a T-33 on a night transition mission from a western training base. The student had made two uneventful landings from the front seat, but on the third approach the instructor noted that the airspeed was lower than normal. The student was told to increase the airspeed. This he did by lowering the nose. The instructor thought that the airplane would contact the runway, nosewheel first, so he took control of the T-Bird and rounded out.

His roundout was too high and caused the plane to stall and drop to the runway from about 10 feet. Both landing gear were sprung rearward. During the accident investigation it was noted that the airspeed indicator in the front cockpit was a rotating pointer type and the one in the rear was a window digit reading type. A possible discrepancy between the two indicators is being checked. But all the gages in the world won't substitute for knowing when and how to take over.

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A C-54 pilot, with an approved clearance and alternate, was flying a passenger flight in a northern area. En route, he received an advisory that informed him of poor braking action on the runway at his destination, and of a 12- to 19-knot tailwind that would exist at the time of landing. Despite the fact that these factors would combine with a near-dark condition at his time of arrival, the pilot stated his intention to "take a look."

Upon learning that the aircraft would continue to its original destination, the local base commander directed his operations officer to recommend strongly to the aircraft commander that he proceed to his alternate. The operations officer got on the radio and advised the pilot that the landing would be at his discretion. The pilot was not so discreet however, to compute his landing distance, otherwise he would have known that he could expect to stop on the overrun—but not until.

The C-54 went off the runway, struck a ditch and the nose gear collapsed. Operator error caused this accident, with weather and runway conditions as contributing factors. One more factor: Lack of supervision. Base ops failed to relay the commander's strong recommendation that the pilot proceed to his alternate.

• • •

Two pilots took off from a Texas base at 1836 in a T-Bird on IFR clearance via VOR. They were en route to a base in southeastern United States; their ETE was two-plus five hours, fuel three-plus 15, and ARTC clearance 41,000 feet.

When the T-33 arrived over its destination VOR at 2051, the pilot reported to ARTC that he had just come through a severe thunderstorm. Upon requesting approach clearance, he was given the latest weather for his destination and also the weather for a nearby civilian airport.

At 2056 he was cleared for a standard jet penetration, was told to report leaving 22,000 feet and was given the latest weather change. Shortly thereafter the pilot reported that he was encountering severe turbulence, and repeated this when he was further into his penetration.

When he completed his penetration turn and reached 3000, he reported turbulence to be so severe that he wasn't able to maintain altitude and was climbing out on a northerly heading. He got the latest weather for "X" and two other airfields, then advised that he was proceeding to "X", which was northwest into the weather area. At this time, visibility at the original destination had lowered to half a mile. This information was relayed, together with clearance to "X".

Positive contact with the aircraft was established by "X's" Approach Control at 2118. In the minutes following, multiple DF steers were obtained and confirmed and weather relayed—"30,000 scattered, 5000 broken seven."

Again, the pilot reported that he was in a severe thunderstorm; the ADF was erratic and he was considering bailout. He was immediately cleared to descend to 10,000 and given instructions for penetration and standard range approach away from the weather area.

At 2132, when the pilot reported a reciprocal heading after station passage, he was requested to follow steers and change frequency to facilitate radar pickup. This was the last contact with the T-Bird. Three minutes later it was found, crashed on a heading away from the station. Fuel exhaustion was evident, and both pilots were killed when they attempted to eject at low altitude.

• • •

A C-118, with an IFR clearance, departed on a scheduled overseas passenger flight. The control tower granted permission to switch to Approach Control and the pilot was instructed by Approach Control to report over a nearby intersection. He acknowledged this instruction.

No further radio contact was made with the big Liftmaster. It had crashed—unobserved—just two minutes after takeoff. Sixty persons were on board and forty-six were killed. Forty-five minutes after takeoff, one of the passengers found his way to a hospital, adjacent to the air base.

The accident scene was reached a few hours later. The airplane apparently flew into a violent thunderstorm which was in its takeoff flightpath. The Board later concluded that severe downdrafts encountered in this storm caused the accident.

Although the thunderstorm was observed on radar in the base weather station, this information was not relayed to the pilot of the C-118 when he was in takeoff position. The pilot of another airplane at the end of the runway verified the fact that the thunderstorm was masked by layers of stratiform clouds near its base ▲

It has become necessary for pilots to understand the engineering principles of high-performance aircraft.

"Toward the Unknown" is the motto of AFFTC at Edwards AFB. Edwards is the location of the . . .

. . . WORLD'S

"Toward the Unknown" is the motto of the Air Force Flight Test Center at Edwards Air Force Base, California. This is the location of the USAF Experimental Flight Test Pilot School—the fastest school in the world.

The product of this school is very seldom seen by the general public. The glint of silver that streaks across the sky in the early morning will probably only be noticed by the radar observer who's trained to track the flight. Yet this streamlined silver cage is the office of the test pilot, a man expertly trained to cope with the best that scientists can provide. He is the modern Columbus or Magellan and must be a match for the machine which he flies.

In the early days of aviation the "engineers" who built the airplanes were also the pilots who flew them. Until recently the gap between the engineers and the pilots had been widening. The engineers who designed and built the planes had little in common with the pilots who flew them because of the varied background needed for each job.

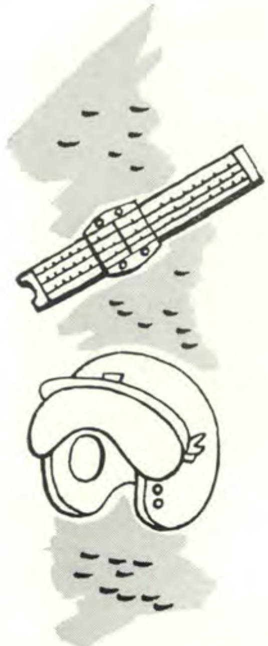
With the rapid technological advancements in recent years, however, it has again become necessary for the pilot to understand the engineering principles in these highly complicated airplanes. These two careers have thus been combined into one in the Air Force. This person is called an Experimental Flight Test Officer or just Test Pilot (AFSC 8744).

The test pilot has the important and highly technical job of evaluating the new types of airplanes and equipment. Often the evaluation by this pilot is the basis for the decision to reject or purchase a new type airplane. He must be able to explain to the designers such things as roll coupling, decay in stability derivatives at high speeds, and energy zoom climbs. So, he must know the language of the engineer. He must also be an exacting pilot so he can measure these qualities in flight. An impossible task to do both? Well, not exactly, but it does require special training.

What kind of man is this test pilot?

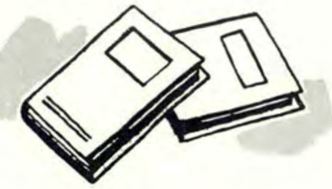
Hollywood would have you believe that he is a daredevil who shows no fear under any circumstance; a man who enjoys narrow escapes with his life; a man who can play a hunch at just the right time and be right, and one who has his girl friend waiting in the control tower as he goes through his supersonic dive straight down, with all controls vibrating. This type of test pilot has no place outside the movies.

The United States Air Force cannot allow a man to play the hero type in an airplane that has cost many millions of dollars and required many years to produce. He must understand the mechanics of all the systems in order to



The equipment, literature and personnel who back up the test pilot student are graphically shown here.

FASTEST SCHOOL



evaluate their operation. Above all, he must understand as much about aerodynamics of flight as possible.

The pilots currently performing test duty are in no way daredevils who resemble the movie version of a test pilot. Instead, for the most part, they are married and have children; they are well past their mid-twenties, and they are veterans of many long hours in many types of airplanes. To the Air Force they are pioneers but to their families they are still "Dad." Most of them have served at least one combat tour. They're intelligent men, working hard toward the exacting job of pilot-engineer. Most of them have an engineering degree, and the Masters Degree is not at all uncommon among their ranks.

For the one test pilot who is fortunate enough to get a project which gives him a chance for fame in the Air Force and the associated television appearances, there are scores who spend long exacting hours gathering the engineering data that is necessary for the advancement of this art of building better airplanes.

The mission of the Test Pilot School is to find the types of persons mentioned above, train them, and supply them to the Flight Test Organization as well trained as possible. To accomplish this mission, the Air Force has assembled a highly qualified staff of instructors at the school. The eight military persons presently assigned rank from Captain to Lieutenant Colonel. They have accumulated some 25,150 hours of flying time in all branches of the Air Force. They have spent some 48 years in college to ac-

During course, the student receives about 70 hours of actual test flying, much of it with an instructor who demonstrates techniques.

quire the one Ph.D., the seven Masters and the one Bachlor of Science degrees, and have spent some 27 years in the flight testing field. All the military are instructors in the classroom as well as in the air. One civilian aerodynamicist also is assigned to the academic staff.

Fortunately, the school is located adjacent to the actual testing organization and the Flight Research Branch at the Flight Test Center. This proximity allows maximum coordination between the operating and research sections so that the latest techniques can be taught. Also, it allows the prospective test pilot to see the operation of the testing organization for a period of time before he makes the final decision to become a Test Pilot.

The classes for the six-months-course begin each three months. The first three-month phase teaches the prospective test pilot the theory, flying and data reduction techniques necessary to accomplish a Performance Flight Test program on both jets and recips. In addition to the actual theory of flight, the classroom work also includes mathematics, physics, mechanics and aerodynamics.

The detailed steps of converting all performance figures to a standard set of atmospheric conditions covers a large portion of the data reduction lectures. This portion of the school gives the student a background of knowledge that will allow him to understand thoroughly all the charts in the back of the Flight Operating Handbooks dealing with range, speed, distance and endurance. It also teaches him to plot up actual curves from his own test data.

The second three-month period is devoted to Stability and Control investigations. A new airplane must have superior performance but it must also be stable and easy to fly. During this phase the student is given the opportunity to perform a detailed and systematic check on the Stability and Control characteristics of several different types of airplanes. Actually, this is a most interesting phase because during this period many practical problems encountered in every day flying are discussed.

During the six-months-course, reports are submitted on both the Performance and Stability phases. These reports parallel very closely the actual reports from the Flight Test Center and therefore the student learns the problems involved in these reports; better still he also knows how to interpret them.

This school has the highest entrance requirements and is probably the most technical of any flying school in the Air Force.

Half of course is devoted to stability and control investigations.

The test pilot must know the technical language of engineer.

During the course, the student receives about 70 hours of actual test flying. A large portion of that flying is with an instructor who demonstrates the techniques of putting the classroom lectures to practical use. Nowhere else is more emphasis placed upon wedding the theory learned in college to the actual mechanics of flying. For example, the emphasis is not to be able to hold exactly 200 knots on the downwind leg but to fly the machine within the limits for which it was built, and at the same time according to the conditions of traffic, visibility, fuel economy or any other given set of conditions set up by the instructor.

The student is given a set of conditions and then is judged on his ability to analyze the situation and do the best thing. He might be required to arrive in a T-33 at 21,250 feet, at 135 knots indicated at a minimum time from takeoff. Then he must realize the energy level of the airplane at its best climb speed and then zoom the last few thousand feet to arrive at the required altitude without any excess speed. The course is designed to make the pilot think his problems through instead of flying mechanically. This type of thinking and flying is necessary because a test pilot must begin taking data on his first flight even before he leaves the ground. As soon as he climbs into the cockpit, he begins his evaluation of the ease or difficulty of getting in the airplane.

The student is taught to qualitatively evaluate the airplane's features in general. Then he learns to get the actual figures from all the various tests which are recorded on the photo-recorders and oscillographs installed in the school airplanes.

For those of you who're interested, the requirements for this course and the application format are outlined in AF Regulation 53-19, dated 9 June 1955. It must be realized however, that only 15 pilots are selected for each class from the most qualified of the applicants received. Persons not selected are allowed to re-apply at another time.

Since 1951, pilots of the "World's Fastest School" have flown 25,000 hours, and suffered only three major accidents. Granted that these conditions are carefully controlled with the world's longest runway, this is still an amazingly good safety record.

Among the distinguished graduates of the school are Lt. Colonel Charles "Chuck" Yeager; Colonel Frank H. "Pete" Everest; Capt. Milburn G. Apt, W. B. "Bill" Bridgeman, Louis W. "Lou" Schalk, and Capt. Iven Kincheloe, the present holder of the world's altitude record. We can look forward to even more illustrious accomplishments from the graduates of "The World's Fastest School." ▲

SEEN A POWER CURVE LATELY?

Maj. Wallace W. Dawson
Research & Analysis Div., DFSR

Ran into a fellow down town the other day, said he was trying to buy a power curve. Heard so much about not getting on the back side of one, thought he'd get one of his own and paint the back side red, so he'd be sure to stay off of it. This sounds real sensible and it's sure a shame it's not that easy. However, power curves, like so many other things we deal with, are not quite so easy to tie down.

A power curve—or more correctly—a speed-power curve might be defined as the relationship between the power available and total drag throughout the speed range of the aircraft. Quite obviously the higher speed we want, the more power we need. It follows then that if we want to fly at a slower speed we reduce the throttle and the bird slows down to where the power required is equal to the power available. We could keep on doing this indefinitely except for one thing, and that's the "fly in the ointment."

As we continue to reduce power and speed we have to raise the nose to maintain altitude. This is fine to a point, but beyond that point it's no good at all. As the nose comes up, induced drag—which we might call drag "induced" by the production of lift increases. So, although we are flying slower, the power required is greater, not to be converted into speed but just to keep some ozone between the bird and terra firma. This is the "back side" of the power curve, the point beyond which reducing speed requires more, instead of less, power to keep 'em flying.

All this is very well, and, on the surface, looks like all that is needed is to increase the engine power. True, but eventually we come to the point where the engine is putting out all it's got. In other words, there "ain't no mo'." This is the dangerous situation; this is when everything's open but the tool box, to the wall. Hanging on the props, or pulling 101½ per cent you're still just staggering through the air.

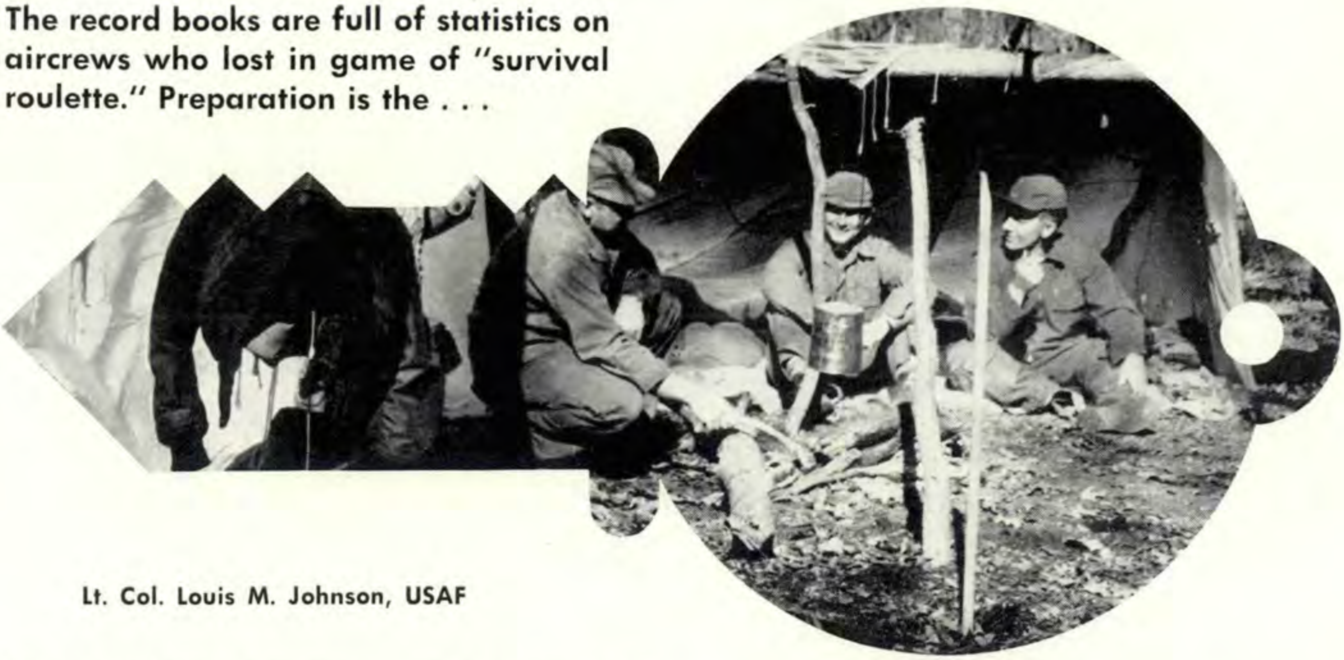
One thing about it, you won't have to worry about this condition very long because it won't last long. Either you reduce the induced drag by getting the nose down or you clobber. Of course if you're fortunate enough to get into this not-so-humorous situation with eight or ten thousand feet of altitude under you—fine. Sacrifice some of this lovely stuff and get back on an even keel. If, however, "it" happens to you—as it does to most—close to the ground, this is the day you should have "stood in bed."

Well, so there's the problem. Now what's the answer? Actually, it's so simple, it's pitiful. Just don't allow your bird to get into a combination of altitude, attitude and airspeed where full power won't pull you out.

As we said, "it" most often happens close to the ground. Final approach, go around, GCA, trying to stretch a simulated flameout, short field, single engine. Any time and place when, and/or where, things aren't exactly normal. These are the times to be just a little extra cautious, sure of the Dash One final approach speed for your weight and conditions — alert every second for any indication that she might be slippin'. "It" can be avoided, and easily too, if you just fly right.

So don't really sweat it — that's not the purpose of this article. Just know that 'it" exists and act accordingly. ▲

The record books are full of statistics on aircrews who lost in game of "survival roulette." Preparation is the . . .



. . . Key to Rescue

Lt. Col. Louis M. Johnson, USAF

The operation was a success, but the patient died! You probably have heard this paradoxical statement before or at least one containing the same apparent direct contradiction. Could such an unfortunate circumstance ever be true? Stop and think! Could a person, through a weak link in the scheme or process of his daily life suffer failure although everything else that he did was accomplished correctly? Ask any of the well experienced Air Rescue Service people, especially rescue crewmembers, and they will tell you it can and does happen.

I know of several incidents that might be used to form the basis for an answer to the question posed. Some of them are from first-hand observations and others are from eye-witness accounts or official reports. All were gained during duty with Air Rescue Service. I feel that these observations could be of value to anyone flying anywhere at anytime, but I sincerely hope they will not be needed.

But what connection does this have with survival? Or air rescue work? Just this: Air rescue missions can be completely successful from the standpoint of correct planning, thorough preparation, timely dispatch and professional execution, but end in failure.

Why? Because the persons whose rescue is the objective of the mission fail to survive the full term of their ordeal. In the chain of events that occur throughout a distress incident, survival is the master link. It is the most important part of a person's life during a period of extreme danger or accidental isolation. It might be used for only a few seconds or it might be the result of hard work for several days. Successful existence depends upon many conditions; so does successful rescue.

A few examples of distress incidents that caught aircrew members either unprepared for, or unsuccessful in using, correct survival techniques will prove my point. These cases with unfortunate endings comprise but a small fraction of the total number of emergency situations I have observed.

The first is a simple and old story—the need to wear protective equipment. A success and failure contrast occurred on this flight and although the exact reason for the failure was not proven beyond a doubt, you can draw some pretty firm conclusions.

A helicopter crew was one of several called upon to participate in a maximum effort, overwater search mission. This particular crew was flying parallel to the course of a helicopter landing ship which was supporting their aerial search. Upon entering an area of poor visibility in squalls, the pilots did not realize immediately that a very strong crosswind was rapidly drifting them away from their landing ship.

To aggravate the situation their ground speed back to the ship was greatly reduced by the strong wind. The pilots soon became aware of this unfavorable turn, but they could not locate the mother ship. When faced with the possibility of fuel exhaustion, they did not keep their problem a secret. Emergency radio calls alerted two rescue aircraft flying in the area and the lost helicopter was intercepted before it was forced to ditch.

Just before the helicopter ran out of gas, it was hovered near the surface of the sea to allow two of the four crewmembers aboard to launch a life raft and jump. It then moved off a bit and was ditched in a very rough sea. Right after contact with the water the helicopter pitched forward, broke apart and was engulfed by a fast, running swell.

Only one of the two pilots aboard cleared the rapidly sinking wreckage. The three survivors of the ditching were picked up shortly afterwards. One of the survivors said that the pilot who failed to clear the sinking helicopter was not wearing a crash helmet on his last flight. The pilot who escaped said that he received several bruises about the arms and shoulders, and remembers a few sharp knocks on his helmet during the time that he was fighting clear of the sinking aircraft.

All the protective and survival equipment you can wear will not help unless you have a plan established for its use. The next case shows a breakdown at the very last step of the survival process.

Too few aircrew members have had opportunity to practice water survival techniques under realistic conditions. Knowledge is life!

An F-86 flying on a combat mission in Korea received battle damage which caused engine failure. The pilot immediately headed for open water and called for help from rescue aircraft known to be in the area. Two of his squadron mates joined him to protect him from hostile fighters as he glided his stricken airplane.

They also kept the rescue crews posted on the progress of the crippled F-86 toward the most desirable area for bailout. A rescue helicopter and an SA-16 were orbiting nearby so the pilot ejected. His parachute opened normally and he soon was spotted by both rescue crews as he floated down toward the water.

The crews easily followed the pilot's descent—thanks to the vivid orange and white color of his chute canopy.

They also could see the pilot clearly by using their binoculars. He was moving his head and arms. His white crash helmet and yellow life vest, as well as his one man raft pack, were plainly visible. A brief splash marked the end of his drop, and the helicopter quickly swooped down to the spot.

The hoist operator had unreeled several yards of cable and the pilot pick-up sling, attached to the end of the hoist cable, was skipping along the top of the water directly toward the survivor. All he had to do was slip into the sling.

As the helicopter slowed to a hover over the deflated chute canopy which was floating just below the surface of the water, the hoist operator sensed trouble. The man in the water was not doing too well; he was fouled in his shoud lines. It did not appear as if his life vest had been inflated. His struggles were not freeing him from his parachute harness or canopy. Worst of all, he made no effort to grasp the pick-up sling which was well within arm's reach.

The helicopter crew tried desperately to reach the distressed pilot. Realizing he might not free himself and slip into the pick-up sling, they called for the circling SA-16 to land and assist in the attempt to save the pilot. This was done with all possible haste, but when the SA-16 crew reached him he no longer was struggling.

It took three men to bring his body aboard the aircraft, since it was weighted down with waterlogged equipment. He had been wearing his crash helmet with oxygen mask attached, pistol, vest with emergency radio, life vest, parachute and life raft pack (unopened), in addition to other flying clothing.

He probably would have been much better off had he thrown away his helmet and mask, pistol and emergency radio on the way down. He would then have been free to shed his parachute as soon as he hit the water. These things done, he could have concentrated on using his flotation gear, which was not used at all.

Anyone who has worn an exposure suit for two hours or more knows why it might be unpopular. As a matter of fact, this cumbersome outfit, often referred to by aircrew members as a "moon suit," is even difficult to put on. However, it is well established that it gives excellent protection if one is forced to bail out at sea. Crews flying aircraft over water are generally briefed as to when and where the water and air temperatures fall below the point allowing survival at sea for a reasonable length of time without an exposure suit.

Despite this, many still take the chance the suit won't be needed even though the water is cold. Yes, the odds that they will need the "moon suit" are very slim, but the record books are full of statistics on aircrw members who lost at the game of "survival roulette."

I remember hearing the last few radio calls from two pilots who had missed a turning point during an inter-island flight one cold, December night. Between checkpoints they had caught the bottom of a stray jet stream and were whisked miles out to sea before they declared an unknown position emergency.

When they finally got headed back toward land it was too late. We knew they would have to bail out so we tried to encourage them to use their emergency equipment wisely and with confidence. You can imagine how futile and heartsick we felt when one of the pilots asked how long they would last in the water without exposure suits.

We spent four days searching, but they could not have existed for more than two hours that cold and windy night.

Flying the old reliable C-47 in the local area can put you on the survival spot. One mild and sunny winter afternoon two pilots buckled into a C-47 for their monthly four-hour stint. Through a rather spectacular chain of events they were soon to find themselves in a crash high on a very steep, icy and windy mountainside.

It was no place for a blue uniform, flying suit, light flying jacket and low quarter shoes, since the temperature hovered around zero. The poor Gooney Bird, now much worse for the wear, could no longer keep enough cabin heat for comfort. The pilots, although poorly equipped for an alpine venture, kept their heads.

Before the crash they had seen men near a small stone hut at the peak of the mountain.

In the face of 40-knot winds, blowing snow and treacherous footing, they fought their way upward to the very top to reach shelter from the frigid, howling wind. The men at the top were weather observers and housed and fed the pilots through two days of blizzards and gales.

Two expert mountain climbers finally reached the summit with extra clothing, boots and climbing equipment. They outfitted the hapless pilots with proper clothing and guided them down the mountain to safety. Each summer this mountain is successfully climbed by thousands of people but it has claimed the lives of many climbers during winter months. These pilots were lucky!

There are many more stories that parallel these, and dozens of variations to each story. These are representative, I feel, as they have told the common story of weaknesses in survival technique which can develop into tragic situations. Each case has portrayed the need to have survival equipment, to wear it properly or to know how to use it in a correct and timely manner.

Too few aircrew members have had the opportunity to practice survival under realistic conditions, but they can offset this disadvantage by having full knowledge of the basic techniques. Learning the best plan of action for survival in all climates and topographical conditions certainly would be a good starting point. They can then select the particular equipment felt necessary for survival under the conditions expected to be encountered in the area over which they are flying.

A general requirement for aircrew members is to demonstrate proficiency in the use of water survival gear once a year. It's wise to practice until everyone is absolutely sure that he can clear his parachute harness while in the water, inflate his life vest and raft, and climb aboard the raft without difficulty. The drill should be done while wearing a flying suit and tennis shoes at the very least.

Those crewmembers who frequently wear exposure suits while flying should practice while wearing the suit. To be realistic, they should jump into the water from a height of at least 12 feet.

All too often this valuable training period ends in a diving exhibition or a rough-house over a life raft when several people could really profit by more practice drill. One more point: Every aircrew member should be able to swim a little. Just the basic strokes and the ability to float without difficulty is all that is necessary.

Aircraft commanders of large aircraft have a special responsibility to plan and prepare for meeting a situation requiring use of proper survival procedures. Although preflight briefings have become old stuff to many people, crewmembers and passengers alike gain much confidence and peace-of-mind when told exactly what is expected of them during periods of danger. These briefings prevent confusion and panic, and minimize the possibility of important items of survival equipment being misused or lost in the tense moments of distress.

Well, we have seen what can happen. Men who have sound professional ability in the complicated and exacting skills of military aviation still fail to prepare themselves to survive in the event they are overtaken by misfortune. Sometimes it appears as if they lack the patience, interest or will-power to put up with the inconvenience or additional effort it takes to wear and learn to use the equipment designed to protect their lives. (Like the patient that failed to benefit from a successful operation.)

Aircraft commanders, flight leaders and operations supervisors should dedicate themselves toward the establishment and enforcement of these three simple functions:

- Conducting realistic survival training drills and practicing with the same equipment carried during actual operations.
- Setting the example by conscientiously wearing the proper clothing and possessing the correct equipment on every flight they personally make.
- Periodically inspecting aircrew members under their supervision as they board their aircraft, insuring that they have all the necessary survival equipment on their person or in the aircraft.

Steady pressure by supervisors will force the rate of survival failures in a downward curve and aircrew members will be around to be rescued after being afflicted by mishap. They all can possess the key used to open the door to rescue.

The Key is Survival!

If the prize offered for memorizing the emergency procedures in the Dash One were a date with this young lady, we'll wager that few pilots would fail to win it. Yet the real prize always at stake is life itself and too many fail the final exam. What price lack of education? When did you last take an exam covering the red bordered pages? Did you pass? Did you fail? See page 31.

*U.S. GOVERNMENT PRINTING OFFICE 441795