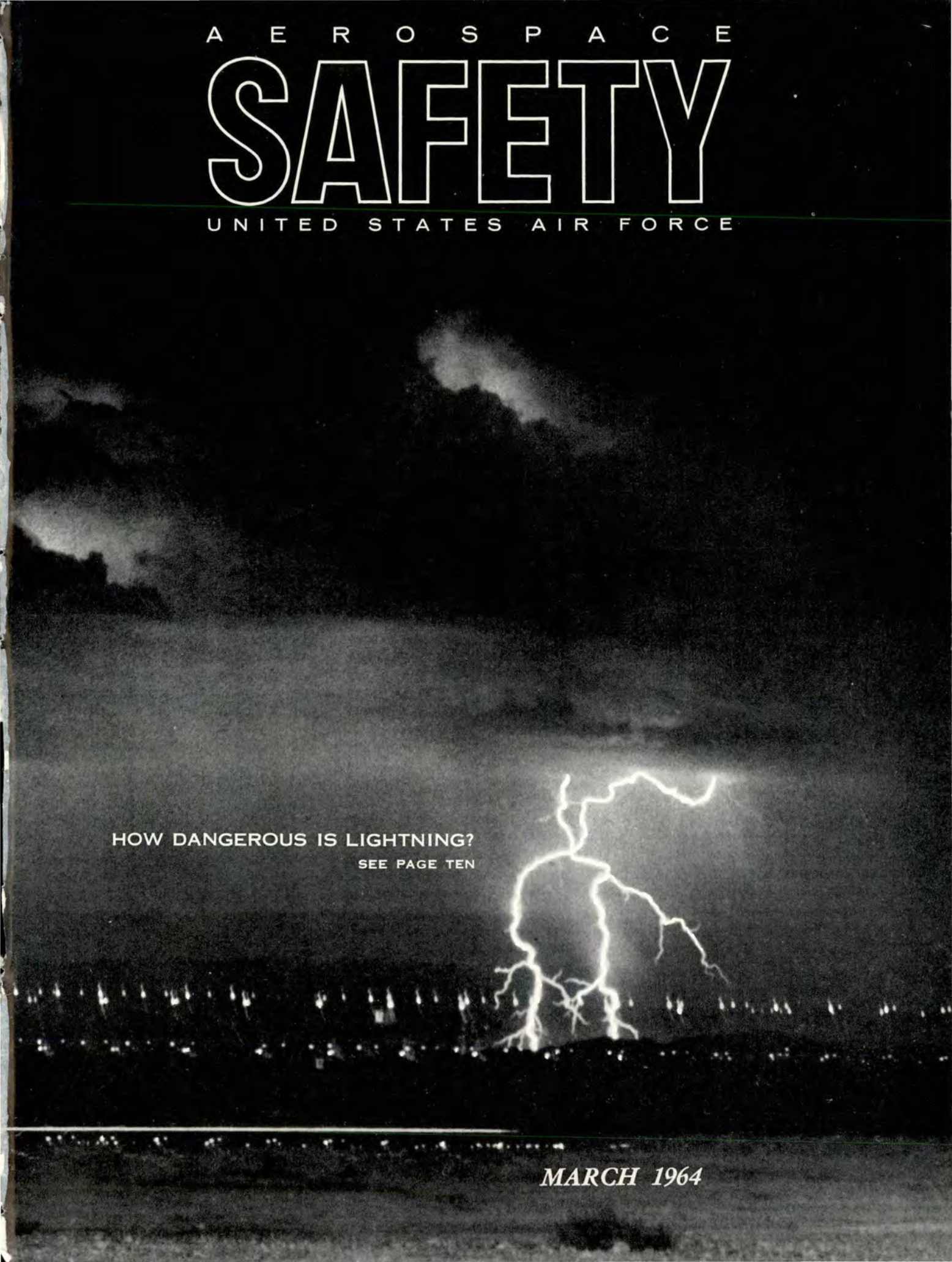
AEROSPACE

SAFETY

UNITED STATES AIR FORCE



HOW DANGEROUS IS LIGHTNING?

SEE PAGE TEN

MARCH 1964

Ground Safety Report For '63; Outlook For '64.

A LOOK AT THE RECORD

Colonel James F. Risher, Jr. · Chief, Ground Safety Division

Preliminary year-end accident data for calendar year 1963 reflect a favorable downward trend in most categories of ground accidents. For example, the total number of ground accidents reported was approximately five per cent less than in 1962. There was also a decrease of approximately five per cent in military and civilian disabling injuries. Experience in maintenance, supply and services, communications, civil engineering, and related industrial functions generally paralleled the downward trend.

However, total Air Force fatalities in 1963 were somewhat in excess of the 1962 total. This is directly related to a slight increase in private motor vehicle fatalities, which traditionally account for three-fourths of all Air Force deaths from ground accidents. Although this continued rise is discomforting, it should be noted that the increase (one to two per cent by present data) for 1963 is considerably lower than the 1962 experience, when the private motor vehicle fatalities increased slightly more than ten per cent over the 1961 level. It is noteworthy, too, that Air Force experience has consistently been better than the national average.

This brings us to the outlook for 1964. In past months —through safety surveys, staff assistance visits, and miscellaneous TDY visitations—we have noted an increased awareness of the ground safety challenge. It appears that more and more commanders and supervisors realize that safe operations are efficient operations, whether they be tactical, maintenance, or other support. The demands of safety are recognized as being synonymous with the demands of efficiency—involving the same people, using the same tools, performing the same tasks. Our accident files are still being cluttered with startling, sometimes ludicrous accounts of supervisory inefficiency as a principal cause factor in accidents. However, we detect a growing awareness of the primary role of *supervision* in insuring efficient performance of Air Force mission requirements in the ground environment.

The responsibilities of the supervisor—the junior commissioned officer and the non-commissioned officer —are recognized as extending beyond duty hours. Here, influence can be brought to bear upon our number one accident producer, private motor vehicle operation. Extracts from a recent *TIG Brief* outline the gravity of the problem: "... During the three-year period beginning in 1960, 1241 Air Force personnel were killed and 9100 were injured in private motor vehicle accidents. ... A large number of the private vehicle accidents involved young officers and airmen. ... Lieutenants and captains, comprising 65 per cent of the officer strength, sustained 80 per cent of the accident injuries and fatalities among officers. Airmen of the lower three grades, comprising 40 per cent of the enlisted strength, sustained approximately 55 per cent of the accident injuries and fatalities involving airmen. Over half of the accidents and nearly two-thirds of the fatalities occurred between 2100 and 0500 hours . . ." Accident data clearly reveals that many of these accidents involved the factors of alcohol and/or fatigue in various and usually undetermined combinations.

Again, from the *TIG Brief*: ". . . Such information is particularly distressing as it points to our past inability to cope with a problem which does not pose the same challenge or dangers as others that the USAF has mastered and kept under control. By strengthening local information and guidance programs, and supervision of local recreational and off-duty activities, commanders can prevent some of these disasters that befall our younger members. Stress should be placed on programs to strengthen their moral fiber and mold them into good citizens who can be relied upon to drive courteously and safely, and to eliminate such dangers that carelessness creates on the highways. All local supervisory personnel must take aggressive action to assure maximum quality and no weaknesses in such programs."

We believe that in 1964 the Air Force supervisor will steadily increase his influence for safety and efficiency in all operations. We believe that he will do this by giving judicious attention not only to on-the-job performance, but to the after-hours environment and activity which bear so directly on the efficiency of duty performance. ☆

IN THIS ISSUE

SAFETY GAIN IN '63

Year-end statistics confirm that flying operations in 1963 were the safest of any year on record.

The number of major and minor aircraft accidents was down 17 per cent from 1962. The major accident rate was 4.4 accidents per 100,000 flying hours in 1963—a 23 per cent reduction from the previous year. Numbers of fatalities and aircraft destroyed were the lowest in the history of the service.

While the number of accidents and disabling injuries involving USAF personnel in all ground activities was down 5 per cent from 1962, fatalities resulting from ground accidents were up from 560 to 575. Most ground accident fatalities result from private motor vehicle accidents during off-duty hours.

Air Force missile operations increased considerably in 1963. As a result, there was a 9 per cent increase in missile mishaps over 1962. Airlaunched missiles accounted for the increase. Mishaps in 1963 involving ground launched strategic, tactical and interceptor missiles were actually fewer than during the previous year.

SUBSCRIPTION—AEROSPACE SAFETY is available on subscription for $3.00 per year domestic; $4.00 foreign; 30c per copy, through the Superintendent of Documents, Government Printing Office Washington 25, D.C. Changes in subscription mailings should be sent to the above address. No back copies of the magazine can be furnished. Use of funds for printing this publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. Facts testimony and conclusions of aircraft accidents printed herein have been extracted from USAF Form series 711, and may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in accident stories are fictitious. No payment can be made for manuscripts, submitted for publication in the Aerospace Safety Magazine. Contributions are welcome as are comments and criticism. Address all correspondence to the Editor, Aerospace Safety Magazine, Deputy The Inspector General, USAF, Norton Air Force Base, California. The Editor reserves the right to make any editorial changes in manuscripts which he believes will improve the material without altering the intended meaning. Air Force organizations may reprint articles from AEROSPACE SAFETY without further authorization. Prior to reprinting by non-Air Force organizations, it is requested that the Editor be queried, advising the intended use of material. Such action will insure complete accuracy of material, amended in light of most recent developments. The contents of this magazine are informational and should not be construed as regulations, technical orders or directives unless so stated.

Volume Twenty Number Three — USAF Recurring Publication 62-1

Early humans survived the rigors of nature with a few animal skins and primitive shelters. By so doing they testified to the strength and endurance of man and his capacity to outwit the elements. Air Force crewmembers with their modern survival equipment and training should be able to do as well. As one recent survivor said, "It was just like Stead, except there was more snow."

THE THIN LINE OF LIFE

It's a thin line that separates life and death.

Why, in a survival situation, does one man make it and another man die? How is it that a healthy individual who is not seriously injured dies just as surely as if he had placed a loaded gun to his head and pulled the trigger? Let's examine some of the reasons that seem apparent—why one man survived even though we don't know precisely why the other one didn't.

"Follow the book. Don't panic. Apply every bit of winter survival training you can remember." This is what one recent survivor of a B-52 ejection had to say.

The pilot quoted above followed his own advice. First, he allowed his automatic timer to deploy the chute. After landing in a wooded, snow covered mountain area with subfreezing temperatures, his first action was to give his situation some thought. Having considered his problems and what to do about them, he built himself a shelter. He then inflated his life raft and, using it as insulation from the cold ground, placed his sleeping bag on it and crawled in.

Prudently, in view of the weather and the fact that it was night, he decided to stay put. He knew that searchers would be out as soon as possible so he prepared to attract them. He built a fire for warmth and placed his emergency radio inside his flying suit in order to warm and conserve the batteries. Really using his head, he decided to operate the radio only when he heard aircraft and then only on TONE in order to get maximum life out of the batteries.

Later, when he spotted a helicopter he was ready When the chopper got close enough he used the signal mirror in his survival kit to attract the crew. When the pickup was made he was in good condition.

Now, for another case. This man accidentally opened his chute at high altitude. As a result, and because of the turbulence, he had a chilling, highly uncomfortable ride down. His survival kit, swinging from its lanyard, flopped around dangerously so he wrapped the lanyard around one leg. Consequently his leg received painful cuts. In his pocket was a small survival kit but this was lost during the rough descent. Finally, somewhat the worse for wear, he landed in the branches of a fallen tree. Even in this ordeal he kept his head. Realizing that he was probably in shock, and that warmth is a treatment for shock, he started a fire. He also survived.

These are examples of those who made it. How about some who didn't? Others, after successful ejections and apparently in good condition, left their survival equipment and perished in numbing cold. Here is a shocking contrast—some made proper use of survival equipment and survived such ordeals in excellent shape, others made little or no use of their equipment and perished.

A tragic example occurred when five men out of nine died a few years ago in a remote, frigid place aptly

called "Hell's Canyon." (Horror in Hell's Canyon, FLYING SAFETY, February 1959 and November 1960.) This crew left a warm southern base for a cold northwest destination. Dressed in summer clothing, some even without jackets, not schooled in survival methods, they were terribly unprepared for the deathly ordeal that awaited them.

"In the dead of winter some of our pilots wearing summer flying suits fly over terrain and in weather that is as bad as any in the arctic. They crank up the heater and never give a thought to what they're going to do if the fire in that stovepipe they are riding should go out." These are the words of a survival expert who conducts an outstanding survival school at his base. "That's why we really grind it into them," he continued, "so that if they do get into trouble they'll know what to do and will come back alive."

Here are some essential items that every crewman should memorize, prepare for and never forget:

After chute opening deploy the survival kit lanyard. Some reasons for this: A pilot who landed without deploying his kit broke his back. Paralyzed from the waist down, he lay 30 hours in snow before he was rescued. Another pilot broke both legs on landing. Still another bled to death from a compound fracture of the leg after landing with his kit on.

After landing take time to analyze your situation and plan appropriate action. Concentrate on what you learned in survival school, then put this knowledge to use to save your life.

Hole up. Unless you know exactly where you are in relation to human habitation or a traveled road, stay where you are. The men in Hell's Canyon tried to walk out. Five died. Last winter a crewman down in deep snow in sub-freezing temperature, stayed put and used every bit of survival knowledge he had. Next day he was rescued in good condition, even though he received an injury on landing.

Be prepared. If you have never received survival training or are vague on the subject, take the next opportunity to get this training. Know, preserve and use your survival equipment. Wear adequate clothing for the terrain and weather along your route. Here's a quote from one of our RCAF friends: ". . . the surface temperature at Cold Lake turned out to be 40 below zero! S'fact! An 80 degree temp drop on one flight. . . . In talking this over we got to mentioning as how we had sometimes seen American jocks staging through Comox (the RCAF place here) and as how we had often admired their bright plumage, but as far as we could see, the plumage looked fine for 40 above, but no good at all for anything a whole lot lower—especially if you consider an all night stint in the open such as might happen if it became necessary to leap out of the nice cozy airframe. . . ."

Don't neglect your first aid knowledge. If injured, your most important task is to stop the loss of blood. Do you really know how to put on a bandage or a splint or a tourniquet? Do you know how to give mouth to mouth resuscitation? Can you recognize shock and do you know what to do about it?

Have the equipment to attract searchers or be prepared to improvise. One survival instructor tells how he attracted help with a strip of metal foil that glistened in the unslight. There's always the signal mirror in your survival kit—if you don't lose it. Do you know the standard symbols to be used to provide information to a rescue aircraft? And there's the radio in your kit, probably a URC-11.

Soon you will probably be equipped with an AN/URT-21 Personal Locator Beacon. This is a compact little job attached to your parachute. Since it operates automatically, it starts beeping away as soon as the chute is deployed. There's no voice—for long battery life—but a distinctive tone signal. It operates on Guard channel, 243 mc. Latest info is that procurement began in January.

One thing about this beacon: Operating on 243 mc., it can be jammed or blanked out by other transmissions on Guard, as can SARAH and other beacons operating on this frequency. Consequently, if you hear an unusual and distinctive tone on Guard, take it for granted that a locator beacon is operating, that someone is in trouble, and give the guy a chance by not transmitting on that frequency unless you, too, have a *real* emergency.

When possible, alert someone to your emergency. A MAYDAY or actuating an emergency keyer before you go over the side, crash land or ditch might provide Rescue with the few minutes needed to save your life.

There are many other suggestions that could be made. Space doesn't permit a complete listing, so a hard look at the survival manuals is a must. For those who may be lackadaisical here are a few statistics from a five-year study, 1958 through 1962, that may overcome that tendency.

- One in every ten USAF major aircraft accidents results in a survival situation.
- There are excessive delays in approximately one in three of all survival accidents.
- Fifteen preventable fatalities (during the study period) were attributed to post accident survival conditions.
- Additional training in the use of survival equipment and in survival techniques is indicated.

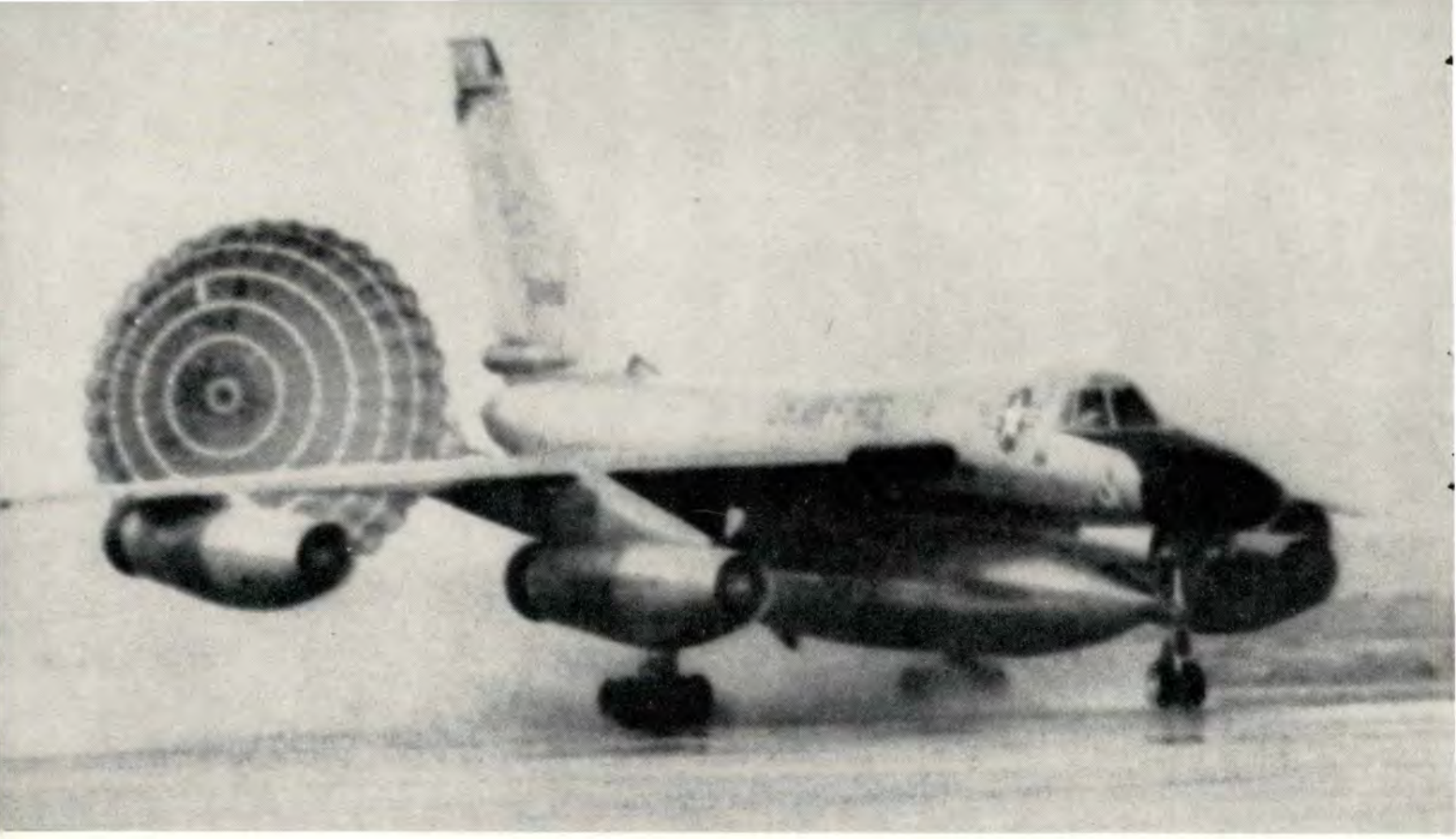
If at this point you have reached the conclusion that it CAN happen to you and if you wish to learn more or refresh your memory on survival you will find the following references valuable.

SURVIVAL ARTICLES APPEARING IN AEROSPACE SAFETY MAGAZINE
Winter Survival, Dec 1961; The Problem of Sea Survival, Jan 1962; Winter Clothing, and Learn and Live, Feb 1962; Chute Uses, Jun 1962; Out From Under (overwater bailout), Jul 1962; AMVER System, Feb 1963; What To Do Until the Chopper Comes, May 1963; Make the Sharks Work For It, Oct 1963; One Man's Experiences, and Arctic Survival, Nov 1963; Fallout —letter, Dec 1963.

FILMS
FTA 279d Utilization of Game; FTA 279i Fire-building; FTA 279m Medical Aid; FTA 279w Shelter; TF 1-4597 Arctic Tundra; TF 1-5309 Stay Alive in the Winter Arctic; TF 1-5310 Stay Alive in the Winter Bush.

PUBLICATIONS
- Aircraft Emergency Procedures Over Water M64-6
- Arctic, Desert, Tropics, Sea, Sea Ice M64-3
- Land, Sea, Sea Ice M64-5
- Parachute Uses M64-15
- USAF Survival Training School R-53-28
- AF Manual SURVIVAL Training Edition 64-3

Information on combat survival material can be obtained from the Research Studies Institute (ADT), Maxwell AFB, Alabama. ☆



Apparently many pilots are unaware of the poor braking action and steering effectiveness on wet runways—especially when standing puddles cover a large portion of the runway. In most cases the apparent absence of effective braking causes the pilot to suspect a brake or anti-skid malfunction. After the anti-skid is turned off, brakes are locked, tires blown, and steering difficulties encountered. An especially dangerous combination is a wet runway, a crosswind, and an aircraft that uses a deceleration chute as a braking device. The weather-vaning effect in a crosswind is considerably amplified on a wet runway and may exceed the steering capability. Jettisoning the chute may help the steering problem, but adds to an already critical braking problem.

The following extracts from actual mishaps will illustrate the problem:

A B-52 touched down between 3000 and 4000 feet on a wet runway during a rainstorm. When brake chute was deployed, the aircraft weather-vaned to the left. The brake chute was jettisoned immediately. Brakes were checked between 7000 and 8000 feet and appeared to be ineffective. Engines 1, 2, 7, and 8 were shut down since the pilot anticipated overruning the end of the runway. The pilot turned off anti-skid and applied full brakes. The aircraft began an uncontrolled slow left turn at the 9000-foot point and full right steering failed to correct the left turn. The aircraft left the runway approximately 500 feet from the end and traveled 50 feet before stopping. Cause of this mishap was attributed to reduced braking and steering effectiveness on a wet runway. The skid resulted from locked brakes when the anti-skid was turned off. An additional factor was an increase in the tailwind component during the landing roll.

A B-57 made a normal touchdown approximately 1000 feet down the runway in a very heavy rain. Braking action was very poor and there was some skidding when one brake would lock and skid before the other. Visibility was limited due to the heavy rain. When the navigator called passing the 3000-foot remaining marker, the pilot retracted the gear. The aircraft slid to a stop 1700 feet from the runway end. Brakes were checked and no discrepancies were found.

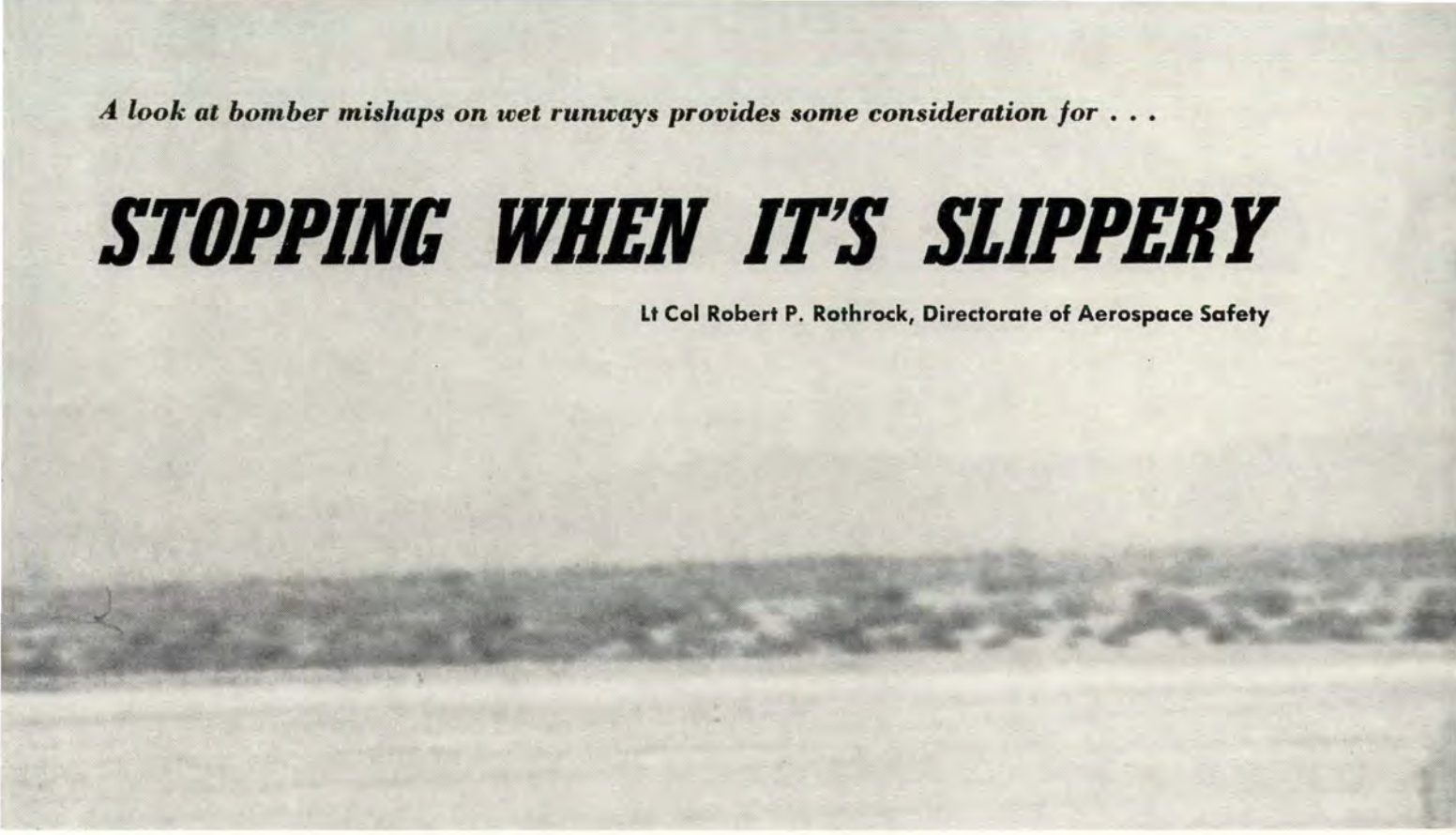
A B-52 landed on a wet runway with a 90 degree crosswind of 18 knots gusting to 26 knots. Shortly after brake chute deployment, the aircraft tended to go to the right with full left steering applied. Brakes appeared to be ineffective. The aircrait continued to the right hand edge of the runway where the chute was jettisoned. The aircraft departed the runway and came to a stop 45 degrees from the runway heading.

A B-58 was landing with a ceiling of 200 feet obscured, one mile visibility and thunderstorms. The run-

A look at bomber mishaps on wet runways provides some consideration for . . .

STOPPING WHEN IT'S SLIPPERY

Lt Col Robert P. Rothrock, Directorate of Aerospace Safety



way was wet and the brake chute failed to deploy after touchdown. The pilot attempted aerodynamic braking and normal braking with no effect. As the aircraft was approaching a lake off the north end of the runway, the pilot intentionally veered his aircraft off the runway to the right. The nose gear collapsed and the aircraft came to a stop approximately 820 feet from the end of the runway. The primary cause of this accident was materiel failure in that the brake chute failed to deploy. Also a lack of friction of dimple tread tires on the wet runway made normal braking ineffective. TO 1B-58A-1 and 1B-58-SF-1-95 were in error in that they did not contain adequate stopping information for B-58 type aircraft on wet runways.

A B-52 was landing on a runway still wet from a recent shower. The approach and landing were excellent and when the normal brake check was made after landing there was no apparent indication of braking action with anti-skid on; anti-skid was turned off and there was still no indication of braking. A decision was made to go around. After the aircraft became airborne, the additional qualified pilot on board proceeded to the forward wheel well area for a visual check of the brakes. This check verified that the left front brakes were operating normally. A second landing was attempted. After a smooth touchdown, the drag chute was deployed, brakes were checked and found to be operating satisfactorily. The aircraft started a slight veer to the right which was partially corrected by left steering. Shortly thereafter the aircraft again started to veer to the right and could not be realigned on the runway with left steering. The pilot reported his difficulties to the IP. The IP got on the controls, applied nose left crosswind crab and heavy braking. The aircraft responded and stopped on the runway. After the crew departed the aircraft they noted that the right aft gear had failed across the journal area, Nr 1 tire had blown, and all tires had flat spots and scuffing due to heavy braking action. A thorough brake check revealed normal operation with anti-skid "on" and "off."

Wet runway stopping distances as shown in the Flight Handbook may be overly optimistic as to stopping distance required. As in the case of the B-58, tire condition and tread type have considerable effect on braking action. A recent study has shown that at high speed on a very wet runway, hydroplane effect may extend the stopping distance considerably.

Perhaps the most important lesson to be learned from these mishaps is that there really isn't too much a pilot can do to prevent an accident once he has committed himself to a landing under the aforementioned conditions. Quick reaction time and proper technique may prevent a skid from getting out of control, but the only sure way to improve the braking action is to look for a drier runway. ☆

IT'S A LONG DAY

Robert W. Harrison

The cloud of dust rising far out in the Dakota hills is not from a roaming horde of buffalo. Nor is it from Indians riding across the prairie in pursuit of the bison. But a person with a sense of history has that I've been-here-before feeling as he pictures the Old West in his mind's eye.

The dust cloud follows a blue Air Force station wagon rolling along a dirt road. The occupants are two men dressed in white coveralls with blue Hollywood-type scarves around their necks. From a distance their safety helmets look like jaunty derbies. Seat belts hold them tightly in their seats. Their destination: Delta. Their job: the combat crew of a Minuteman Launch Control Center (LCC).

The men are in their third hour of what would be a 30- to 40-hour stretch of duty and travel time during which they will get little, if any, sleep. During 24 hours of that time they must remain on Alert and ready to handle any problems that may occur within the LCC or at the 10 launch facilities they will be responsible for during their tour of duty.

Within each Launch Facility (LF) is an intercontinental ballistic missile—the instant-launch Minuteman, a slim, lethal, solid fuel propelled instrument of deterence buried deep underground in a steel and concrete tube. The combat crew has the responsibility of monitoring the status of each missile by means of an extremely complex electronic network. Any malfunction in this system will appear as a light under one or more of the many plastic buttons that glow on the panel of the crew commander's console. Following is a much simplified example:

A red light appears under a certain button on the console and VRSA (pronounced VERSA and meaning Voice Recorded Signal Assembly) read out follows. (This may occur automatically or by command.) Having isolated the fault to a particular system, the crew commander then calls Job Control, "We've got a Channel 9 at Delta 5." This information is then passed to Plans and Scheduling which dispatches the appropriate team of technicians to check out the system and perform necessary maintenance.

The combat crew, with proper controls, also is responsible for launching their missiles. Perhaps even more important is their responsibility to assure that none of their missiles is inadvertently launched.

But this is not one of those dramatic stories about the awesome weapons that make up the nation's deterrent power. It's a simple story of two men, a cut above the ordinary but by no means supermen, who are representative of the many other two-man teams that man the Minuteman Launch Control Centers. They're a pair of captains —call them Jack and Bill.

They first met when they reported to the Wing six months ago. Both had volunteered for the Minuteman program, Jack from a maintenance job at a southern base, and Bill from a fighter outfit overseas. They were motivated by the offer of an opportunity to earn advanced degrees through the Air Force Institute of Technology (AFIT) program tied in with the Minuteman. "The Air Force is increasing its emphasis on education and men with advanced degrees will have a leg up on those who don't have," they were told during an interview.

During their training period both men had given the AFIT program much thought. Somewhere Bill recalled seeing some figures that, to him, were conclusive proof that he had been wise to get into the Minuteman program. The figures said that nearly every Air Force officer had some college, that well over half were graduates and the latter figure was growing all the time. Later, in discussing the matter, Jack had pointed to the high educational standing of the young men coming into the Air Force. "A man had better get all the schooling he can, or he's going to find himself Tail End Charlie," he said. "Besides, if things continue as they have, it's going to take a Ph. D. to understand what the Air Force is all about."

Although Bill had entered the Air Force to fly and disliked giving up his job as a pilot, he now had family responsibilities and must consider his future. Where else could a man get an advanced degree while on the job and at no cost to himself? And, while enhancing his career, he'd be doing an important job.

After four weeks at Chanute and a like tour at Vandenberg, the men had reported to their present post for more training, including on-the-job practical experience. They had been among the first to be certified as combat crewmen and were assigned to work together as a team. Now, they have several months of experience behind them.

Their week goes something like this: Day 1, duty at an LCF; Day 2, duty and time off; Day 3, miscellaneous activities—school, study, training, etc; Day 4, LCF tour, the beginning of another cycle. Until recently they were averaging 90 hours a week, now they're on a more normal schedule of about 70 hours.

Time begins to drag. The night seems to inch along

In addition, Bill has to find the time to fly between tours.

On Monday morning (this varies due to the scheduling cycle) they report to the squadron briefing room at 0715. There they are briefed on a number of items and receive the equipment and information they need for their tour of duty in the capsule. At 0730, the briefing behind them, they walk to the line of cars parked outside the hangar, find theirs, make a quick inspection of the vehicle and depart for the LCF where they will put in a 24-hour tour. The LCFs are scattered over a wide area many miles from the base and they may drive from 30 to 150 miles to get to the job. Today they will go to Delta, which is about 60 miles and two hours out in the hills. Driving time depends somewhat on the roads and today they'll have 15 miles of dirt and gravel.

At the LCF they grab paper cups of coffee from the kitchen, check with the security sergeant and ride the elevator down to the door of the capsule, a steel tank buried many feet underground. The crew they are replacing, notified of their arrival by the sergeant topside, opens the massive eight-ton steel and concrete door.

"Clear," a voice inside calls. Bill, his hands full of paper, a brief case, parka, two cups of coffee and some magazines, is too close. He steps back to avoid the door and echoes the call. Greeting the new arrivals are a pair of red-eyed individuals dressed in costumes similar to theirs. "Broughtya some coffee," Jack says. The duty crew welcomes the hot liquid that helps take some of the chill off the room. As they enter the capsule, Bill's eye catches the thermometer. 70 on the button, it never varies, but it seems colder.

Thirty minutes later the capsule door is opened and the retiring crew leaves. The door closes again on the two men who will remain in the tiny electronics-equipment filled room until another crew arrives tomorrow to take over the task of minding 10 missiles.

So far Jack and Bill have had little time to study, while on duty, for their classes in the AFIT program. They are not busy every moment, but interruptions are too frequent to permit long periods of concentration on lessons. So they don't attempt to study; instead they go into the capsule equipped with magazines and pocket books to while away what leisure time there is. Perhaps, as the Minuteman program gets farther down the road, the combat crews will be less busy and will have more time to crack the text books with fewer interruptions.

The lights on the status board indicate that one missile is on standby and automatic checkout. The log reveals that it should come back on alert in about one hour. A maintenance team is working in LF3 and should be finished and have the site buttoned up by 1430. Otherwise, everything at the moment is GO.

Traffic on the radio is brisk and every few minutes the telephone rings. Jack, crew commander, handles this while Bill, checklist in hand, makes an inspection of the entire capsule. The floor suspension system is still out of whack—three of the pneumatic cylinders read zero while the fourth is at 2000 psi. The item has been UR'd. Except for the oven being out and recurring trouble with the UHF, everything is in good order.

Although far from spacious, the capsule provides adequate room for two men. The commander's console faces, say north, in which case the deputy's console faces east. They have a four- to five-foot space for a walkway between the cabinets of electronic and other equipment. There's a tiny toilet and hand basin at one end with a curtain for privacy. As an accommodation to crew comfort, there is a cot and a cabinet containing a small oven and freezer. The cot doesn't get much use.

By 1500 all LFs are on strategic alert and the maintenance crew is on its way back to the base. Meanwhile, another maintenance crew has arrived in the capsule to work on the UHF. After they leave, Bill switches on a tape recorder that has been provided for the crew, and the soothing notes of a current hit tune fill the room. This continues for some time, then the music abruptly ends and a voice announces, "This is recurring training in the operation of . . ." They concentrate on the message; then, when it ends, replace the tape.

The phone rings. It's one of the cooks ready to bring dinner down. "What is it?" Jack asks. "Okay, send him down." Turning to Bill, "Cookie is on the way with the goodies."

Again the ponderous door opens. "Clear." "Clear," a voice echoes. The cook starts through the short tunnel to the capsule with trays of food. He doesn't duck far enough however, and his head strikes the sharp steel lip of the tunnel. He bounces back with a moan and Bill catches the trays just in time to keep dinner from landing on the floor. "Now you know why the hard hat," he admonishes the cook.

With the cook out of the capsule and the door again closed, the two men settle down to dinner. "Well, we're coming up in the world—steak," Bill observes. "Sure beats that chili goop and hot dogs we had last time we were here."

Dinner over, the men engage in small talk for awhile, then Jack finds himself busy with red lights on the console announcing outer security violations at two LFs. "The jack rabbits must be hoppin' around," he observes. Meanwhile he has alerted security topside to dispatch a strike team to the sites to check out the trouble. Their arrival and penetration of the launch facili-

like a crippled turtle. There are continuing security alarms . . . .

ties cause more telephone traffic which continues for several hours. A stiff wind has sprung up which results in many different reasons for the security alarms to sound off—someone, one of the maintenance men at LF3, had left a metal cover loose on a box. This, blown by the wind, was causing repeated alarms from the site.

The men in the capsule recall past incidents when the alarms had been deliberately set off by juveniles throwing rocks into the enclosure. Another time an unidentified individual had fired several shots into an LF enclosure. An AP stationed on watch had been endangered.

Time begins to drag. The night seems to inch along like a crippled turtle. There are continuing security alarms, a couple of exercises announced by radio that cause the men to go to their code books, VRSA readouts when red lights indicate trouble of some kind in an LF, chatter on the radio, telephone conversations with topside security and patrols at the LFs. In between, the men read in snatches from magazines. Bill fiddles awhile with plans he is drawing for a tool shed he intends to build when he has time. Finally, he gets up and paces the floor for a while. "Wonder who designed these chairs?" he asks, rearranging a blanket he had folded on the seat. "Without a doubt they're the most uncomfortable things I've ever had to sit on."

"Wish we had some coffee," Jack said, examining an electric coffee maker atop the freezer cabinet. "Where's the cord?"

"They took them all out—can't make coffee anymore," Bill replied.

"Why not?"

"I don't know. Somebody said something about the pots not being shielded and maybe they could cause trouble with the electronics. Guess we'd better start bringing a thermos."

At 0515 topside calls to say that the cook is getting on the elevator: breakfast is on the way down. While they are eating, Bill points out that he never has become time-disoriented. "I thought maybe I'd lose my time bearings. So far I haven't, but maybe if we were down here for a week, or at least several days, we'd lose track of whether it was night or day or even the day of the week."

"Have you heard about the new idea somebody's got on scheduling?" Jack asked.

"No."

"Well, the way I get it is that, if we can get an additional crew per squadron, the schedule will be changed so that we don't spend more than 12 hours down here. We might have to stay here at the facility for three days, but we'd have some off time, shorter tours in the capsule, and three days off between tours."

"Sounds like a good idea," said Bill. "That would give us a chance to sleep, study, read and get out doors for a little exercise. And think of all the miles we'd save on those cars. That might even pay for the extra men."

They discuss the idea for awhile, then Jack frowns. "One problem is our eat-sleep-work cycle. People get pretty used to the 24 hour day, regular meals and time for sleep. We might get all fouled up. I hear that some airline crews, especially on overseas flights have a hard time adjusting to a lot of irregularities in work and rest time, not to mention eating. Half the time they don't know whether to expect breakfast or dinner."

"That's something the docs will have to figure out," Bill replies, "but how about the school program? They'd have to work out something that would fit with classroom schedules."

Finally the clock begins to nudge past nine. "Hope those guys are on time, there's rain between here and the base," Jack announces.

At 0945 the command post calls to say that the replacement crew has had a flat tire, they'll be late.

Eventually the new crew arrives. Turnover accomplished, Jack and Bill ascend to the light of day, coffee and the long ride back to base. Bill, driving this leg, snoozes off momentarily and has to be prompted by Jack. This was something they have been cautioned about in every safety meeting. The man not driving must stay awake to observe his partner. Fatigue is their worst enemy during this long drive home.

The men drive through the gate at 1300, check in and head for home and an afternoon nap. Sometimes sleep comes easily. Other times it won't come at all, and the futile chase for oblivion is finally given up and the man reluctantly rouses himself to putter around the house or take care of some postponed chore.

Time moves fast and good budgeting of the available hours is a necessity. During the next two days Jack must take a physical, Bill has to get in some flying. Both men attend classes, study for a forthcoming examination, attend commanders call, a safety meeting and a training session. This leaves them with a little spare time for shopping with the family, attending a movie and playing with the kids. (There are variables that may change the picture. Occasionally a man may find himself with considerable free time. Then he may be called for extra duty as a replacement for a man on the sick list, or, as recently happened, the wife of one of the men was having a baby and Bill was called to fill out the man's tour in the capsule so that the new father could get to the hospital.)

The fourth morning finds them meeting at the coffee bar downstairs from the briefing room. The time is 0710. "We'd better get upstairs, the briefing starts in five minutes," says Jack around a donut in his mouth. "Looks like snow and today we go to Tango. That 40 miles of dirt road is for the birds." ☆

HOW DANGEROUS IS LIGHTNING?

PHOTO BY DON DOWNIE

Lt Col Ferd J. Curtis, AWS Liaison Officer
Directorate of Aerospace Safety

Recently there has been renewed interest in the significance of lightning as a hazard to flight. To best answer the question, "How Dangerous Is Lightning?" let's look at the Air Force record. In this way conclusions can be based on facts.

During the five year period from January 1959 through December 1963 there was one major Air Force accident in which electro-static discharge was the primary cause. In this case a pilot ejected from an F-102 after a discharge blew the radome and pitot tube off causing loss of instruments and control difficulty. In only one accident was lightning strike or electro-static discharge credited as a contributing cause.

Reporting procedures do not require reports on all incidents and it is fair to assume that many lightning strikes have been experienced where little or no damage resulted. However, during the two year period ending in December 1963 there were 66 reports of lightning strikes or electro-static discharges. In most of these damage was confined to pitting or discoloration of the extremities of the aircraft, such as wingtips, radome and vertical stabilizer.

Information available does not, in all cases, differentiate between a natural lightning strike and an electro-static discharge. Therefore, no distinction is made in the following statistical discussion.

DAMAGE

Damage reported in the 66 inflight lightning strikes varies from skin discoloration to superficial skin damage and disruption of electrical systems. Pitting and discoloration of nose, wingtip and tail surfaces occurred in 41 incidents. The incidents of pitting occurred in large transport and bomber-type aircraft.

Radomes are particularly susceptible, and were involved in 22 incidents. Damage varied from pitting to complete loss. However, radar became inoperative in only two of these cases. One or more radios became inoperative in six cases, of which four were due to antenna damage.

In 11 cases more extensive damage resulted. The most significant was a C-130 pylon fuel tank aft section rupture when residual fuel was ignited and fuel burned for several minutes. Fabric control surfaces received rips that required repair or replacement in four cases.

Systems malfunction resulting from a lightning strike occurred in 12 incidents. The most serious was disruption of power in three engines of a C-124 due to temporary malfunction of magneto switches. Target darts were inadvertently jettisoned by firing squibs in two F-100 incidents. Airspeed systems were affected in three cases. Magnetic compass and directional gyro malfunctions occurred in a flight of two F-101 aircraft.

Figure One shows a damage breakdown. It includes more than one damage type in a single incident. In four incidents reported there was no damage.

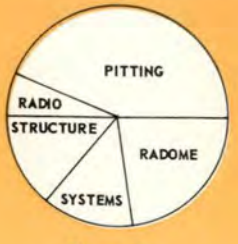


Figure 1.

OCCURRENCE

A comparison of altitudes above mean sea level at which aircraft were operating when lightning strikes were reported shows maximum reports in the 5-10,000 feet area with a sharp drop in reports above 20,000 (Figure 2). It may be of interest to note that nine of the 11 lightning strikes reported on B-52s were below 20,000 feet.

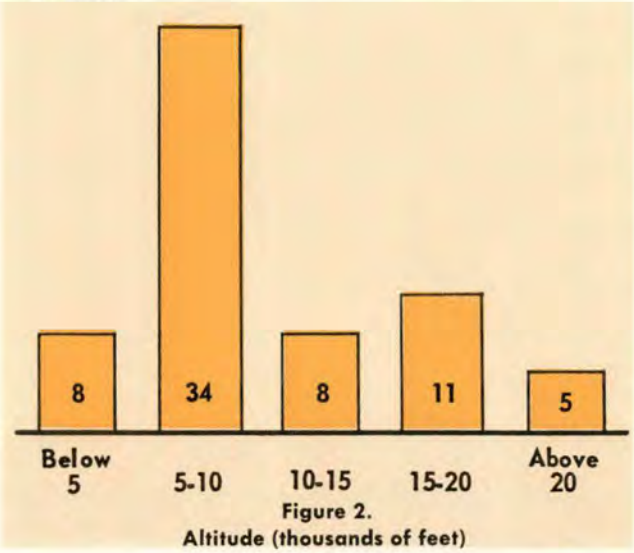


Figure 2.
Altitude (thousands of feet)

AIRCRAFT TYPE

Lightning strikes occurred to most aircraft types with the B-52 receiving the most (11), closely followed by the C-124 (9) and the C-54 (8). (Figure 3.)

Most of the lightning strikes reported by single and twin-engine jet aircraft occurred during climb and in no case was metal skin pitting reported. These aircraft were subject to loss of tow targets, tip tanks and damage to pitot tubes.

Aircraft	Incidents
B-52	11
C-124	9
C-54	8
C-118	6
F-100	4
C-119	3
C-133	3
F-101	3
B-47	2
B-57	2
C-135	2
T-33	2
F-102	2
F-105	2
C-130	2
C-97	1
C-47	1
B-50	1
F-89	1
F-104	1
	66

Figure 3.

SEASON

Incidents were reported in all seasons with a maximum in the spring and a minimum in the fall. (Figure 4.) Many reported incidents occurred in atmospheric conditions where natural lightning was not observed and does not normally occur. These were most likely electro-static discharges and generally occurred to large aircraft flying in clouds or precipitation.

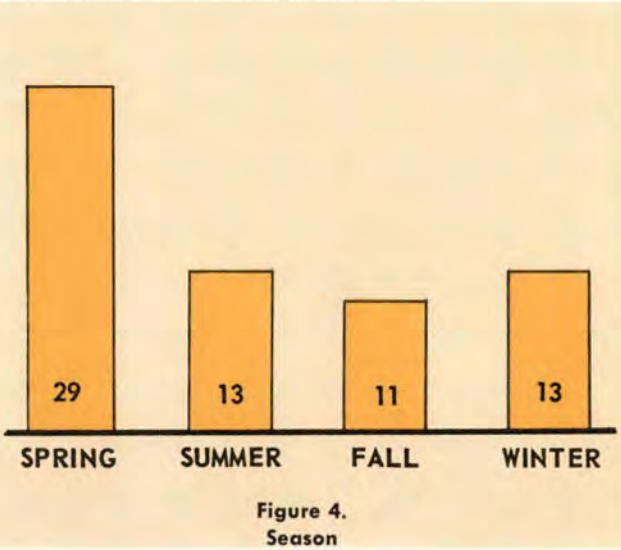


Figure 4.
Season

BRIEFS

Major Accident. F-102 pilot was at 4500 feet during instrument approach, when a ball of fire was observed in front of the canopy, accompanied by an explosive noise. The airspeed indicated zero and the attitude indicator was tumbling. The pilot experienced control difficulty and ejected. The radome and pitot tube were found to have been separated from the aircraft by an electro-static discharge.

Incidents. A B-52 had electro-static discharge while cruising on a low level navigation route at 4000 feet. Flight conditions were in-and-out of clouds with light sleet and snow. A streak of light was observed in front of the aircraft followed by a blue and red fireball about four feet in diameter. All systems were normal after discharge. Damage was a seven-inch hole in the radome and burning of the antenna in the right wingtip.

A B-52 was cruising at 9000 feet on a low level navigation route when a cloud-to-ground lightning strike was observed directly in front of the aircraft. Weather conditions were: overcast clouds with light rain. All systems appeared normal and the mission was continued. After the aircraft landed fuel was observed leaking from the aft section of the left external fuel tank. Inspection revealed a one-fourth inch hole in the tank and three other arc blobs of metal located horizontally along the outer portion of the tank.

C-130 cruising at 7000 feet, circumnavigating thunderstorms, was struck by lightning followed by one loud and one muffled explosion. Flames were observed outboard of the Nr 4 engine and trailing to the aft section of the fuselage. Flames disappeared after two minutes total burning. Inspection revealed that the aft cone section of the right pylon fuel tank was blown off by an explosion within the tank. Pitting was found in both wing tips and outboard extremities of both

HOW DANGEROUS IS LIGHTNING?

continued

ailerons. Only normal residual fuel remained in the pylon tanks at the time of the incident.

A C-135 was climbing at 285 knots indicated through 4000 feet. An explosion was heard accompanied by a slight jolt and a lightning flash at the left forward portion of the aircraft. Sound level increased and held proportionate to airspeed. A jagged hole four inches in diameter was found on the left side of the radome about 12 inches from the nose. Also, a static arrestor was burned off the right wingtip leaving a hole five inches long and one and one-half inches wide. Weather was continuous clouds with moderate rain.

A flight of two F-101s was making an instrument departure through thunderstorm activity. At 5000 feet, both aircraft were struck by lightning. Loss of magnetic compasses, directional gyros, and radome damage resulted. Both pilots experienced mild electric shock.

A C-124 was cruising at 10,000 feet in light to moderate turbulence with no lightning observed. Areas of severe weather were circumnavigated visually and through use of radar. St. Elmo's Fire was observed followed by a blinding flash in the cockpit. The lightning passed through the aircraft, smashing overhead cockpit windows, burning out numerous lights and radio components, and interrupting power in three engines. Power loss was due to popping of the magneto switch pins to the OFF position, possibly the result of heat generated by arcing in the switch case. Power was regained by returning the magneto switches to the ON position.

A B-47 crew observed St. Elmo's Fire on the nose section followed by an electro-static discharge. The incident occurred during departure at 26,000 feet in haze above broken cumulus clouds. There was no damage.

CONCLUSIONS

Lightning strikes and electro-static discharges frequently occur to Air Force aircraft. Damage resulting from these incidents is usually negligible. Isolated cases indicate that structural damage does occur but rarely results in an aircraft accident.

Lightning strikes occurred most frequently below 10,000 feet and rarely occur above 20,000 feet.

Reporting requirements and lack of exposure statistics by aircraft prevent a close comparison of susceptibility by aircraft type. There is some indication that lightning strikes and electro-static discharges are more likely with large aircraft and result in damage greater than with smaller aircraft.

Lightning strikes or electro-static discharges occur in all seasons with a maximum in the spring and a minimum in the fall.

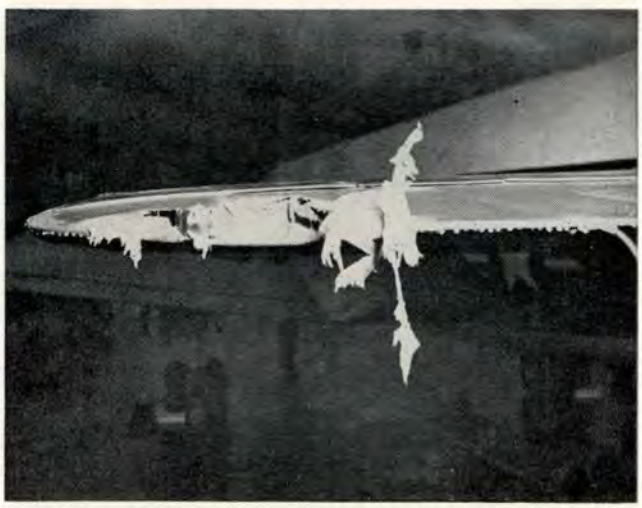
Lightning strikes are among the most startling phenomena an aircrew can experience. They are usually accompanied by explosive sounds and blinding flashes of light. Historically, the evidence shows they are rarely dangerous, but aircrews should recognize the hazard potential.

RECOMMENDATIONS

Flight handbook recommendations, such as turning cockpit lights up bright, should be followed. Better yet, avoid all areas where lightning strikes are most probable. Other weather phenomena of greater hazard to flight safety—such as extreme turbulence and icing—are frequently associated with areas of greatest lightning prevalence.

Report lightning strikes and electro-static discharges in accordance with paragraph 29, AFR 60-16. Inflight reports should be given to a Military Metro or Flight Service Station. Reports may be given to the ATC controlling agency when conditions do not permit leaving ATC frequency. After landing, the pilot is required to complete an AF Form 1228, "Aircraft Hazardous Weather Report," available at the weather station. The forecaster will assist, and completion is quite painless. Information obtained from these reports will be used to develop techniques in predicting unusual weather phenomena. ☆

Lightning damage to radome of C-54



Same plane received serious damage to horizontal stabilizer

FAA ADVISORIES

Robert L. Terneuzen, FAA Liaison Officer · Directorate of Aerospace Safety

RADAR ENROUTE PENETRATIONS. Many words have been written on this subject and, as with many new air traffic procedures, there are loopholes that cause misunderstandings between pilot and controller. Let's try to clarify a few right now.

First off—it is no longer necessary for a pilot to request "JAL Enroute Penetration to Patushnik AFB."

FAA has eliminated the requirement for the jet pilot to advise if he possesses low altitude charts. This will be reflected in a forthcoming revision to Planning Document, Section II, page 19, paragraph IV A-3 and 4. So that you'll better understand a few of the rules the controller works with, here they are—in condensed version:

1. An enroute penetration shall be authorized only when it will expedite the movement of the aircraft from an enroute altitude to the final approach without execution of maneuvers depicted on the JAL chart.

2. The controller possesses complete discretion for the provision of this procedure and his reason for disapproving a request for this service is not subject to question nor need it be communicated to the pilot.

3. When an enroute penetration is initiated by the controller, the pilot shall be advised of the controller's intent. NOTE: It remains the pilot's prerogative to elect to conduct a published high altitude penetration instead of an enroute penetration.

4. When an enroute penetration has been authorized, it shall not be terminated without the consent of the pilot except as required by radar outage or emergency situations.

5. Prior to issuing an enroute penetration clearance, the controller shall transmit:

a. Current weather at locations where the official weather is reported as being at or below the highest circling minima established for the airport concerned.

b. The current Runway Condition Reading (RCR) to Air Force and ANG Aircraft. RCR information will be provided and updated to centers, towers and Approach Control facilities by Air Force Base Operations Offices at airports not having FAA service.

6. Clearance limit assignment shall be to a navigational aid/fix depicted on the JAL chart from which a jet penetration can be conducted in the event two way communication failure is experienced.

7. The pilot shall be advised of his position in relation to the clearance limit when descent or penetration clearance is issued. In the event radar vectors are required which will take the aircraft off the previously assigned non-radar route, advisories shall be issued giving the position of the aircraft with relation to the clearance limit or destination airport, as appropriate.

8. The distance from the destination airport that penetration clearance should be issued can be determined by adding the number 10 to the first two digits of the flight level; e.g., an aircraft at flight level 370 should start descent approximately 47 miles from the airport of intended landing (37+10=47). NOTE: The above procedure is based on a rate of descent of 4000 to 6000 feet per minute.

Now that you understand a few of the controller's responsibilities, it is also necessary for the pilot to understand the necessity of explaining to ATC the handling he is requesting in connection with the "Radar Enroute Penetration."

When making your request, include the *type* approach you wish to make, i.e. "Handoff to Patushnik GCA" or "Radar vector to Patushnik ILS final approach course Runway 31," or "ASR approach to Patushnik Runway 31." Also, cross check your radar position with VOR, ILS, etc.

To wind up—let's just say that should a situation arise with which you are unfamiliar, "for your own safety *ask questions.*"

HOLDING PATTERNS. Commencing 1 March the revised IFR aircraft holding pattern procedures implemented by the FAA in January 1962 are the sole basis for providing protected airspace for holding patterns.

VOR IDENTIFICATION. FAA has completed plans to make a change in voice identified VOR stations. Instead of hearing "Coolstone Omni" you will soon hear "Coolstone VOR"—or "VORTAC" and in a female voice, yet!

ROSES. On 15 November 1963 Mr. Harold D. Garman, a March RAPCON controller, very likely averted an aircraft accident. A T-33 was departing Norton AFB during IFR weather (400 feet ceiling and one-half mile visibility in light rain with cloud tops reported at 12,000 feet). Shortly after takeoff, a right turn was started to comply with the ATC clearance. Due to a 50-degree discrepancy in the primary compass system, the turn was stopped short on a heading that would have taken the aircraft into mountains. Mr. Garman noted the error on his scope and promptly steered the pilot to a safe heading. ☆

ON GUARD

ATTITUDE! "Somehow if you can get every man in the organization to realize that what he does will make or break a mission—may mean a pilot's life . . . that's possibly the best accident prevention insurance in the world."

This is the conviction, expressed in varying ways, but the underlying, inescapable conviction of members of the ANG's 163rd Fighter Group (AD), Ontario, Calif.

One of the best ways of improving any operation is to examine a similar, highly successful one, then apply practices and procedures that are paying off. It was with this purpose in mind that activities of the 163rd were observed and its people questioned.

"Applying 66-1 concepts and making the system work, this is the simplified explanation of our maintenance concept." So said a Chief Master Sergeant in the glassed-in Workload Control Room from which all ramp activities can be observed. He should know; he has been on the job since before the squadron was called to active duty for Korean service in 1950. He and another CMSgt seated nearby readily admitted that a nucleus of permanent men helps, but they hastened to stress the attitude aspect, one saying, "These people are here because they want to be—for many it's their bread and butter, and for all, the best they can contribute at all times is their minimum fair share."

The Group's Fighter Squadron, the 196th, flys F-86s—not the most forgiving aircraft in the world. And there was a note of pride in the voice of the maintenance squadron major who pointed out that these birds are now 13 years old. They don't look it. Obviously, a lot of people do care. The fire control system with its intricate radar gear probably constitutes the biggest maintenance headache, but it's vital to the mission, and in-commission rate is high.

How long are 781-2 writeups carried forward? One day. Occasionally two days, but never more unless there is a delay in obtaining a part. One reason is that maintenance technicians don't hesitate to look in the snack bar, the ready room, Ops, anywhere in the complex if they have to locate the pilot to get a better briefing on the squawk. As one supervisor explained, one or two questions and the technician may be able to eliminate a three hour checkout of a system. In fact, the pilots have caught on and usually, when there is a maintenance problem, will make it a point to personally debrief the specialists.

The wavy contrails that these part-time flyers draw across the Southern California sky could lead the uninformed to think that this is a real fun assignment. Not so! Hang around the fighter squadron for a few hours and it's readily apparent that this is a serious job performed by skilled specialists. They may be airline pilots, insurance salesmen, clerks . . . you name it; but while on duty at Ontario they are all Air Force professionals with a serious mission to perform. The 196th jocks can never forget that frequently there are more than 100 passengers on board the commercial jets that go into and out of busy Los Angeles International; and the climb and descent corridors for the fighters have to share this airspace. In addition, the jet runway at Ontario is on a direct line with the instrument runway for Norton AFB and intersects the extension of the March AFB runway. To complicate the problem even further, visibility in the lower altitudes is usually at or below VFR minimums in smog. Here's motivation to stick to departure and arrival corridors! Even this isn't all—neither smog, nor anything else deters the hardy California lightplane pilots from buzzing around in the valley like so many multicolored bugs.

The Sunday Morning Confession—this might be a fitting title for the practice the Ops officer credited as








another important accident deterrent. Any pilot who has had an experience which could have resulted in an accident is expected to get up in front of all the other pilots and tell what happened. The key here, as pointed out by the Ops officer, is not to levy blame or criticize (we all make mistakes occasionally) but look upon such confessions as tools that may save the lives of the 35 to 40 other pilots in the room. As a major said, "It was embarrassing telling of the time I punched off my tanks out at sea without verifying I had enough fuel to get back, but I felt better for the telling."

Personal equipment. It's all hung on special racks in a PE room. No one enters without the combination. Two full time PE specialists are responsible for maintaining everything in top condition. Chutes, life vests, helmets and masks are all in orderly rows in a well lighted, spotless room. There's no escaping the impression that everything kept here is as safe as dedicated men can make it.

Another impression—this obtained from command level—there's always an effort to make sure every man knows the "why" as well as the "how" of his job. All support personnel are briefed on what goes on in the cockpit from the time the yellow-marked fighters break ground until they have completed climbout, followed GCI instructions, made their intercepts and are recovered. When a man knows, in detail, his unit's mission, and especially that his contribution fits in and is necessary for success, he is bound to have a little more incentive to do the best job he possibly can.

What about the FOD problem; especially when the responsibility is limited to the squadron ramp and the taxiways leading to it? The rock on someone else's taxiway is just as damaging as any other, and there is nothing to prevent frequent, careful inspections of all areas used. A little extra cooperation—the willingness to contribute a little more than your fair share is a good technique with which to win friends and influence people who can help. As to FOD, it doesn't matter what it is, where it comes from or who is to blame; what matters is keeping foreign objects out of intakes and cockpits. Careful tool checks, not wearing caps around running engines, prominently placed posters; these are some preventatives employed by the 163rd Fighter Group.

Things like morale and pride are important in the accident prevention program of this ANG outfit. These are underlying attributes, easier to sense than define. Members of the 163rd Fighter Group are in it because they want to be, not because they have to be. They remember that to get in they had to sweat out a waiting list, and that there are always others anxious to take their places if they don't do their job well. These Guardsmen maintain a 24 hour alert as their contribution to the air defense posture of the Southwestern U.S. Their minimum obligation is two fighters airborne within five minutes, two more within an hour; quite an accomplishment for a total of 40 pilots, the majority of whom hold down full time civilian jobs. To do this, month after month, without accident gives the pilots and all their support personnel reason to be proud.

The payoff comes when boring along at night high over the Sierras. The best survival gear is not the chute on your back or the survival pack you're sitting on, it's an airplane made dependable by top ground support together with the know-how to fly the assigned mission. ☆

From an overseas safety publication—in an article titled Tailplane Icing—comes the following information on . . .

HORIZONTAL STABILIZER ICING

After some incidents which occurred in icing conditions, experimental investigations have been made into the effect of ice formations on the horizontal stabilizer leading edge. It is known that in extreme cases such formations can lead to difficulties in control.

The serious cases occur with a sharp "horn" shaped ice formation (see diagram)—the shape is more important than the amount—which causes separation of the flow on the underside of the horizontal stabilizer; this alters the pressure distribution and therefore the aerodynamic forces acting on the elevator.

Whether such separations will occur or not will be determined by many factors, such as speed, local angle of attack of the airflow at the horizontal stabilizer and the precise nature of the ice formation, which cannot of course be predicted.

The angle of attack at the horizontal stabilizer is the sum of

- the setting of the horizontal stabilizer relative to the free air stream, and
- the deflection of the free air stream due to the lift generated by the wing: this is termed the downwash.

The diagram shows that the horizontal stabilizer setting relative to free air stream is normally negative (nose down) and this angle increases with increasing nose down aircraft incidence, i.e., with increasing forward speed or with lighter weight. The downwash angle depends on the lift distribution along the wing and, in particular, will increase as flaps are progressively lowered.

Flap lowering also causes a rearward movement of

the point through which the lift may be said to act on the wing, so that a higher downward load is required on the horizontal stabilizer to prevent the nose from dropping and this is provided to a greater or lesser extent by the increase of downwash.

Flow separation on the lower surface as a result of leading edge ice will do two things:

- It may cause the elevator to be pulled down.
- It will cause more UP elevator movement to be needed to compensate for the decay in horizontal stabilizer lift.

These two effects combine to produce a pull force which may reach a very high value in a badly iced up condition, and in an extreme case, say after increasing the flap angle, it may be impossible to recover control without loss of height and considerable effort.

An investigation has been made concerning a reported airline incident where, on lowering the flaps to the final-approach setting, an aircraft developed a nosedown attitude which required considerable manual effort to overcome. After some subsequent difficulty in maintaining the desired approach attitude, the pilot was able to continue the approach and accomplish a safe landing. It is worth noting that the final-approach flap selection had been made at the maximum permitted airspeed for that setting.

External inspection of the aircraft—immediately after landing—revealed the described horn-type ice formation along the tail surface leading edge, the fin and the outboard sections of the main-planes.

The amount of ice understandably surprised the pilots—for the following reasons:

- The sector concerned was of only 18 minutes duration.
- The cloud layer at departure and destination airfield was relatively thin (3000 ft or so) and well defined, affording good contact conditions below its base and clear air conditions on top during the cruise phase of the flight.
- The pilots had inspected the wing leading edges at the top of climb and established an ice-free condition.

Although power-plant anti-icing had been in use throughout the flight and windshield heaters also in continuous use (and switched to 'High' during descent), the L/Edge anti-icing system was not used for the very simple reason that it was considered unnecessary.

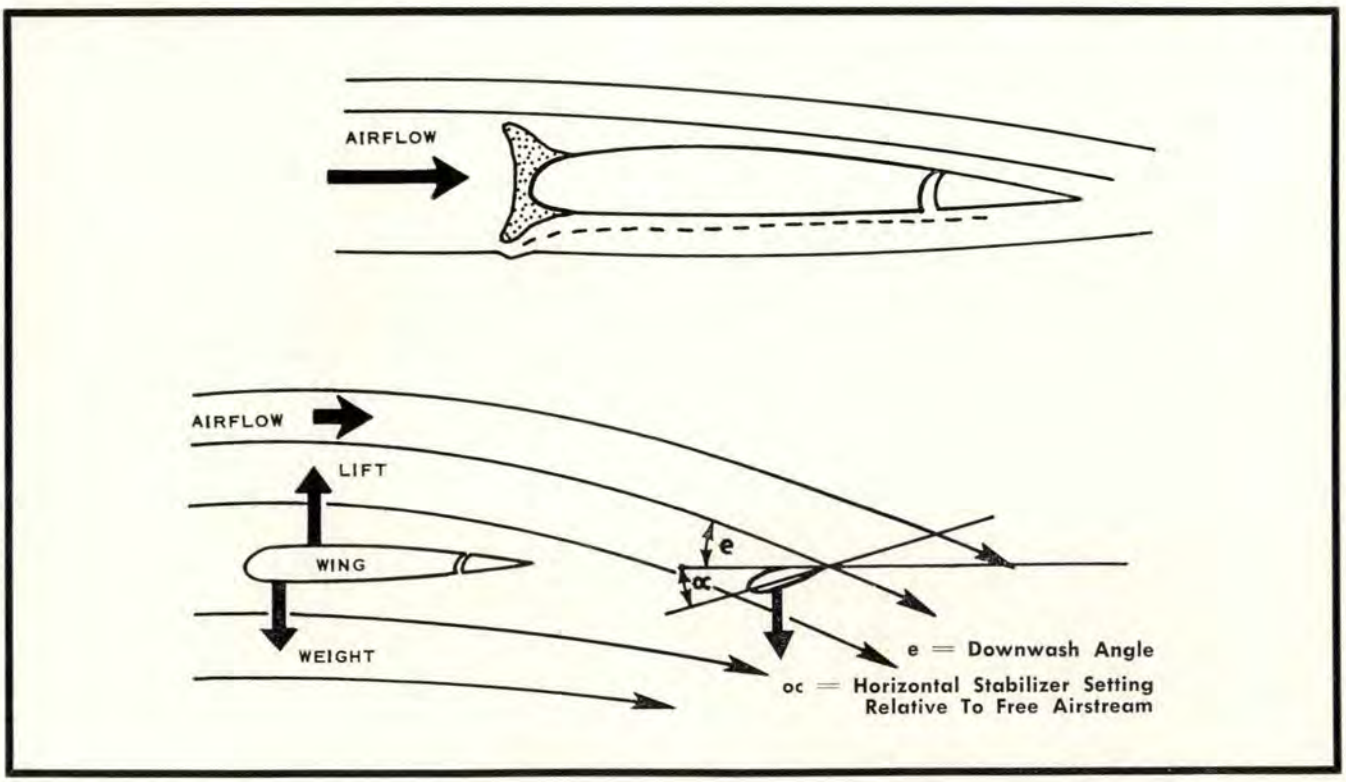
CONCLUSION

Ice can form extremely quickly and, in the case of the horizontal stabilizer, it could reach hazardous proportions in the approach phase without any prior evidence of its presence in the clean configuration.

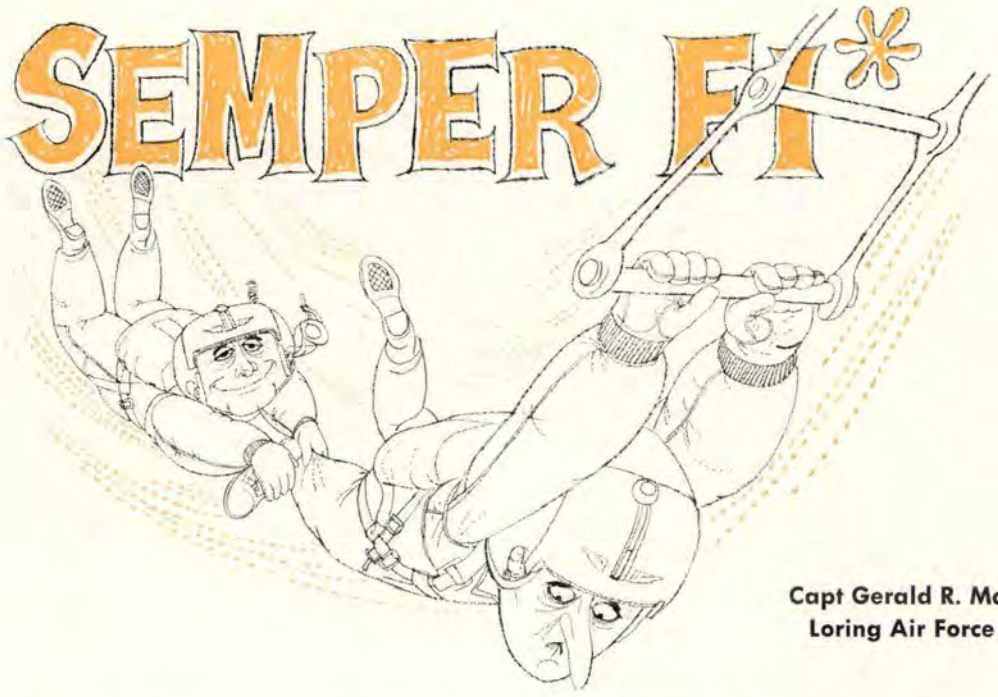
Where the use of aircraft anti-icing systems is concerned there is ample world-wide evidence of the fact that pilots tend to rely on personal judgment. It must now be emphasized that the pilot cannot always be aware of the presence of ice on his aircraft, especially the horizontal stabilizer, not to mention the fact that the shape of any accrued ice will be only one of an infinite variety. The moral, therefore, is simply this:

In the interests of flight safety, pilots should make the fullest use of all available anti-icing systems whenever ice is present or likely to be encountered even for a short time. Modern anti-icing systems are extremely effective and, when properly used, will prevent the ice formation described in this note. ☆

Flight Safety FOCUS



SEMPER FI*



Capt Gerald R. Malmgren (ADC)
Loring Air Force Base, Maine

***an old Marine axiom meaning "pull up the ladder, Jack, I'm aboard."**

Our hero and Joe, the cool copilot, have departed the east coast for Scott AFB, Illinois. They have been delayed waiting for fuel, for a power unit, an ATC clearance and clearance on the active. When they take off, their clearance for weather has expired by five minutes. Ten minutes before their takeoff the weather for Scott has been changed drastically. This change is not relayed to the pilots before their takeoff and no effort is made to forward them a weather advisory while they are enroute.

The pilots have calculated for a moderate headwind during the climb but their first checkpoint finds them far behind their time and fuel schedule. They write this initial error off to mutual mistakes by themselves, weather service and Lockheed. The clear air at flight level 320 is unaccountably crowded with clouds so our hero presses on to a higher altitude. The briefing indicated the most adverse winds to be in the middle thirty thousands so the climb is continued to flight level 400.

At this lofty stratus they find the peaches to be soggy and the cream curdled as they continue, despite inflight revisions, to fall behind in time and fuel. Twenty minutes from destination hero, by diligent use of his rose colored pencil, figures they can make it legally and theoretically.

The unexpected cloud layer at flight level 320 and the adverse winds at cruising altitude have whispered nasty things about weather into hero's ear, so he calls well in advance for the Scott weather. The report he receives is the same foul news he should have known before he took off. A few more rungs of Jack's ladder are pulled up when hero is advised that three aircraft have already made missed approaches at Scott and are on their way to their alternates.

Now hero is a 60-16 lawyer from way back and his alternate on the form is a debutante's stone throw from Scott. A hasty glance at the chart finds Sewart AFB to be his best bet so they immediately alter course for Nashville. Credit hero with a rung or two.

On the way to Sewart hero searches for, but can't find, the letdown book for that area. He hadn't checked prior to the flight and someone has removed it. Another rung gone. Happily enough, for the moment, hero learns that Joe has a letdown book so he tells him to handle the radio and the navaids and hero will direct the air machine.

Extreme radio difficulty is encountered on the way to Sewart and hero notes that Joe is saying "Stewart" instead of "Sewart" so he corrects him over the interphone. They finally contact Center control over Nashville and Joe asks for a "Stewart" VOR approach. Center denies this request but they don't tell our crew that Sewart doesn't have a VOR approach nor do they correct Joe for saying "Stewart" again.

Hero doesn't know that Sewart has no VOR Approach. He doesn't know that Joe has a crummy mask. He does know that the cabin altitude is 37,000. He doesn't know why Joe keeps saying "Stewart" after repeated corrections. Hero is pretty dumb.

Center can't get our crew into Sewart because of heavy cross traffic at lower levels. They have been informed that our crew is running out of fuel. They ask Joe if the bird can get to "Hop." Hero and Joe search frantically for "Hop" or anything like it; they give up and say that they don't think they can make it to "Hop" and want to land at

Sewart. Come to find out when Center said "Hop" they meant Campbell AAF which has over 10,000 feet of concrete runway and is called, locally and colloquially, "Hop" because the servicing navaid is located at Hopkinsville and its call letters are HOP. Another rung over the side.

Center gives Joe a clearance to Sewart so complicated and so quickly that neither pilot can copy it much less comply with their limited fuel supply. It is dark by now and the red fuel low warning lights are casting a warm glow throughout the cockpit. Hero gives up the clearance routine and declares an emergency. A discrete GCA frequency is declined in favor of Guard channel. Hero is squawking "mayday" and GCA has him and is controlling the descent.

The indications from the VOR that Joe has cranked in don't look right to hero but Joe has complained about not being able to get the right identifier so hero ignores it, besides hero's middle initials are GCA. That ladder is just about fingertip high.

Hero's attitude indicator's red light goes out so he asks Joe to take the airplane since they are in night weather. Joe right away starts a climbing right turn. Hero now gets a clue that maybe Joe is on the sauce or something so he takes the airplane again and uses a very distracting white light to illuminate the instrument panel.

They break out of the clouds around 3000 feet in the very dark rain. Suddenly GCA isn't talking anymore. Hero and Joe call them frantically, individually and collectively. The tower responds very weakly with a steer to Sewart. This heading is almost the opposite from the VOR indication. Hero follows the steer; they have an oscillating indication of 30 gallons on the liquidometer and a flat zero on the totalizer.

"Semper Fi" is the first in a series of safety articles written by students attending the Flying Safety Officers' Course at the University of Southern California. Under the guidance of Col Daniel Lewis, USAF, Ret, formerly an information and Safety Education officer, and now a USC faculty member, articles such as this are being written as a school assignment. We of AEROSPACE SAFETY magazine staff are confident readers will find these articles refreshing, pertinent and of value to the accident prevention program.

"This is Goblin Control, can we be of assistance?" When hero hears this voice he looks up expecting to see something coming down like Mt. Sinai. Goblin control has been trying to tell Sewart GCA over the landline that they are making some serious errors in controlling hero but Sewart has ignored them because they were busy with an emergency, i.e. hero. Due to a radar phenomenon that hero still doesn't understand, Sewart was painting a reflection of his squawk and had run him 52 miles from the base.

When they are informed of their position our crew knows they'll never make Sewart with their fuel and ask for the nearest base. It's a small civilian field 15 miles distant; hero, with eyeballs on the plexiglass, spots a green light a long, long way off. He can't see a runway until Goblin asks them via landline to turn on their runway lights.

Now hero has been flying from a 12,500 foot runway that is 300 feet wide, has the IVALA system complete with strobe and centerline lights. The runway before him is 4800 feet long, 90 feet wide and has little approach lighting to speak of. He lands at least halfway down the runway; he knows there probably isn't a barrier and has no idea of the terrain. With supreme effort, hero goes around trying desperately not to look at the fuel indication.

Weather, FAA, GCA and Joe have all had a shot at pulling up hero's ladder and now it's his turn. Hero is going to have a short landing roll, he's going to slow it down and he's going to land on the end of the runway.

Hero doesn't know it but he's run out of rope, ladder that is. Over the end of the runway at a low airspeed he pulls off the power and, as advertised, the airplane quits flying and falls the remaining three or four feet and bounces into the air higher than hero knew anything could bounce. He applies power for recovery but due to an entire lack of fuel the engine does not respond. The next contact is nose first which blows a tire; the bird bounces again and the next contact again is nose first on the blown tire; the wheel cocks and the nose gear is ripped from the aircraft. Hero does indeed have a short landing roll.

Later, smoking several cigarettes and thinking about all the mountains they didn't run into, hero and Joe are approached by the first of a mob of natives. The local observes, "Say, you-all did a right smart job gittin' that there jet on this here field."

Hero, tired and tarnished, says, "Joe, get that man's name." ☆

CROSS COUNTRY NOTES

from REX RILEY

One of the best ways of identifying accident problem areas is to read safety publications of the other services and commands. Editors and safety officers use these publications as a means of alerting their people to current problems—and as a means of offering suggestions as to what to do about such problems.

Here's a f'rinstance, gleaned from half a dozen that accounted for an evening's homework for Rex:

Barrier engagements—not that barrier engagements themselves are particularly hazardous, rather that we still have drag chute failures, wheel and tire problems, takeoff abort situations, hydraulic failures—all sorts of things that can go wrong with the normal stopping systems of our birds.

Ejections. This is a real doozie. Four out of five jocks still make it—that's about the same average we've held for several years. And we've got more contraptions than the whole Rube Goldberg family could have devised. The sad part is, most all systems will work as designed . . . if they are maintained properly . . . if Dash One procedures are followed . . . if you jocks pull the handles before you get too low. Some mighty big "Ifs" there. Incidentally, a lot of people are working like mad to devise a true zero-zero ejection capability. It's needed for two reasons: once in a while a real hairy emergency crops up on the deck, and history shows that we need a system that will protect a few troops from their own mistakes.

Weather. This is one that really makes Rex shake his head. Month in and month out safety scribes pound away on this one. Here's one of those "known but unrespected" areas. Every winter a gaggle of fighters gets caught above a base that's socked in and they find out too late to run for an alternate. Sashayin' around in snowstorms, trying to get lined up with a couple of miles of concrete makes real scary reading. Rex doesn't envy these troops—usually a little better support and they wouldn't get trapped.

Design deficiencies. 'Wonder how many gear-ups we'd have had if the "Up" lever were located back in a cockpit corner almost out of reach and a long way from the flap handle? How many inadvertent drag chute jettisonings if the chute loosener were on the opposite side from the deployment handle? What would the rate be if all trainers would recover "hands off" from spins?

Discipline. Rex used to get as big a kick out of rat racing around the clouds as the next guy. But, like biplanes, free-to-do-with-as-you-please airspace is almost extinct. There's just too good a chance of coming eyeball to eyeball with some commercial joker. Uncle has some pretty sharp radar eyes now, so you'd better be where you're supposed to be at all times. Got to admit that this discipline thing makes sense, any way you slice it. A lot of Rex's friends aren't around to read this because they tried short cuts.

Complacency. There's another one that really gets a workout in the safety mags. Take an experienced pilot, gobs of hours in the bird, good weather, no mechanical problems, nice sunny day, maybe a sukoshe crosswind, and he bashes it. Throw in a little adversity and he hacks it every time (throw in a lot and he'll rack up a "Well Done").

Rex could go on and on like this, but you get the picture. The boys who put out these books keep eyes and ears peeled for accident trends and do their darndest to alert the troops. Their mags are monthly signboards, pointing out current pitfalls. Everyone who flys should read and apply the suggestions to his own situation. Next time you might just be the other guy—somebody always is!

ALL KINDS OF REASONS. With power plugged in, the T-33 pilot carried on with the starting procedures. Shortly, the landing gear decided to collapse. Fortunately the damage was minor or less. Unfortunately for him, the pilot was found at fault. The investigator felt the pilot failed to check the gear handle down and locked prior to engine start or he inadvertently raised the gear handle during start. A contributing cause factor was that the crew chief pulled the down lock safety pins prior to completion of engine start and without the go ahead from the pilot. The pilot was relieved of duties as an instructor pilot and will be given a goin' over stand check before flying again. You know what? No mention was made as to what, if any, actions were taken toward the crew chief. Strangely enough this happens too many times. We nail the pilots' hides to the wall but maintenance and supervisory troops get a slap on the wrist or a dressing down or verbal reprimand. Rex remembers a C-47 accident in which the control wheel chains on the pilot's side were re-installed backward. On takeoff the "Goon" banged real good and the crew almost bought the farm. Sure, the pilot got nailed good but the mechanic and inspector who were equally responsible got off scot-free. End of sermon that I promised I would avoid.

HELOS AND WHEEL FIRES

Capt Thomas C. Seebo
3560 PTWg, Webb AFB, Texas

An invaluable asset, as a bonus to bases with the Local Base Rescue (LBR) system, may be realized in the use of the HH-43B helicopter to cool brake or wheel fires.

Much has been written in AEROSPACE SAFETY (July 1961, March and July 1962) concerning the primary crash-rescue mission of this chopper with its fire fighting capability. Now, another effective use has been added to its flexibility. For example, Perrin AFB has used the HH-43B many times on wheel fires of the F-102. Some fire departments have found that portable fans placed beside hot brakes on large type aircraft are most effective. It stands to reason that the big fan provided by the HH-43B will do a more effective job.

Many personnel have been injured, some critically, from exploding wheels, locked brakes, or blown tires. There is a thin line between contained fire and disaster. When magnesium on wheels starts popping, it's obvious that a big knife of white flame is toying with that thin line. Another multimillion dollars worth of aerospace equipment could easily be scratched from the Air Force inventory. If a portable fan aids in containing a fire, why not use the cooling 30 to 40 knot wind generated by the HH-43B rotors?

Last year at Webb AFB there were numerous occurrences of hot wheels, locked brakes, and wheel fires on the T-38. Of major significance was a hot magnesium fire on one wheel. The fire department was having little success in combating the fire with established CB procedures. When the burning rubber of the tire was pulled with a grappling hook, magnesium sparks flew in all directions and firemen retreated to a safe distance. (Aircraft wheel explosions generally blow out perpendicular to the fuselage so the HH-43B is not endangered if hover is maintained with this factor in mind). The Fire Chief signaled the helicopter to a previously discussed hover position. The HH-43B was maintained in an up-wind hover position and within eight minutes, the crash crew could put their bare hands on the wheel. Subsequent to this experience, it has become standard practice to use the available LBR helicopter on hot brakes or wheel fires. Since ground firemen are able to stand away from the danger area, their exposure to the hazard of wheel fires has been minimized.

(A note of caution must be injected here for the crew of the helicopter: Fires of this type may take place in a row of parked aircraft. Therefore, extreme care must be exercised when maneuvering around this environment, which is usually avoided like the plague. Some associated hazards are: tails of large aircraft which extend many feet into the air, aircraft stands, vehicles, and loose objects, such as cowling, which may be blown about the ramp.)

One might theorize an FOD hazard from debris picked up by the rotor blast and forced into the engine of the distressed aircraft. Although we've not encountered it, this problem could be easily solved by intake plugs and exhaust covers installed by crash crews or an adequate inspection system.

More and more the airborne fire fighting rescue role is being adopted. The Civil Aeronautics Board recently published a study that mentioned the value of airborne crash rescue vehicles. Still there remain many skeptics concerning the value of the LBR-HH-43B in the role of fire fighting support or fire suppression. The most common misconception is the thought that the fresh air blown into the fire will cause the fire to burn more. On the contrary, the air cools the fire, metals, gases and fire fighters as well. The Air Force fire training school has compared the helicopter rotor wind action to that of blowing out the flame of a match.

Although this article deals primarily with a specialization in combating wheel fires, the role should not be restricted. This cooling effect should be employed to maximum advantage. Recall the B-47 disaster reported in November 1962 AEROSPACE SAFETY? Although the B-47 crew was rescued, four firemen were killed in an after-fire explosion. Here the cooling effect of the rotor wash possibly could have prevented the explosion. Thus, there is justification in not pulling the HH-43B away from its established fire fighting support position too soon.

Just where the missions of the LBR detachment and the Base Fire Department become separate is dependent upon personnel and situations. A sound training program, based upon mutual indoctrination, planning, and coordination by personnel of these two distinct and separate, yet complimentary, fire fighting units, will assure maximum mission safety and effectiveness whenever they work together. The HH-43B system has proven itself a valuable asset in fighting fires. The senior Fire Protection Supervisor on the scene should not hesitate to request an assist from the chopper's rotor wash if he deems it advisable.

What is gained by this use of this airborne rescue vehicle? First of all, there is the protection provided crash rescue teams. Second, the savings in aerospace equipment. Third, the increased capability provided base fire departments, particularly where explosive weapons are involved. Fourth is the relatively small danger to the HH-43B crew; and fifth is the added asset of giving the base and the Air Force more return for the individual dollar investment in the LBR detachment.

In short, a close coordination between Base Fire Departments and HH-43B LBR detachments can effectively result in saving of additional lives and equipment—a furtherance of the Air Rescue Service LBR mission, "That Others May Live." Coordinated training will lead to the professionalism and proficiency that makes any system function at peak capability. ☆

Lip Service

Fifteen Years

Maj John V. Florio, AFRES, Alvin Callender Fld, New Orleans

In an age where air traffic has multiplied, speeds have trebled, aircraft have become infinitely more complicated and traffic procedures have become more complex and critical, I see statistics every day which prove that flying is safer than it ever was in the "good old days."

"But," I ask myself, "in the face of such evidence, why do we still have to read accident reports about the same old bonehead tricks that were pulled twenty years ago?"

One fellow blows a ship apart by taking off with a hot brake, another clobbers into the side of a mountain while trying to make up his own instrument approach in IFR weather, a third runs off the end of the runway by overloading his airplane or disregarding his computed takeoff data.

This last one can still be seen in many flight planning rooms any day in the week. This clown will spend the better part of an hour figuring performance figures to jot down on his checklist. He explains that this protects him in case "anything should happen." Then he taxis out, lines up with the runway and jams on full throttle, hoping that his crate flies before the runway runs out—just like in the "old days." No reference at all to the performance figures he has computed!

Why? It has been called poor judgment, poor technique, pilot error . . . put any label you want on it but what it really amounts to is that a small percentage of our people are only paying lip service to the flying safety program.

Here are some typical examples:

Take the aircraft commander who skips all or part of the walk-around inspection to make a takeoff time good, or the instructor pilot who tells his student that the lineup check is completed when it really isn't, but he's in a hurry to get back upstairs into the cool air, or the eager beaver who wouldn't hear of aborting a mission in spite of low torque readings at Decision Speed.

There are many examples I could go through, but you've come across these "vacations from good judgment" if you've but a few months' flying experience.

In the cockpit, there is always the pressure of time. Quick decisions are a must. But most decisions are made for us in the Dash One or the appropriate standardization manual. All that is necessary is that we know our "bible." To my mind this is the big difference between the non-professional and the real aircraft commander.

We have another hazard at the supervisory level. In recent years, because of the increased reliance on stereotyped instruction, grading and evaluation, and because of the increased dollar consciousness, we are developing some of the following types:

- The operations type who sends off a 27-ship formation in marginal weather because he "just has to fill in those squares on the training chart before an inspection."
- The operations officer who reprimands one of his aircraft commanders or instructor pilots for not flying through a severe weather area to get his airplane back on time. Almost every issue of every safety magazine printed has one or more articles on the foolishness of blasting through a squall line or even small thunderstorms, but this makes no impression on the "boss man."
- The commanding officer who unofficially criticizes the instructor pilot who sat down at an outlying field when it became necessary to cage one while over the field. The commander argues that the home field was only 30 minutes away and,

after all, "the bird could fly all day on one engine. Look at all the expense and overtime that could have been saved." I wonder how sympathetic he would be if the IP tried to make it back and creamed the aircraft? Mission accomplishment is a fine thing but it should not be allowed to color the pilot's judgment. Nor should pressure be applied to sway his decision. No matter how realistic an exercise is, it is still a peacetime operation. In fact, even in time of war, I wonder whether it would be better to abort the mission and have the airplane and crew available for another day, or to send them out and lose them! There are many more examples that could be quoted—and I can't entirely blame the supervisory types I've described. They can't do anything about the pressures from above!

In spite of the examples described, I've never come away from a mission briefing without hearing the mission commander say, with great dignity, "flying safety will not be compromised under any circumstance."

If that isn't lip service then I don't know what is!

"So what's the answer?" you ask.

The answer lies with every one of us who wears the shield on his wings. Remembering always that there is no peacetime mission that can justify the loss of a ship or crew, because of cutting corners or bending regulations. We can base our decisions on what we know to be sound judgment.

Learn to overcome "get-home-itis" and "I can always go 100 lower than minimums." Recognize the fact that you, the pilot, are the ultimate deciding factor in the conduct of the flight. Use your prerogatives. Only you know your own limitations. Only you will answer to the Chief Pilot "up there" for the lives you take with you through irresponsible decision making.

Do these things and maybe in another quarter century you will be writing articles, advising young tigers in matters aeronautical!

I'll be reading them on an RON on some far off asteroid in another galaxy (an expression I got from my son).

How do I know I'll still be around?

I know because I fly by the book —do you? ☆

TAX's

ACCIDENTS, INCIDENTS AND ALMOST . . .

▶ FOR LACK OF A BRIEFING. Primary cause for this major accident was levied on the pilot for the straightforward reason that he landed at an incorrect and unsuitable airfield. But consider how improbable this accident would have been had not the following discrepancies also existed:

The crew had not been given a route check into the area.

Neither the crew nor the mission commander had been properly briefed on the mission.

The mission commander failed to closely review pre-planned crew scheduling and route check accomplishment.

Adequate aircrew folders had not been provided for the aircrews.

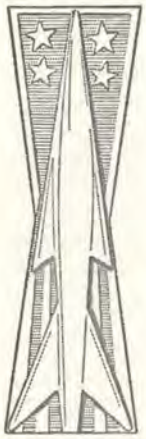
▶ FUEL FUMES IN KC-97s. Fuel fumes were noted in the cockpit shortly after the KC-97 had taken off. The mission was aborted and the aircraft landed without incident. A check of the aerial refueling system disclosed cracks in the drain tube assemblies. Most probable cause was freezing of moisture which had collected in the lines, causing expansion and subsequent cracking of the fuel lines.

▶ BIRDS' RUNWAY. Shortly after unstick and prior to gear retraction, a KC-135 flew through a flock of young seagulls, killing an estimated 40 birds. One or more were ingested into the Nr 2 engine, causing momentary torching, but no loss of power. All copilot's and navigator's airspeed indications were noted to be fluctuating and reading incorrectly. Fuel was dumped and the aircraft returned for landing. Nr 2 engine was changed due to severe bending of inlet guide vanes. The right pitot mast was bent and dented and numerous small dents were found on the leading edge of the wing.

Local procedures now include a physical check of the runway each day after sunrise and prior to the first takeoff.

▶ SLOW SUPERSABRE. At 4500 feet, 350 knots, on a night training mission the F-100 experienced what the pilot interpreted to be a power loss. But a check of engine instruments showed everything to be normal. Just to be on the safe side, he decided to land at a nearby AF base. Upon landing he discovered that his drag chute had deployed during flight. The drag chute canopy was fully blossomed and none of the risers had failed, nor did the chute show any signs of being burned. The coupling, which the books say will shear at airspeeds above 180 knots, still held at 350 knots.

▶ SIDEWAYS FLIGHT. At 5000 feet, when speed brakes were opened, the F-106 pilot heard a loud noise, the nose veered right and the airplane slid left. Speed brakes were closed immediately. Flight was normal. Another F-106 was contacted and came alongside. Again the speed brakes were opened. Chase noticed that the right brake came open, but the left remained closed. Hydraulic fluid was noted to be coming from the speed brake area. Speed brakes were closed. A seven and one-half inch crack running the length of the extended port of the actuator was found after landing. ☆



MISSILANEA

CRITICAL PERSONNEL PERFORMANCE—It seems that every organization has its share of "devil-may-care" characters. They chance injury and even death at every turn and go on laughing. That is, until they get caught in a squeeze.

Take the example of the airman who was to be suited in protective clothing for a hazardous area task. Contrary to all tech data and standard operating procedures, less than the required number of people were used to do the job of suiting the man. No check-out of the air supply valves was made, no communications system check-out was accomplished and, after suiting, the supporting personnel failed to remain in the stand-by area to assist the man in the suit in case of an emergency. Results: The airman in the suit had no communications capability; he experienced difficulty in breathing and left the hazard area in the wrong direction. He failed to pop his face mask or unzip the suit and was found in the shower room in a dangerous state of exhaustion.

What does this point out? HUMAN ERROR.

How does one cope with this? TRAINING.

Management must maintain adequate supervision, assure that personnel are properly trained, and emphasize the importance of abiding by published directives.

Lt Col J. F. Smejkal, Directorate of Aerospace Safety

TORN TAIL—It was 0845 on a rainy morning. The sky was overcast and the wind was blowing at 18 knots, gusting to 27. Visibility was reduced. The temperature was 53° F. It was not exactly picnic weather and certainly not the type of weather conducive to safe operations.

Due to launch site construction, spare Mace missiles were being stored temporarily in earth-covered aircraft shelters which can accommodate six missiles. These shelters have sloping walls with large, exposed brace beams. One of the three missiles already parked was 12 inches off position, thus restricting the parking of additional missiles. Spotters were properly positioned, but while the fourth missile was being backed into the unlighted shelter, the horizontal stabilizer assembly was forced against a brace beam of the shelter, causing a 15-inch tear, six inches from the tip. As the tear exceeded the criteria for repair, the damaged component had to be replaced.

Primary cause was supervisory error in that the crew chief failed to stop the operation when adverse weather warranted it. Contributing cause factors were: (1) Previously parked missile not properly aligned. (2) MM-1 truck is difficult to maneuver in close quarters because of the high RPM required for adequate power steering and resultant lurching of the vehicle. (3) Lack of intercom between crew chief, spotters, and MM-1 operator. The high RPM of the MM-1 trucks creates about 100 decibels of noise which makes voice communication almost impossible. (4) Lack of painted guide lines to indicate correct position for parked vehicles. (5) Prevailing weather which caused the interior of unlighted shelter to be very dark.

Action taken or contemplated: (1) Guide lines will be painted. (2) Maintenance supervisors and crew chiefs have been cautioned against attempting operations during adverse weather conditions. (3) A study will be submitted to WRAMA recommending replacement of some MM-1 vehicles with modified M-series semi-tractors for maneuvering in close quarters. (4) The installed translauncher intercom system is being studied for possible use between spotter, crew chief, and operator positions. (5) The number of missiles stored in each shelter will be limited to four.

This mishap points up the need for continuous vigilance of activities that deviate temporarily from the normal pattern of operations. Supervisors and crew chiefs should analyze each new operation to be performed and insure that any threat to safety is eliminated or minimized.

Where high noise levels restrict voice communication, the use of standard hand signals is recommended. However, if you can't see or hear each other, common sense dictates that the operation should be delayed pending arrival of a more favorable environment.

Lt Col John A. Worhach, Directorate of Aerospace Safety

SECURITY LIGHT RESET—LCC. During a recent test exercise it was noted that the Outer Security Violated and the Inner Security Violated warning lights on the Missile Status Indicator Panel of the Launch Control Console could be reset by depressing the display selector pushbutton only. This appears to be at variance with the technical manual which implies that both the Security Reset button on the Alarm Monitor Panel and the display selector pushbutton must be depressed to extinguish these lights.

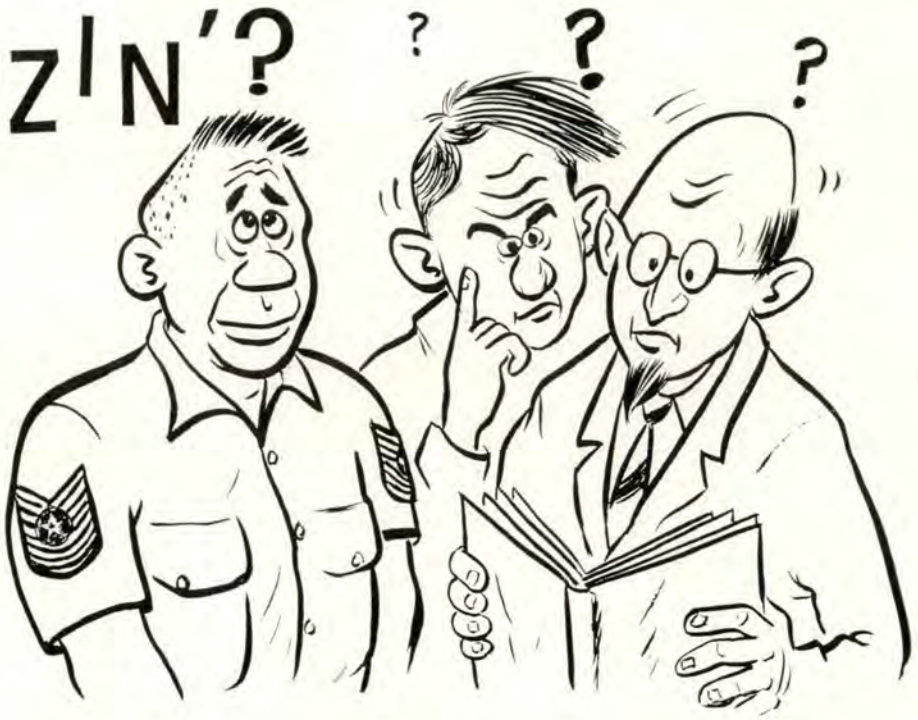
An examination of the circuit reveals that the lamp-driver circuit is so designed that a loss of SCN common, which occurs when the display selector pushbutton is actuated, can allow a clock pulse to reset the lamp-driver flip-flop, thus extinguishing the Inner and Outer Security Alarm indicators.

Use of the display selector pushbutton alone for reset is not detrimental to the equipment. The important thing is for users of the system to recognize that reset on the single button is normal and is not an indication of a malfunction. A technical manual change to reflect this has been recommended.

Minuteman Service News, Boeing Aero-Space Div

Lt Col John L. Anderson, Directorate of Aerospace Safety

CONFOOZIN'?



We're always pounding you troops on the head to use tech orders. So, the other day when we were confronted with a pretty important problem, we quite naturally went to the tech order to look up the answer. (Good idea to practice what we preach, you know.) No sweat, we figgered. All we gotta do is turn to the proper section and read the answer. Oh, it might take a little thought and some interpretation, but the essentials are all there. Whoa! Wait a minute—better make sure we've got the right section—wouldn't want to quote the wrong section or checklist, or otherwise we might destroy the image that we safety troops have struggled to build as "experts" in all matters. Here's how the sentence on applicability reads:

"This section is used to verify the warning and alarm system readiness only in event of a malfunction of a related system during launch control system to standby . . ."

Now, that sentence may be pretty straightforward to you, but it didn't make much sense to us. We thought we had the thread of it for a minute, until we began to flounder on the part about a "related system." (Aren't all systems related? Maybe they're talking about another weapons system!) By the time we got to the part about ". . . during launch control system to standby . . ." we found ourselves going under for the third time.

Well, we thought, this is a fine kettle of fish! First time in months we've been stumped by a tech order, but by George, we're having trouble reading this one! Must be out of practice, eh? Hopelessly confused as to whether or not we should use this section, we decided to consult some of our college-trained engineering friends and ask them to explain its meaning. Noting the puzzled looks on their faces, it wasn't too long until we became convinced that they weren't any smarter than we when it came to reading. A little head-scratching on the part of several others soon made it pretty clear that the problem was not really the intelligence level of the reader. The sentence was just extremely difficult to understand.

Now, we don't want to keep kicking a dead horse and we certainly don't intend to make a federal case out of this particular sentence. If it makes sense to you—fine! Please explain it to your buddies. But, it didn't make sense to us and we're still not sure as to when we're supposed to use this section. Our only reason for bringing the matter up is to serve as an example that not all of the people who use tech orders fully understand all of the words. (We have a sneaking suspicion that not all of them are in our shop!) Even if the reader understands the words, the sentence may be meaningless and confusing to him because of the way the words are put together.

So, what's all the fuss about one little sentence in one small section taken from reams and reams of tech data? And, furthermore, what does all this have to do with safety? Simply this—if we must use tech orders to operate and maintain Air Force equipment (and we must!)—let's be absolutely certain that all the troops understand precisely what, when, and how they are supposed to do a given task. If they don't understand what to do and when and how to do it, and in the process they happen to fracture the bird, that would be an accident; but, when the old man finds out that the accident could have been prevented, he may in turn fracture the responsible supervisor's career—and that wouldn't be an accident!

If you really want to save the birds (and perhaps a career or two—one of which may be your own), you might find it lucrative to deliberately browse through the tech orders on your "related systems" to make sure they are readily and easily understood. If they don't make sense to you, the chances are real good that they won't make sense to someone else. Once you're convinced that the fog count is much too high for clarity and complete understanding, then make out an AFTO Form 22 and send it in.

Now, if you'll excuse us, we've gotta fill out a form. Let's see now—how do you spell confoozin'? ☆

Aerobits

BACKSTOP PAYOFF—Here's a case where a backup barrier system really paid off. At 175 knots, after nosewheel liftoff and as the F-100 was becoming airborne, the windshield fogged over.

Abort!

Drag chute was deployed, then the tail hook released. The hook first touched the runway 336 feet short of the BAK 9 cable. Due to the fact that the pilot was riding the exact centerline of the runway, and there were irregularities in the surface of the thermo-plastic centerline paint, the hook bounced just before reaching the cable. The hook struck the cable slightly above cable centerline, one inch left of a rubber donut, and failed to catch. Pilot confidence in cable engagement led to a delayed decision to jettison external stores until too late.

The aircraft successfully engaged the MA-1A barrier with the gear at approximately 100 knots. The tail hook also engaged the MA-1A adapter cable, but the entire restraining force was borne by the primary cable around the main gear. Engagement was 20 feet off center with only slight swerve encountered with chain pickup. Run-out extended 1150 feet past the end of the runway and both chains were pulled their entire length. Damage was limited to a small fairing panel and wiring on the nosewheel strut plus badly worn tires.

Suggestions: Don't abort at such a critical point when adequate viz can be maintained through the canopy. when instrument flight can be made or when control can be passed to an IP. Properly purge vent system and preheat canopy and windscreens. Don't drag hooks on centerline stripes. Paint runways with smooth paint.

AN F-104 MIRACLE

Two F-104B pilots were engaged in flameout landing practice. After a low approach the gear failed to retract. At this time the pilots chose to leave the gear handle down with the gear indicating down and locked, and commence practicing standard SFO patterns, using AB to get back to the appropriate SFO altitude. The next pattern appeared good at the low key. At the 270-degree point the front seat pilot felt he was too far out and decided to turn short, angling in toward the runway. Both pilots still felt the positioning was satisfactory. At approximately 500 feet above the ground the front seat pilot decided sink rate was excessive and advanced throttle to full military power. Both pilots noted 230K right after power advance.

With sink rate still excessive, the pilot anticipated hitting short and rolled the wings level. About 10 or 15 seconds after the power change, the right tip tank and main gear struck the ground almost 500 feet from the end of the runway. The right main gear failed upon impact. The left main and nose gear then collapsed and the aircraft skidded almost 2600 feet before stopping.

Immediately after initial contact with the runway the pilot in the back seat intentionally ejected himself. The floor of both cockpits rapidly disintegrated during the skid and caused initiators in the front seat ejection system to fire, pulling the pilot's feet into the seat stirrups and ejecting his canopy. The seat itself did not fire due to the binding of the right leg guard on the right lower console, thus preventing rotation of the torque tube.

As the aircraft slid to a stop, fire broke out below the rear cockpit and in the left wheel well.

The pilot in the front seat stopcocked the throttle and tried to get out of the aircraft. Before he could do so it was necessary to pull the cable cutter lanyard over his right shoulder. This done, he departed the aircraft without further difficulty, noting for the first time that the rear cockpit was empty.

The pilot in the back seat landed safely 1591 feet from the initial contact point and ran to join the other pilot.

Neither pilot received injuries other than minor abrasions in spite of the fact that the pilot in the back did not have his zero lanyard hooked.

This accident emphasizes again that there is no room for the pilot to err, particularly in an exacting maneuver such as a flameout landing. Probably one outcome of this accident will be a Dash One revision making the A model flameout airspeeds compatible with those of the C model to provide a better margin of safety.

It is not our position or desire, to place blame or ascertain who was at fault, but rather to present enough factual information to enable the reader to realize the seriousness of emergencies of this nature. However, it appears appropriate to recall that, over the years, it has frequently been not the failure of a single component, but the desire to continue the mission in the face of a component or system failure that has led to trouble.

In peacetime operation it makes sense to put the bird on the ground, get it fixed, then continue the mission.

Lt Col Frederick C. Blessé, Directorate of Aerospace Safety

DISASTROUS DESCENTS. Look back several years in the accident history of the F-102 and you will discover many problems associated with the operation of the aircraft. Many of these problems have been

resolved; others appear on an intermittent basis and some problems continually occur with almost certain predictability.

Among the latter, one of the perennial problems involves aircraft descending below the glide path on final approach. A significant factor of these losses is the consistent frequency of occurrence.

September 1957: During final approach the F-102 struck a telephone pole 1870 feet short of the runway . . .

August 1958: During a GCA the F-102 descended below the glide path and contacted the tops of trees . . .

June 1959: During a GCA the F-102 descended below the glide path and contacted the ground 75 feet short of the runway . . .

May 1960: During a GCA the F-102 descended below the glide path and contacted the ground 300 feet short of the runway . . .

February 1961: During a GCA the F-102 descended below the glide path and contacted a fence 450 feet short of the runway . . .

December 1962: During a GCA the F-102 descended below the glide path and contacted the tops of trees one and three-fourths miles short of runway . . .

April 1963: During a GCA the aircraft descended below the desired glide path and contacted the approach lights . . .

Pilot experience in these mishaps ranged from a low of 500 hours to over 2000 flying hours. All pilots had full power available, all flight instruments were operating properly, and there were no flight control malfunctions. Amazingly, none of the pilots was injured.

Although some of the mishaps involved supervision, weather, and other factors, it was the pilot, in all instances, who permitted the aircraft to deviate from the glide path.

Inexperience, anxiety, and complacency are overworked terms in an attempt to account for mishaps of this sort; for the possible consequence of permitting an aircraft to descend below the glide path is as obvious to the fledgling as it is to the eagle. Yet if history repeats itself, we can anticipate a similar F-102 accident during 1964.

To rebrief pilots advising them not to fly below the glide path, is hardly the answer. It has not worked in the past; it insults the intelligence of a professional pilot.

There is no simple solution to this problem. No one magic action or monumental directive will eliminate this type accident. The course of action rests with each pilot; for the repetitive history of these mishaps leads to an almost certain prediction that at least one pilot, during 1964, will fly an F-102 below the glide path and have an accident.

The intent of presenting this information is to remind you, as a pilot, of this perennial problem. Perhaps the knowledge gained by an awareness of past experience will place this problem in a perspective which is close to home. If it does, we may succeed in eliminating this type mishap during 1964.

Capt Vernon G. Knourek
Directorate of Aerospace Safety

DOUBLE TROUBLE—At 9000 assigned, in a congested area on the east coast, pilots of a C-123 spotted a jet transport on a climbing, left turn collision course. They turned left and pulled up and noted the conflicting aircraft to level momentarily and pass 500 feet below and 1000 feet in front. As the pilots of the C-123 had been advised their aircraft was on Center's radar, they queried as to the reason for the near collision. Center reported that the jet had taken off from a nearby field and the pilot claimed not to have been above 8000 at the time of the incident. Within thirty minutes, and after Center had called a target, the C-123 pilots again took evasive action to avoid another transport that appeared to be on a collision course.

C-123 INFLIGHT FIRE. Runup and takeoff of the C-123 were normal. After takeoff the nose gear failed to indicate up and locked. As the pilot recycled the gear the tower advised that the Nr 1 engine appeared to be on fire. There were no indications of fire from the engine fire warning system at this time. A visual check by the flight engineer confirmed the tower report. At this time the fire warning system T handle did light up. The engine fire inflight procedure was carried out and the aircraft circled to land. The fire was seen to die down, but smoke continued from the accessory section. Upon landing the fire flared up again and had to be extinguished by the crash crew. The fire resulted when hydraulic fluid was sprayed in the engine accessory section from a rupture of the hydraulic pressure hose on the outlet side of the engine driven hydraulic pump.

Aerobits

T-29 CONTROL SURFACE LOCK. During take-off roll, after directional control was transferred from nosewheel steering to rudder, a minor correction was attempted; however, the rudder was locked. The take-off was aborted and during the last part of the rollout the rudder reacted normally. A high speed taxi check was accomplished and all control movements checked from the cockpit. The aircraft then took off and the flight was normal. After the flight, the controls were locked and unlocked several times. The rudder would stay locked intermittently in the unlocked position.

Investigation revealed the locking pin to be broken at the first gear serration, and the top of the pin was lying on the floor of the fuselage.

This malfunction could have resulted in the loss of the aircraft and crew. Any binding or unintentional locking of controls should be thoroughly investigated by qualified maintenance personnel prior to further flight.

Lt Col James F. Fowler,
Directorate of Aerospace Safety

THE YAT-37D. Two twin-jet YAT-37Ds, combat version of the T-37 primary trainer, have been turned over to the Air Force by Cessna Aircraft Company. One of the aircraft is at Edwards Air Force Base where it is undergoing a 22-week flight evaluation by test pilots at the Air Force Flight Test Center. The YAT-37D has General Electric J85/J2 engines that produce twice the power of the trainer version. The aircraft is designed to operate out of short, unimproved strips and can carry up to 3000 lbs of armament. Special features include wing tiptanks, under-wing 100-gallon drop tanks, cockpit armor and an electronics package for communication, navigation and target acquisition.

OBSTACLES—Perhaps pilots don't need a reminder that "when you're on the deck you'd better check." But now and then something reaches up and grabs some luckless soul, hence the following:

The pilot of an F-104C was on a low level mission about 500 feet above the ground at around 425 kts. When he saw a high tension line tower ahead on the left he added power and began a pull-up. He didn't quite make it. The cables shattered the windscreen and did other assorted damage. The pilot's mask was torn loose and he received facial injuries but he kept his head and called for help. Another pilot joined him and led him in for a successful landing. Damage consisted of a bent refueling boom, windscreen and side panels shattered and their metal supports bent, canopy glass broken and other damage to the canopy, damaged nose gear doors, small part of left leading edge flap broken out, hole in the top of the left drop tank.

There's a joker on those power lines that may not be common knowledge. The big lines you see sagging down between towers carry the juice—usually 220 KV. Up above them, taut, smaller, and harder to see, is a ground line known as the skyline. Possibly this pilot failed to see the skyline and drove into it while avoiding the bigger power lines. Remember that little joker on top!

RANGE ESTIMATES—Several Air Force pilots on duty with the Federal Aviation Agency's National Aviation Facilities Experimental Center (NAFEC) at Atlantic City, N. J., took part in recent flight safety research studies being carried out for the FAA by the Applied Psychology Corporation. One of the series of studies investigated the role of pilots' range and altitude judgment in midair collision prevention. Conclusions, based on laboratory experiments, F-100 flight simulator studies, and a program of flight tests, were that:

- Pilots tend to overestimate the ranges of aircraft relatively close to them, and to underestimate the ranges of those farther away. (Misjudgment of the range of a nearby threat can engender complacency.)

- Pilots are generally imprecise in their judgments of altitude, and somewhat better in judging relative altitude in gross categories. (Unaided altitude estimates were poor but pilots could accurately judge whether other aircraft were above, level with, or below them.)

- A considerable improvement in pilots' ability to estimate the range of observed aircraft can be realized through training. (Pilots received both air-to-air and ground-to-air training by the "immediate knowledge of results" method of training.)

- Pilots should gain range estimating experience by estimating and verifying ranges as a personal aid in evaluating collision threats. (Individual accuracy differences are large. The most experienced flyer was the most accurate in daylight, but not at night. Do-it-yourself training can consist of your comparing your estimate of the range of visible traffic with that reported by radar advisory.) ☆

Col Leslie O. Peterson (Ret.)
Applied Psychology Corp.

WELL DONE

TSgt. Elmer F. Schilling

433 TROOP CARRIER WING, AFRES, KELLY AFB, TEXAS

Technical Sergeant Elmer F. Schilling, a loadmaster in the 433 Troop Carrier Wing, AFRES, Kelly AFB, Texas, distinguished himself through personal bravery in aerial flight and extraordinary achievement under extremely hazardous conditions on two occasions within a 35 day period.

The first incident occurred on 5 August 1963 during Exercise Swift Strike III. Following loss of an engine, six minutes from the drop zone, the C-119 was unable to maintain altitude and it was necessary to salvo the heavy equipment load. With complete disregard for his own safety and at great personal risk, Sergeant Schilling worked in the open cargo compartment of the aircraft, removed all restraints on the heavy equipment and armed the load for jettison. This was accomplished in an extremely short period of time. He then stored all loose equipment in the cargo area until ordered to return to the cockpit because of the impending crash. After the crash landing, he assisted in freeing the other crewmembers from the wreckage, in spite of a badly dislocated shoulder.

Sergeant Schilling returned to flying status on 6 September 1963. Three days later, on 9 September 1963, when he was participating as loadmaster on the heavy drop mission in the Troop Carrier Competition at Clinton County AFB, Ohio, the C-119 developed an engine malfunction on takeoff and the pilot attempted to return to the base. An emergency was declared and Sgt Schilling was told to prepare the 3490 pound load for jettison. Again, at great personal risk and complete disregard for his own safety, he left his seat and worked in the open cargo compartment of the aircraft, releasing all tie-down shackles and armed the extraction parachute on the heavy load. This was accomplished in less than one minute, under extremely hazardous conditions with the aircraft steadily losing altitude and flying at less than 600 feet. He notified the pilot that the load could be salvoed, secured all loose equipment, and returned to his seat after giving the two passengers additional instructions as to what to do in event of crash landing. About 60 seconds later the load was jettisoned successfully and the aircraft crash landed. After the crash landing, he assisted the passengers from the aircraft.

In each of the above instances, had it not been for Sergeant Schilling's thorough job knowledge, quick action, and cool thinking under duress, severe injury or loss of lives would have resulted. This airman's reactions during inflight emergency situations are exemplary and reflect great credit upon the Air Force, the Air Force Reserve, and his unit of assignment. ☆

My thoughts

FOR A SAFE FLIGHT

1. I am physically, mentally and aeronautically prepared for the flight involved, a flight which I know will be in keeping with safe and approved operating procedures.

2. I know the safe operating techniques of my aircraft, and I shall make every effort to assure that my aircraft is in a good state of airworthiness.

3. I know my own limitations.

4. I will maintain the highest degree of vigilance throughout the conduct of my flight, being always mindful of the risk to human lives and property while I am at the controls.

5. I know the performance capabilities and limitations of my aircraft and have studied and reviewed all applicable emergency procedures to the extent that I can perform them under the pressure of any emergency.

6. I have a thorough understanding of existing weather conditions in my area of operation, and I have given considerable thought to alternative actions should there be an unexpected change in the weather conditions while I am airborne.

7. I will stay "ahead of my aircraft" and be in control of every phase of the flight.

8. I will make a precautionary landing as soon as possible, when any condition or occurrence causes me to deem it inadvisable to continue my flight. Unfavorable weather conditions, unfavorable wind conditions, a fuel state lower than that consistent with safe flight planning, a condition or discrepancy in my aircraft or powerplant that I do not understand, shall be predetermined conditions for discontinuing the flight.

9. I will always keep in mind that the flight does not end until the aircraft has been brought to a stop and the engine(s) shut down.

10. I will make appropriate notes and discuss with appropriate persons any mistakes or errors in judgment pertaining to my flight even though they may have been unobserved by others. This action may benefit other pilots or disclose an area for improvement in my piloting ability.

CIVIL AERONAUTICS BOARD BUREAU OF SAFETY

☆ U. S. GOVERNMENT PRINTING OFFICE: 1964—701/214/7