Flying SAFETY

JANUARY 1992

Welcome to Flying Safety Magazine

■ In 1945, Air Force leaders determined they needed an effective means to convey the safety message to people working in every office, shop, or field location. The Office of the Air Inspector, Langley Field, Virginia, was given the task of creating a new magazine to carry the safety message. The first issue was called *Flying Safety.* During the 1960's, the name was changed to *Aerospace Safety* but the purpose remained clear — let everyone know they play an important part in saving lives and resources.

Today, our magazine is once again named *Flying Safety.* To give you a small taste of the heritage of Air Force safety programs, the staff at the Air Force Safety Agency has created this special edition of the US Air Force *Flying Safety* magazine. The first article reproduced is perhaps the best expression of what *Flying Safety* is dedicated to. We think you'll agree that not one word needs to be changed after nearly half a century.

More than any other reason, however, you, the readers are the reason for every issue of *Flying Safety.* This magazine should bring you valuable information, entertaining articles, and periodic updates on the status of safety programs. Experience has shown us *Flying Safety* leaves just enough safety ideas in your minds to be helpful when you are faced with a decision where lives are at stake.

Safety is not a recent phenomena, it's part of the Air Force heritage. We know you will enjoy reliving this heritage through the pages of this anniversary edition of *Flying Safety* magazine. ■

UNITED STATES AIR FORCE

Flying SAFETY

JANUARY 1992

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FEATURES

CONTRIBUTIONS

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DEPARTMENT OF THE AIR FORCE • THE CHIEF OF SAFETY, USAF

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SAFETY'S FIRST READER

THROUGHOUT THE WAR the principal challenge to U. S. air power was not enemy action but accidents. During the first 32 months of battle, for example, a total of more than 11,000 USAF aircraft were lost in non-combat wrecks in the U. S. alone, compared to 7,700 lost on combat missions or attributed to enemy action.

The same challenge exists today because accidents threaten our future air power. The crashes reported in this and every issue of FLYING SAFETY magazine have a direct bearing on how well America and its ideals can be defended, they determine how many first-line planes we will have for an emergency and they even determine the production plans of our entire aircraft industry.

Here is why:

The future strength of the United States in the air will depend not merely upon its Air Force but upon the foundation upon which air power rests: the magnitude of commercial and private aircraft operations, the size of the aircraft industry, and the technological advancement which will be fostered by large scale growth. Public acceptance of aviation as a principal part of the American transport system will to a major extent provide a basis for national security. The public will not accept a dangerous thing by using it on a large scale. An unhealthy aviation industry and a weak transportation system do not back up air power.

We cannot escape the conclusion that military aircraft accidents stunt the future growth of civil aviation. Likewise, we are faced with the facts that all air accidents hamper our military potential because they thwart the growth of the industry.

This publication has access to the greatest single source of aircraft accident information. It is the data to be found in the tens of thousands of accident reports available in USAF Headquarters. To use this information as a basis of furthering safety standards in peacetime aviation is a possible compensation for the tremendous wartime losses such information represents.

Public support for air power will be contingent upon the realization of high standards of air safety. The economy and reliability which the public wants in all forms of air transportation, military and civil, can only be achieved by safety.

And maximum safety can be attained only by employing to the highest degree the knowledge gained from past experience and the results of research and study. Thus, this magazine seeks to present the experience and know-how of the Air Force in an effort to engender flying safety among the members of the largest and most successful operators of aircraft in the world.

WHY?

THE PILOT of this F-82 signed the Exceptional Release despite a write-up on the Form 1A that the brakes were weak in the right cockpit and the directional gyro was inoperative in the left cockpit. The brakes had not been checked by maintenance personnel, the directional gyro had not been replaced.

After flourishing his signature on the 1A, this pilot took off and flew on an IFR flight plan.

Later, a landing was made on a 3,600-foot runway. The right brake failed in both cockpits during the landing roll.

The pilot attempted to groundloop the F-82 at the end of the runway, but the airplane turned only 70 degrees before the right gear folded. The wind at the time was six to 10 mph.

This was another accident waiting to happen, and it didn't have long to wait. Why did this pilot take such chances? Why did supervisory personnel allow this F-82 to be flown in such a condition? Why?

I LIKE TO KNOW!

THE LONGEST flight of my life lasted exactly two minutes by the clock in the control tower.

That two-minute flight should have been my last two minutes on earth, because by all rights I should have spread that F-84 over two miles of terrain and been written off as a victim of maintenance blunder.

Not harsh enough words? Well, maybe homicidal negligence would be a better way to put it. Here's the way it happened.

We'd had this F-84 out for a rear bearing change. To change the bearing you have to remove the whole aft section of an F-84 and disconnect a lot of cables and controls. It was a hot, sticky August afternoon when maintenance called the ship in for test.

I went out about 1500 and made a complete outside visual inspection and climbed aboard. As soon as the power unit was plugged in I checked the cockpit and neutralized all the trim lights. After starting up I set the aileron boost control at seven to one and checked the controls. I pulled the stick back and watched the elevator in the rear view mirror. The elevator came up properly and went back down as I moved the stick back to center.

Everything was normal as I taxied out. The pre-take-off check showed everything operating properly and the tower cleared me for takeoff. On the take-off run I let the speed build up to about 140 then eased back on the stick. With very little stick travel the nose lifted and the plane became airborne. It was instantly evident that the elevator controls weren't hooked up properly or weren't functioning as they should. I retracted the landing gear.

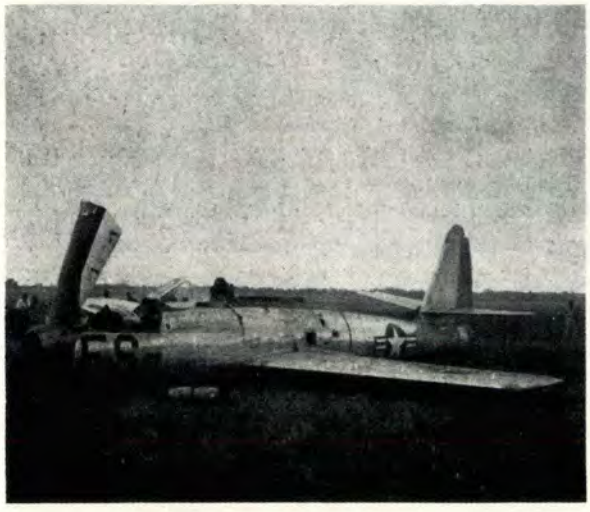
I was too far gone to try to put her back on the ground, and since I seemed to have some control I decided to take it around. At 200 mph and 450 feet altitude I retracted flaps. When the airspeed indicated 240 I started a very gentle turn to the left. As soon as I came in with left stick the F-84 reared back and pointed its nose at the sky. I shoved full forward on the stick but nothing happened.

The airspeed was unwinding like a broken watch spring and I decided to bail out. I pulled the canopy about half way open and hit the jettison switch. The release charges fired but the canopy did not move. That was about as near panic as I ever came in my life. I found out later that the canopy would have jettisoned had I followed the tech orders which says that to jettison the canopy by the firing mechanism the canopy must be all the way closed.

Since I couldn't get out I had to try to get the airplane down. I immediately reduced power and rolled forward on the elevator trim. At an indicated speed of about 150 the nose slowly came down. While all this was happening I was still in a gentle turn and I rolled out lined up with a large grassy area on one side of the field. The plane would porpoise as I tried to hold the nose level and throttle and trim.

I brought it in wheels up at about 180 and managed to put it on the ground tail first. The tower log said I had been airborne exactly two minutes.

It didn't take investigators long to find out what had gone wrong. The guy who was supposed to reconnect the controls when the aft section was re-



placed failed to connect the elevator push-pull rod to the elevator bob-weight. You can see it good in the picture. On top of that the inspector who okayed this man's work apparently didn't do his job either. The bob-weight would strike the connecting ring of the push-pull rod when the stick was pulled back forcing the elevators up. Gravity would return them to the normal position when the stick was put forward again. That's why I didn't see anything wrong when I watched the elevator in my rear view mirror on the pre-take-off check.

If I had clobbered that F-84 across the countryside they might never have known what went wrong. As it is they will be able to nail the guys who stuck my neck out. And brother the way I feel about it they can't find a big enough book to throw at them.

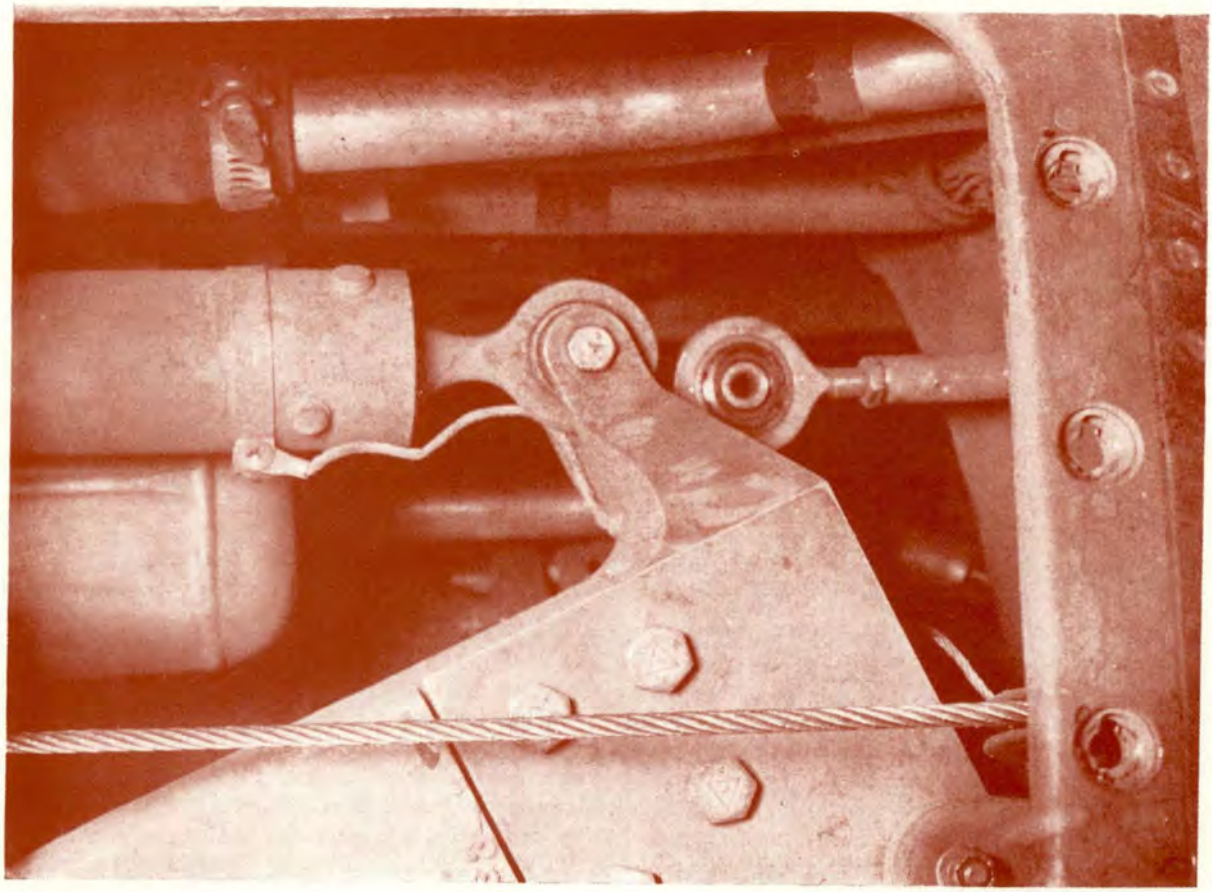
The way I figure it, maintenance people and flying people have got to work like a team. A pilot has his hands full, and he has plenty of things to worry about getting a plane off the ground, through whatever kind of weather happens to be along the way, and back on the runway at the end of the flight without having to wonder whether his plane is going to fall apart on him because maintenance people failed to do their job right.

I like to know that it's right.

In a topnotch outfit every man who nurses a plane on the ground is as proud of his job and plane as the man who flies. Disregarding the life or death aspect of the situation as it applies to the pilot, the real Air Force mechanics and inspectors have so much professional pride in their difficult and exacting work that a goof-off deal like the one I drew just won't get by them. I've flown nearly 3,000 hours in this man's Air Force and this is the first time I've nearly got killed because someone let me down.

Probably it won't ever happen to me again. I know it won't if the real maintenance men of the Air Force get next to the few characters careless enough to pull a stunt like this. The boys who care will just naturally take care of the goof-ups.

Elevator push-pull rod is shown as it was found after the accident, completely separated from bob weight



ARE WE A GOOD RISK?

THE American people believe that Airpower is needed to guarantee their country's security. They have asked for a strong Air Force—not one bigger than the preservation of our democracy requires, nor one so expensive that it will bankrupt the country. Americans are paying heavily to provide the budget out of which such an Air Force can be built. They have faith that we in the Air Force will match their sacrifices with efficient and economical operation. In effect then, the Air Force has the mission of getting the maximum Airpower for the minimum funds expended.

In carrying this mission to its goal there is one factor which we must bear in mind constantly. America's resources are not unlimited. Therefore, we must be aware of the danger in squandering any part of them. Otherwise economic suicide could defeat us. By eliminating unnecessary waste in our operations not only will we be able to forego the shadow of economic suicide, but we will also be able to live up to the expectancies of the people who support us.

The question, then, is this: Are we a good risk? Or, are the people, our partners and supporters in this Air Force, being cheated? Let's look at the facts.

A pilot puts on a private air show (even though he knows such an act is contrary to regulations) so his home-town folks can see the fine new fighter they helped buy and the fine training thousands of dollars provided. When they gather around the smoking wreckage after a neat buzz job, they are faced with the fact that tax money and resources, perhaps of a higher valuation than the entire village, have been wiped out—squandered.

Was this pilot serving the people?

A mechanic lets a faulty fuel line go until the next inspection. Later the plane bursts into flame and crashes.

Was he aware that every man who wears our country's uniform is in partnership with the American people?

A commander fails to brief his crews properly on procedures to be used during a formation flight. Two planes collide, three others crash-land after becoming separated from the squadron.

Was he trying to help give the American people an Air Force within the price they can afford to pay?

It would be a startling thing to question a man about his loyalty to the country after he had caused an aircraft accident.

Without a doubt he would insist that he as much as anyone else was concerned that this nation be provided with the most powerful air arm possible. Unthinkable that anyone would hint that he had betrayed the trust of his nation or the mission of his service.

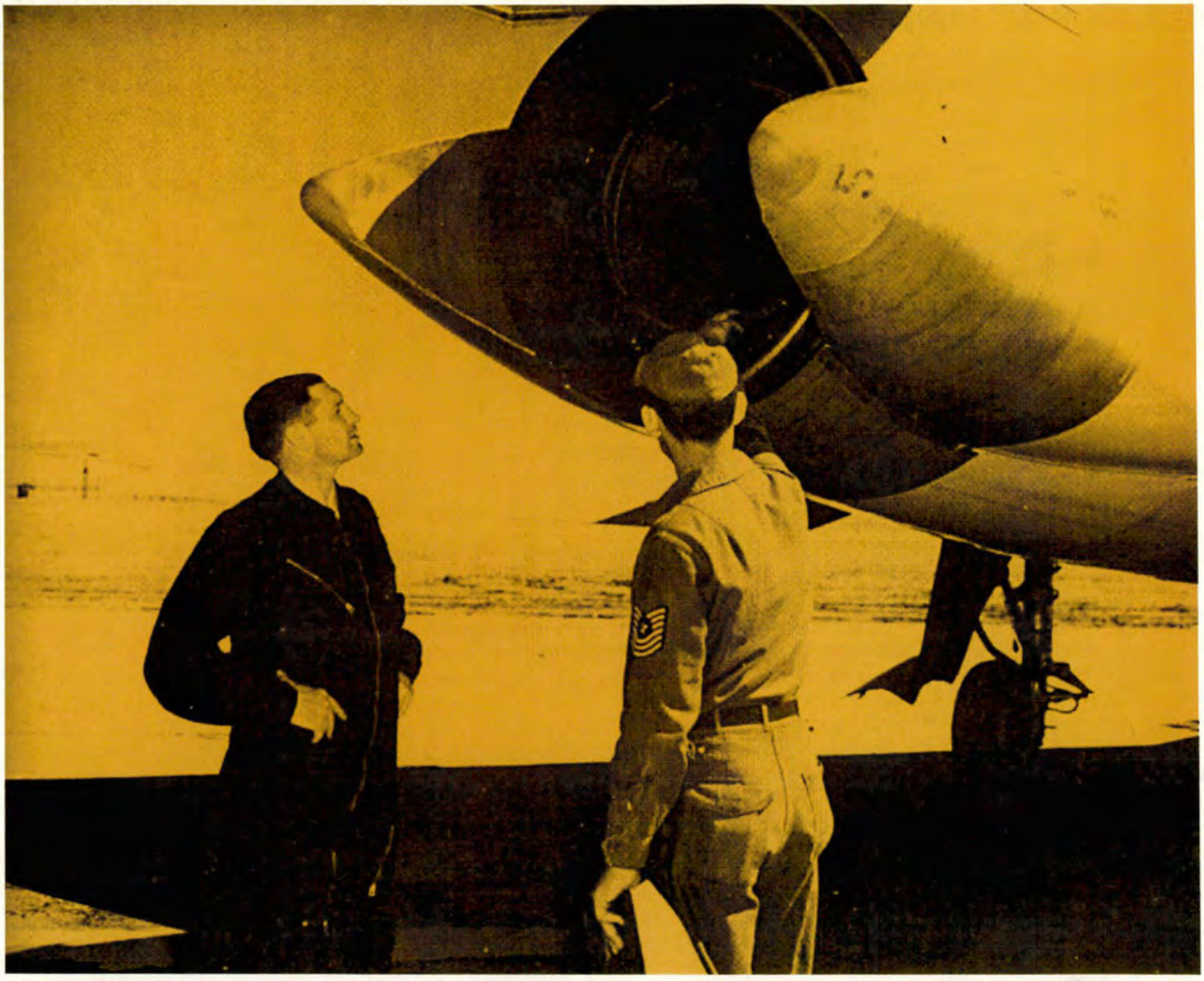
General Bradley once said: "A democracy such as ours cannot be defeated in this struggle (for freedom); it can only lose by default. It can only lose if our people deny through indifference and neglect their personal responsibilities for its security and growth.

"Our danger lies not so much in a fifth column whose enmity is avowed. It lies in a first column of unconscionable men who are 100 per cent citizens in their daily routine of neglect."

Our people are buying an insurance policy. In it there is no room for the squanderer, the waster, the careless, or the neglectful. We must strive to see that we do not betray the trust of our nation as a whole or of ourselves as individual servicemen and citizens.

We must be a good risk!

FLYING SAFETY, MAY, 1952



Keep Me Posted

William F. Funk, Design Safety Specialist
CONVAIR, A Division of General Dynamics Corporation

The writer has used the word "incident" in this story but not in the same definitive manner as it is used in AFR 62-14.

"It had to be one of those blasted pumps, sir. We've had trouble before, but never like this."

Captain Jim Kelly, the investigator, leaned over the hospital bed in order to hear the testimony of the injured crew chief who had just spoken in faint tones. "You say you've had trouble with them before? Can you tell me what kind of trouble?"

The bandaged figure on the bed was silent for a minute; then, he said haltingly, "Yes, we've had to change quite a few of them 'cause they've run intermittently or stopped completely. I never did get to see inside one afterward, but we've always heard that they were jammed up with junk from the tanks. Yep, it just had to be one of those pumps back there freezing up, overheating, and—." His voice trailed off weakly.

The investigator, realizing the interview was over, whispered his thanks to the nurse in attendance and quietly closed the door as he left to return to the flight line.

★ ★ ★

"Tom, have we had a lot of fuel pump failures due to contamination freezing the impellers?" The investigator had returned to the base, and was questioning Major Tom Green, the Maintenance Officer.

continued

Figure One

"No, Jim, not a lot of failures. Records show only one pump UR'd for jamming, but since the explosion I've learned of three more failures that occurred during the past few months that weren't reported. One even failed in flight, but the pilot didn't report it. The crew chief found it on postflight. You know, Jim, if these guys would just write these things up, then we could get faulty equipment replaced with improved items. We'd UR them and the manufacturer would get the word that the pump screens are inadequate. I talked to our tech rep after the fire yesterday and he'd just heard about the rash of pump failures. He told me then, that if he'd known about our problems he'd have contacted his Air Safety Engineer at the plant for expedited action." Green frowned as he gazed out the office window toward the burned hulk of what had once been a sleek, fast, metal bird. He went on, "It's the same old breakdown in communications. We can't get ahead of these accidents unless everyone informs each responsible agency of the problem involved and the seriousness of its potential as an accident cause factor."

"You're right," said Kelly, "I read an article not long ago by General Caldara in *Maintenance Review* Magazine (Feb. 1959). The General was really after all of us to report incidents in order to prevent accidents. He didn't mince any words about it either. As it is, I'm afraid Turner suffered some pretty bad burns as a result of this fiasco. Doc says he's going to make it, but he didn't look too good when I talked to him a while ago."

"Thanks a lot for the info, Tom. I've got to get back to the investigation board session and discuss this pump business with them. It could have overheated and caused the explosion but of course we don't know yet."

"OK, Jim," Major Green said, "let us know if we can help any further, and by the way, please keep me posted on the findings, particularly with respect to this pump business."

"Will do," answered Kelly, "be seeing you."

★ ★ ★

Let us leave our friend Captain Kelly and his investigation problems and let me discuss the necessity of

INCIDENT CAUSE FACTORS EXPERIENCED DURING A TWO-YEAR FLIGHT TEST PROGRAM

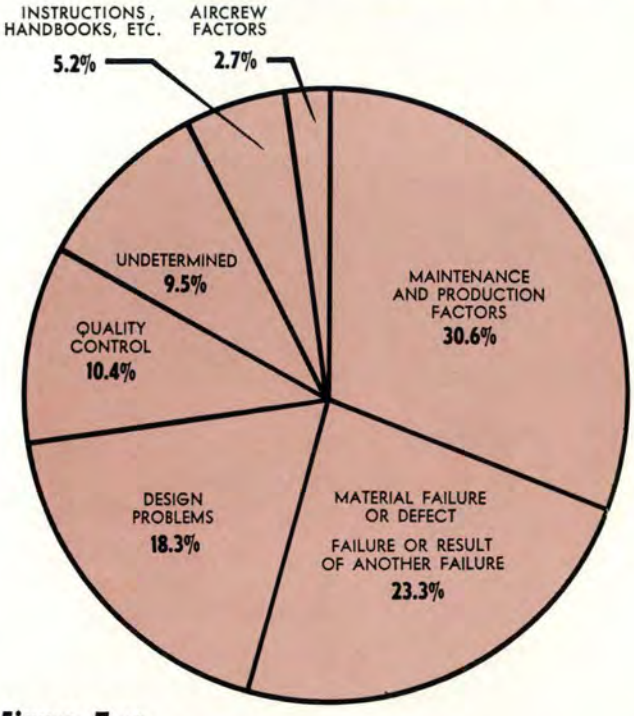


Figure Two

incident reporting. For instance, the fictional explosion in the preceeding story could have been prevented by timely reporting of the rash of pump failures.

"Keep me posted" could well be a watchword for this business of reporting incidents as a means of preventing aircraft accidents. It really is *everyone's* responsibility. It's true that a person who reports an incident to the proper people never knows how many accidents he has prevented, but he can rest assured that he has probably helped save money and lives somewhere along the chain. No one associated with aircraft can assume that *he* isn't responsible for reporting these things. The accidentally bumped switch, the failure to remove ejection seat pins,

the "hardover" signal on the flight controls, the elevator trim hooked up backwards or running away, the reaction to a sudden distracting light reflection on the flight instruments—all these and many more are incidents that have too often been the prelude to an accident. Properly reported these items can be, and in many cases have been, eliminated. No matter how insignificant it appears, *report it;* it could be the straw that breaks the camel's back.

Each command in the Air Force has its own incident reporting procedure; the Navy has its "Anymouse," some airlines have procedures for reporting, as do many of the manufacturers' flight test sections.

In a manufacturer's flight test program, incident analysis is of extreme importance. It's during the early flight tests of a new aircraft that most of the bugs show up. These faults can be eliminated before the customer starts operating the bird. The manufacturers vary as to their methods of incident reporting, but all of them are well aware of the importance of such reports, and are sincere in their efforts to eliminate the problem areas involved.

Let me give you a quick rundown on how we handle incident reports here at Convair—Fort Worth. Figure 1 gives a general idea. From the incident reports we do a little statistical work to provide our management with an idea of where any weaknesses may lie. The chart, figure 2, gives an example of an analysis of the cause factors involved in some incidents which occurred during a two-year test program. Notice that—

Now here's a coincidence. One of our pilots called to report trouble in flight due to a failure. Excuse me, there's the phone again.

How about that, the affected design group called to tell us they know about the problem and the vendor will be in tomorrow! Meantime, inspection is checking other airplanes to be sure this problem will not recur.

That was fast action—wish they were all handled that fast, or that they were all that simple. We'll attend the session with the vendor tomorrow, sure, but the important thing is, our pilot didn't *have* to report, except to maintenance. Design didn't *have* to call the vendor to discuss getting immediate redesign started! But we're out to eliminate any item which could cause an accident, so the wheels are turning to prevent that—x-x-x—item from ever coming unglued again!! Our pilot probably helped prevent a mighty large-sized accident.

We never did get back to the discussion on Convair incident reporting procedure, but the above illustrates it pretty well. (If the design group hadn't called us, we'd have called them).

Regardless of what your incident reporting procedures are—*use them*. Regardless of how trivial the item may appear to you, if something annoyed you in flight, couldn't be reached comfortably, was accidently bumped, or is in a location you just don't like—SPEAK UP. All manufacturers of aircraft are vitally interested in providing you with the best equipment possible. What may appear completely satisfactory in test may not be the best in combat, on a long cross-county, or for an operational requirement that was developed after your airplane was delivered. Let the manufacturer know in detail, through your channels, just what gives with that annoyance, distraction, or problem area.

Your problem on *your* airplane could be a potential accident cause factor—AND—you might be on board at the time! Excuse me. . . .

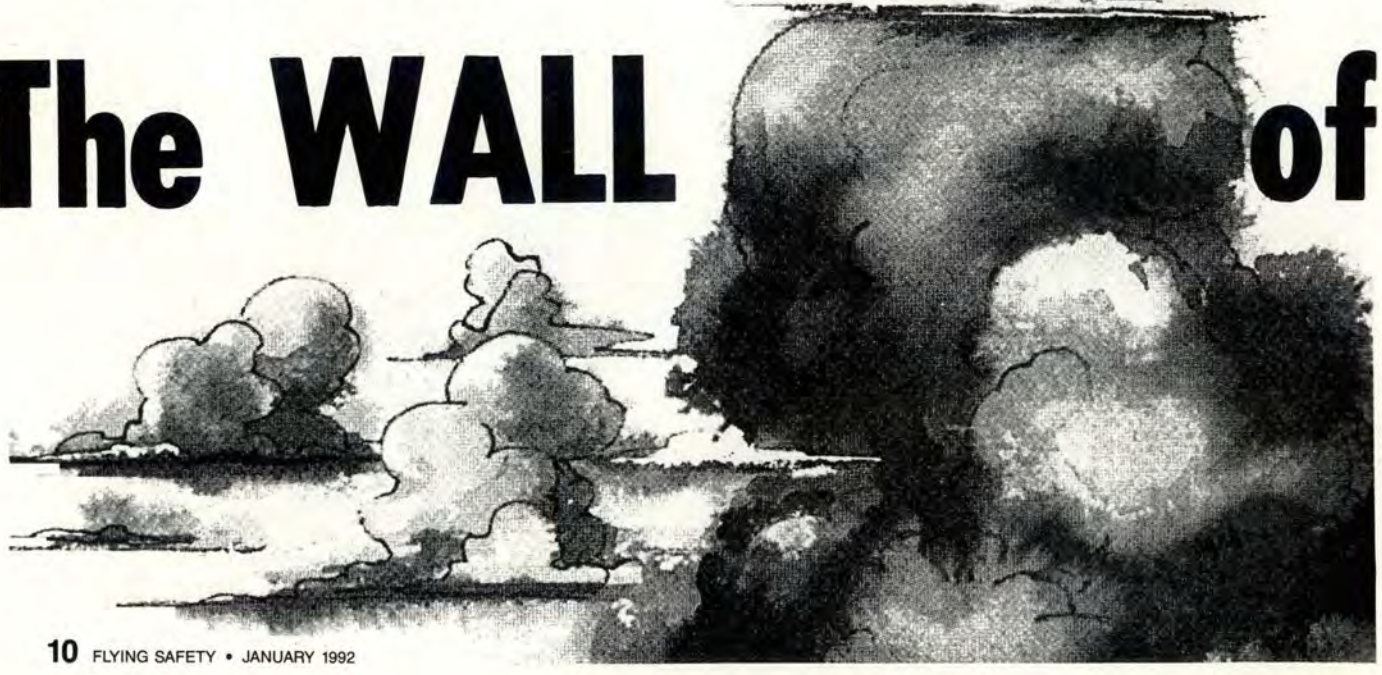
The WALL of

"VFR ON TOP — the ooonl-y way to fly," remarked one of a pair of T-Bird pilots getting a weather briefing.

"I think it will be rather difficult," the weather officer replied. "There is a line of thunder bumps extending from New Orleans northeast to New Jersey and, from the reports we have received, they are building up rather rapidly. We just received a pilot report from a '104 jockey out of Maxwell who didn't get on top until he reached 42,000 feet. And your flight from here to Jacksonville, Fla., will require that you take a flight path that will put you right in the middle of the most severe area."

"No sweat," came the tart reply, "we have a '58 bird and she'll keep us out of trouble."

His back seat partner was rather concerned over his buddy's confidence in the aircraft; anytime you can get a T-33 up to 40,000 feet it's



Lt Col Anthony S. Cavallo
Editor, Aerospace Accident and Maintenance Review.

CLOUDS

a struggle, let alone getting one up to 42,000 feet and above, especially with a pod. "Look, Jack, why don't we just get a hard altitude and if it gets too rough we can always make a 180 and come back."

"You won't get me in that soup at a hard altitude," replied his partner. "No sir, I've had enough of those bananas. We'll give VFR/OT a try and we can always head east and try to get over. It appears to be a little thinner in that direction. We can then swing south down the coast to Jackson."

His partner reluctantly agreed and they filed their flight plan accordingly. Climb out was VFR and they were able to make the first wall of clouds on top at flight level 390 with about a thousand feet to spare. They were tuned in to Atlanta center on the UHF frequency for that area.

"Looks like we'll be able to make it . . ." Before the confident pilot could complete his remark, an excited transmission from an F-100 pilot was blaring out over the radio on Guard, requesting help from Atlanta Radar. The pilot said he was in the soup at 45,000 feet in severe turbulence and was asking for a steer to a more stable area. Atlanta informed the pilot that the whole southeast was in a severe weather warning category; however, they would give him a steer that *MIGHT* help him out. A minute or so elapsed and the F-100 pilot reported that he had encountered hail the size of golf balls in addition to the turbulence, but was finally on top at 49,000 feet and was proceeding on course. Subsequently Atlanta Radar was jammed with requests from numerous pilots asking for assistance. The radar operator was hard pushed to keep all the jocks happy. However, as is the usual case, he handled all the pilots' requests for help in an exceptional manner. Meanwhile the lads in the T-Bird listened to the chatter over the air. Finally the front seater completed his unfinished earlier remark, this time with a little less confidence in his voice. It even sounded a little shaky. He was determined to make Jacksonville, do-or-. . . . He tried to appear a little cooler when he stated that they may have to climb a little due to a gradual increase in the height of clouds ahead of them. As they approached the wall, it was obvious that they wouldn't be on top before they hit the soup.

"I'll just make a few climbing 360s here, and I believe we'll be OK in another thousand feet or so." The 360s continued for many turns. You know how a jockey will try to look over the clouds as he's climbing, sort of urging the nose up over the mound. Pretty soon he finds himself behind the power curve about to stall out. Our friend made it to 42,000 feet, but it was an up and down proposition. He still had a long way to go to get on top. At this point, with the bird getting a little sloppy, he attempted to continue his climb at around 170-175 knots indicated. T-Birds just won't climb at that altitude at that airspeed. Accordingly this pilot was in a constant mush — getting no higher and losing more space than he could hold.

Much to the chagrin of his rear seat partner the inevitable happened. During one of the dive-and-climb maneuvers, the T-33, (bless her soul, she tried to let them know), went into a spin. Now you readers who have been in a spin in a T-Bird at flight level 420 will appreciate the predicament these jocks were in. It was a real hairy ordeal all the way down to 20,000 feet, when they finally managed to bring her back to straight and level.

Fortunately this all happened where there were few clouds below them — this story does have a happy ending. After much confusion, mostly in the front cockpit, a few fixes by GCI established their position and they were directed to a VFR installation. There a very nervous and shaky pilot made a very nervous and shaky landing.

After parking, the pilots had a difficult time getting out of the cockpit. It seems that hands and fingers could not hold still long enough to accomplish the simple tasks of doing a little unbuckling.

By the way, they RON'd but, you guessed it: they had lost their pod and with it went their dancing shoes. ★

AEROSPACE SAFETY, JANUARY, 1963

LEGAL OR SAFE?

Maj Francis A. Dellorto
928 Troop Carrier Group
Chicago-O'Hare Intl Aprt, Ill

I was riding with a pilot friend of mine the other day in his beautiful new Pontiac GTO. He was understandably proud, calling forth the eager horses to zoom down the highway. As we approached an intersection another auto made a half-hearted attempt at stopping, then proceeded onto the highway directly in front of our galloping steed. This didn't bother my friend at all. Blasting his new trumpets, he continued at the same speed. The other car stopped halfway across the road and our splendid vehicle careened around and sped on merrily. My friend was very perturbed about this intrusion and when I asked him why he hadn't slowed down or stopped, his retort was, "I had the right of way, I was *legal.*"

This brought to mind many such incidents that happen while we are in command of many more horses than the GTO possesses. I mean the *flying machine.* How many times has ground control cleared us across a runway and we galloped across without checking to see if the approach end was clear? How often has the tower cleared us to take the active and hold, and again without checking the approach, we whipped out onto the runway eager to roll? How often have we been cleared to land while one and a half miles out, and, although we saw another aircraft holding on the runway, our approach was continued because after all *we were* cleared to land. We were *legal.*

All of these incidents reveal an inert tendency in us humans to perhaps want to go outside the realm of the law, but also to want everyone else to think that we are *legal.* We feel that since the controller has cleared *us* it is then up to the other fellow to watch out.

Let's look closer at the word *legal.* It is a word meaning lawful, legitimate, basically implying strict conformity to the law. Definition of the word *legal,* although broad and lengthy in the dictionary, does not say anything about *safety.* It follows then that making an instrument approach at minimums is *legal* but it is not necessarily *safe.* Many things should be taken into consideration.

Is the weather up or down? Does it go from 200½ to 100¼? If so, you might have a tendency to go lower than you should and inadvertently break minimums while concentrating on the approach.

Is the air smooth or rough? Two hundred and a half in smooth air can be more or less routine, but in turbulent air extremely difficult. It's legal! But, is it safe?

Is there heavy precipitation? Two hundred and a half in heavy rain or snow is legal. Is it safe? You have to rely on wipers and clean windshields to allow you to even see half a mile.

Is there adequate approach lighting? This can make a big difference if you are cracking minimums.

How long is the runway? Two hundred and one half in heavy rain, landing on a 5500-foot runway might be legal but—!!

Is there a stiff crosswind? It's legal to land with a 40-degree crosswind of 15K and 200 and a half, but it would take a proficient instrument pilot, who is also a crosswind expert, to handle this situation. Many other items enter the picture, such as runway conditions, approach zone obstructions, icing conditions. When you are in doubt or when safety dictates, exercise your prerogative and divert to a *safe* alternate.

I know that from now on whenever I hear this word *legal* used in flying or driving that I personally will not use it as a synonym for *safety.*

• •

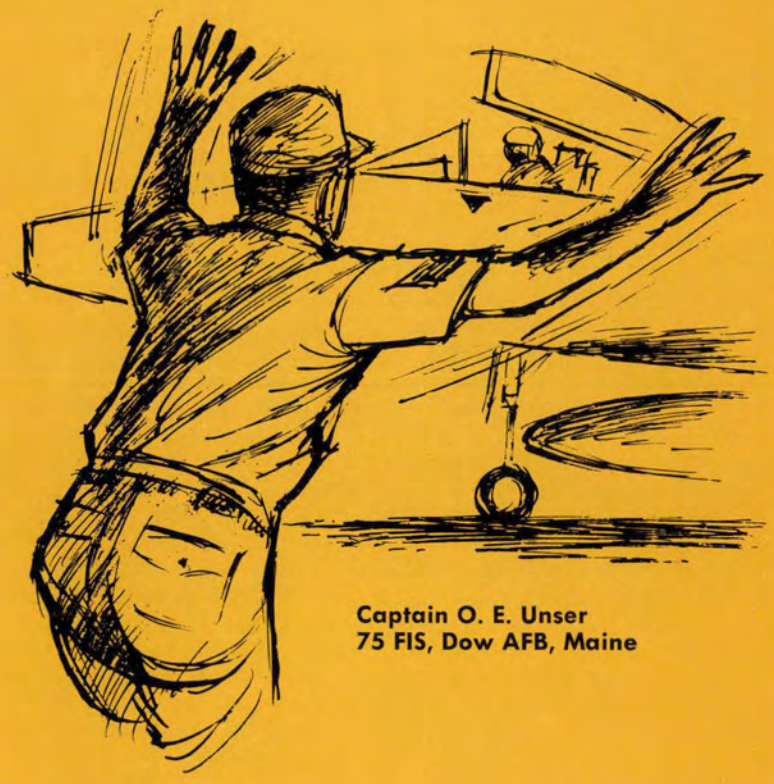
Although a driver (either aircraft or automobile) "has the right of way," he is not legal if he is involved in an accident which he could have prevented. The Courts call it "the last clear chance" or "subsequent negligence" rule. What is really meant is that if another driver has placed himself in a position of peril through his negligence, every other driver has the responsibility to avoid collision with him if possible and reasonable to do so. If such action is not taken by the legal driver, he has not taken advantage of the last clear chance to avoid the accident and could be charged with subsequent negligence. ★

Got your signals straight?

ONE IF BY LAND

The following four tales are unrelated – or are they?

Nr 1. The noise level on the ramp was high. The Sarge couldn't seem to get his message across to me. For a guy who was usually supercalm he sure seemed excited. I read his lips, as he slowly mouthed: ". . . Y.O.U.'R.E. . . O.N. . . . F.I.R.E. . . ! ! !"



Captain O. E. Unser
75 FIS, Dow AFB, Maine

Nr 2. I was number four in a formation assigned the job of cleaning out a Viet Cong village. As I came in low, I felt ground fire hit the bird. I completed my run. Lead was saying, "Four's been hit!!" I tried to tell him I was heading out to sea for possible ejection; – no transmitter.

The headset crackled, "Three, stick with four" – then silence.

The coastline ripped rapidly aft. Three thousand feet–right wing looked bad – better get out!

"Three, this is four, move out, I'm going to eject!" – Nothing.

". . . dammit, move over!" No response.

Speed boards, idle power – three went skidding by. EJECTION!

I saw the right wing fold up; three was clear and okay. I was in a good chute.

Nr 3. The weekend cross-country had been great. No problems with the bird. And that little chick I met last year even remembered! Real swinger – great time.

Now waiting for clearance. Cockpit check almost done. Better check the pitot heat; weatherman says there'll be a 500-foot ceiling on approach. "Hey, Sarge. . . ."

Too noisy, can't seem to make him understand. Oh, well, give him the index-finger-to-the-nose check pitot heat signal. Yep, he's got it; walking toward the front end.

Here comes the clearance–really organized this time–simple, concise. Copied and read back just like in the movies – no sweat!

There's the Sarge – finger on nose and OK sign. Pitot heat is good. Let's crank.

THE NOSE GEAR COLLAPSED! Shut down!

"Sarge, what happened?"

"I don't know, sir, I didn't pull the nose gear pin till you gave me the signal with your finger on your nose."

Nr 4. Engine going, all checks completed, ready to taxi. Pull chocks signal: both fists, thumbs out, rapid movement. Crew chief signals okay. Power up – must be in a hole; more power – *thump!!* It felt like I went over the chocks. Stop, check.

"What happened, chief? I gave you the *pull chocks* signal."

"Well, sir, I was standing a little to the right and I only saw one hand. It looked like you were asking for *electrical power out;* I'd already pulled the power, so I gave you the OK sign. Next thing I knew, you had gone over the chocks!"

Do some of these situations sound familiar? What do they have in common?

From the cockpit of the modern jet fighter it is near-impossible to see the engine(s). At the present time, in your organization how does the man on the ground (usually the crew chief) notify you that "Y.O.U.'R.E. . . . O.N. . . .F.I.R.E! !"

The good book on "Handy Hand-Signals for Aviators and Associates" does not include a signal for this vital communication in its vocabulary. Also missing from the vocabulary is a signal to warn a wingman that you have impending structural failure – that you want to eject. Consider this position. No radio, wingman tight on the right, you can see that the right wing is about to fail, he cannot. How are you going to tell him?

You might consider the idle-speed-boards bit. Is *is* a rather rough way to treat a guy who is only looking after your interests.

The signals mentioned in the above two cases are not included in AFR 60-15. After all, they cannot think of every possible situation. However, in the two cited cases, something must be done. Not only your aircraft is in jeopardy, but also other aircraft in the immediate vicinity. Discuss possible situations with your aircrews. They may offer some pet theories and maybe some "what-I'm-going-to-do's." Pick the best suggestions for your situation. Spread the ideas around; forward them. Then we can all benefit.

Tales Nr 3 and Nr 4 come from a well-known ditty. First verse: unfamiliarity with proper hand signals, use of non-standard signals; improper signaling position or practices. Second verse: same as the first. Etc., etc.

Well, here is your chance to ". . . throw a nickel on the grass . . ." Take an hour to review hand signals in your squadron. If you find a lack of knowledge or a non-standard practice, you have found an accident or incident in the making. It does not take much to correct the situation: a demonstration, a series of photographs (for display in the ground crew lounge and the aircrew briefing room), and a practical test, to be sure the "message" was received.

Another excellent place for your photo series is your checkout folder. When a new man arrives, he immediately jumps on the bandwagon. He will not be the one who, during the investigation following an accident or incident, says: "That is the signal we used at my *last* squadron . . . !" ★

PLAN B

One of the neatest things about the human mind is that it has the ability to adapt to changing conditions. But like mechanical computers, it will not function unless we tell it to. In other words, we have to keep thinking or we can find ourselves up the creek without a paddle. In this case, let's call the paddle Plan B. Most of us recognize the need for an alternate way to get where we want to go, but sometimes our computer doesn't spell this out because we fail to tell it to spit out a solution.

When we plan a cross country, or any flight for that matter, we are required to select a suitable alternate if the weather is below a certain value. However, one thing that is not spelled out in the regs is a *unique* situation. Let's say, for example, that we are planning to land at a high density training base with one runway. If someone slides to a halt minus the gear about the time you arrive there, what's your alternate? Do you have *something* in mind?

Another one of these Plan B situations occurs about the time you break ground in a single-engine fighter, and the engine catches fire. What now? Did you consider this possibility? We know one pilot who swears that before brake release on

THE T.O. WAY IS A.O.K.

every mission he considers what his alternate plan of action is if the motor stops or he loses thrust. We believe him. We are also relatively sure that if he ever does have an emergency on the takeoff roll, his chances are much better than those of the pilot who ignores the possibility and refuses to consider what he would do.

Hangar flying certainly has its place in helping us formulate our own personal Plan B. Has anyone ever listened to a hairy story related by some other pilot, who hasn't asked himself what he would have done if faced with the same set of circumstances? After many years of listening to these remote frustrations, most of us tend to formulate a course of action to solve a particular pet problem. With some pilots it's weather, others fear midairs or the embarrassing classic of too little fuel and too many miles left to go. What we must do is consider *all* the combinations of problems that are likely to arise *and* at least a tentative course of action.

Nor is this need for an alternate plan limited to the guys who drive airplanes. Remember the one years ago where the crew chief was running up a C-46? Unfortunately the beast jumped the chocks (perhaps the brakes were not set). Again, unfortunately, the crew chief was not qualified to perform the run up. He panicked and leaped out of the aircraft without any effort to stop the bird. Before this one was over, several airplanes were destroyed and several lifeless bodies were strewn around the ramp. What was this man's alternate course? He probably didn't have one because he was not familiar enough with emergency procedures. **Rule:** if you can't predetermine a way out of a possible sticky situation, chances are you are going to end up a very sorry guy.

We all know how routine it is to see the familiar fire guard handy when we crank engines. Have you ever wondered if the fellow really knows what to do with that piece of equipment, if the time comes? We know of one that was eager but just didn't have the training. A jet caught fire but the fire guard *didn't know where to aim the nozzle on the extinguisher*. Result, one burned up airplane.

How about the one where the fire truck was responding to an off-base crash? During this effort the driver managed to get on an access road that had been closed months before and found himself, truck *et al*, at the bottom of a big ditch. Someone had failed to determine a substitute route and update the accident response plan.

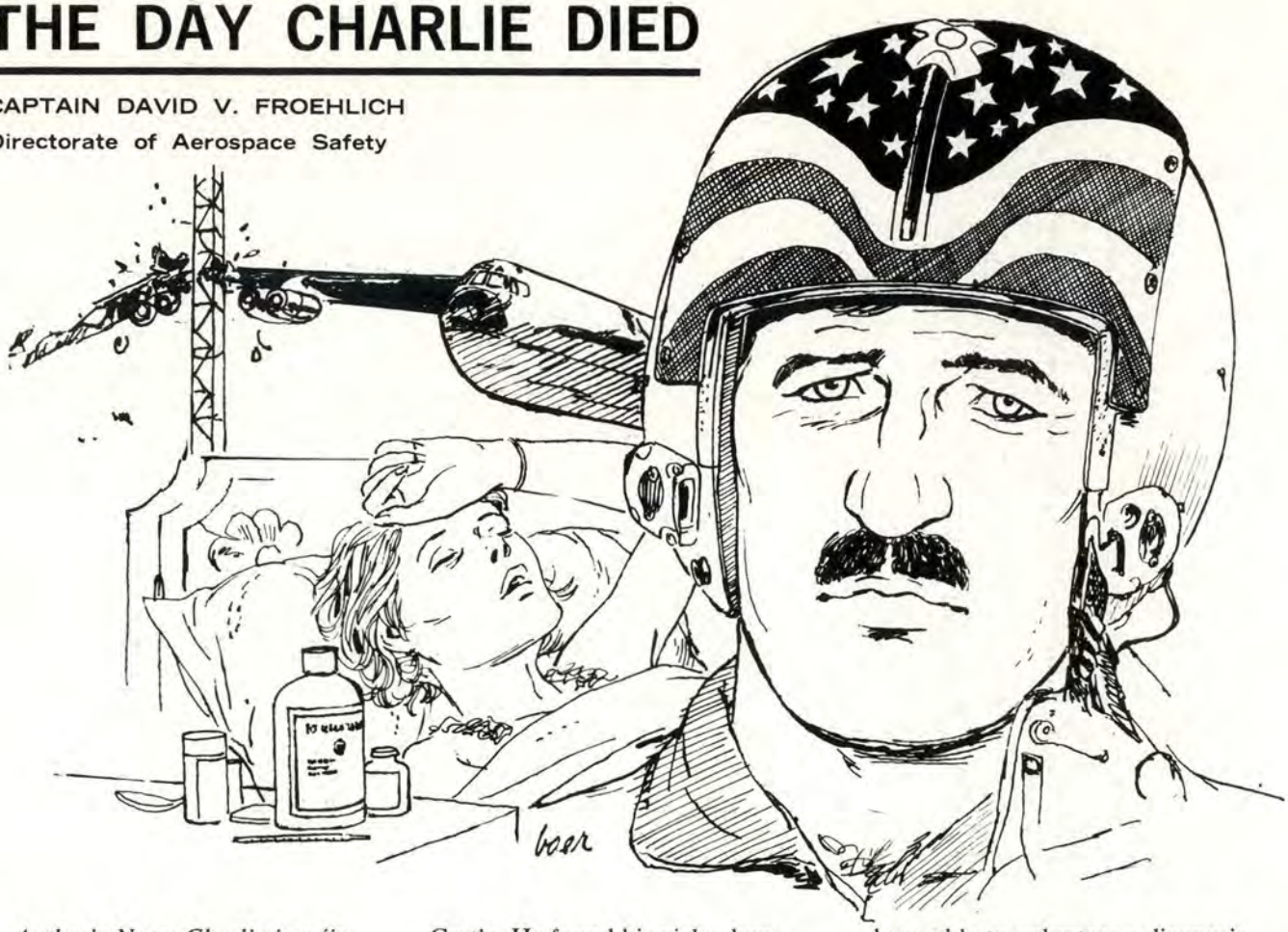
Does one of your duties involve taxiing airplanes? What happens if the brakes fail? Do you shut the motor(s) off? That just might not be the best course of action since, when the T wheel stops going around, you usually find yourself without hydraulic pressure. Without this nice feature, you end up strapped to a very large unguided tricycle. It might be worth a few minutes of preplanning to determine just what you would do.

Naturally, we can't come up with a course of action for every situation. However, in most cases we can think of the one that can do us the most harm and compute a Plan B. A pilot doesn't have an alternate for every mile of his cross country, but he should be familiar enough with the track that he knows in general terms where he can go if an emergency arises. What this all boils down to is that you have to be AWARE. Know where you are and don't daydream until time comes for some rapid action and discover the computer reads empty. The more pre-planning you do the less grief you will suffer. ★

AEROSPACE SAFETY, SEPTEMBER, 1971

THE DAY CHARLIE DIED

CAPTAIN DAVID V. FROEHLICH
Directorate of Aerospace Safety



Author's Note: Charlie is a fictitious flyer. He is the guy who sat in the left seat, flew on my wing "up North," yelled at me from the back seat or hovered over me while I was pulled up on a cable. Charlie is the aviator with the mental and physical ability, and skill, but through some disregard of rules, limits or flight discipline, he kills himself (and mayhaps others). Those of us who fly, either have known or will know, a Charlie, before he kills himself.

Charlie felt like the most senior captain in the Air Force. He missed the last O-4 board by 2 days and then the "power" decided to delay the next board "in order to . . . (mumble, mumble, mumble)." When it comes to pilots, Charlie's a pro. He left UPT and traded in his white rocket for an eight-engine aluminum overcast at Castle. He found his niche, however, and became a "good" copilot. A "good" B-52 copilot would usually be a "great" copilot in the right seat of any multi-place machine that also carries a loadmaster, flight engineer, steward or the other folks that do all the same stuff a *Buff* deputy does.

Minimum time and several *arclight* tours later, Charlie upgraded to the left seat and got his first crew. Shortly thereafter, he put in a 1-year tour as a "NAIL" and came straight back to the land of snow and ice and Buffs.

Everything in his first 11 years had been normal progression. Smooth until last year as a matter-of-fact. Then things began to sour. The Mrs. had taken ill.

At first, she was just sick enough to be misearable most of the time. The docs at the local USAF facility had thrown their hands up and not been able to volunteer a diagnosis. Charlie had taken leave to take her to a "specialist." No luck there either! So now Charlie didn't know anymore than he did at the beginning. That was the most serious problem, but all the little gremlins seemed to be cropping up at once.

The mission planning had been done on alert. It seemed like a good idea and had been done for years that way. Charlie, however, always had a nagging feeling that he just didn't have quite the handle on the upcoming 10-hour flight that he did when the planning and briefing were done the day before. Let's see, might as well start sorting through the mountain of paper in the mission folder. Flight orders—boy, a crew with two captains, three lieutenants and a tech. I remember the days with nothing but majors and L/C's on crews.

The mission—we drew a good

one. Heavyweight T/O, fighters running intercepts, high runs, refueling, low level with racetracks and back home for a few approaches. Not missing much! Weather? Great, as usual! Multi-layered cirrus for the fighters, high runs and refueling; low crud with thunderstorms and possible turbulence for the Oil Burner. That's just what I need! What? Phone call. "Uh—OK, be there in a minute."

Charlie's mind was not running at the 100 percent mission concentration level. The phone call was from his wife letting him know of another small domestic problem. Normally, no biggee! But today, it was just enough to send his mental computer and patience bank into overload. He returned to his premission briefing. His attention wandered; he snapped at the nav and the EW during the briefing and left his checklist in the mission briefing room when the mob got on the bus. Definitely didn't have his act together.

Pre-flight was OK and they went back outside for a stretch before engine start. Charlie knew it wasn't his day when the stanboard hatchet man arrived with seventeen sharpened pencils and announced "Just thought I'd ride along and give your 'co' a no-notice."

Takeoff was normal—as normal as a 10,200 foot takeoff roll can be. The half million pound machine staggered toward flight level, and an hour and a half later they were the target for jocks out of a nearby fast-mover base. Intercepts and high runs went OK, but Charlie could tell that his "suite-mate" was nervous.

He remembered the feeling. As a new guy, he had worked hard at his job as a copilot, but it always seemed that whenever an evaluator crawled on board "the harder he tried, the behinder he got." Some stanboard folks (the minority, unfortunately) were better than others. Some had the knack of putting you at ease, letting you do your job and yet giving you an evaluation that really helped you improve as a crew member. This guy wasn't like that!

Charlie found the tanker in the thin soup. "Stabilized—pre-contact —ready." "Damn!" Charlie silently cursed the bureaucrats for his lack of proficiency as he slid out of position. You can't be good at this when you only get to do it once every 2 or 3 weeks. You're also supposed to help the "co" learn how to refuel, too. Fat chance!

Charlie was working hard! In and out of the clouds, he hung on, got the gas and then relaxed and got two more contacts. He hung on extra long the last time and didn't even offer the right seater a practice shot. When the final disconnect came, he saw the copilot look at him with "Thanks, I didn't need that" in his eyes. They had an hour before low level entry and Charlie needed a stretch. He had just realized how really tired he was already and there were still 5 hours to go.

Charlie harassed everybody on the way downstairs and back up again. A good-natured harassment about job, leave, and miscellaneous. Harmless, except on the way back up, Charlie began to think about wife, family, and problems.

Concentration broken! Strap back in—everything OK? Get ready for low level entry. Weather? Yuk! Just bad enough to make life miserable, but not bad enough to cancel. Checklists accomplished. "Boy, she really sounded bad when I talked to her before takeoff. I sure am tired; what, oh yeah, leaving FL 240 for 160 enter OB- . . . ."

Through the low level (flown at IFR altitudes because of weather) everything went OK, and the first bomb run seemed good. On the second racetrack, Charlie's concentration began to wander, his tiredness showed in heading and altitude control. He snapped at someone on the intercom and missed a radio call.

Turning inbound to the IP. What's that light! Hydraulics! Co—take the airplane, I'm gonna check out the hydraulic problem! What? A generator out! What radar? Yeah, I know the heading, I'll roll back in a minute . . . .

Charlie was a competent pilot. That day he had no business in an airplane. On a VFR day with no problems and no additional factors (stanboard/emergencies, etc.), he probably could have handled everything, but this day he couldn't. The mission was complex, the weather was bad, the machine began to come apart and worst of all, he was tired and had too much on his mind. At the critical moment, his mental and reaction computer overloaded and he stopped flying the airplane just long enough to overshoot heading, lose 600′ and collide with an 1867 foot tower. The IP and copilot were intent on the electrical panel; the RN and nav were setting up for the next run. Nobody noticed until it was too late. Charlie could have handled it all if he just had his stuff together and his head on straight.

Mental overload killed Charlie and he took six others with him. No causative aircraft malfunction will show up in the investigation; the aircrew qualifications and experience will indicate no reason for the mishap; the 72-hour histories won't give any major clues; crew rest was "not" a factor! The mass of twisted metal will not answer any question. CAUSE: UNDETERMINED. That was the second day Charlie died. ★

OPS topics

Hard Landing

An Aero Club pilot was practicing landing around dusk. The pilot had some difficulty with the rapidly changing light conditions, landed hot and bounced.

When he tried to "fly" the aircraft back to the runway, he touched down nose wheel first hard enough to activate the ELT (5-7 Gs). The nose gear strut failed on impact, and the aircraft slid to a stop on the main gear and broken nose strut.

Wire Strike

■ Two UH-1's were redeploying from Red Flag. After a refueling stop at an enroute base, the two aircraft took off in formation.

While enroute, Number 2 practiced crossovers, trail, and fingertip procedures. The procedures used were not in accordance with command directives, and changes in position were not coordinated by radio.

After about an hour of flight, Number 2 was in fingertip at lead's 7:30 position. Number 2 executed a left 360° constant airspeed turn in an attempt to enter extended trail.

As he rolled out of the turn, the pilot of Number 2 realized that he was below lead and still descending. He immediately added power but, as he started to climb, the aircraft struck some power lines at about 150' AGL. The pilot was able to make a safe emergency landing in a nearby field.

Thunderstorm Problem

A C-130 was over southwest Colorado enroute to a western base when the aircraft encountered an unexpected solid line of thunderstorms which had built up after takeoff. The aircraft radar was weak, and so the aircraft commander requested vectors from Center in an attempt to penetrate the line.

After about 3 or 4 minutes on the vector heading, the aircraft encountered moderate to severe icing and then about 45 seconds of hail. After landing, the crew found numerous cracks in the nose radome.

Unlocked Gear

An F-15 took off on a DACT mission without incident. During the first intercept, the pilot began a near vertical low to high conversion in min AB, 500 knots, and 4-4½ Gs. The pilot then heard a loud bang and muffled thump. He called "knock it off" and upon investigating, found the gear handle down and the red light in the handle on.

Lead rejoined and confirmed the gear down de-

Some recent happenings in the arena of flight — some good, some bad, some simply amazing.

spite an unsafe indication for the right main. The pilot returned to base and made a successful straight-in landing. But after aerobraking, the pilot could get no braking with either the normal or emergency systems. He then lowered the hook and successfully engaged the BAK-12 cable.

Investigators found that the landing gear handle could be placed up but would not slide into the uplock detent unless deliberately placed there. From this intermediate position, less than two pounds of force were required to cause the handle to come down. So, under the G forces of the stern conversion, the handle came down and so did the gear damaging the gear door linkage, brake lines, and separating the right aft main gear door from the aircraft.

Split Flaps

A CT-39 was at 3,000 feet MSL on a night VMC approach. As the pilot lowered the flaps to initiate an intermediate descent, the aircraft started a left roll. The pilot stopped the flap movement and determined that the flaps had split with the left up and right partially down. He was able to work the right flap up and then set up for a no-flap approach. The crew was almost 12 hours into a 14-hour crew duty day at this point. At about five miles the pilot initiated turn to final and lowered the gear.

Then habit patterns interfered and the pilot automatically and unintentionally lowered the flaps. This time the crew did not detect the rolling moment as quickly because the aircraft was in right turn and the gear was in transit. The right flap came full down while the left stayed up. All attempts to bring the right flap up failed.

By now the aircraft was on a three mile final and luckily was fully controllable, so the crew elected to continue the approach to landing which was successful.

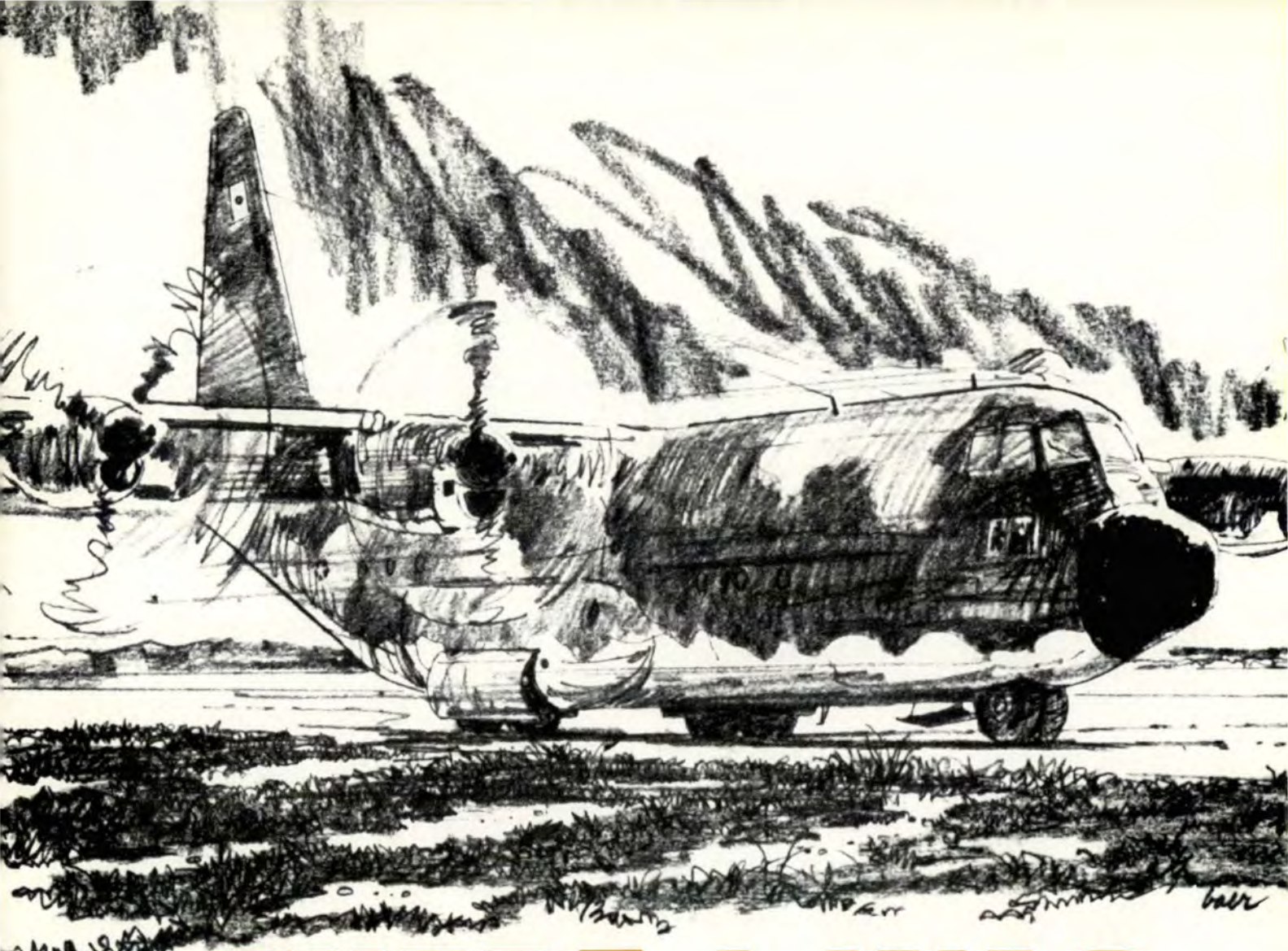
Transient Alert Boarding Ladders

Just after brake release, and prior to engaging the afterburner, a hard thump was felt in an *F-106B* aircraft. The takeoff was aborted, and the Tower informed the aircrew that both external tanks had jettisoned. It turns out the aircraft had just returned from a cross-country during which an *F-102* boarding ladder had been used by a transient alert crew for entrance to the rear cockpit.

The F-102 ladder hangs farther over the canopy rail than the F-106 ladder and had broken the guard on the rear cockpit external tanks jettison button. The guard, but not the button, had been replaced the night before the incident flight. However, the jettison button switch was broken internally and shorted during the ill-fated takeoff roll causing the tanks to jettison.

The moral of the story is that when you're cross-country and see TA coming at you with the latest model of home-made or modified boarding ladders, make sure nothing in the cockpit can be activated/damaged by the part that hangs over the canopy rail. ■

— Maj Gordon N. Golden, Directorate of Aerospace Safety.



THERE I WAS

■ . . . a senior flight examiner on C-130's with many hours in the airplane. We had shut down No. 1 engine and were landing at Dover AFB.

As I briefed the approach I very carefully explained that I would reverse the inboard engines after landing. After touchdown, I again verbally briefed that I was bringing the throttles to ground idle and was going to reverse the inboards. I counted the throttles 1, 2, 3, and reversed what I thought were 2 and 3.

The airplane suddenly veered right and headed for the grass. With a little luck, I was able to catch it and stay on the runway. Then I figured out what I had done.

As an IP/FE I had flown a lot of simulated engine out approaches on locals. In that case, the engine is merely pulled back to idle to simulate the failure, but in a real shutdown situation the throttle is pushed full forward. So, after landing, when I counted throttles I forgot that No. 1 wasn't there, but started with No. 2 and reversed 3 and 4. There was no harm done, but I sure felt dumb. ■

FLYING SAFETY, FEBRUARY, 1984

Do You Understand WAKE TURBULENCE?

A Quick Quiz

■ Listed below are 10 questions about wake turbulence. Each question is worth 10 points. If you score less than 90 points, please refer to "May the Force Be With You," which will be published in *Flying Safety*, November 1985. If you score 100 points, you're knowledgeable in wake turbulence, but we still think the article would be interesting for you, also. Check your answers against those listed at the bottom of the page.

1. When does a departing aircraft start producing wingtip vortices?

☐ At the start of the takeoff roll
☐ At approximately 50 knots
☐ At rotation
☐ At liftoff

2. The winds are calm, and you're awaiting takeoff on Runway 32R. A jet transport takes off on 32L. How long should it take for the turbulence to reach your runway if the runways are 1,000 feet apart?

☐ a. 1/2 minute
☐ b. 1 minute
☐ c. 1½ minutes
☐ d. 2 minutes

3. When departing behind a large cargo aircraft, which of the following types of wind would result in the most long-lasting runway turbulence?

☐ a. Calm winds
☐ b. Direct headwinds
☐ c. 5-knot crosswind component
☐ d. 10-knot crosswind component

4. What conditions of airspeed, weight, and configuration would generate the greatest amount of wake turbulence?

	Airspeed	Weight	Configuration
☐ a.	Slow	Heavy	Flaps down
☐ b.	Slow	Heavy	Clean
☐ c.	Fast	Heavy	Flaps down
☐ d.	Fast	Heavy	Clean

5. At what rate and to what altitude will the vortices generated by an aircraft descend?

☐ a. 500 fpm for 900 feet
☐ b. 500 fpm for 500 feet
☐ c. 1,000 fpm for 2,000 feet
☐ d. 1,000 fpm to ground level

6. When taking off behind a departing jet, a good technique would be to:

☐ a. Delay lift-off as long as possible to gain extra airspeed for penetrating the vortices.
☐ b. Plan to lift off before the rotation point of the departing aircraft and continue climb above or away from its flightpath.
☐ c. Climb to 500 feet, level off, and turn to cross the vortex path at a 90-degree angle.
☐ d. Adjust your flightpath to penetrate the vortex core 500 feet below the departing aircraft.

7. Under what wind conditions will the movement of vortices in ground effect cause the greatest hazard to following aircraft in the touchdown zone?

☐ a. Light and variable winds
☐ b. 5-10 knot quartering headwind
☐ c. Light quartering tailwind
☐ d. Strong headwind

8. Vortex cores range from 25 feet to 50 feet in diameter. How are the two vortices from an aircraft affected by time?

☐ a. The cores rapidly expand until they overlap and dissipate.
☐ b. They stay very close together until dissipation.
☐ c. They gradually reduce in size until dissipation.
☐ d. They either increase or decrease in size, depending on atmospheric conditions.

9. The vortices created by the C-5A or 747 have tangential velocities of approximately:

☐ a. 500 fpm
☐ b. 5,000 fpm
☐ c. 9,000 fpm
☐ d. 15,000 fpm

10. Which of the following encounters with wake turbulence would probably result in the greatest loss of control of the penetrating aircraft?

☐ a. Flying 1,000 feet below the generating aircraft
☐ b. Crossing the wake at a 90-degree angle
☐ c. Climbing through the wake at a 90-degree angle
☐ d. Climbing through the wake on the same heading as the generating aircraft.

— Adapted from *Aerospace Safety*, Apr. 79. ■

ANSWERS TO THE ABOVE QUESTIONS

1.c, 2.d, 3.c, 4.b, 5.a, 6.b, 7.c, 8.b, 9.c, 10.d.

UNITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Mishap Prevention Program.

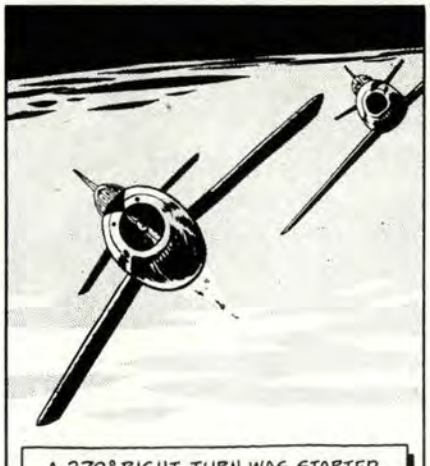
MAJ. CHARLES E. **YEAGER**
EDWARDS AFB.

MR. CARL A. **BELLINGER**
CIVILIAN TEST PILOT

THE CALM TEAMWORK OF BELLINGER AND YEAGER PREVENTED POSSIBLE LOSS OF LIFE AND PROPERTY AND MONTHS OF FLIGHT TEST DELAY!

SHORTLY AFTER TAKEOFF, IN AN XF-91, BELLINGER SAW HIS OVERHEAT AND FIRE WARNING LIGHTS COME ON... YEAGER, IN A PACER F-86, RADIOED THE TAIL SECTION WAS AFIRE AND PIECES OF METAL WERE COMING OUT OF THE TAIL-PIPE... ALTITUDE WAS 500 FEET!!

THE TERRAIN WAS TOO ROUGH FOR A BELLY LANDING... DROP TANKS WERE JETTISONED... AIR SPEED WAS DROPPING... A QUICK ASSESSMENT INDICATED ABOUT ONE MINUTE OF FLIGHT REMAINING!!



A 270° RIGHT TURN WAS STARTED.. ...YEAGER CALLED OFF DECREASING ALTITUDE AND SPEED... BELLINGER WAS UNABLE TO SEE THE RUNWAY BECAUSE OF THE RISING SUN SHINING INTO THE SMOKE-FILLED COCKPIT!

YEAGER TOOK A POSITION IN THE SHADOW OF THE "91" TO OBTAIN BETTER VISIBILITY AND POSITIONED BELLINGER ON FINAL APPROACH.....

... NEARING TOUCHDOWN THE MAJOR CALLED OFF THE REMAINING ALTITUDE TO ASSIST BELLINGER IN MAKING AN IMPROMPTU GCA LANDING... A JOB WELL DONE!

IS THERE SAFETY IN NUMBERS?

MAJOR KELLY M. HAGGAR
Directorate of Aerospace Safety

■ Why do airplanes fly into the ground? The simple answer—they are pointed at it for too long—belies a lot. After all, what is actually necessary for an aircraft to collide with the ground? It literally need only have the wrong vector for a few seconds too many. Why else are low-level missions so sporty?

Provided the aircraft is properly equipped, the low-altitude environ-

continued

FLYING SAFETY, JULY, 1990

ment itself isn't particularly hostile. The engines will tolerate throttle bursts a lot better at 500 AGL than FL 500, the generators don't care about air density, and the radar will work as well as it did at high-level cruise. True, gusts, wind shear, and turbulence are all greater at low level, but airplanes only come apart when a limit is exceeded. Aircraft that can't structurally endure the low-level environment shouldn't be in it. This leaves birds as the remaining low-level peacetime threat. Birds fly low, so that's where most of the bird hits are reported. But, bird hits are not the most common reason for low-level losses; the ground is. More airplanes simply fly into the ground than are lost from any other reason at low level.

Perhaps this is easier to see in fast movers. The fighter pilot is alone (or has only one other crewmember, the WSO) and has no one else to say, "stop looking over your shoulder at your wingman, and look at this big rock dead ahead." (Sorry for the pun.) Additionally, the fighter/attack missions involve much steeper dive angles and more maneuvering than do "heavy" sorties.

Then why do heavies fly into the ground? The B-1, B-52, C-141, and C-130 all have lots of folks with window seats. The bombers have special radar modes just for terrain following, and the B-52 even has both low-light television and an infrared sensor for terrain monitoring. With all that going for a heavy crew, how could they come to grief on a hillside?

In much the same way fighter pilots get bit: Everyone's attention is focused on something other than where the airplane is going. It doesn't matter if "everyone" is one solo pilot or a whole crew. For that matter, the airplane doesn't have to be on a tactical, low-level mission. If "everyone" is a whole L-1011 crew, and they are all concentrating on changing a burned-out bulb on a landing gear light panel, the Everglades swamp will do just as thorough a job of destroying the aircraft as a mountain in the Red Flag ranges.

For example, a bomber crew is descending into a low-level route.

Fighter pilots spend a lot more time in the low-level environment than most pilots. So why is "collision with the ground" the leading cause of mishaps among "heavy" fliers?

Their plan is to level off at 800 feet on the radar altimeter. They have not computed a rough pressure altitude which corresponds to 800 feet above the terrain. The pilot flying the descent suspects the radar altimeter isn't working right because it shows roughly a constant height above the terrain while the aircraft continues to descend. The crew becomes focused on analysis of this radar altimeter as the descent continues. Unknown to the crew, the radar altimeter is working perfectly. The flightpath is over down-sloping terrain, resulting in a near constant height above terrain even though the pressure altitude is dropping steadily. Mere seconds before impact, the other pilot sees a ridge and attempts to pull up over it. They almost make it . . . the aircraft is too damaged from the impact to be flyable, but it pitches up and rolls just enough for nearly all aboard to eject before that final impact.

Large aircraft have crews for many reasons, one of which is extra eyes can see more. The solo pilot can't delegate these other tasks to anyone else; the only option is "time sharing." ("Can I look inside the cockpit or behind me *now*? If so, for how long? If not, when can I?") For heavies, other choices are possible. "*You* look at those; *Nav*, get out the books; *I'm* going to level off here." In any event, alone or with a crew, somehow the flightpath of the aircraft must *always* be continually monitored. If it is not done by the autopilot, the TFR equipment, the WSO, the right seater, the solo troop...it will be done by the ground. ■

HOW CLOSE IS TOO CLOSE?

CMSGT ROBERT T. HOLRITZ
Technical Editor

■ Aircraft were stacked up at EOR as they usually were on surge days. To save time, when the engine specialist arrived to check on an oil fluctuation problem on one of the fighters, the EOR team continued checking the jet. Just as the specialist told the pilot to bring the problem engine up to 85 percent, the crew chief came out from under the aircraft, and a headset went down the no. 1 intake.

When questioned by the safety folks, the crew chief stated he checked the aircraft exactly as he was trained and came out from under the aircraft the same place he had for the past several months. He could not understand why his headset was pulled from his head.

But this occasion was different. His headset was ingested this time because the no. 1 engine was cranked up to 85 percent instead of idle. The crew chief was under the potentially deadly misconception the safe distance from an engine intake is the same under all conditions. The fact is, there are many factors which have a bearing on the safe distance from an operating aircraft engine.

Power Setting

As this crew chief discovered, the engine power setting has a significant effect on the size of the danger area. It doesn't take a propulsion engineer to figure out the higher the power setting the greater the danger area.

But many flight line folks are misled by the danger area diagrams found in the Dash -1 or Dash -2 technical manuals. The problem with these diagrams is they usually depict the danger area only at one power setting, whether it be idle, mil, or AB, leaving it up to the ground personnel (and flightcrews) to estimate the hazard area at other settings. continued

How Close Is Too Close? continued

Unfortunately, it is extremely difficult to estimate the safe distance from an intake during different power settings because the pulling power of a jet engine does not increase gradually as the distance from the intake decreases. Instead, the suction force increases rapidly in an insidious curve, depicted in the figure. This can lead a maintainer to a false sense of security. As the chart indicates, a person may not even feel a hint of suction yet be only inches away from being snatched into the intake by the full force.

Area of Influence

The area of influence is also a major factor on the safety zone. For example, the pulling force increases dramatically as the area of a body opposing the suction increases. To put it in wrenchbender's terms, merely turning 90 degrees from profile and facing the inlet can double the pulling force, and standing from a crouch can triple the force!

An engine specialist learned this the hard way. During an engine run, he came from under the F-4 just in front of the inside right leading edge flap. As he stood up, he was immediately ingested up to his waist, his eardrums bursting and eyeballs tugging in the sockets. Fortunately, his presence in the intake caused a compressor stall which alerted the operator who shut the engine down. The specialist escaped with only minor injuries.

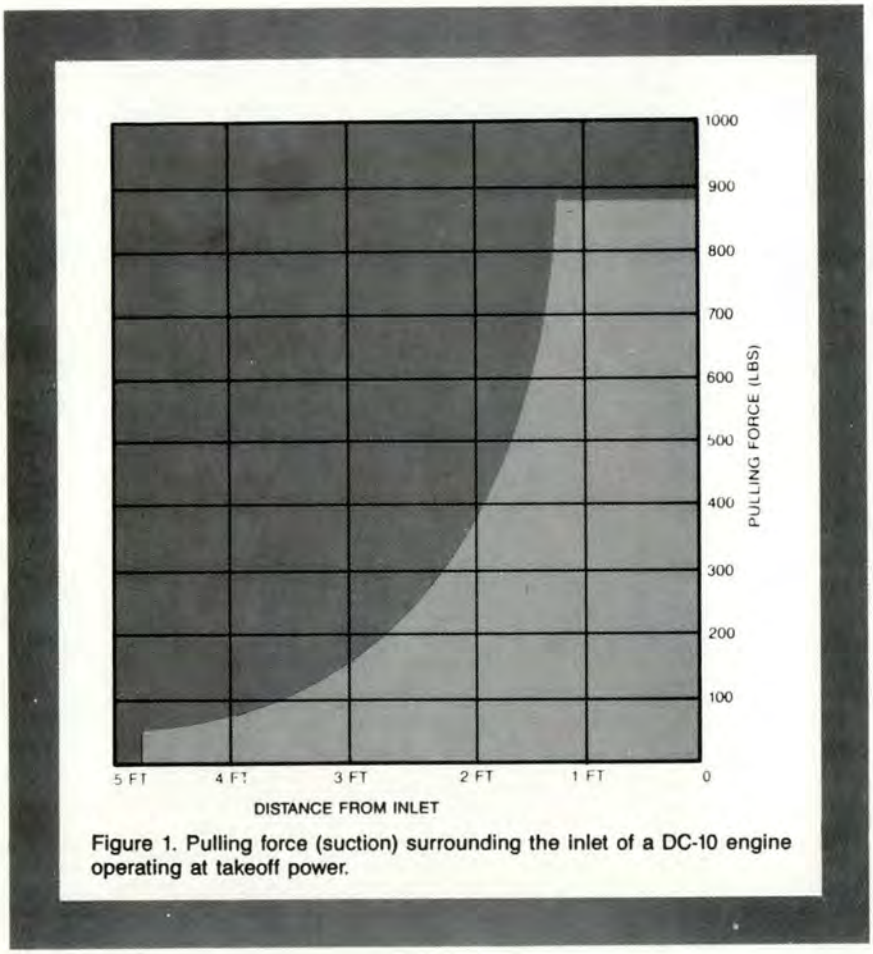


Figure 1. Pulling force (suction) surrounding the inlet of a DC-10 engine operating at takeoff power.

Ballooning Effect

Clothing can also be an important consideration. Garments such as parkas and rain gear tend to balloon or inflate from the low pressure caused by the flow of air in front of, and around, the intake. This, in effect, increases the person's area of influence, multiplying the pulling force of the engine's suction. This effect on the hood of a field jacket can easily pull a person into the inlet. Clothing has been a major factor in many of the ingestion mishaps which have occurred over the years.

Prevention

In spite of the complexity of evaluating the danger, there are a few simple commonsense ways to minimize the hazard. For example, engine screens or personnel guards virtually eliminate the possibility of an individual being ingested. While they cannot always be installed, using them whenever possible can greatly reduce the hazard.

If possible, avoid wearing bulky clothing, especially parkas and jackets with hoods, when working around jet engines. Most of all, stay clear of the danger areas published on the aircraft technical publications and maintain situational awareness. Since 1975, there have been three fatalities and two serious injuries due to personnel being ingested into jet engines. At a conservative rate of one every 5 years, a mishap is overdue. Don't become a statistic. ■

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A MESSAGE FROM THE COMMANDER

Safety In Changing Times

As the Air Force restructures, risk remains high.

■ We hope this anniversary edition of *Flying Safety* gives you a sense that mishap prevention programs have been an integral part of Air Force efforts to improve combat capability since our beginnings. This year our service is in the midst of historic events and changes, many of which will present unique challenges impacting flying safety.

This time of change follows a year of unqualified success in Air Force safety, especially aviation. The 1.1 mishaps per 100,000 flying hours experienced in FY91 was the lowest in history and 30 percent lower than the 10-year average. This was accomplished despite the accelerated buildup and intense activity of Desert Shield/Storm.

Programs to improve our understanding of and preparation to counter the human failures which cause mishaps were important contributors to this success. The human element will be a key ingredient if we are to successfully continue this downtrend in mishap occurrence through the coming months of change and uncertainty.

Uncertainty is a natural by-product of change, and importantly, is a breeding ground for distraction. **Our challenge is to recognize these distractions and act to prevent them from becoming hazards.** How do we downsize and restructure without allowing distraction to affect the mission at hand?

There are no easy answers. First, commanders and supervisors at all levels must be involved with their people and listen to their concerns. History clearly shows human factors to be causal in about three-fourths of all mishaps. Sound training programs are a key element to maintaining our focus, but the responsibility goes beyond top-down supervision and training. Each individual must commit to an increased level of awareness and surface detractors before they become hazards. Only then can we address solutions.

There are many human factors which may divert attention from the critical tasks to come. Some obvious ones come to mind.

- Reduced manning levels create uncertainty about job security and career progression. As units downsize, will enough experience remain to properly plan, supervise, and execute the mission? What resources will be left to do the job?
- Unit reorganizations may require further changes in personnel assignment procedures. How will we deal with the inevitable impact on finances, family, and career?

Not every instance of distraction will lead to a problem, but disaster often lurks in unknown places. An individual focus on doing each task correctly will help to counter these unforeseen distractions and see us safely through the year.

FY91 was the safest year in Air Force history. We will be challenged to sustain that trend this year. The mission may not seem as critical now as during Desert Shield and Desert Storm, and our natural tendency may be to focus on peripheral issues. We must be alert to this possibility and maintain our focus. The human element, so often causal in mishaps, is also the key to safe progression through turbulent times. ■

CHARLES W. PARKER, Col, USAF
Commander
Air Force Safety Agency

I'M Impressed!

by Bob Hope

THE AIR FORCE'S FAVORITE ENTERTAINER HAS SAFELY TRAVELED THOUSANDS OF MILES IN OUR AIRPLANES

I'M A LUCKY GUY. Not because I made a picture with Jane Russell (all I got out of that was high blood pressure), but because I've had a better opportunity than most U. S. citizens to see our Air Force at work —under all conditions. I saw the boys in Europe in '44 and '45 flying those round-the-clock bombing missions. In '48 I watched them make aviation history operating the Berlin Airlift, and more recently in Korea I had a gander at the jets that have the North Koreans writing to Moscow for AWOL instructions. I flew in one of those jets, and take it from a guy who's still waiting for his stomach to arrive—they really go!

Seeing these things gives you a feeling of security, and also the feeling that the government isn't spending Crosby's tax money foolishly.

I wish it were possible for every American to have a box seat and watch the great Air Force team in action. I have, and all I can say is—thanks for the memory.