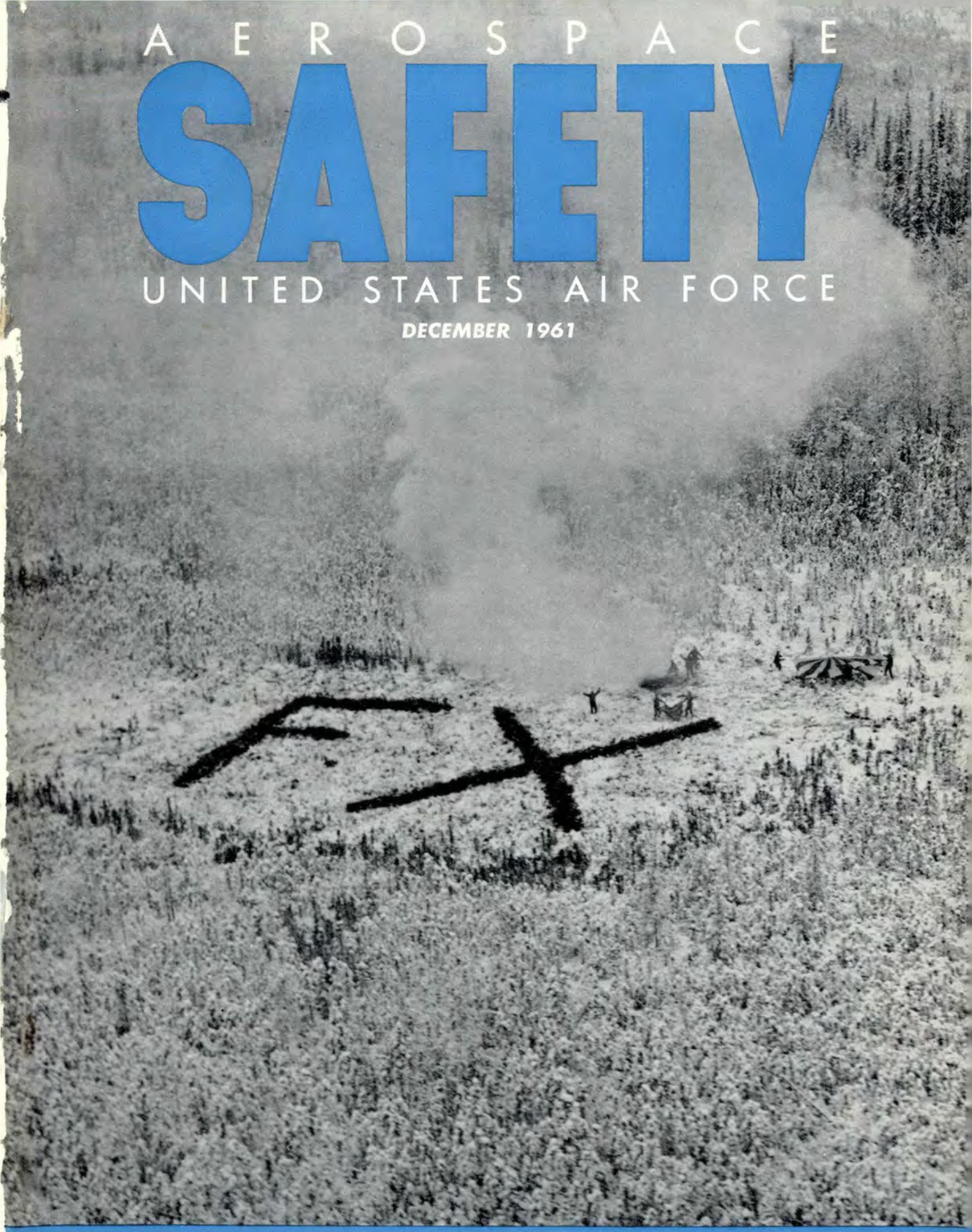
AEROSPACE

SAFETY

UNITED STATES AIR FORCE

DECEMBER 1961



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PAGE TWO

HOLIDAY MESSAGE ★ ★

One of the most tragic aspects of looking at accidents in retrospect is reflected in the oft-made remark that begins, "If he had only . . . " The next words in the sequence are usually "waited, checked, turned back, listened, remembered." There are many of these.

Of course, had the victim been convinced that the accident could happen to him, even that it might happen to him, there is a good chance he would have "waited, checked, turned back," or whatever was appropriate in his particular case.

I believe this is one of the great unsolved areas of accident prevention. We haven't been able adequately to sell the fact that accidents don't always happen to the other guy; what makes good safety sense for someone else also makes good safety sense for YOU AND ME.

Fortunately, there is an excellent safety precedent we can all follow. Just before Labor Day of this year General Power, the Commander of SAC, in a message to all his commanders, called on them to use every means available to assure that their personnel were made aware of their ". . . responsibilities for exercising mature judgment and extra caution in all their activities during the Labor Day weekend."

His concern and the actions taken by all SAC commanders were rewarded by having no fatalities among SAC personnel from ground accidents during the Labor Day weekend. Considering the worldwide scope of SAC operations, that was indeed a remarkable accomplishment and one that the entire Air Force can set as a goal. This accomplishment, to me, is an example of real command leadership.

I bring this matter up at this particular time for a very specific reason. Soon we will be celebrating the Yuletide Season. Some of our thinking is already devoted to plans for this occasion. Many will gather with friends and relatives, some traveling comparatively long distances for this purpose. The temptation to let our thoughts dwell on the pleasures of the season is great. There is a temptation, too, to relax our normal attentiveness, to not abide as closely to stringent practices we know are for our welfare. These temptations appear in many forms, and they are hard to ignore. Some are comparatively harmless—we eat more rich food than usual. Others have the most serious implications—we press on over slippery roads when we are sleepy, or we take off, victims of a gigantic case of "Gethomeitis."

Even our most routine duties are subjected to a higher accident potential than normal. You may have your mind completely on the job at hand, but the pilot overtaking you, or the driver of the car approaching from around the next curve, may be completely absorbed in anticipatory thoughts of the season. The man who services the airplane and the man who adjusts your brakes may not be as meticulous as usual. Your best safety assurance is to be alert to just such a possibility and be doubly careful. By the same token, if your job is to service aircraft, adjust brakes, or provide any other support service, give a little extra as your seasonal contribution; you may just save some pilot's or driver's life.

Traditional, too, with the holiday season, is the policy of providing as much time off as can be afforded. Supervisors are encouraged to support this policy, but are reminded that the work force must still be sufficient to provide safety to those operations that will have to be conducted. The pilot making an approach on the 24th of December needs every bit as much assistance as he requires the other 364 days of the year; possibly even a bit more.

One of the temptations I face is to suggest that everyone relax and have a good time over the holidays. As to wishes for joys of the season, these I extend most heartily; as to relaxations from our responsibilities, these I dare not suggest. I am convinced that those who are to enjoy a happy new year must remember that safety takes no holiday. ★

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

IN THIS ISSUE

COLONEL
WILL L. TUBBS
(RETIRED)

We reluctantly take leave of Will L. Tubbs, "Mr. Ground Safety for USAF," who recently announced his retirement to be effective late this year. His long and distinguished career as a dedicated public servant began early in World War II (1943). At the direction of General "Hap" Arnold, Colonel Tubbs assumed responsibility for the development and direction of the USAF Ground Safety Program. He has served consecutively, except for two years, in the capacity of military and civilian director of the program from its inception to the present time.

For his outstanding World War II record he received the Legion of Merit, Commendation Medal with Oak Leaf Cluster, and other campaign and service honors. In 1955 he received the Air Force Commendation Medal for meritorious civilian service followed in 1957 by a Department of Defense Exceptional Civilian Service Award. Last October he received the Federal Safety Council Award of Merit signed by the Secretary of Labor.

Under his leadership, ground accidents have been reduced with a substantial savings in men, materiel and money. His achievements in accident prevention have gained the Air Force national recognition. From 1949 through 1960 the Air Force consecutively won the coveted National Safety Council's "Award of Honor," a record unmatched in the Federal establishment. In 1957 President Eisenhower conferred the President's Safety Award on the Air Force "in recognition of outstanding advancement in accident prevention among its employees." The President conferred a similar citation in 1959. In recognition of the Air Force safety program to combat the critical highway accident problem, the National Safety Council has for the past three years presented the Air Force with a "Traffic Safety Citation Award" for "outstanding contributions to the prevention of traffic deaths on our nation's highways." Colonel Tubbs' driving force was largely responsible for the high level of effectiveness in Air Force accident prevention. Industrial executives, educators, military commanders, and leaders in private and Federal organizations seek his counsel in planning for safety at the national level.

It is with a sense of deep loss that his associates bid him farewell. His outstanding qualities of foresight, resourcefulness and tenacity of purpose, which are measures of his great worth to the Air Force, will be missed. We wish him a full measure of good fortune, health and happiness. ★

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ACAASTS SPELLS

The bunny trail ended right here for Mr. Rabbit. He may taste a little like spruce pitch, but who cares? Aircrewmen are taught how to get food and other techniques of survival in the wild at the Alaskan Command Aircrew Arctic Survival Training School.

SURVIVAL

SMSgt Keith R. Clemmons, Arctic Survival Training School, 5010th Air Base Wg, Alaskan Air Command

A reconnaissance pilot and his observer were returning from a routine mission. At 0725 he radioed for and received landing instructions. He made two passes over the field and disappeared into the ice fog. Due to poor visibility and low ceiling it was impossible to utilize search aircraft so a ground search party was dispatched. At 0935 they called in to report that they had found the plane several hundred yards from the end of the runway upside down with both occupants dead.

The most important information, in regard to the survival aspects of this crash, lies in the report of autopsy rendered by the medical officer. "The pilot apparently did not die instantly, he possibly lived for 30 minutes after the crash." The report goes on to state, "the pilot was not dressed for cold weather flying."

Another, but more recent story, tells of a pilot taking off from a Distant Early Warning Site and shortly afterwards having engine failure. He set his plane down on the frozen tundra and both he and the plane were unhurt. He had an Air Force survival kit but when he opened it he found that certain important items were not there. Food, matches, flares and rifle ammunition were all missing. The equipment that was in the kit was entirely new to him and he had no idea how to use most of it. By some miracle he survived and was ultimately rescued.

These stories and hundreds like them were responsible for the formation of one of the oldest organizations in Alaska. It is the Alaskan Command Aircrew Arctic Survival Training School. The school is located deep in the interior of Alaska, just a short distance from the Arctic Circle, at Eielson Air Force Base. Here the winter temperatures seldom rise above —10° and it is ideal for Arctic survival training. Each year during the cold weather period hundreds of Air Force, Army, Navy and Coast Guard personnel get exposed to "living in the great outdoors." The aim is that if they should have a flying mishap and suddenly find themselves sitting on a pressure ridge in the Arctic Ocean, on a wind swept hummock of tundra grass or high on a barren mountain side they will have the know-how to live and survive, thus not becoming statistics to be filed away under "Unnecessary Deaths."

The school is under the direction of Captain Richard E. Lakey and SMSgt. Keith R. Clemmons, with a staff of "Skookum" and woodswise survival instructors. They have a combined 75 years of Arctic and rescue and survival experience and background.

Flying personnel from all services in Alaska attend the school. In fact it is mandatory that an aircrew member attend the school within his first ten months of duty under the Alaskan Command.

A typical class numbers 40 to 45 officers and airmen. They come from all services and all corners of Alaska and the "lower 48." Last winter an officer from Arizona reported in sporting a beautiful suntan. The temperature at his home base when he departed was +95° and the temperature at Eielson was −42°. A week later when he left for home his suntan had disappeared.

Some think he *shook* it off. Others say his body needed all the heat it could muster and simply absorbed it.

One subject that doesn't particularly fit in with cold weather survival, but one that is considered important, is bailout, ejection and crash landing. The school has a realistic program which includes the main causes of ejection fatalities, use of the parachute, and where and how to crash land.

At the end of the academic phase the student will be familiar with Alaskan terrain, its people, its weather and its problems as pertains to survival and cold weather living. The student is shown how to build a tepee, an igloo, how to catch and skin an animal, and the medical conditions, such as frostbite, that he may have to contend with. Most important, he is shown how to help himself be rescued by building signals which can be seen by search aircraft.

The school feels it is of little value if a downed airman can live through the dangers of a crash landing or bailout and the sub-zero temperatures only to die of starvation because he could not attract attention to himself. Unfortunately, the records of survival incidents are full of such happenings.

Early one morning (after classroom work) as a frozen sun tries unsuccessfully to warm things up, the student finds himself in a wild and seemingly desolate part of Alaska. He has not jumped from an aircraft or hazarded the perils of a crash landing, but he is down in the frigid Alaskan back country. What he does now and for the next two and a half days depends largely upon what he has learned in the past two days. There is an instructor for each six men but he is there to keep them out of serious trouble and to answer questions. He is not there to "do" for the student. Each student, from general on down, cuts his own wood and makes his own camp. The crews build individual shelters and camps the first day and, if they are from a cargo or bomber type aircraft, they will work together as a crew the second day as well. The fighter pilots and light aircraft pilots build and stay in individual shelters the entire time they are in the field.

Under training conditions, safety is always foremost, so before any camp construction starts the instructor will gather up his crew and remind them of the dangers of frostbite, cutting tool injuries, and the steps in building a fire. We are always surprised at the number of people who attend the school who have never slept out or can't even build a fire.

Also while in the field, the crewman learns where and how to set snares, improvise equipment that has been broken or lost or maybe some item that wasn't provided for. He also has an opportunity to become familiar with survival weapons and to hunt that wily swamp ghost, the snow-shoe hare.

One point of interest is the competition among crews in signal construction. Each crew develops a signal and builds it. At a predesignated period, but unknown hour, a Search and Rescue helicopter will fly over and evaluate each signal, if they can find it. The winners receive an air drop of extra food. Normally you can't get a G.I. to eat C-rations under any circumstances, but when he is cold, tired and very hungry the rations taste like a home-cooked meal and the crews will stop at nothing to win the drop.

The aircrewman who believes that he can breeze through the school soon finds that this is not true. A combination of cold weather and extremely hard work all tend to wear down the best of them. The pace is fast moving and not designed for goldbricks. The physical condition of most of our students reflects a soft life and good living. Most of them return from the field swearing that they wouldn't do it again for love nor money, but that they are extremely glad they had the opportunity.

"What would I do if I had to bail out or crash land in a remote area?" It is sad but true that modern man has mastered the miracles of advanced science, such as supersonic aircraft, but cannot keep himself alive when faced with cold, hunger, and loneliness. Do not develop and nurture "not meism" because every time you get into an aircraft you are a potential survivor.

If you have never attended a survival school, do so at your first opportunity and listen to what the instructors have to say. They may not be able to fly that sleek, shiny airplane, but they know how to live in the wildest of country. If the school is worth its salt it won't be a picnic, but it will be ten times easier than a real survival situation. You may say, "I am a good hunter and camper. I don't need to go to a school to learn how to live in the woods." Stop and think a minute though. How do *you* go hunting and fishing? Most likely with a station wagon load of tents, gas stoves, cots, air mattresses, a fancy high powered rifle and modern fishing tackle. Try the same trip with a knife, a piece of wire and chunk of parachute. A survival school will not give you all the answers but it will help.

Learn all you can about your equipment. You probably spend quite a bit of time checking over your aircraft before you take off, but how much time do you spend checking the things that will save your life if

THE AUTHOR

The author, SMSgt Keith R. Clemmons, has spent the majority of his sixteen years of service in Alaska. He first went to Alaska in 1948 and was assigned to the 10th Rescue Squadron. He has proved his woods knowledge by becoming a member of the "Elite Woodsmen of Alaska," a registered, big game guide, and he is President of the Alaska State Archery Association.

the plane fails? Many pilots and crewmen have no idea what they are flying with or even if they have any survival gear. Find out what is in your kit. For all you know it may be packed with old T.Os. Have your personal equipment man show you what you have and how to use it.

Ask your training officer to set up medical lectures and practical application periods. I can hear you now. "I've had medical training every time I've turned around in the Air Force. I don't need any more. I can put on a bandage or splint a leg." But can you? Do you really know how? Can you perform a tracheotomy? Do you know how to give mouth to mouth resuscitation? Can you recognize shock and are you aware of what a man suffering from shock might do after an injury?

Keep current and proficient. Aircraft and ideas change rapidly. So do medical techniques. It isn't all just wrapping up a cut. I am sure that you wouldn't want it on your conscience that a man, a friend and buddy, died because you did not know how to help him. Don't kid yourself! If you aren't sure, find out. A man can bleed to death from a small cut in a matter of minutes.

Don't fly without proper clothing, even if you are only getting in time around the flag pole. The pilot and his observer mentioned at the beginning of this article illustrate this warning.

I realize that many of our jet aircraft today are very limited in space, and heavy warm clothing is too bulky to be worn while flying the aircraft. But by careful manipulation many additional items of clothing and equipment can be added to your kit, parachute, and the clothes you wear.

Arctic Survival School museum features displays of many types of Alaskan game. Below, TSgt Jesse Springer demonstrates survival weapon that will be used by crew in the field.

No matter how or where you go down you must be seen before you can be rescued. Rescue aircraft will find you but sometimes you must put forth a little additional effort to help them. If you didn't land with your plane the problems increase, but it is not hopeless. An aircraft makes an excellent signal but a good ground-to-air signal is just as effective. Symbols have been seen and read from as high as 10,000 feet. Three fires at night marking the corners of a triangle have been seen from as high as 40,000 feet. The same three fires in the day with spruce or pine boughs added to them will emit great columns of smoke which can be seen from great heights and distances. Night flares can also be seen in daylight under certain conditions.

One time while I was hunting on Kodiak Island a pilot came by looking for my camp. The weather was nasty and visibility poor. He had passed over the camp and was turning about three miles away when I remembered a roll of aluminum foil that I had in my pack. I thought it might be bright enough for him to see. I held onto one end and pitched the remainder into the air. The wind caught it and stretched it out. The plane immediately headed straight toward me and landed. The pilot said it looked like the whole shoreline had exploded. This was a dull rainy day. What would it have been like if the sun had been shining? A very effective signal is the mirror in your kit. Aircraft have been drawn from over 35 miles away when they first saw the mirror flash.

If nothing else, walk in a straight line across snow-covered clearings. This is a good sign of man, as animals rarely walk in a straight line. This is also a good point to remember if you are ever in a situation where you want to hide from air search.

You don't have to fly to get into a survival situation. We had an amazing incident near Fairbanks this past summer. A tourist from Kentucky was out enjoying some of Alaska's fabulous fishing and became lost. Searches were mare but to no avail. Finally, after *two months,* he was found. He had lost 90 pounds and was in pretty bad shape but was still alive, having lived on berries and anything else he could find. He said that he remembered reading somewhere that you should drink lots of water; consequently, rose hips, cranberries and lots of water made up his entire food intake. Having lost his fishing equipment he could not catch fish. When found he said that he was about to give up.

Instructors from the school underwent an experiment last winter during which they had *NO* food for five days. Three days prior to the test and three days afterwards their intake was practically nothing so you might say that their intake for eleven days was nil. They built camps, cut wood, and did normal camp chores. They experienced a weight loss and were extremely cold but suffered no other ill effects. The temperature was quite low, hitting —32° one night and averaging about —20°.

We have a saying in the school that goes something like this. "Survival Training may be likened to Life Insurance with one major difference. You are your own beneficiary." ★

Maestro, The Theme, Please

Captain J. B. Knighten, 6139th Support Sq
APO 919 San Francisco, Calif.

The theme of this story is engineering, support and facilities. Immediately, a pilot asks: "what 'n heck has that got to do with me when I'm forty thousand feet up?" The answer is—plenty. Engineering made that missile you're strapped in, support put the white lightning in your tanks that got you up there, and if there are no facilities when that white lightning runs out, you'll be mighty sorry.

"But," you retort, "I'm a pilot. Somebody else has the responsibility to provide the facilities and support. My job is simply to mount this steel horse, spur him in his big fat afterburner and serve hydrogen martinis to our adversaries."

This is a historic fallacy. Modern day aerospace safety demands more than maintenance and operational perfection. The pilot and crew chief are a great safety team, but they're the equivalent of a backfield on this All-American team. They're the ones the spring-legged cheerleaders know by their first names and who get all the publicity in the papers. But they wouldn't move one inch if that massive front line of engineering, support and facilities didn't clear the way for them.

Then you ask, "Why don't you publish this article in some engineering magazine or a construction worker's digest?" The answer to that is that operational and maintenance people have a responsible part to play in our effort to get ESAFE (Engineering, Support And Facilities Excellence).

To begin with, nobody expects you, the pilot or crew chief, to know the coefficient of gravel concrete on a hot day in West Texas. That's not in your job description. If it were, you wouldn't be running around the sky with an F-102 strapped to your behind, kicking rudders and ailerons and yelling "Tally Ho." As a matter of fact, aviation medicine is making some studies, and there is some suspicion that if they can ever teach monkeys to say "Tally Ho," a lot of us pilots are going to be out of a job. But you are smart enough to assess your requirements in terms of the facilities you need to conduct a safe flight. I realize you don't have much say as to whether your field has TACAN, ILS or VOR, but you do have something to say if such facilities aren't operating properly. This means you've got to write down, possibly on the back of your DD-175, the names of all facilities you find not operating properly or that are hard to receive, and bring this information to the base operations officer when you land. Many times, you'll land just as another crew is clearing out over the same route you've flown and your information may decide whether they "buy a farm" or "buy a fifth."

Facilities comes from the Latin word, *facilius,* which means *EASY,* and that's what facilities are designed for: to make it easy for the pilot, and in this day and age it ought to be a pleasure to know that somebody is making something easy for the pilot.

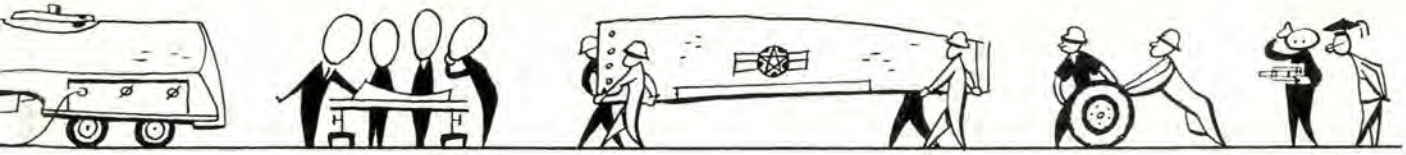
Discuss the facilities with other pilots. Are they being utilized to the best advantage? AACS and BASOPS figure these things out scientifically but when the chips are down and the hail, lightning and turbulence are having a mambo party over the high cone, BASOPS and AACS boys are sitting in a warm shack and you're the sucker who's up there yelling "MAYDAY."

And don't forget those approach lights. Again, you're the astroNUT with two miles of thin air between your jockey shorts and that corn field, not that tower operator. He turned the lights on five hours ago to "Brightness One." Meanwhile, six fronts and seven layers of fog have moved in and they're still on "mode one." Sure, he'll turn them up brighter after you engage the barrier but by that time, there'll be a whole lot of light on you and one set of those lights is going to be the headlights of the base commander's Cadillac. And on my base, when the base commander drives his shiny new Cadillac through all that soggy mud and gets it real dirty going to your accident, you'd better be dead or have proof you didn't "geef" (that's singular for goof). So, have those lights adjusted to make a good landing.

There shouldn't be any need to mention your duty to report objects on and off the runway. This is particularly important after five o'clock because when that five o'clock whistle blows, those eight-to-five types drop their shovels right where they are. Use your microphone, wake the tower operator and tell him about it. He'll appreciate it. It was probably time for his coffee break anyway.

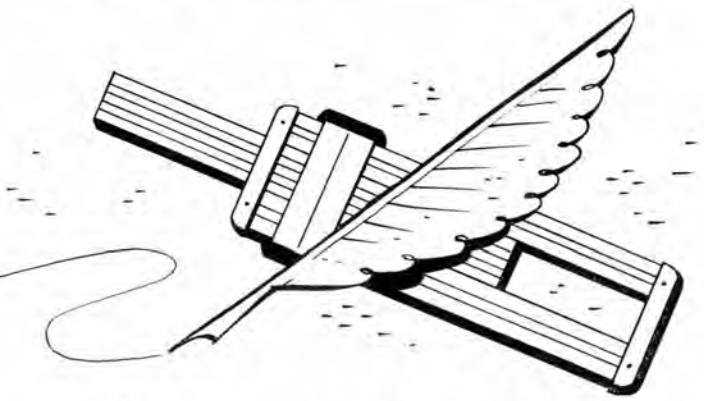
Generally speaking, examine the facilities of the base with an eye for greater safety, ease of operations and increased utilization. Remember, Pentagon planners can plan just so far and then they depend on us, the pilots—the low men on the totem pole—to come up with a suggestion. The suggestion may not be worth a dime, but, at least, it gives some survey team TDY to come out and look at it.

Support! Now, we're getting somewhere. This is Base Operations, Transient Alert, Refueling and In-flight Kitchen, better known as the Four Horsemen of Death. These are known killers. Take In-flight Kitchen. If they should happen to get your food out before you take off, examine it critically and make a report. I can hear some civilian laughing, "I thought pilots drank



their dinner." That may be true back in the States, but overseas, where I am, since they took Scotch off the rack, we have reverted to food. And may I say, here and now, food is an awful substitute for whiskey. Anyway, a hungry man is an inefficient man and we don't need inefficient men running around in outer space in ten million dollar machines. Everytime one of those big machines crashes, my income tax goes up. I can tell how many planes crashed last year by looking at the increase in my income tax. So insist on being well fed when you fly.

But even with your stomach bulging with goodies you may have an inoperative airplane because some guy just drove by in the DDT truck and filled your fuselage tanks. And if you think DDT is rough on mosquitoes and flies, you ought to see what it does to B-47s and '52s. However, it must be said, truthfully, that this refueling problem is almost licked. A man has



to be mighty ingenious to make a mistake under most refueling procedures and, as everyone knows, we have the most ingenious air force in the world. But, more important, observe refueling techniques as you would everything else, with an eye to efficiency and safety.

Transient Alert is probably the most aggravating of all the support sections. At my base, every man in Transient Alert was at one time a master sergeant. One goof and a TSgt, two goofs and an airman basic. In fact, the only way to make tech sergeant here is to come on the base as a master sergeant. Anyway, Transient Alert can exasperate the Egyptian Sphinx, not to mention a pilot, and an exasperated pilot is a dangerous pilot. Here again, take your pencil and write a note to let the base operations officer know what happened and how you'd like to have seen it happen. Then give this note to the dispatcher. Don't wait around for the BASOPS officer or you'll miss your takeoff time. He only comes around on Thursdays.

And since you're in BASOPS, use what they have for you: THAT map, THAT radio facilities chart and THAT bottom half of a computer. Actually, you are about to leave this earth. You don't intend to go very far but whether or not you come back at all may well depend on the information you get from BASOPS. Here again, if there's something you want and can use to make your flight go safely, some other pilot may someday want it too, so make a note but don't give this to the dispatcher. Mail this to the base commander. He'll be happy to get a letter that isn't a fund drive brochure.

The support activities of a base have a tremendous impact on safety. These activities, on the accident report, are usually found under "contributing factors." The pilot or the maintenance man made the big goof, but way in the background, the man who threw the first stone was often in the support unit. Unfortunately, these deficiencies never come to light until the crash. Meanwhile, 50 pilots have been inconvenienced, harrassed, misinformed and scared by some support mediocrity, but returned safely and were so happy to get that aluminum death chair off their backs and get home to see the maid, they forgot to write up the discrepancy. The pen is a strong weapon. It can save lives or it can ruin lives. If you don't believe that last statement, read my OERs. That pen can be more dangerous than singing "Yankee Doodle" in Cuba or it can be as blessed as a power failure on Friday night in Sing Sing. But you've got to use it.

Engineering: Last, but it's actually first. These are the "eggheads" who got you up in the ozone. And once you're up there, you're the blockhead who's gotta' stay up there. Right behind your big head is the Form One. Back in BASOPS are the UR blanks. In your shirt pocket is the government ballpoint pen you stole. Put the three of them together and you're moving towards engineering excellence. The engineers designed that airplane and located the components to satisfy a normal human being. Just why they didn't try it out on a pilot in the first place, I'll never know. But now you've got it and you're the one who's going to be in it, playing tag with a caviar tipped sidewinder. The C-47, which is older than most fighter pilots today, is still being modified. Now, if the engineers haven't been able to make that clunker perfect in forty years, you know how they goofed on that stove pipe you're riding that just came off the drawing boards last week.

Above all this, let us not forget that Engineering, Support and Facilities have their own experts constantly trying to improve things for your safety. Despite this, your two cents worth can be heard and will be heard if you'll just be vigilant. This is not a plea for the military suggestion program. This is a plea for reporting urgent matters. You're a boxer in the ring with three deadly opponents—Support, Engineering and Facilities—and you've got to figure out "how can these guys hit me next?" Then you've got to be ready to block that blow and report it to the world. Because if you don't tell the world, the world will soon find out, but it'll be the Accident Investigation Board that discovers it. ESAFE means *Greater Flying Safety* and that's the aim of this publication and all Air Force components from the Pentagon down to the lowly pilot. Let's do it! Scrutinize, criticize, then journalize. ★

CO-OP

The sky around most Air Force bases is getting a little more crowded every year. The problems created require the cooperation of each airspace user if flight safety is to be maintained.

Three of these cooperative efforts have come to our attention (undoubtedly there are more) and deserve to be passed on for other bases to use as they see fit. They are the South Plains Aviation Safety Council in the Reese AFB—Lubbock, Texas, area; the Montgomery Air Safety Council in the Montgomery, Alabama,—Maxwell AFB area, and the USAF/Civilian aviation meeting sponsored by Williams AFB for the Phoenix, Arizona area.

The Montgomery council dates back to April 1957, when Major Harold W. See, Flying Safety Officer at Maxwell, saw the need for such a group ". . . as a means of promoting better relations between the military and the civil aviation groups and to talk over mutual air traffic problems." (Flying Safety Magazine, Oct 1958)

There were many airways over and around the vicinity of Montgomery. Flying activities in the area included the Air Force at Maxwell, National Guard at Dannelly Field, seven miles away, and numerous commercial and private flights. Obviously, cooperation among the various interests was necessary.

Major See's idea for a council representing all the interests was accepted enthusiastically and has paid high dividends in flight safety and cooperation from the press and other media.

Last spring the first in a series of planned semi-annual flying safety forums was held by the council at Dannelly Field. More than 100 military and civilian pilots plus representatives of interested agencies attended. The event, part of Aviation Safety Week, proclaimed by Montgomery Mayor Earl James, was designed to assist pilots in developing or increasing their proficiency in the use and understanding of the latest flying aids and services available to them.

Colonel L. C. Hess, Reese AFB commander, credits the base flying safety officer with bringing the South Plains Council into being. The first meeting was held June 22, 1959. Since then regular meetings have been held to discuss and solve mutual problems.

The goal of each of these organizations is air safety. Probably the greatest good that accrues is from the close relationships and the mutual respect and understanding established among the participating agencies and individuals. This is considered invaluable.

Membership includes representatives of local government, the FAA, airports, airlines, the military services, weather bureau, flying organizations, state aeronautics officials and the press.

The councils provide a forum for airing complaints, offering solutions to problems and providing educational materials. For example, the South Plains Council provides light plane pilots with maps so they can avoid the Reese traffic patterns, posters illustrating flying areas for each airspace user and best routes in and out of small airfields. They have worked out schedules for crop dusters so that farming areas near the base can be dusted without danger of midair collisions. They advise private pilots of training flights by SAC, TAC and other agencies not represented in the area.

Williams Air Force Base recognized the need for

ASKING FOR

No attempt at fancy preamble this time. This might be likened to epitaph writing—a subject seldom treated lightly.

Witnesses noted sounds of backfiring during takeoff roll. Takeoff was continued. The aircraft crashed, wing low, and burned shortly after lift off. Subsequently, finding of parts of the aircraft that had shaken loose during the takeoff run and fallen to the runway indicated the severity of backfiring.

When malfunctions like these occur there is no recourse but to abort. That planned takeoff time has been exceeded, that the crew had taxied back once because the bird failed to check out, that crew duty time was rapidly running out have no bearing. Rationalizing the accident by dwelling on such matters will not: erase the accident from the record, restore scraps of aluminum into an aircraft, bring back dead crewmembers.

The real lesson we can learn, or rather relearn, from such an accident is that if you don't abide by the established procedures, you're dead. There is no allowance made for such fanciful considerations as, "O.K., go this time because you're out of clean uniforms, but next time be sure to bring more clothes." Yes, it's ridiculous . . . especially when repeated and repeated and repeated.

Here's another. Minimal weather conditions for the VOR approach were 300 feet and one mile. A special observation of "partial obscuration, one-half mile visibility, fog" was passed to an aircraft awaiting takeoff and to one that was inbound. At the time the inbound aircraft reported procedure turn, a special weather observation of "partial obscuration, one-eighth mile visibility, fog" was logged. This information was twice transmitted to the inbound flight. No verbal acknowledgment was received, however the individual who made the transmissions reported a sound over the radio which he thought was a "mike click" after each transmission. Shortly thereafter the captain in takeoff position reported a fire in the approach area. The probable cause (crew and aircraft were lost in the crash and fire) was attributed to failure of the pilot to abandon the approach in adverse weather, and descending to a dangerously low altitude while still a considerable distance from the runway.

Sometimes we're lucky. Example: air aborts and abnormal flight conditions due to flight control problems in a cargo category aircraft represented a serious accident potential. Failure involved known malfunctions of trim actuators, trim switches, elevator balance panels

positive measures to assure flying safety in the Phoenix area and has taken a slightly different approach.

First, specific actions included contacting all agencies using the airspace or having a control function in the area and presenting them with a layout of the local flying area. Other data furnished included:

- Copies of the Williams local traffic regulation and volume figures on air traffic.
- Information about maintaining current NOTAMs and permanent insertions in the Airman's Guide covering training operations.
- Scheduled broadcasts through the FAA of the training operation over key navigation facilities.
- A VFR advisory service available to any pilot traversing the airspace over or around the base, and establishing with FAA instrument training procedures which are under control of Phoenix Approach.

Next, the base sponsored a USAF/Civilian Aviation Meeting which attracted a large turnout of key people from a number of agencies.

The careful planning that preceded the meeting paid off in a smoothly running agenda that covered every conceivable detail from escorts for participants to a flight for each in a T-37. The program consisted of an opening address by the wing commander, Colonel Richard S. Abbey, group briefings, panel meetings, luncheon and an orientation flight.

The objectives, all centering on flying safety, were:

- To develop and maintain personal harmonious relations with joint users of airspace including airline, FAA and other civil aviation officials.
- To thoroughly acquaint these personnel with WAFB local flying area and associated air traffic. This included graphic presentation plus an actual flight covering, (a) traffic pattern and letdown areas, Goodyear and Williams AFB; (b) eastern training complex; (c) instrument training procedures in use—Gila Bend, Davis-Monthan, Chandler; (d) IFR-VFR departures and arrivals.
- To develop a cooperative spirit for a continuous exchange of viewpoints in effectively promoting air safety.

Statements from the bases indicate they are well satisfied with the results of their programs. Comments Major Jack Miller, director of operations, Williams AFB, "... You will recognize the strong foundation we have laid in promoting and perpetuating air safety in this area and as a by-product we have fortified the positions of this base and the Air Force in case a mid-air incident ever occurred. ... Promoting and perpetuating these air safety measures (with the accruing protective position for the base and the Air Force), to me, should be assessed each USAF base."

Colonel Hess feels that the visible accomplishments are the smallest gains. However important, they "do not compare with the feeling of good will, the mutual respect and the understanding that exist between the pilots and ground crewmen of this area, regardless of the equipment flown."

An Air Force base and its personnel and equipment are part of the local community. Cooperation between Air Force and civilian agencies is common. When it concerns airspace and its use by all, it is vital.

(While this article was being prepared a message from the Deputy Inspector General for Safety to all commands urged cooperation with all civilian airport managers and civil aircraft operators to prevent accidents in the vicinity of Air Force bases. Specifically, flying safety officers were urged to brief civilian operators and managers on the hazards associated with flying aircraft through Air Force arrival and departure routes.) ★

ACCIDENTS

and aileron bolts. Most corrective actions involved routine T.O. compliance or installation of parts on an attrition basis. On one day two mission aborts were attributed to excessive aileron flutter resulting from sheared hinge bolts. The aircraft were not modified in compliance with T.O.'s due to late and/or non-receipt of kits. In one instance, kits were on base but had not been installed due to routine classification of TOC. Apparently it is necessary to re-emphasize that serious accidents can occur as the result of flight control malfunctions. When hazards are reported we have taken an accident prevention step. When fixes are provided for we have taken another step. But when we simply don't get around to making the corrections we have nullified to a large degree (and in case of the accident, completely) these two accident prevention steps.

One more. For a period of 16 days the left engine of the twin engine transport had been written up for oil leaks. Corrective action included the replacement of rocker seals, gaskets, rocker box covers and the tightening of hold down nuts around the propeller governor. Prior to the last flight a ground crewman noted oil leaking from the left engine and called the discrepancy to the attention of the copilot. The copilot checked the leak with his flashlight and the pilot checked the engine from his window. They agreed that the leak was not serious enough to interrupt the flight. A few seconds after the aircraft became airborne (parts from the left engine and cowling were found on the runway) a loud explosion was heard and fire was noted in the left engine. Buffeting became severe, the aircraft struck the ground, cartwheeled and burned.

When should the oil leak have been fixed—really fixed, that is? Surely there can be no argument that it should have been before this flight. But, this was the sixteenth day, remember. Sometimes you can get away with taking chances, but not over and over. And, since sometimes you can't get away with taking that first chance—you figure it out. Sure, it's your life; but there are some, like next of kin, taxpayers and passengers, who feel you have a professional obligation.

If we were to operate by the rules and use the common sense we had to exhibit to become members of our profession—and if we were to do this all the time rather than just most of the time—there is almost no end to the number of accidents we could prevent.

But because a few take chances most of the time and more take chances some of the time, we keep on having preventable accidents. ★

JAN · JUNE 1961 FLYING SAFETY AWARDS

Shown above is the Colombian Trophy which will be awarded for the first time since 1940, to a tactical unit determined to be the outstanding winner of an Air Force Flying Safety award during calendar 1961. This trophy was first awarded to the GHQ Air Force in 1935 in the name of the Republic of Colombia, and last awarded to the 7th Bombardment Group. Criteria for this award have been incorporated in AFR 62-9. The Colombian Trophy will be awarded annually to an Air Force Flying Safety award winner that meets tactical criteria and has exhibited top originality in safety programming, organization and management—particularly for ideas or concepts that may be applied in other units. This trophy will be rotated throughout the USAF, and will remain in the recipient's possession until the next selectee is announced. The unit name will be inscribed on the trophy.

A Flying Safety Awards Board composed of senior officers within the Office of the Deputy Inspector General for Safety recommends selection of Flying Safety Plaque winners. The same system will be applicable for selection of the Colombian Trophy recipient. Establishment of the Colombian Trophy under these selection and eligibility criteria places no additional workload on the field.

Another change in the Flying Safety award program now in effect is the change of the award period from semi-annual to annual.

Flying Safety award winners announced on these pages are for the first half of 1961. Winners selected from among the nominees submitted in January will come under provisions of AFR 62-9, dated 18 July 1961, and will be for the entire year. The Colombian Trophy winner will be chosen from a tactical unit in this group.

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57 Fighter Group
Paine Field, Washington ADC

78 Fighter Wing
Hamilton AFB, California ADC

408 Fighter Group
Kingsley Field, Oregon ADC

552 AEW and Control Wing
McClellan AFB, California ADC

The first step in a long-range program to get the "CAT by the tail" has been taken by Air Weather Service (AWS). This step is a product from the study group that convened at Scott AFB during June to review the USAF requirements for clear-air-turbulence (CAT) forecasts and the AWS capabilities to provide these forecasts.

A CAT forecasting section at Kansas City will prepare CAT forecasts for most of North America each day. These forecasts, which will be relayed to our weather detachments, will contain the location of all CAT—more intense than light—for 24 hours and an outlook for the following 24 hours.

Primarily, forecasts will be based upon upper-air weather patterns in relation to what pilots have encountered. PIREPS, therefore, are essential to the success and effectiveness of this service. The CAT forecasting section will need as many reports of CAT as possible as well as negative reports when CAT is forecast but not encountered. The most questionable part of any subjective report (PIREP, AIREP, etc.) of turbulence is the turbulence intensity. Many attempts have been made to define turbulence by aircraft behavior, but, for the most part, these have been unsuccessful. So far, reported turbulence intensity is still dependent upon the pilot's opinion.

There are available two instruments which can be used to obtain a semi-objective measurement of turbulence; i.e., airspeed indicator and outside air temperature gauge. Pilots are asked to observe fluctuations in their IAS when in turbulence. A number of CAT reports have contained a notation of rapid temperature change along the flight path just before or during the CAT encounter.

Pilots, you can help take the next step to get the "CAT by the tail." Whenever you are briefed on CAT stronger than light, give a PIREP of occurrence or non-occurrence when you reach the area. In addition to reporting location, time your opinion of the intensity, altitude, and aircraft type, include proximity of clouds, IAS fluctuation and temperature variation. Remember these ground rules—CAT is that high-level turbulence (normally above 16,000 feet) not associated with con-

2750 Air Base Wing
Wright-Patterson AFB, Ohio AFLC

3510 Flying Training Wing
Randolph AFB, Texas ATC

3525 Pilot Training Wing
Williams AFB, Arizona ATC

1370 Photo-Mapping Wing
Turner AFB, Georgia MATS

9 Weather Reconnaissance Group
Scott AFB, Illinois MATS

1611 Air Transport Wing
McGuire AFB, New Jersey MATS

6102 Air Base Wing
Yokota Air Base, Japan PACAF

47 Air Division
Castle AFB, California SAC

820 Air Division
Plattsburgh AFB, New York SAC

310 Bombardment Wing
Schilling AFB, Kansas SAC

307 Tactical Fighter Squadron
George AFB, California TAC

314 Troop Carrier Wing
Sewart AFB, Tennessee TAC

353 Tactical Fighter Squadron
Myrtle Beach AFB, S. C. TAC

47 Bombardment Wing
RAF Sculthorpe, England USAFE

50 Tactical Fighter Wing
Hahn Air Base, Germany USAFE

322 Air Division
Evreux-Fauville Air Base, France USAFE

349 Troop Carrier Wing
Hamilton AFB, California AFRes

434 Troop Carrier Wing
Bakalar AFB, Indiana AFRes

175 Fighter Interceptor Squadron
Sioux Falls, South Dakota ANG

141 Tactical Fighter Squadron
McGuire AFB, New Jersey ANG
(Now on Active Duty)

BY THE TAIL

vective activity. Don't report turbulence as CAT when encountered in the clear between thunderstorms or towering cumulus, but do report the turbulence. You can report turbulence as CAT when flying in cirrus clouds not associated with thunderstorms (slightly confusing, but nevertheless, that's the definition). Here are a few choice examples:

PIREP. OVER TINKER, 1345Z. MODERATE CLEAR AIR TURBULENCE AT THREE TWO THOUSAND. B-52. CIRRUS ABOVE. INDICATED AIR SPEED TWO EIGHT ZERO WITH VARIATION THREE ZERO. TEMPERATURE DECREASE FROM MINUS THREE TWO DEGREES TO MINUS FOUR THREE DEGREES IN ONE FIVE MILES.

PIREP. OVER MAXWELL, 1610Z. SEVERE CLEAR AIR TURBULENCE AT THREE ZERO THOUSAND. T-33. IN AND OUT OF CIRRUS. INDICATED AIR SPEED TWO FOUR ZERO WITH AIRSPEED VARIATION FOUR ZERO.

PIREP. FORT WORTH TO TOLEDO, 0300Z. NEGATIVE CLEAR AIR TURBULENCE AT THREE SEVEN THOUSAND. B-47.

It is a joint operation. We step together and help put the "CAT in the bag."

P.S. If you forget the details, check the FLIP Enroute-Supplement. ★

Maj Wilson V. Palmore, Hq Air Weather Service, Scott Air Force Base, Illinois

If you are one of those who goes busting along looking neither right nor left, whether at 40,000, 4000, or 400 feet, then you can bet that someone up there is looking out for you, or you've got more than your share of luck.

If you're like me and most of the people I know, your neck is built on a 360-degree swivel and your eyes beat a path up, down and around like a neurotic radar antenna. I may get mine someday, but I'll be doing my best not to get it from some other airplane trying to play footsie with my bird.

Now that sounds sensible doesn't it? But haul up a minute, dad. That isn't all there is to it. See and be seen may be headed for the same fate that befell the old line aristocracy—there's not much of it left and what's still around is somewhat questionable. You and I both know the old eyeballs are hard put to hack it anymore. At least when you've got two or more birds making for each other like lovesick rockets. When a couple of them point their noses at each other—well, you don't even have time to say here he comes before there he went. And by that time he's 50 miles down the road and fading fast. Even if the other guy comes boring in from the side you don't have time to dip a wing. By the time it's down he's gone and you're over the next state. But until a sure-fire, safer system can be provided the eyeballs must be used.

Some figures I'm going to quote pretty soon may startle you. They say that there are more near mid-air collisions in clear air than when the viz is poor. There are reasons and I won't argue with the statistics. But we both know how nervous we get in some of the big terminal areas cluttered as they are with a greasy black substance the Southern Californians call smog. Everybody talks (complains or brags) about the amount of Los Angeles smog. Well, L.A. and even the rest of Southern California, has no monopoly on the stuff. Much of the east coast (I'm thinking of Washington to Boston), the midwest (St. Louis, Kansas City), and other assorted places around the country have got it pretty thick. Even Arizona's fabled blue skies get pretty grimy sometimes around Phoenix.

Now, back to the point. Mid-air collisions are nasty things to have happen and the odds are going up that there are going to be more of them before they are eliminated. Reasons: poor viz can be a contributor. But the main reason is very clear. There are more aircraft in the skies. For convenience we'll classify these as military, airline and general aviation types. They're not as well separated as they used to be. Terminal areas have always been hazardous, but now all types operate from the ground up. It used to be that they were pretty well layered—general aircraft on the bottom, up to 10,000 feet; airliners and military recips up to 20,000-25,000; jets (military) above that.

Well, the airliners have moved upstairs and now they're manufacturing and selling general aviation jets. True we now have three layers of sky—low, intermediate and high levels—we have IFF-SIF, GCI, GCA, and so forth, but not all aircraft are equipped with all of the gadgets to utilize facilities that exist. Numbers of aircraft alone are increasing the odds on a pair mating above the terrain during letdown and approach.

What's the answer? Well, there just isn't one answer; there are several. And we can hope that research now being conducted will result in some better way of preventing collisions. One effort along this line is the FAA's Project SCAN. Meanwhile we can gain something from past research including USAFE's Near Collision Survey conducted during 1960. Here are some data from the USAFE study to chew on before we get to remedies.

Ninety per cent of all collisions occurred in VMC (Visual Meteorological Conditions).

Twenty per cent occurred within five miles of an airport.

Jets were involved five times more often than non-jets.

Pilot visual perception reaction is not adequate.

USAFE's study eliminated formation and training incidents and dealt only with near-collisions between aircraft whose positions were not known to each other prior to the incident. The data showed 82 near-collisions reported in USAFE by civil and military sources. Undoubtedly there were more that were not reported. We can hope that Project SCAN has encouraged pilots to report near misses, since they may do so anonymously and to an independent agency (Flight Safety Foundation) rather than to FAA or a military agency.

THE CROWDED VOID

These near-collisions were classified by altitudes at which they occurred, visibility conditions, proximities, type aircraft, phase of flight, flight attitude and time breakdown by month. We'll skip the last one and concentrate on the others. Forty per cent of the near misses happened below 5000 feet, 21 per cent from 5000 to 10,000; 11 percent 10,000 to 20,000, and 28 per cent above 20,000 feet.

Visibility was VMC in 67 per cent of the cases, IMC in 24 per cent and unknown for the remaining nine per cent.

In 56 per cent of the cases the aircraft were within 500 feet of each other (less than 100 feet in 29 per cent), 500 to 2000 feet in 11 per cent, over 2000 feet in 16 per cent. The proximity in the other 17 per cent was unknown.

Jets were involved in 82 per cent of the near collisions, other types in 18 per cent.

Arrivals and departures were involved in 52 per cent, cruise on assigned level 44 per cent, unassigned altitude four per cent. These figures were further refined to show that 35 per cent were in GCA patterns, 33 per cent in letdowns, nine per cent in departures, 11.5 in holding patterns and 11.5 in VFR traffic patterns.

Eighty per cent ot the time one or both aircraft were changing altitude, and both were straight and level 20 per cent of the time.

Here are a few examples to mull over.

- T-33 cleared for GCA approach. F-100 was cleared for a VFR overhead and full stop landing. Near collision occurred on turn to base leg at 300 feet. (Visibility, six miles.)
- F-100 holding over a beacon at FL 280. Control informed the F-100 pilot that a 707 was due at the same fix at 0936Z, FL 270. When the 707 arrived, the F-100 pilot estimated the proximity at from 300 to 400 feet.
- T-33 descending from FL 270 to 19,000 under Control. Vampire type passed within approximately 400 feet in front of the T-33. (VFR)
- T-33 departing for Wheelus was given ATC clearance to climb VMC to FL 340. As the T-Bird passed through FL 270, it passed a 707 headon at a proximity of 500 feet. (VFR)
- Pilot of Lockheed Electra reported a T-33 crossed his path in a descending attitude within 150 to 300 feet. (VFR)
- Two F-102s were in close formation in the GCA pattern when a Canberra in a 90-degree turn passed within 50 feet. (IFR)
- Two F-86s were instructed by control to descend from FL 320 to 22,000. As they approached 23,000 feet they heard another aircraft reporting at 23,000. The lead F-86 pilot then saw an F-100 directly below him and directed his wingman to pull up. Proximity was estimated at 100-200 feet. (IFR)
- C-119 first observed an unknown civil aircraft approximately five minutes before the incident. Neither aircraft took avoiding action until they met at a beacon where the C-119 made an abrupt descent and avoided the civil aircraft by 500-700 feet. (15 miles viz.)
- Convair pilot reported C-47 flying in opposite direction in a descending attitude flew within 300 feet of his aircraft. (VFR)
- Civil aircraft reported sighting a T-33 coming out of a cumulus cloud in a descending attitude. The T-33 flew under the civil aircraft by about 30 feet. (VFR)

That should be enough to convince any skeptics. So, where do we go from here? The conclusions reached by the investigators will provide some clues:

"The foregoing analysis of near collision reports submitted in 1960 points out several factors deemed worthy of consideration in arriving at possible courses of action. The majority of near collisions occur:

- When one or both aircraft are changing attitude.
- In visual meteorological conditions.
- During the summer months. (In USAFE)
- After arrival at the destination fix.
- Below 5000 feet and above 20,000 feet.
- During the landing phase or departure.

Recommendations were limited to actions within the command scope. They are:

"That all aircrews be indoctrinated on all aspects of mid-air collision hazards. It is vital that all information . . . be brought to the attention of all flight crews. The 'scanning' problem peculiar to single crew aircraft and the high percentage of near collisions that occur during changes in attitude should be particularly emphasized.

"That specific 'scanning' responsibilities be delegated in multiple crew aircraft when operating in VMC. The procedure whereby one pilot flies the aircraft while the other operates the communication and navigation equipment is common practice. If the pilot at the controls is making frequent reference to cockpit instruments and the other is engrossed in making fine adjustments to the radio compass or checking the data in one of the FLIPs, a considerable period of time could transpire in which neither is maintaining visual separation. A 'who's looking?' concept must be made a definite part of the cockpit procedure whenever operating in VMC regardless of the type clearance filed.

"That additional emphasis be given VFR entry and departure points in and out of airfield complexes. The high percentage of near collisions that occur below 5000 feet involve IFR/VFR aircraft in VMC. Although the aircraft on IFR clearance has an equal responsibility for maintaining separation from other aircraft, preoccupation with cockpit duties brought about by 'simulated instrument' conditions, changes in aircraft configurations (flap settings, gear check, etc.) reduces scanning time. It follows, therefore, that the VFR traffic in the area must shoulder the brunt of the separation responsibility. The above recommendations would help solve the problem of separating IFR and VFR traffic."

Other recommendations not part of the study but presented separately include development of an Air Force manual summarizing known data and providing specific guidance on how mid-air exposure factors can be reduced to a minimum. Among these are identification of the most prevalent factors that lead to collisions and how to avoid them; scanning techniques (how to look); explanations of the limitations of visual reaction times; a training course on mid-air collision problems; a USAF-wide information program, a maximum effort to assure the early development and installation of a cockpit presentation type proximity warning system.

Perhaps Project SCAN will lead to some additional methods of preventing mid-air collisions. Meanwhile it is the responsibility of every aircrew member and controller to do everything within his power to keep aircraft safely separated. Supervisors also have the responsibility of indoctrinating their people and assuring that all of those involved are constantly aware of the collision hazard. ★

Rear cockpit F-101B.

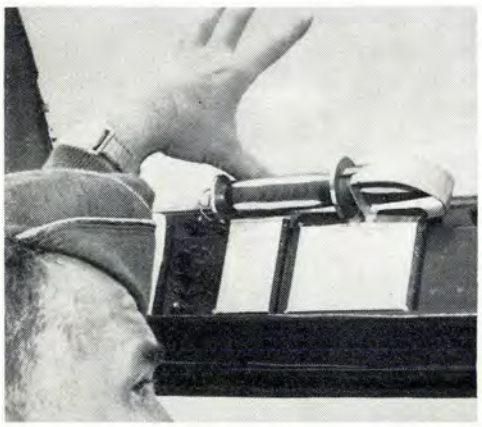
CANOPY STUCK?

•

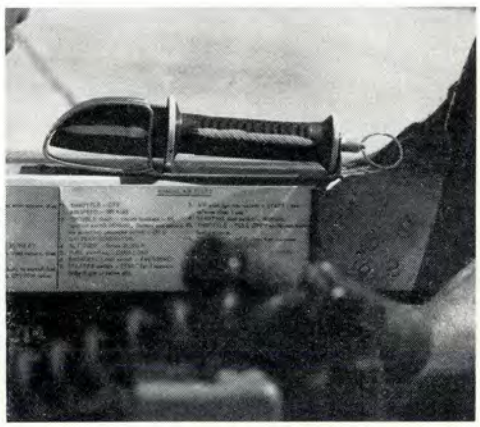
BUST OUT!

•

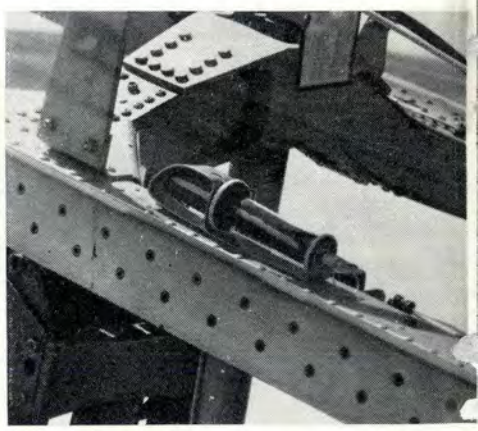
Pictures above, below and across bottom illustrate suggested location of canopy tool in cockpits of various aircraft.



F-101B front cockpit.

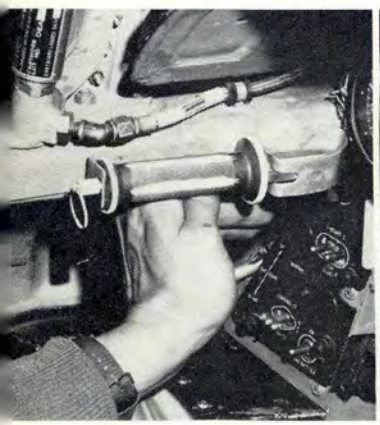


T-33 front cockpit.



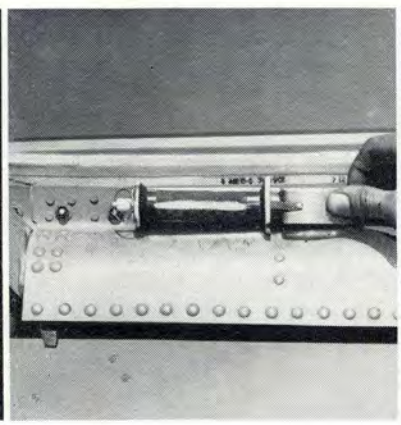
T-33 rear cockpit.

F-104A, B, front cockpit.

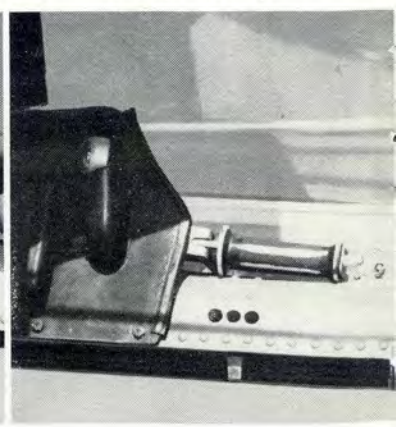


F-104 rear cockpit.

F-106A, B, front cockpit.



F-106B, rear cockpit.



ADC's Interceptor Magazine, in the September issue, featured a story about a new tool for hacking one's self out of a cockpit in an emergency when the canopy cannot be removed in any other way. They had tested the tool on the canopies of several of the aircraft used by the Command.

Figuring that what is good for ADC ought to be equally good for other commands operating aircraft with stubborn canopies, we investigated and present the following findings:

A flaming aircraft with a pilot inside and a canopy that won't come off can be just as lethal as if the airplane had bashed itself into the ground, nose first. The difference is that it would take a little longer to produce the final result—death.

That used to be the situation and many a pilot has wondered what he would do if faced with such a predicament. About the only gloomy choice was ejection through the canopy—not a very happy thought. He needn't wonder any longer. ADC has figured out an answer and there is no reason why all Air Force aircraft having a need for a similar means of escape can't be so equipped. The answer is a small tool, somewhat resembling a knife but not designed to carve up a beef. It's really a pounding tool with a sharpened edge for shattering a plexiglas canopy so that the individual trapped inside can crawl out.

The tool has been tested on a number of aircraft and found to be very effective. To give you some confidence in its efficiency here are some escape test results, perhaps for the aircraft you fly: F-100F, 5-10 seconds; F-101B, 10 sec; F-102, 10-15 sec; F-104, 15 sec; T-33, 10-15 sec; F-106, 2 min (laminated plexiglas).

Lt. Gen. Robert M. Lee, ADC Commander, has directed that each ADC aircraft should be equipped with this tool, without delay. In addition, complete production kits for the tool have been sent by ADC to the Chief of Safety of each major command.

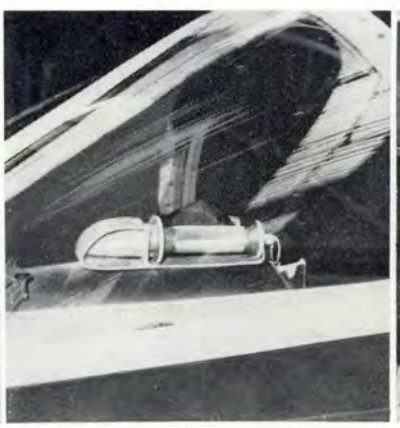
It is recommended that all commands consider installing this tool in their aircraft as soon as possible. One life saved will pay for all the tools needed to equip the entire Air Force aircraft inventory. ★

Pilot proves to himself on condemned F-101B canopy that you can bust out.

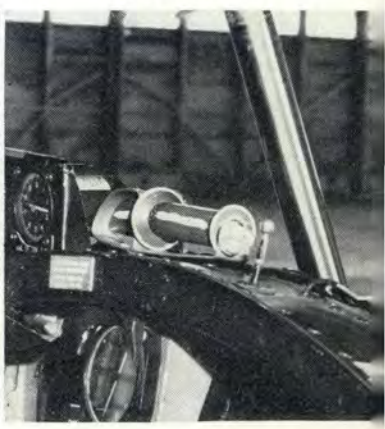
TF-102 cockpit, left side.

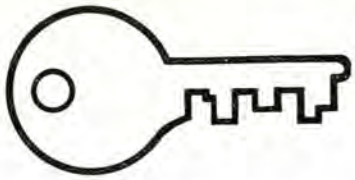
F-102A cockpit.

B-57 front cockpit.



B-57 rear cockpit.



Good Management: The  To

The tremendous and varied appetites of today's operational aircraft have created accident potentials heretofore unparalleled.

Demands for more but less time-consuming services, costly equipment, highly trained specialists and related problems are causing nightmares for flight line supervisors. Their efforts to safely supply thousands of barrels of jet fuel and aviation gas, great amounts of liquid oxygen and other necessities keep them constantly busy. In the back of their minds is the constant worry and fear that a mishap may result in a destroyed aircraft, or even worse, a death.

They are caught in a dilemma between supplying more and better service and developing and managing the training and procedures necessary to provide that service. How can they accomplish both?

The answer to the servicing jockey who drives the refueling truck from the airplane with the hose still attached is simple. He just doesn't belong on the flight line. The mechanic, however, who does an excellent job of one servicing task but flubs on another needs supervision and training in methods and procedures. The efficient supervisor will find time to provide this training. Even when automatic servicing equipment is available and used to the fullest extent, safe starting and stopping procedures must be applied.

Maximum safety in aircraft servicing calls for positive safety procedures. A mechanic parks a ground power unit at the nose of a jet airplane, parallel to the fuselage, in preparation for engine start. After engine start the vibration causes the locking feature of the cart to release and the cart rolls into the engine and the wing. The engine ingests lines and hoses, resulting in a complete engine change and repair to the wing. Parking the unit parallel to the wing and positioning a fireguard by the airplane would have prevented the contact.

Fire is the greatest worry in flight line servicing. The flight line must be supported by a well-equipped fire department to provide prompt and adequate fire protection. Each flight line must be fitted with a fire alarm system, with properly identified fire lanes free of obstructions. There must also be a plan for removal of airplanes from refueling areas, maintenance docks, hangars and other congested areas in case of fire.

There are many fire hazards on any flight line, but the principal fire hazard is aviation fuel. All grades of jet fuel, as well as aviation gasoline and lubricating oil, will form flammable vapor mixtures in the presence of air. At certain temperatures they will ignite from an open flame, spark or heated material. Pumping fuel through a servicing hose is another source of explosion and fire. A high linear rate of fuel flow, like that encountered in servicing jet airplanes, will result in an accumulation of static electric charge which may be sufficient to set off an explosion. Proper electrostatic grounding and bonding or servicing equipment is absolutely essential in preventing explosion and fire.

The military services and the air lines have experienced many incidents of improper electrostatic grounding and bonding during fuel servicing. Last year an explosion and fire destroyed a U. S. Air Force jet aircraft at an overseas airfield. The airman who connected the static wire from the truck to the aircraft did not connect a static wire from the truck to ground or from the aircraft to ground. He also forgot to connect a static wire from the hose nozzle to the aircraft. This refueling attempt took place while the aircraft was being serviced with oxygen, yet. How careless can one be?

The airman should have used the following accepted procedure for grounding during refueling: (1) Attach the grounding cable to the airplane, then to an approved ground, (2) attach a grounding cable to the servicing truck, then to the same approved ground used for the airplane, (3) attach another cable from aircraft to refueler to complete the bond, and (4) ground the fuel hose to the airplane. The fuel hose nozzle ground should be in positive contact with the airplane before the airplane fuel tank filler cap is removed, and this bond must be maintained until the filler cap is replaced. When the fueling operation is complete, the truck grounds should be disconnected in exact reverse order, the aircraft ground cable should be disconnected at the aircraft before disconnecting from the ground connection.

All fueling operations should be conducted at least 50 feet from any building or other aircraft, and outside a radius of 100 feet from an airplane radio/radar transmitter and a radius of 300 feet from a ground based radio/radar transmitter.

All electrical switches in the airplane should be turned off, except those actually used in fueling operations, and all lights and electrical cords from the airplane should be disconnected at the ramp outlets. Ground power units should be parked at least 50 feet from the airplane being fueled.

Only explosion-proof floodlights and flashlights should be used for illumination. Why? Recently a servicing mechanic knocked an ordinary drop light from its position while connecting a fuel line. The light contacted the ramp breaking the bulb and igniting a puddle of fuel that had accumulated under the airplane. The airplane was destroyed by the spreading fire and the mechanic was critically burned.

Open-flame heaters, lead pots, cutting torches, flare pots, and the like should be removed from the vicinity, and airplane engines must never be operated during fueling operations. Scaffolding, tool carts and other appurtenances must not be in a position to obstruct or prevent free movement of personnel or fuel servicing equipment.

The number of personnel should not exceed the minimum necessary to accomplish the operation safely. However, adequate servicing personnel must be at hand to shut down all servicing equipment in case an emergency arises, and adequate fire-fighting equipment, properly manned, must be available during fueling operations.

Servicing personnel should remove matches, cigarette lighters, key chains and tools from their person, and must make certain that they are not wearing shoes with

Safety In Aircraft Servicing

metal clips or exposed nails which would create a spark in a vapor area.

Fuel spillage is a common fire hazard on the flight line, and one of the best reasons for servicing an airplane in a restricted area, isolated from passing vehicles, operating engines and other sources of sparks. Fuel spillage is not only dangerous, it may deteriorate the flight line ramp, particularly the asphalt type.

If fuel is spilled the area should immediately be blanketed with foam or washed down with water. An important point to remember: Don't use metal-backed mops or brooms to clean up fuel spills on a concrete ramp—a spark may be created. All mops and rags should be of a cotton or friction-proof type.

Flight line personnel must keep in mind that successful operation of the airplanes begins with SAFE procedures in aircraft servicing. Any contamination of jet fuels, for instance, with hydraulic fluids and other specialty products, many of which are non-petroleum in origin, may seriously affect airplane engine performance.

Contamination of jet fuel with a moderate proportion of aviation gasoline will not normally affect jet engine performance. On the other hand, a very small amount of jet fuel can contaminate aviation gasoline to such an extent that its anti-knock value is reduced and may seriously affect its operating performance.

In one mishap servicing personnel at a western municipal airport fueled a DC-3 airplane with 230 gallons of JP-4 fuel. The airplane crashed immediately after takeoff because it could not maintain power. Several nights later another recip was serviced with a mixture of JP-4 and 130 grade aviation fuel from the same airport. The mixture caused excessive cylinder head temperature and loss of power. Fortunately, the pilot was able to land at a nearby airport.

To avoid the possibility of delivering the wrong product, jet fuel and aviation gasoline should never be alternately carried in or serviced from a refueler or hydrant cart, nor should both fuels be carried simultaneously in separate compartments of any one refueler. When changing over from one fuel to another, tanks should be flushed, cleaned and inspected to insure against contamination. All fuel storage tanks, tank shut-off valves, and other similar appurtenances should be conspicuously marked to indicate the type and grade of fuel.

The cases of contamination by delivering the wrong product are numerous. In one mishap a serious power loss occurred because de-icing fluid was inadvertently placed in the water injection system of an aircraft. The error was attributed to similar coloring of drums containing alcohol and de-icing fluid.

Most aircraft are fueled from a truck or refueler, and a good many of the larger jets are being fueled from a hydrant system. Often airplane fuels are being handled in a hazardous manner. Deficiencies found on the flight line are: system filter screens missing; filters damaged or clogged with foreign matter. Valves and seals show leaks under pressure; refueling pits and trailer refuelers cluttered with soiled rags or located

Robert H. Shaw, Investigator
Civil Aeronautics Board, Los Angeles

adjacent to arcing ignition or electrical systems; measuring meters inoperative or not calibrated; too little attention is paid to removal of free and entrained water from fuel; charged fire extinguishers are often not in place for use and fuel storage areas are not protected by ditches or dykes; fuel plugs and lines are not identified by color code; inspection records do not reflect the actual condition of refueling equipment and refueling crews are undermanned.

An important point often overlooked is that all airplane fuel vents must be open when fueling. Fuel pumped into the tank under pressure with clogged vents will cause the tank to rupture.

Servicing crews should be mindful of temperature changes when servicing airplanes with fuel. Fuel caps should be left loose to avoid overflow (and the wrath of the pilot) and fuel system leaks. A reminder, however, that *these caps must be tightened before takeoff*, otherwise fuel will siphon from the tanks during flight.

Ground power unit, particularly the fuel burning type, are a source of mishaps. These units should not be used in locations where flammable vapors or fuel spillage exists, and spark arrestors should be provided. Wind direction, slope of the ramp, and location of airplane fuel vents should be considered in positioning the power unit.

Air pressure servicing can also be dangerous. Recently a mechanic connected a high pressure line to a low pressure hydraulic unit on an airplane. The high pressure caused the hydraulic unit to explode. The mechanic was killed and the airplane was heavily damaged.

A good working rule for servicing is that each fuel servicing unit be equipped with at least two fully charged fire extinguishers of carbon dioxide, bromochloromethane or a dry chemical. The quantity of carbon dioxide or dry chemical should be at least 15 pounds and at least two gallons of bromochloromethane. Access to each extinguisher should be unobstructed.

Oxygen servicing, whether gaseous or liquid, requires particular care. Personnel responsible for servicing airplane oxygen systems must first determine whether the airplane system is high or low pressure, and insure that a low pressure system is never serviced with a high pressure service unit. Liquid oxygen is a non-toxic, extremely cold (—297° F.), transparent liquid. It must be handled by personnel familiar with its properties, and must never be left unattended. Protective clothing such as face shields, gloves and aprons must be used in handling liquid oxygen.

Organic materials such as clothing, oils, etc. exposed to liquid oxygen will explode or burn violently if ignited. Obviously liquid oxygen should be protected from smoke, flames or sparks, and all liquid oxygen carts should be grounded prior to servicing airplane oxygen systems. Oxygen in any form must never be allowed contact with oils, lubricants and fuels.

One of the more important aspects of safety in aircraft servicing, usually given the least attention, is the personnel health hazards. Toxic agents are one of the primary hazards. Carbon monoxide, carbon dioxide, alcohol, fuels, and acids are toxic and can be extremely harmful to personnel on the flight line.

Jet fuels contain toxic aromatics and should be handled with the same health precautions as leaded aviation gasolines. They should not be used for cleaning purposes. Excessive inhalation of vapors and excessive skin contact should be avoided. In case you do come in contact with this fuel, the skin should be washed thoroughly with soap and water immediately, and clothing upon which jet fuel has been spilled should be removed and laundered. Fire extinguishing agents, depending on the type, are also toxic.

Other serious hazards to personnel in aircraft servicing are falls from scaffolding, slipping on wet surfaces, jet blasts, dangers from compressed air, and static electricity.

The foregoing indicates that the flight line is extremely hazardous. It needn't be, however, with effective procedures, proper equipment and well-trained personnel.

These may be summed up in two words: Efficient management. This is the key to safe flight line servicing operations. Accident prevention is the reward. ★

Name tag light signals. Heard of some vehicle drivers who were written up for crossing runways without clearance, but who protested that they had received light signals from the tower. An experiment clinched the dispute when four drivers in succession were cleared across by flashing name tags from the tower. So, if the sun shines at your base and tower operators wear name tags, we suggest you look into and correct the situation. Maybe, if we all get with it, we may be able to eliminate a hazard *before* we have an accident.

CROSS COUNTRY NOTES FROM REX RILEY

Ran across a new twist and will pass it on for what it's worth. In base ops and the VOQs, one of the bases Rex visited has collected 10 or 12 of the super-sized menus from some of the best eating places in town, bound them together and displayed them for all to see. If you've a mind to visit town and eat high off the hog, you can select the type food you want to eat and decide whether you can afford it. Sure answers the question, "Hey, where will we eat tonight?"

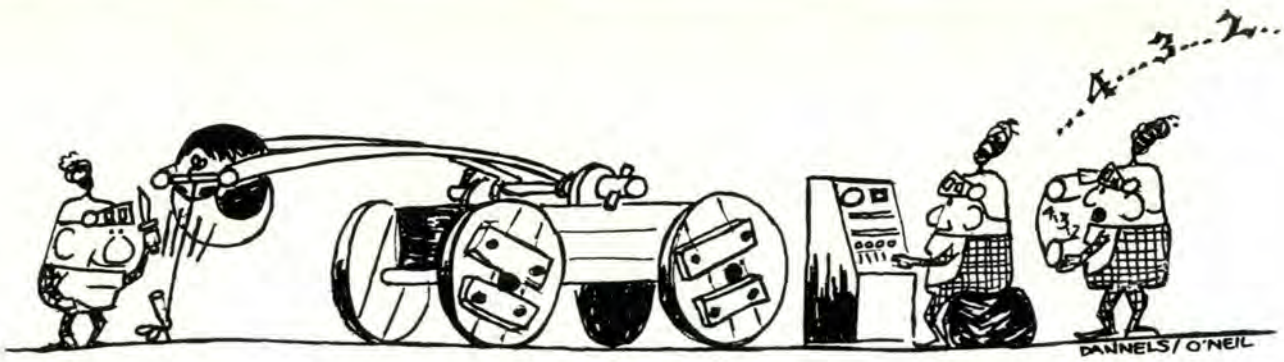
While the menu idea was real fine, Rex looked at a few things that weren't so fine. Example: the PIF. Don't sneer and stop reading. Rex doesn't go around preaching that the PIF will ever replace sex, but there has been a time or two when he pored through 10 or 12 pounds of directives, regulations and procedures then wondered if this was really necessary. But things change so fast these days that some method of getting the word to the flying troops is needed. Anyway in idly flipping through the PIF, it was evident that almost all of the base CRT types, including the base and deputy commanders, thought they should read the PIF at least once a year whether they needed to or not. In sincerity, some of them either hadn't read or initialed the PIF in six months. This makes for a rather loose operation—an attitude of "If nobody else cares, why should I?" One point and we'll leave the subject: The T-33 Dash One, nicely bound in the PIF, was not the current one in use. Ho, hum! ★

LIP SMACKER

Photos: Courtesy Jack M. Smith, Aviation Safety Specialist
Middletown AMA, Olmsted AFB, Pennsylvania

These pictures are of landing tracks made at Olmsted Air Force Base. As you can see from the photos, being short another three to six inches would certainly have been disastrous. The runway is 8000 feet long with 1000 feet of overrun on either end. The entire construction is concrete. In addition, there are 62 feet of asphalt on the east end and 150 feet on the west end to eliminate the overrun lip. Field elevation is 308 feet. We think you'll agree that this landing was made just a bit short of the overrun to the overrun and was certainly out of a poorly planned approach.

Using the old adage that one picture is worth 10,000 words, here are the equivalent of 20,000 words telling how not to do it. Meanwhile we will try to requisition another year's supply of luck for this unknown pilot. Indications are he'll be needing it. ★



THEY'RE PUTTING PSYCHOLOGY INTO SPACE

Robert W. Smith & George R. Purifoy, Jr. American Institute for Research, Pittsburgh, Pa.

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Exploding technologies are literally blasting man into space. Today's aero- and astronautical endeavors, from hypoxia to hypervelocity, have increased system complexity and expanded operational envelopes, causing the ever-present human factor to "come critical!" What's with this psychological bit, and how do psychologists contribute to the total space flight picture?

To be textbookish for a moment, modern psychology is concerned with the study, prediction, and control of *behavior*. Behavior of an astronaut, a line chief, or the "old man" himself, is influenced by many factors. When we can identify the influence of appropriate factors, behavior can be controlled. It is this prediction and control of man's behavior in the strange and rather hostile environment of space that constitute the areas of contribution of psychology to space flight.

Why should such a "long hair" area as psychological research be appropriate for Aerospace Safety Magazine? The answer, of course, is that effective performance must always include, within the operation and research philosophy of the United States, safe performance. Safety, ever relative, is always a prime consideration.

Psychologists then, are interested in keeping you hole-borers (vertical as well as horizontal) alive. There are four major areas where knowing about people in general and fly-types in particular, can significantly reduce those moments of stark terror. These areas, or kinds of considerations are:

Hardware design—making machinery fit man's abilities.

Job design and manning—assigning the right tasks to the right people.

Selection—identifying people who can do the job.

Training—developing necessary capabilities in the space team.

Obviously we could ramble around in each of these areas ad nauseam. Each is complex, extensive, and dehydrating. However, we will try to briefly describe some of the psychological considerations which occupy and at times perplex the space psychologist.

• • •

HARDWARE DESIGN

As part of their responsibility for the efficiency and safety of the man in the system, research psychologists work closely with other human factors and engineering personnel in the design and layout of equipment for optimum human performance. Such human engineering of aircraft cockpits has brought many a pilot through squeaks ranging from flameout at 500 feet to fire at 50,000. Space missions toss some pretty crazy design problems at the human engineers. For example, the flight engineer of an old B-50 could unbuckle his straps and turn a stiff control knob without the reaction force rotating him instead of the knob! Such crew rotation could happen in the weightlessness of outer space, and to say that the experience would be psychologically disturbing to the man involved would be putting it mildly.

The psychologists involved in human engineering are constantly striving, along with other design personnel, to build space systems to take advantage of, rather

than be handicapped by the unique characteristics of the space environment. Readers who have followed these research efforts will be familiar with the pictures of Air Force psychologists and M.D.s walking about on the ceiling of a C-130 during the 30 seconds of weightlessness provided by flying a parabolic path. Other studies, including those from across the pond, indicate that man can perform effectively in a weightless environment as long as sufficient visual cues are provided through proper instrument configuration and lighting.

Design problems related to keeping man safe in space, and during the transition to and from, range from use of a contour couch while under high G loads to developing ways of recognizing the dangerous hallucinations which may occur when an individual is isolated for long periods of time. Tomorrow's astronaut may even be plugged into his own alarm system; that is, tiny sensors may tie the man's nervous system to his own instruments, so that the pilot's alertness and other factors critical to his own safety may be monitored, and lapses displayed to him even before he is aware that any problem exists. Such design concepts, of course, are as "way out" as space itself, but research psychologists and others interested in design for safety in space are actively investigating such possibilities.

JOB DESIGN AND MANNING

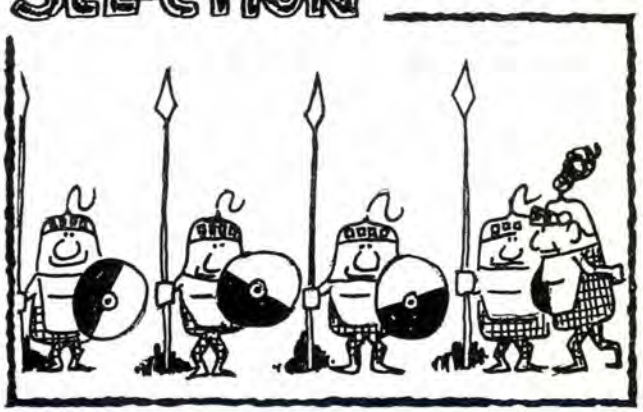
Once we get a complex space vehicle designed, how is an earth creature going to run it? This is another problem for the space psychologists. Once you blast off for Venus it's kind of tough to add a third pilot when you find the work load's going to be a little too heavy. And, as we all know, add an extra man and like as not you're going to have to leave a couple of hundred pounds of fuel behind, if you get off the pad at all! The implications of such tradeoffs for the safety of our blossoming astronauts, and the fact that many space missions may be "one shot deals," makes the prediction of manning requirements by the human factors people critical in space systems.

Psychology also plays an important role in designing the job of each man aboard the space craft. If the work load for a given individual is too light boredom may set in, and with it such undesirable consequences as the "break-off phenomenon," which has given many a fighter pilot a bad time when flying alone at high altitudes. Bored astronauts will be even more subject to this phenomenon and its associated euphoria, depression, or even hallucinations. As for making a man's job too tough in space, well, who wants to be isolated for six weeks with an AC who's being worked too hard? It's up to the space psychologists to design the astronaut's job to provide maximum system effectiveness along with maximum personal safety and good adjustment to the rigors of space travel.

And then there are procedures. One no longer leaps lightly from the cockpit at his destination, white scarf flying in the breeze. He who tries to do this in the moon's gravity is likely to end up battered and bruised in a crater twenty-five feet away. Any idiot knows that? Who needs procedures? When was the last time someone you know landed with the gear up? Still seems to happen, doesn't it?

Studies in space cabin simulators suggest that procedures involving complex performance, interaction with other crew members, moving about in the space ship, and communication with persons outside the space ship will help to offset the effects of isolation. You pilots of those high-altitude birds probably will go along with these findings when you think of the night that making a routine position report seemed to reduce the trouble you were having with "break-off." Such reports may become SOP on space flights as much to help the astronaut keep track of his marbles, as to help Space Traffic Control keep track of him.

SELECTION



Who's going to go? Psychology will play a major role in this decision. In the selection of eager astronauts, the psychologists must cope with two major problems. First, what is it about a man that makes him a good space man? Behavioral scientists prefer to express this problem as "the identification of basic skills, knowledges, and personality factors which are correlated with a high level of performance and good personal adjustment during space flight." Either way you say it, it's not an easy problem to solve.

Many desirable attributes, such as good sensory acuity, may be generalized from the requirements for good performance in today's high altitude, high speed jet aircraft. However, new emphasis may be placed upon old traits by the demands of missions in space. For example, cabin temperatures may be a problem in space systems during emergency re-entry, or in the event of a malfunction of the life support system. It just so happens that man is least likely to detect temperature changes in the range (70° F. to 150° F.)

where his behavior is most apt to be affected by such a change. Thus, selecting a man who is better at this type of perception may be the added safety feature between A-OK and chaos during space flight. There are other aspects of space flight in which selection may be critical. What kind of pilot is best fitted to react to the extremes of light, sound, time, and space itself; to encounter alien forms of life; to endure the potential threats of decompression, meteors, radiation, etc.?

Many questions, such as the most desirable age, or even sex, of future astronauts, remain to be answered.

The second major responsibility of psychology in the selection of astronauts is to develop techniques for measuring, at minimum expense, those personal attributes which have been identified as essential to successful performance in space. We simply can't afford to put each candidate into orbit to see how he will adjust to weightlessness, or lock him up with other candidates for six weeks to see how he gets along with people. The psychologist must predict these things quickly and cheaply, since there will be a large number of candidates. He also has to be accurate in his prediction, since we can't afford to wash out 80% of the trainees who participate in a long-term, expensive training program.

One technique for identifying critical characteristics *before the fact* is to look at the candidate's personal history. For example, psychologists have found that people with aviation experience possess many traits desirable in astronauts, such as high reaction speed, good resistance to high G's, adequate adaptation to weightlessness, and the skills and knowledge required for piloting high performance vehicles. Studies also have found that men who did time in the guardhouse exhibited relatively poor adjustment to duty at isolated locations.

Useful techniques for selection include the pencil and paper type tests or simple simulator tests which can predict how a man will perform in the operational situation. The questions asked on some of the current air crew selection test batteries often bring guffaws from those who read them, but a heck of a lot of research has demonstrated that test items ranging from how you feel about beating horses to queries about your technical competence with aircraft, give a pretty good idea, when analyzed as a whole, of what a man's going to do in the operational situation. This research is continuing, and has a long way to go in the search for talents for space.

C-NOTES

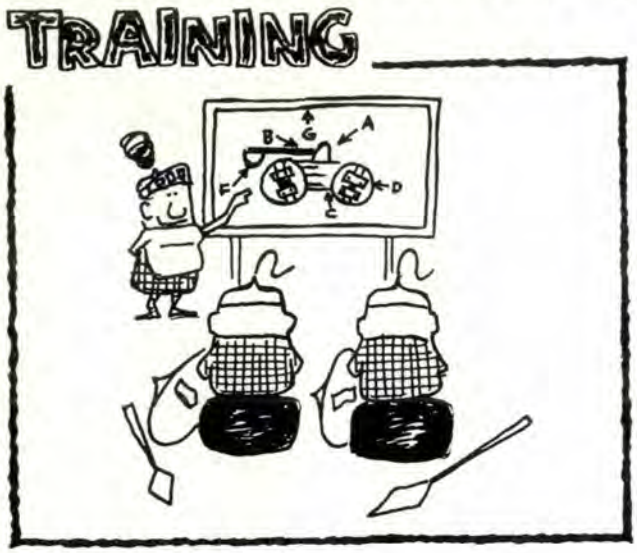
Quite a lot of interest has been expressed recently by various units as a result of Lt. Colonel W. W. Wilson's C-Note article appearing in the August issue. The article had to do with drag chute deployment during takeoff. Of course, the first and foremost concern is whether the deceleration is caused by afterburner failure or by drag chute deployment. Emergency procedures are different and a wrong conclusion when you are just airborne can end up in a bent bird. In other words, this is no time to reduce thrust when drag has just been increased.

The problem then is how best to quickly diagnose what has happened. In one recent F-100 mishap the takeoff was being made at sunset. Immediately after becoming airborne the pilot experienced a deceleration. The pilot had been indoctrinated on the use of the mirror but it showed nothing except the sun at his back. Assuming then that the afterburner failed, he moved the throttle inboard and immediately settled back on the runway sans gear.

Some units have recommended changes to the Flight Manual Emergency Procedures with regard to afterburner failure. As you know, the present procedure is in two parts: *before* refusal point and *after* refusal point. Since takeoff roll often is shorter than refusal point, recommendations are to change procedures to afterburner failure during takeoff roll, and A/B failure during takeoff—airplane airborne. In either case, the pilot would be able to diagnose the cause of deceleration more positively and quickly by reference to the EPR gage. It was suggested that the amount of drop on the EPR gage indicating afterburner failure be incorporated in the emergency procedures section.

We would appreciate any comments from you cockpit jocks. Even though afterburner failures or drag chute deployments during takeoff or immediately after becoming airborne are comparatively rare, it does call for a quick response by the pilot—and a correct one.

Maj. Clarence H. Doyle, Jr., Tactical Br., Fighter Division



Okay, we've figured out how to design this space bird, how the crew should run it, and who they should be. Now how do we fix it so the crew *will* run it like they *should* run it? The psychologists face four big problems in the training of space crews. First, in space systems the reliability of the man in the system must be higher than ever before; mistakes at 40,000 miles are even less forgiving than they are at 40,000 feet, and they cost more money. Second, the duration of the space trips requires retention of some skills over a longer period of time than that required by earthbound missions. Right now you can practice dead stick landings while still filling squares, but when you flame out coming into Venus it may have been six months since your last practice session. Psychology has got to come up with a way to make you remember.

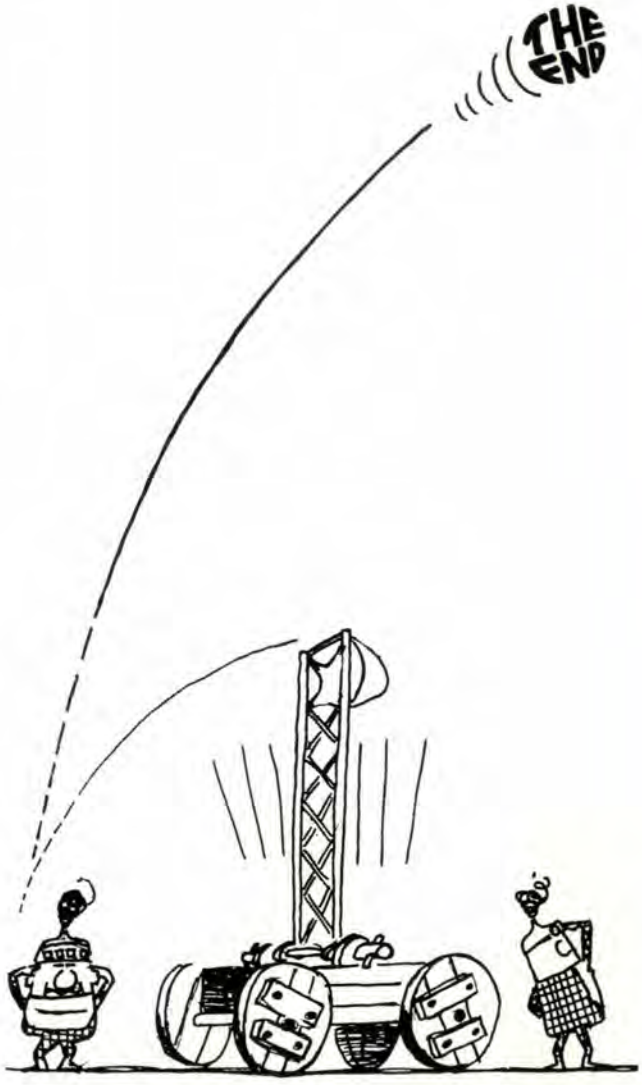
The third problem is that training to operational proficiency in space vehicles must be accomplished with a minimum of actual flight experience. The Mercury capsule doesn't have a back seat. A no sweat orbital jaunt will cost a good bit even in comparison to a ride in a '52. Thus, your life may depend on the ability of the behavioral scientists and engineers to predict these "stark terror" moments in space, and give you an opportunity to develop the essential skills for coping with all possible emergencies. (You think you spent a lotta simulator time just checking out in the F-104, just you wait!)

Fourth, when that expensive sub-orbital, orbital, or earth-moon training mission comes along, the men in charge will want to make sure that you don't waste valuable training time looking at the scenery. They'll keep you busy every minute (just ask Sheppard and Grissom), and the behavioral scientists will be responsible for assuring that you practice all of the critical skills.

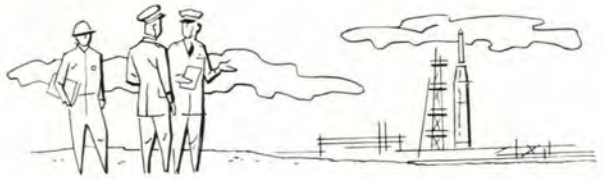
Just what behaviors will be critical in space? The training psychologists have some ideas along these lines. For example, in addition to the usual vehicle driving skills, it is felt that effective training on preventive hygiene and first aid will not only facilitate physical health, but also increase confidence, reduce anxiety and reduce the fear of accident or injury during long space flights. Also, prior knowledge of, and preferably first-hand experiences with their own physiological and psychological responses to stresses of space flight should help to reduce anxiety and avoid panic in space crews. Such knowledge and experience should, of course, be provided during training.

These areas, then, briefly describe the responsibilities of space psychologists. Not all of the answers are known, and the control of behavior is, presently, somewhat less than precise. (How long ago was that last gear-up touchdown?) One thing psychology does know is that individuals are different. All we need to do is design systems for meeting operational goals, develop jobs to maximize man's abilities, select people who have the right types of differences, and train into them those necessary capabilities not obtained through selection. A big job!

Care to lie down on our couch for a fitting? ★



Missile Safety At Vandenberg



During the past two years, multitudinous questions about missile safety at Vandenberg have been asked of VAFB personnel. The questions have been expressed in many different ways, and have come from all levels throughout the Air Force and U.S. industry—particularly that part of industry involved in ballistic missile work. Regardless of who asked the questions, or how the questions were phrased, they in general can be summed up and reduced to the following four basic questions: (1) What sort of safety organization do you have at Vandenberg Air Force Base? (2) What does the safety organization do? (3) How is it done? (4) Why is it done that way?

This article will attempt to answer those four basic questions in such a way as to reiterate the answers given to the many questions already asked and, more important, answer the majority of the questions that are yet to be asked.

The missile safety organization at Vandenberg did not just happen, nor was it arbitrary in its origin. It is the result of much study, careful planning, and hard work beginning in 1958.

Learning from the experience gained at the Atlantic Missile Range at Cape Canaveral, we developed our present safety program. Along the way we received invaluable help from many sources including Mr. T. C. Randerson, Pan-American pad safety supervisor at Canaveral.

Today, the Directorate of Safety, 1st Strategic Aerospace Division (SAC) consists of: a Director of Safety, a Deputy Director, an administrative section, and two divisions—Missile and Nuclear Safety Programs and Plans Division and Missile Safety Operations Division. As the division titles imply, most of the work accomplished by both divisions is in the area of missile safety.

The Missile and Nuclear Safety Programs and Plans Division is subdivided into two branches: Programs Branch and the Accident Investigation, Reports and Analysis Branch. Personnel of the Programs Branch specialize by weapon system (including R&D and space systems). Their major effort is devoted to developing safety plans and programs to support the ballistic missile weapon systems and space programs in operation, or programmed for operation at Vandenberg AFB. The Accident Investigation, Reports and Analysis Branch exercises normal division-level staff surveillance over the base ground and flying safety programs, but devotes most of its time and effort to investigating missile accidents/incidents, processing missile hazard reports and disseminating information concerning both areas for the benefit of missile units throughout the Air Force.

The Missile Safety Operations Division is also divided into two branches—Safety Education and Promotion Branch and the Operations Safety Branch.

The Safety Education and Promotions Branch is small, consisting of only three personnel slots, one officer and two NCOs. This branch conducts demonstrations and presentations on hazardous potentials of missile fuels and oxidizers; provides training on the use, care and storage of protective clothing and equipment, prepares training material and curricula; maintains OJT records and publishes information on missile safety problems and practices.

The Operations Safety Branch, with 14 officers and 20 NCOs assigned, probably has the most unique functions of any organization or activity at Vanden-

Lt Col William D. Hooper, 1st Strategic Aerospace Div (SAC), Vandenberg AFB, Calif.

berg. It provides launch complex safety coverage (missile safety specialists physically present and exercising safety supervision over the operation) for hazardous operations conducted within all operational, training, and R&D launch complexes at Vandenberg AFB. This coverage includes keeping a minimum of three safety officers/technicians on alert 24 hours per day, seven days per week to support non-scheduled, hazardous operations during other than normal duty hours. It provides for regular safety inspections of all missile maintenance and launch facilities on the base and monitors activities in those areas to insure compliance with policies, regulations, and other current directives on missile safety.

This branch is organized to provide maximum specialization of personnel in specific weapon systems, yet permit cross-training and utilization of personnel in support of shifting workloads and priorities. It furnishes input to the Missile and Nuclear Safety Programs and Plans Division to be used in the development of danger and hazard area plans, to include requirements for communications, roadblocks, and personnel warning devices. It supervises the implementation and execution of such plans. It develops safety checklists for use by all safety personnel during the support of hazardous operations.

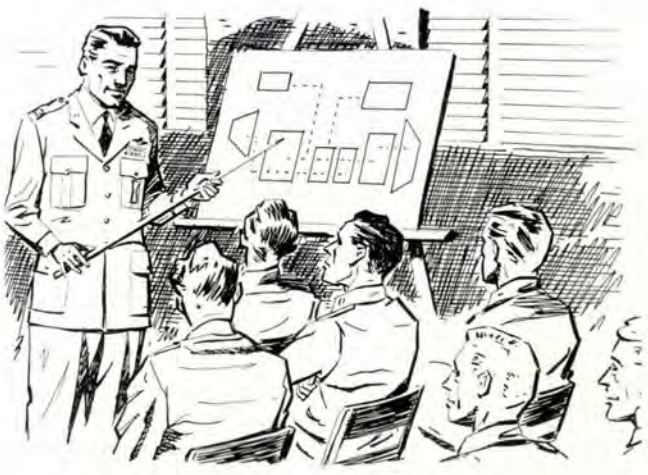
While supporting hazardous operations, personnel of the Operations Safety Section monitor the use of checklists, technical orders, or other approved, written technical instructions by all personnel directly participating in the operation. They supervise the operation and utilization of the Missile Accident Emergency Team (MAET). This team is composed of fire, medical, and CDF elements, plus a number of missile maintenance and other technical specialists that might be needed should an emergency develop during or after the launch countdown. They frequently assist in the investigation and reporting of missile accidents and incidents. They are still required to maintain daily logs of their activities and submit recommendations for correction of, or pertaining to observed hazardous operations, procedures, situations, or other appropriate items appearing in their logs.

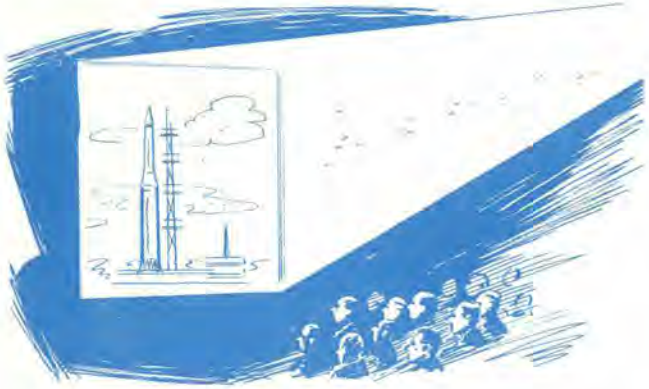
For a launch, one officer and two technicians are assigned to support the operation. On the day prior to the launch, they perform a number of specific tasks in preparation for the launch-day activities. Some of the more common tasks are: (1) Pre-launch-day safety inspection of the launch facility. (2) Check all "hot-line" safety communications nets. (3) Check the status of electrical power facilities, water-pumping facilities, and actual water supply available to support the launch. (4) Coordinate with the launch control officer/test conductor and other members of the launch crew to insure awareness of any late changes in countdown or plans for launch. (5) Brief the Missile Accident Emergency Team (MAET).

On the actual launch day, each member of the three-man safety team has a specific duty station and specific duties to perform. The Complex Safety Officer (CSO) operates a safety console in the Launch Control Center (LCC) and maintains continuous communication with the launch control officer/test conductor, the Range Safety Officer, the 1st Strategic Aerospace Division Command Post, and with the two safety technicians. One of the safety technicians works at the launch emplacement and keeps the CSO informed on activities there. He is the last man to leave the launch emplacement and is responsible to give an "all clear" report to the CSO when he arrives inside the control center, has locked the doors, and verified the status of the control center ventilation system.

The other technician works at the fallback area outside the hazard corridor, and is in charge of the Missile Accident Emergency Team. He controls access to the launch complex and is responsible for insuring that the land portion of the Missile Flight Hazard Corridor is clear.

After the launch, when the launch emplacement has been restored to, or determined to be in a safe configuration, the CSO dismisses all support elements or takes other action as appropriate in case of an unsuccessful launch.





The missile launch is one of the more publicized and glamourized, hazardous operations supported by missile safety personnel. To date, there have been 65 missile launches from VAFB since the first Thor launch in December 1958. Some of the less publicized hazardous operations supported by missile safety personnel include:

- Liquid oxygen and liquid nitrogen off-loading from transporter to launch emplacement storage tanks, and emplacement storage tank to transporter.
- Transfer of storable propellants to launch emplacement storage tanks.
- Welding operations on missiles or on propellant loading systems after such systems have been exposed to propellants.
- Ordnance (explosive bolts, engine igniters, retrorockets, etc.) installation and removal at launch emplacements.
- *Initital* systems tests and *all* high-pressure system tests involving pressures in excess of 50% of normal working pressures.

Since the start of hazardous missile operations at Vandenberg and the providing of missile safety support for those operations in 1958, over ten million gallons of propellants have been expended here.

To a member of an active heavy jet bomber or cargo unit, the quantities of propellants expended may seem small. However, in ballistic missile operations, large quantities of the propellants are reused several times to conduct maintenance, checkout, and training exercises before they are finally lost through boil-off (evaporation), contamination, or through actual missile launches and static firings.

The above briefly answers the first three basic questions mentioned at the beginning of this article. But there is still the fourth question, "Why is it done that way?"

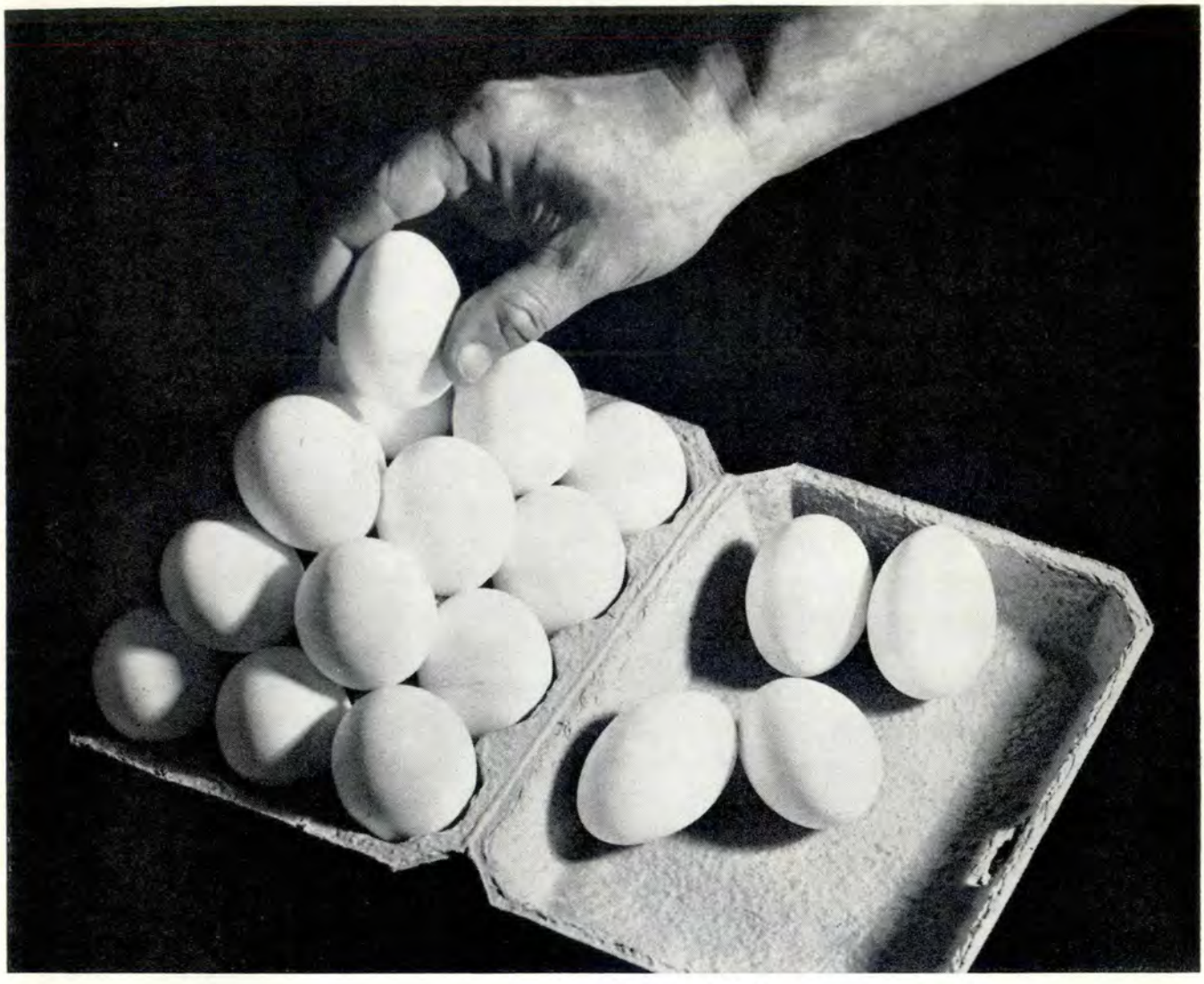
Almost 100% of the "Why is it done that way?" questions have had to do with providing missile safety specialists to support hazardous missile operations here at VAFB. The providing of missile safety specialists to be physically present and exercise safety supervision during hazardous operations is to a large degree based on the following premises:

- Newness and unparalleled complexity of ground-launched ballistic missile weapon systems.
- Newness and inherent risks associated with R&D missile projects.
- Relatively low skill and experience levels of Air Force personnel in ballistic missile maintenance and operations.
- Frequent turnover of students here at VAFB.
- More than normal personnel exposure to risks and hazards in the training situation of peacetime operations at this base.
- The inherent hazards associated with: handling and use of large quantities of missile propellants; existence of extreme high pressures (up to 10,000 PSI), large numbers of pneumatic and manual valves; extreme low temperatures of cryogenic liquids (LN_2 and LO_2), chemical properties of the propellants currently in use and programmed for use at this base.
- The inability of the unaided human senses to detect and warn quickly enough of certain existing hazards, i.e., an oxygen-deficient atmosphere caused by nitrogen displacing the normal oxygen content.
- The human tendency to become complacent about exposure to hazard or risk.
- Operational commitments and/or pressures causing attempted short-cuts and failure to observe essential personnel and equipment safety precautions.
- The relative sensitivity of ballistic missiles and launch facilities to extremely expensive and program-delaying damage resulting from accidents.

The providing of missile safety specialists to exercise safety supervision during hazardous operations here at VAFB should not be construed to mean that the commanders and supervisors of missile operations are relieved of their inherent responsibility for safety. However, the ten premises given as reasons for supporting hazardous operations as we do, should help to make clear the fact that in today's greatly accelerated missile programs (training, operations, and R&D), the commander, and particularly the supervisor, urgently need operating missile safety specialists to aid them in fulfilling their safety responsibilities. This is thoroughly borne out by experience at the Air Force Missile Test Center at Cape Canaveral and here at Vandenberg.

In approaching the end of this article, it becomes obvious that a fifth and most important question should have been included along with the other four questions at the beginning: Is the missile safety program at Vandenberg effective? The answer is "yes," without qualifications or reservations.

In the three years that missile safety personnel have been providing direct support for hazardous missile operations, there has been only one fatality and four serious injuries to military personnel while participating in missile activities at Vandenberg. There has been one fatality, and approximately nine serious injuries, to civilian contractor personnel while engaged in missile work at the base. None of the accidents that caused the fatalities, or the injuries, occurred during missile operations supported by missile safety personnel. ★



CARTON

...IN ONE ~~BASKET~~

By now you should be aware of the "new look" in the NOTAM system. Back in May, Headquarters USAF announced a program to correct deficiencies in the system. The whole idea was conceived to get the bugs out of the preparation, distribution and filing of the NOTAMs. With this improvement, it was considered that you, the pilot, would get adequate information more quickly and in an uncoded, readily readable NOTAM. In addition, it would serve to improve the efficiency in base operations, weather and communications services, by reducing the workload on these services. The plan includes confining NOTAMs to essential information for the safe arrival and departure of aircraft.

The system is being implemented by a three-phase plan, two phases now in being and a third to follow. Phase I of the program required:

- Strict compliance of base operations with pertinent directives. These directives include AFR 55-48 and 100-52.
- Maintenance of a daily log by each activity responsible for transmission, receipt, or delivery of NOTAMs. The base must acknowledge receipt of each NOTAM to insure communication accountability.
- To insure a current NOTAM file, all base operations must post NOTAMs immediately and maintain a local accountability.
- All NOTAMs are to be limited to a text essential to convey the condition. NOTAMs are to consist of only data that will preclude safe termination/departure of flight. Among these are status of terminal navigation aids for either arrival or departure use, airport facilities and air traffic control services. Perma-

nent items affecting service of a facility will be published in FLIP Enroute Supplements only.

• Local conditions which will influence safety, but not affect the decision to operate the aircraft to or from the base, will not be published as NOTAMs. If these items are not included in Enroute Supplements, local control facilities should advise the pilot of the hazard in accordance with procedures in the Air Traffic Manual for issuing advisories on airport conditions.

During August 1961, the second phase was implemented. This is the operation of the CONUS Central NOTAM Facility (CNF) at Tinker AFB, on a limited basis only. At present, the functions will be to monitor NOTAM contents, issue summaries and advise of noncompliance with the existing NOTAM directives. Normal communication by the CNF will be via the ZI weather communication system until AIRCOMNET tributary can be established for this facility. Administrative messages to the CNF will be via AIRCOMNET to the 1984 AFCS Squadron, Tinker AFB. Everyone is enjoined to cooperate fully with CNF to help bring the USAF NOTAM program to full realization by an early date.

All ZI generated NOTAMs will be in clear text. The new format, outlined as follows, is geared to simplify the preparation and the use of the information contained in the NOTAM message. A single letter indicates whether it is a new NOTAM (N) or cancellation of a NOTAM (C). The date is identified by two-digit numeric day and two-digit numeric month. The base message number is a two-digit number in consecutive order for the month. You shouldn't be confused but let's see what this would look like in message form so far. The sixth NOTAM for Norton AFB initiated on 18 September would begin like this, N 180906.

Now we will continue with the formulation of the message. The CNF number follows, which will consist of three digits assigned consecutively within each month. This will be left blank by the base when initiating a NOTAM, but will be used when cancelling a NOTAM. The name of the base where the condition exists will be identified by four letters. The FAA location identifier for the base where the condition exists, preceded by the international designator "K" will be used. For instance, Norton AFB would be identified as KSBD. The description of the facility reported by the base will use the appropriate FLIP abbreviations and is limited to no more than six alphabetical digits, i.e., if the facility being reported was the VOR omni-range, the identification would be VOR. If the Nav Aid facility is assigned a coded identifier, it will be inserted following the description of the facility. If there is no identifier, it should be identified by appropriate remarks in the remarks section.

The condition of the facility is to be described by an alphabetic code of up to three letters. When the facility is not in operation, the word "out" will suffice. Upon return to service the message cancelling the NOTAM will use the word "in" to indicate resumption. The word "out" will mean a facility is inoperative or that it is not to be used. Facilities that are unreliable or limited and will affect IFR operation should be NOTAMed as "out." The word "in" will mean an unrestricted facility or a facility with limitation which does not preclude its primary intended use. Such limitations are to be explained in the remarks section of the NOTAM. If the information is of long standing nature, it should be forwarded to ACIC for inclusion in the FLIP.

In the remarks section of the NOTAM, only essential information to clarify the identity, or description of limitation is authorized. FLIP abbreviations are to be used to conserve space. Factors that contributed to the hazard or condition are not to be used.

An innovation which really improves the effectiveness of the new system is the daily summary of all NOTAMs. This complete summary is issued every night. This puts "all the eggs in one basket" and makes for easier reference and reading.

The display of the summary is a most important facet in the new NOTAM system. An adequate display of the summary must be developed which is readily available and convenient for use by the pilot. The cardex method of filing NOTAMs is considered taboo. Cutting and posting NOTAMs is cumbersome for the aircraft dispatchers, and the numerous small cuts of paper are easily misplaced or lost.

The summary lists the Air Force bases in alphabetical order. This form is convenient for mounting on clip boards identified by appropriate alphabetical headings. These may be found now in some aircraft clearance offices. Any NOTAM received after the summary is made up is merely added by hand correction.

The complete exchange of NOTAMs with the FAA will be some time in coming because of expense and manhours involved. The base commander is responsible for entering a NOTAM into the USAF system anytime there is a change in the status of a navigational aid affecting IFR operations at his base, regardless of the operating agency. Consequently en route and FAA NOTAMs for civil airports will be the only civil NOTAMs not appearing in the USAF system. Therefore when clearing for a civil airport it will be necessary to ask the dispatcher to check FAA Flight Service Stations for additional NOTAM information. This is the picture to date.

What's next? The remainder of Phase II provides for a semi-automatic machine operation. This will speed up NOTAM service and increase the accuracy. A method of complete exchange of all USAF and USN NOTAMs is being worked out. The exchange of USAF overseas/ZI NOTAMs will be expanded and improved. The weather communications net, used for NOTAM distribution, is undergoing modifications which will provide added capability and increase the speed of NOTAM service. It is hoped that this will allow for transmission of a NOTAM summary every six hours in the future.

Action is underway to rearrange the information in the FLIP, Enroute Supplement U. S., so that all information pertaining to a given base will be reflected under that base. In this way the NOTAM summary will be easy to compare with the Enroute Supplement.

Finally, make the proper notes. Do not take the summary with you. ★

Harrie D. Riley, Air Safety Investigator, Flight Safety

IT CAN BE DONE

Maj Colin J. Walker, Directorate of Safety, Bolling AFB, Washington 25, D.C.

As of this writing, the last official accident rate reported for the H-21 is 33.4. Yet, one organization, the 1001st Helicopter Flight at Andrews AFB, has flown over 10,000 accident-free hours in this helicopter. When one unit can have a zero accident rate with equipment with which other units average a rate of over 30, there is cause to explore that one unit's safety secret.

When we do dig into the whys of accident-free operation, we find that relentless application of sound practices and principles is the "secret." Here are some specifics.

Personnel. When the 1001st was organized in 1955, unit personnel included some of the most experienced pilots and maintenance personnel in the host command. Commanders of other units with excellent safety records emulate this practice through careful personnel screening to place their most highly qualified and experienced personnel in key operations and maintenance positions.

Training. Training standards were set extremely high at the outset, and have been kept at the same high level through the years.

Standardization. Standardization has contributed materially to the flying record. All pilots are standardized by one pilot. Uniform effectiveness in flying the H-21B professionally is the reward.

Maintenance. Maintenance, the 1001st people proudly claim, is as good as any in the U.S. Air Force. They attribute this to two factors, primarily: highly experienced people and high morale.

The 1001st is well aware of the high accident rate for the H-21. The Flight contends this to be due, for the most part, to the adverse conditions under which the helicopter is operated, lack of qualified personnel and inadequate supervision. It is also believed that when these aircraft are operated under controlled conditions, with highly qualified and properly supervised personnel, the H-21 accident rate can be in balance with other single engine aircraft.

Even operating under stringent safety measures, as the 1001st does, emergencies are still a potential and must be planned for. In attaining the 10,000-hour accident-free record, 13 engine failures were experienced. Of these, eight led to emergency autorotations with forced landings. These landings were made on all types of terrain, day and night, with no damage to aircraft. This speaks well for the skill of the pilots, who practice constantly to maintain razor sharp flying ability. (Any day of the week an H-21 or two can be seen on training flights in the Andrews area.) The fact that none of the 13 engine failures were due to unit maintenance deficiencies speaks most highly for the quality of organizational maintenance.

In the six years required to attain the 10,000-hour accident-free record, the 1001st Helicopter Flight has successfully carried out its primary mission of carrying passengers or conducting courier operations as directed by Headquarters USAF. In addition, the Flight has been called upon many times to assist in rescue operations in the Washington area.

Units of the U.S. Air Force vary considerably in equipment, mission, and often, accident rate. When a close look is taken at those units that are accident free, the "secret" of their safety success again serves to underscore the importance of always striving for the best in supervision, standardization, training and maintenance. A case in point is the outstanding achievement of the 1001st Helicopter Flight, Andrews AFB. ★

Proposed Departure Times. An Air Route Traffic Control Center reports considerable difficulty in trying to pre-plan air traffic control procedures based on the proposed departure times filed by military jets. A recent check of proposed departure times on military jets departing military bases within this control area discloses that the majority of proposed times are very unrealistic. The aircraft are departing as much as 50 minutes after the proposed time filed on the flight plan.

Center controllers have been instructed to begin coordination to obtain a departure clearance for all military fighter/interceptors 10 minutes before the proposed departure time. After coordination has been effected with all concerned, a departure clearance is then issued regardless of whether the pilot has requested clearance.

In the majority of cases, this center reports, military jet aircraft depart from 30 to 40 minutes after the departure clearance is issued. This means the flight level assigned is tied up for a period of 40 to 50 minutes, both by the departure center and the adjacent center. If this is compounded by late departures from other military bases, in a short time all available flight levels are tied up by aircraft which have not departed at or near their proposed departure time.

The proposed departure time filed by the pilot should be the time that the aircraft will be in takeoff position and ready to take off. Whenever the pilot cannot make good his proposed departure time within five minutes, the center should be so advised through the base dispatcher or tower. ★

And I broke out at 200 feet and there was the runway straight ahead.

That was probably the lousiest run I've ever seen, three missed approaches with a 1500-foot ceiling.

TWO POINTS OF VIEW

This is the last time I'll ever land at this blankety blank base.

All he had to do was to check NOTAMs to find out that we have limited maintenance and ramp space . . . and a six-hour delay on fuel.

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