AEROSPACE SAFETY

UNITED STATES AIR FORCE

DECEMBER 1966

AEROSPACE SAFETY

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AFRP 62-1 VOLUME 22 NUMBER 12

FALLOUT

AVAST, YE NON-VOLUNTEERS

In Major Sherrill's article "Avast, Ye Swabs, We've Been Torpedoed!" (Oct. pg 10), the goof on the part of the U-11 is quite apparent. The book says VFR flight below 18,000 msl will be odd thousands plus 500 feet in the 0-degree to 179-degree M quadrant. Assuming the U-11 to be on the 137-degree radial outbound after completing the SID, then he should have been at 3500 or 5500 feet, etc., not 4500.

As an air traffic controller of some 20 years standing and a VFR (CFR) light plane pilot 'way back before WW II, this was easy to spot. However, not being on flying status I must decline your kind offer to go to SEA in the 0-1 program. Sorry about that!

Seriously, AEROSPACE SAFETY is one of the best professional "trade" journals I have ever read. Keep up the good work.

Maj Robert H. Tefft
Commander, 2191 Comm Sq (AFCS)
Dow AFB, Maine

Regarding the midair collision article, I wish to accept the challenge in purporting the U-11's goof. I believe Rex is referring to the U-11's altitude preceding and at the time of the accident. Deducting from the article an approximate easterly heading for the U-11, I would say that in lieu of his VFR clearance he was flying at an incorrect altitude if the terrain was not higher than 1500 feet msl. In this event, his altitude should have been an odd altitude plus 500 feet for an easterly heading between 0-179 degrees.

If this is the answer that you are looking for I'll appreciate a recommendation to fly 0-1's. In any event, we look forward to receiving and reading your excellent articles every month.

SSgt Jonathan C. Kuntz III
Shaw AFB, S. C.

The U-11 should have leveled at an odd plus 5 altitude and should have had radio contact with departure control if he was intent on using a standard IFR departure route. (The latter from common sense.)

Thank you, No, on SEA—and besides, who wants to be known as a VFR pilot?

Anonymous

I've just finished reading the article on pages 10 and 11 of the October issue of AEROSPACE

continued on page twenty-five

THE COVER

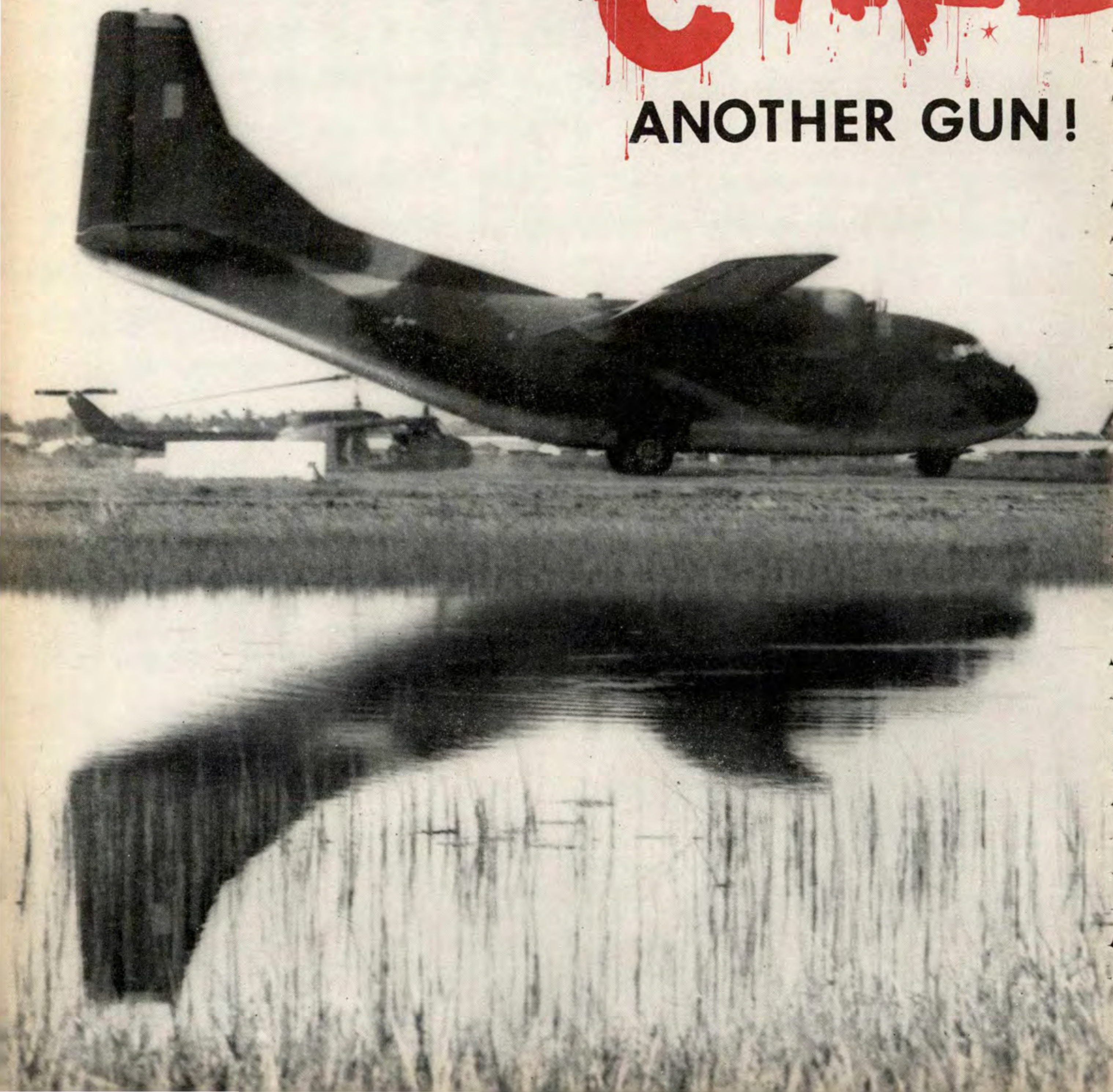
Credit for our cover drawing goes to Artist Dave Baer who got the idea from a well known drawing by Lt Col Thomas P. Garvin, TACLO to Army Combat Development Center, Ft Belvoir, Va. Lt Col Garvin did the original of a pilot loaded with gear while editor of USAFE's AIRSCOOP magazine.

SEAsons Greetings

SEAsons greetings from the members of the Directorate of Aerospace Safety. It is most appropriate that we emphasize the SEA of this holiday season because, although the intensity of the struggle in Southeast Asia may vary with the seasons, the continuing support of every member of the Air Force team is vital to free world survival. We invite you to continue to read and contribute to this publication for several good reasons. It's your magazine and, therefore, your interest is absolutely essential; also, it transmits the wisdom generated by the experiences of our fellow team members. Support the *big mission* by keeping *safety* in focus as a very important mission support factor. SEAsons Greetings.

The author recently returned from a one-year tour in Vietnam. He draws on his experience there as a C-123 AC and squadron Flying Safety Officer to present a hard-hitting argument against the idea that good safety practices can be disregarded in a combat environment.

DON'T GIVE CHARLIE ANOTHER GUN!



Capt Anthony J. Burshnick, 40 Mil Airlift Squadron, McGuire AFB, New Jersey 08641

We have often heard it said that Flying Safety is great, but when it comes to combat we can disregard it. Unfortunately, people *believe* that. Well, it just isn't so. True, we put mission accomplishment first, but aggressive flying safety is the best guarantee that the mission will be performed with maximum results.

Flying C-123s in Vietnam is a tough, demanding job. It takes training, skill, and a lot of luck to put a max grossed *Provider* safely down on an 1800 foot dirt strip. Equal ability and good fortune are required to thread your way through fog enshrouded valleys to a Special Forces camp carved out of the VC infested jungle. Skill and ability are acquired and innate traits, but Lady Luck? You have to be nice to her and when she starts holding out on you, you have to make your own luck. The best way to make it is to adhere to sound and proven operating procedures.

Let me cite a few cases where Flying Safety was compromised but Lady Luck stayed with our fortunate Air Commandos.

The pilots were in a big hurry to get off one more mission before darkness and weather closed down operations. The copilot started the right engine on the right mag. His failure to go to BOTH was probably due to some distraction during start. No sweat though, he would probably catch it during the mag check. As the aircraft approached the active, he requested an immediate takeoff from an intersection 1000 feet down from the start of the 3000-foot runway. Tower cleared him for an immediate, so "forget the checklist, everything looks good." Great, under normal circumstances, except that the right engine is running on one mag and the copilot had not set the water injection. Away they go. Power doesn't check! Not enough runway left to abort! "Our Father who art—Hey, it's flying! I think we will make it." They did, with Lady Luck for a copilot.

Then there was the pilot who was going to make an assault landing on an 1800-foot dirt strip with a cargo load of JP-4. Needless to say, stopping distance was critical so he planned on setting down right on the edge of the runway. Five feet from the approach end is a four-foot drop-off. On final everything looked good, but our pilot was getting nervous and pulled off too much power. Down came the *Provider* about five feet short of the drop-off. The first bounce was a good one—the aircraft landed up on the lip of the runway. Roll out was normal.

Well, like they say, it's a good landing if you can walk away from it.

The crew had just loaded up with 10,000 pounds of ammo and were taxiing out for takeoff when they heard a popping noise in the nose gear wheel well. Nose wheel steering was lost so the pilot assumed that the steering cable had snapped. He was going into an assault strip, but figured he could handle the aircraft without nose wheel steering. (This is not a recommended procedure.) He did not check to see exactly what broke but called for immediate takeoff. "Cleared" and off he went. When he called for gear up, the nose gear would not retract. He was able to get it locked down and requested a return to Tan Son Nhut. Landing and rollout on the 10,000-foot concrete runway was uneventful. Investigation showed that the nose wheel steering cable had snapped. Then it wrapped itself around the retract mechanism which prevented the nose gear from going up and locking. "Lady Luck rides again."

Well, let's let the "Lady" take one more ride and then get off. The pilot was either sweating out stopping on a 3500-foot runway, or else he thought inflight engine reversal would compensate for his excessive final approach speed. Anyway, about 10 feet in the air over a grassy overrun, he reversed. In the next five seconds he lost his 10 feet, his high airspeed, his composure, and about five years of the copilot's life. The landing was hard, but again no damage to anything but the pilot's pride.

So here we have some obvious violations of good operative procedures and a resulting compromise of safety—the fact that an accident

DON'T GIVE CHARLIE ANOTHER GUN!

did not result is either luck or Divine Providence.

Well, how about a ride with Luckless Larry. We will start out on final approach at the same assault strip that our short lander bounced one in on. Everything looks good and again he is shooting for the end of the runway. Pull a little power off, oops too much, and down comes the *Provider*. The bounce – right gear moves up through the wheelwell – the air-aircraft swerves – hits a dirt pile – off the runway – through the boondocks – CLASS 26!! No injuries.

Let's go back out on final but on a different runway. The pilot finds himself a little low but is slow adding power. It looks like another short landing. The only trouble is that you don't land short on *this* runway. There are drop-offs on both ends and no overruns. More power, but too little too late! The nose gear hits the lip, then the mains do likewise, and our pilot makes a beautiful belly landing. In both cases the runways were the most difficult assault strips in Vietnam. They are 1800 to 2000 feet long. Surface conditions have to be guesstimated by the pilot and, of course, there is the constant threat of enemy fire. However, the computed stopping distance, in both cases, was approximately 1500 feet so there was really no need to put it on the end. It's the same old story, land a hundred feet long but not one foot short.

The next flight is with our reversing friend SANS Lady Luck. The crosswind at the assault strip is guessed to be at or near maximum. Parked helicopters line the rollout end of the runway, giving about three feet clearance on each wingtip. The Old Head is in the right seat with a "new to SEA" pilot in the left seat. The touchdown is a bit firm and they are airborne again. "Reverse inflight," only this time the nosewheel comes down first and collapses. The aircraft swerves off the runway and skids to a stop just short of the choppers. No injuries. Well, maybe Lady Luck was back in the cargo compartment.

Our next pilot has a snapped nose wheel steering cable but he doesn't know it. No rules were broken by this aircrew, but this episode shows what could happen if you elect to fly a questionable aircraft as our other pilot did.

The pilot briefed for the assault landing. He touched down in the center of the runway on his planned touchdown point. The aircraft rolled straight and full reverse was applied. The aircraft started to veer to the right so nose wheel steering and left brake were applied but with no effect. The right gear went off the runway and started knocking out runway markers. The right engine was brought out of reverse and into full forward range. The aircraft was finally stopped back on the runway with the nose gear cocked off 15 degrees to the right.

A quick look showed that the nose wheel steering cable had broken. Further investigation showed that the cable had been frayed and numerous strands were broken, long before this particular landing. Aircraft damage was just short of a minor accident.

There you have it: one aircraft destroyed and three badly damaged. The score could have been higher!

You must have some calculated risks in a combat situation. For example, every max gross takeoff from an assault strip. Lift-off speed for the C-123 runs about 95 knots and minimum single engine speed is 109 knots. When you lose an engine on takeoff, it's crash straight ahead. That was proven. However, you don't throw the book out the window because of these rare instances. In fact, proven operating procedures must take an even bigger role to minimize the risk that must be taken. Every time we damage an airplane we lose airlift when we can least afford to. The enemy takes his toll on our aircraft. Sloppy procedures that lead to accidents is just like giving old Charlie another gun. ★

THE IPIS APPROACH

By the USAF Instrument Pilot Instructor School, (ATC)) Randolph AFB, Texas

Here's an index to all IPIS Approach items that have appeared in AEROSPACE SAFETY since inception of this feature in January 1965—A CHRISTMAS GIFT for you from IPIS and AEROSPACE SAFETY.

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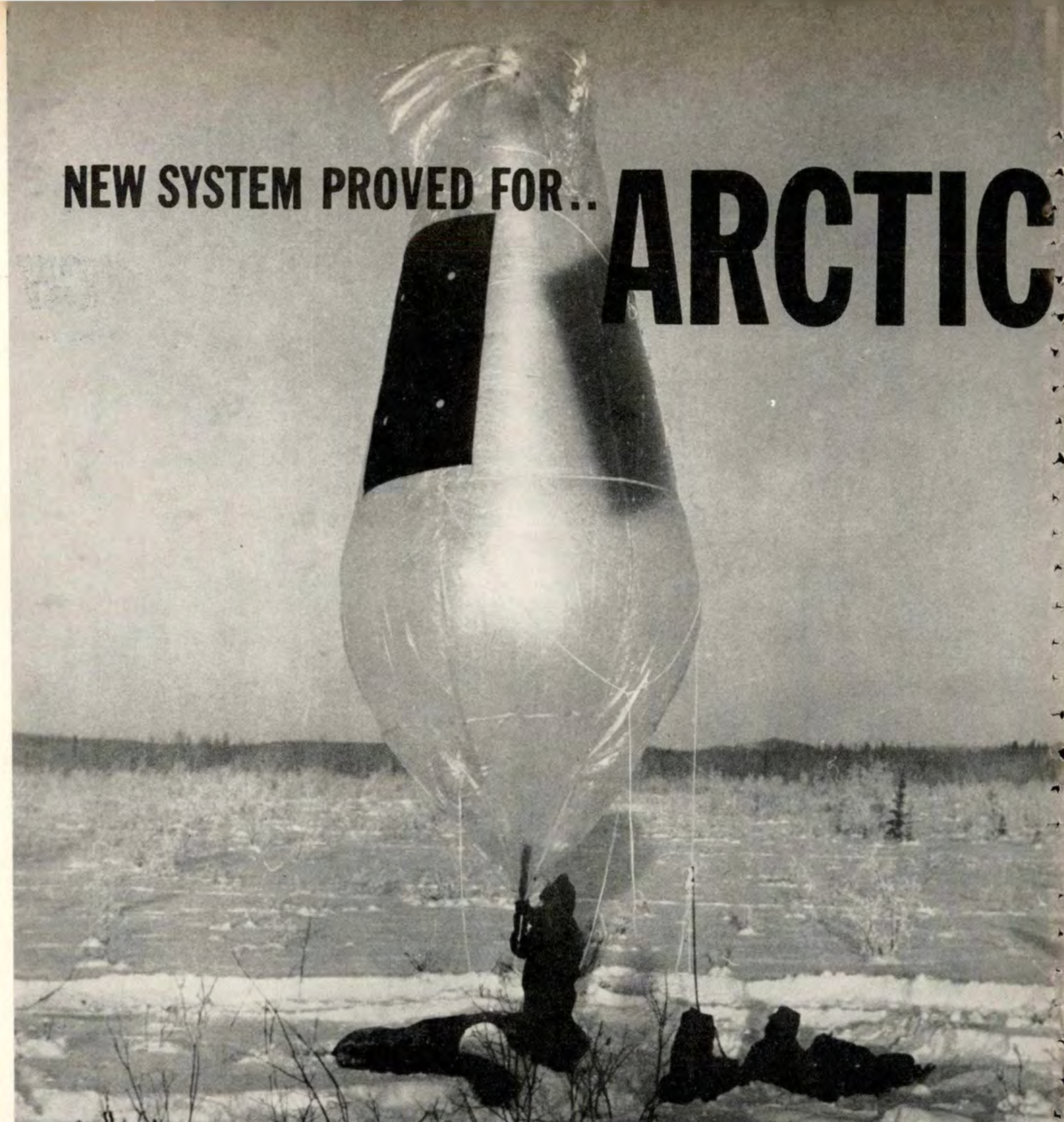
Copies of all IPIS Approach articles to date are available from the USAF IPIS, Randolph AFB, Texas 78148. ★

NEW SYSTEM PROVED FOR.. ARCTIC



THE FULTON RECOVERY TECHNIQUE

RESCUE

Capt James R. Stine, ASD, Wright-Patterson AFB

The pilot sitting in the life raft looks expectantly upward as the search aircraft flies over. Minutes later he is snatched from the sea and finds himself dangling at the end of a thin nylon line several hundred feet in the air.

Is this any way to run a rescue? You bet it is.

But how about the man down in the frozen Alaskan interior? He could freeze ice cubes in his pockets and needs help quickly. Will this same new rescue system work for him? On a bleak, chilly morning last winter, 15 men took off from Wright-Patterson AFB to find out.

This team – from the Deputy for Flight Test, Aeronautical Systems Division – arrived 10 hours later aboard an HC-130H at Eielson AFB, Alaska, 26 miles from Fairbanks. Their assignment: test and evaluate the Fulton recovery system installed on an updated version of the Lockheed C-130.

The Eielson area was selected for the test site as being one of the consistently coldest locations available. The temperature upon arrival was –28°F and a two-foot snow covered most of the open areas. The runway and taxiways were snow covered with a hard-packed layer. These weather conditions prevailed during the 21 days of the test, providing an excellent cold weather test environment.

Inflated balloon will carry lift line aloft for engagement by yoke on nose of aircraft. Sequence is shown in drawings at left.

The test force was greeted by the advanced party consisting of two men: one supply and one maintenance specialist, who had been deployed a week ahead of the main group to set up the offices, spare parts, and equipment storage in a nose dock hangar. The aircraft was parked in an open area adjacent to the hangar to obtain maximum exposure to the arctic environment.

The HC-130H testing was divided into three phases:

- Navigation and avionic equipment evaluation at high latitude and in cold environments.
- General aircraft operation evaluation in cold climates.
- Recovery equipment evaluation both during ground set up and during aerial pickup of dummy loads.

The navigation and avionic equipment tests encompassed three missions to evaluate the ASN-35A doppler navigation computers, two missions testing the Loran C and one polar flight to check the limits of operation for both systems.

The general aircraft system tests were performed in conjunction with the above missions and in two instances aerial recovery tests were also completed following avionics missions. The ground portion of the recovery presented some unique problems. The recovery test site was located six miles from the main base at Eielson on a former bomb range. Access roads to the ground site had been plowed open for access to automobile travel. However, to provide access across the open field, a trackmaster vehicle, similar to a weasel, and driver were borrowed from the Arctic Survival School. The snow cover was 20 to 24 inches deep and was difficult to traverse on foot. The trackmaster vehicle was large enough to carry 10 people, but it was used mostly to transport extra equipment to the ground site. The trackmaster drivers were arctic survival school instructors who also became the test subjects for the ground station set up. They were thoroughly experienced in arctic survival techniques, but had not seen the Fulton Recovery kit before this test. Neither man experienced much difficulty in following the kit set-up instructions and their arctic experience enabled them to give objective evaluation on the adequacy of the equipment for arctic use. The rescue kit comes in one or two man modules and day or night models.

The recovery tests followed a similar pattern for each mission. The aircraft would perform a simulated search using direction finding and tracking equipment to locate a portable ground transmitter activated by the ground crew. After homing in on the ground site, a pass at low level was made to drop the recovery equipment from the rear of the airplane. The ground

Dummy attached to lift line begins journey aloft, reaches aircraft ramp in photo at right.

Arctic cold provided realistic environment for determining how recovery system will function under such conditions.

station set-up portion of the test was then begun using test subjects to assemble the parts of the kit. The kits were dropped in two parts; one container carrying the accessories and the other containing helium used to inflate a balloon. The accessories in the kit include a recovery suit-harness, 500 feet of braided nylon lift line and a large plastic balloon resembling a small dirigible used to hold the lift line vertically. The problems facing the man to be rescued are to gather the equipment, dress in the suit, and inflate the balloon after attaching all lines properly. These tasks were aggravated in the arctic by the cold and the snow and complicated by the bulky arctic clothing worn by the test personnel. The recovery suit and balloon were stiffened by the extreme cold temperatures encountered down to −35°F during the tests. The arctic clothing also made dressing difficult and brought on extreme perspiration if the individual tried to work too rapidly.

After the man is dressed in the suit and has attached the lines between the suit and balloon, the balloon is ready for inflation. The helium used for inflation is held under 4000 psi pressure in fiberglass bottles. The bottles are too heavy for one man to move, especially through deep snow; therefore, the balloon and other equipment has to be carried to where the helium containers landed. After inflation is complete, the balloon is released to rise and pull the lift line up to maximum extension in readiness for the aerial recovery.

In Alaska, dummies were used for the recovery since the initial live pickups had not yet been made. (Since the Alaskan test, successful live recoveries have been made at Edwards AFB.) The dummies were carried to the pick-up site aboard the trackmaster vehicle and attached to the lower end of the lift line just before the aerial recovery portion of the test.

The aircraft approaches the lift line at about 450 feet altitude and 125-130 knots. This is 125 feet beneath the balloon. Upon contacting the line with the V-shaped yoke on the C-130's nose, the balloon breaks free at a weak link and floats away.

The line is locked into the nose of the aircraft and trails underneath the fuselage aft where on the open ramp, the recovery crew stands ready to snag the line and retrieve it into the rear. The crew at the rear secure the line which is then released from the nose. The front end of the line is then drawn into the rear and attached to a hydraulic winch, at which time the other ties are released and the man reeled in. (For a more detailed description of the system, see AEROSPACE SAFETY for July, 1965.)

In arctic temperatures the recovery crew had to wear full arctic clothing plus a face mask to prevent frostbite from the wind blast received at the end of the open ramp.

The recovery pick up, when viewed from the ground, gives the appearance of lifting the subject smoothly almost vertically for some 50 feet as the nylon stretches, absorbing most of the shock of the contact by the aircraft, 450 feet above. A face mask for the recovered man would also be mandatory in addition to the suit to protect him from the extreme wind chill during his aerial flight attached to a line behind the airplane. From line engagement by the airplane until the dummies were boarded took an average of six minutes.

A series of the aerial pick-ups was performed, both single man and dual, to evaluate all possible contingencies of arctic recoveries before the tests were considered complete. The low temperature remained constant throughout a three-week period and the tests were completed in record time. The HC-130H aircraft and Fulton Recovery gear did not exhibit any serious deficiencies under arctic operation.

The Air Force now has one more effective tool for recovery of downed airmen and is currently equipping Air Recovery Squadrons throughout the world with the HC-130 aircraft. ★

Midair Retrieval

While the HC-130H is in the business of picking up survivors from the ground, a group of experimenters in Delaware snatched a parachutist in midair. The purpose of the exercise conducted by All American Engineering Co. and Pioneer Parachute Co. was to demonstrate a means of preventing pilots who bail out of disabled aircraft from falling into enemy hands. The photos, top to bottom, show:

- *Engagement assembly of the aerial recovery system,*
- *Engineer Chuck Alexander of Pioneer ready for recovery,*
- *Successful engagement,*
- *Alexander approaching the ramp of All American C-122.*

The basic equipment used has existed for several years and has been used for recovery of a variety of payloads since the mid fifties. The parachute system is a standard 28-foot main chute with a reinforced 11-foot diameter target or engagement chute above the main canopy. The loads on Alexander were reported to be six "G" maximum — less than those during opening shock of the parachute. ★

as yE sow

Capt George H. Holbrook
35 Tac Ftr Wg, Danang AB, Vietnam

During a recent flight line inspection, I came across two helicopters that hadn't been grounded. As I stopped and took note of the situation, the sergeant in charge became aware of my presence and sauntered over. I didn't have to glance at the numerous stripes on his arm to know he was in the "Super Sergeant" category. His thinning crop of grey hair and his weather-worn countenance marked him as an old timer in the Air Force.

After a few courteous remarks had been passed, I got down to my reason for stopping. I asked the old Sarge why the choppers weren't grounded.

"Sorry, Captain," he replied, "I just didn't tell the boys to ground them. We just got here and, well, last year when I was at this base, there weren't any safety people and we were pretty much on our own."

After pausing a moment to digest this extraordinary bit of information, I reminded the sergeant that safety people were now stationed at this base and that aircraft would be grounded. His reply stunned me into shocked silence, momentarily. With all sincerity he said, "Yes sir, we'll ground them from now on. By the way, Captain, since I'm new on the base, I don't know how you operate. What do you want me to do here?"

After a few seconds, I shook off my surprise and stammered, "Do your job, Sarge, and do it right just as you have been trained to do it."

He sort of nodded his head "yes" and went back to his aircraft. I left after making sure the birds were grounded.

Later, as I sat melting away in the oven, facetiously titled "Office," I thought back to this conversation and became irritated. The request for instructions on what I wanted *him* to do annoyed me. I couldn't believe that a sergeant with over 20 years service and with more stripes on his arm than a computer can count didn't know his job and had to ask for guidance. Upon further reflection I finally concluded that the old Sarge just hadn't realized that when he does his job as he has been trained to do, using checklists, SOPs, etc., he is doing the job safely. That led me to wondering how many other troops, especially those with fewer years in service, had failed to realize that adherence to regs, checklists and the like goes hand-in-hand with safety. Do you belong to this unfortunate group?

But the part of the conversation that irritated me the most was the Sergeant's operations a year ago. No safety people were here then so he and his men were pretty much on their own. From his statement it is easy to conclude that safety wasn't even considered. Does it take the presence of safety personnel peering over your shoulder and watching your every move to make you do the job correctly? If it does, then, brother, you are in sad shape. Pride in your work should make you want to do the job properly. Your intelligence should tell you that rules, checklists and other controls have been established to help you do the job correctly achieving maximum results with minimum risks.

If you need close supervision at every step of the way to make you toe the mark, then the Air Force doesn't want you. It can't afford you. No business—and the Air Force is big business—can afford to have one supervisor watching you all day long. The alternatives then are to let you work without supervision—and cause a catastrophe—or replace you with a *trustworthy* individual. A smart business would do the latter.

This lack of pride in one's work, this unwillingness to discipline one's self and do the job properly is a poor and dangerous attitude. It is particularly dangerous to the Air Force's efforts in Vietnam because it quite often hides under the name of *war zone-itis*. "We are here to fight a war," so the argument goes, "so there is no time for this safety jazz. We have to get the job done."

I'll be the first to admit that this is a war zone and that we must get the job done. But I'll also be the first to disagree that supervisory controls and safety practices must be relaxed or eliminated. The Air Force has been in the business of fighting wars for over 50 years now and has learned from bitter experience—several times over, in fact—that supervisory controls and safety practices are the only sure means of "getting the job done." For example, in World War II we lost more aircraft in training accidents than to enemy action. During the Korean struggle the Air Force switched to the untamed tiger attitude among its new pilots and promptly littered the countryside with mangled pieces of aluminum.

Even here in Vietnam we have had a bitter lesson. How many of you who say that we must get the job done have ever seen the *complete job* done on Bien Hoa? The toll of death and destruction from that catastrophe was enormous. Is safety to be ignored in operations (get that job done) until the bill for our neglect is rendered and the full price in precious lives and expensive equipment must be paid? Will it be then, and only then, that the light will be seen and safety sought as an important adjunct in our operations?

Will there be another disaster before we learn our lesson? I don't know. The answer lies with every man on the flight line, in the bomb dump, in operations and in maintenance. If you do your job and faithfully follow all procedures and checklists, then the answer will be *no*. If you want to do the job your way using your own homemade, unapproved procedures (and the h.... with safety), then let me know where you work. I don't want to be there when it all goes B-O-O-M! ★

SOMETIMES THE AIRPLANE WON'T FORGIVE YOU

The light airplane, like the automobile, is relatively a safe machine and will forgive many errors. If this were not so, the countryside would be littered with aircraft remains. Nevertheless, this type of flying extracts a grim toll of life and limb.

No, we're not working our way into an aero club story. The subject here is Air Force personnel and light aircraft either privately owned or rented from an operator. (No aero club accidents are included.) Accidents in these aircraft have cost the Air Force 25 lives from Jan 1965 through Sept 1966, a toll that is all out of proportion to risks involved in this type of flying. The reasons for this unhappy situation should be evident after a brief look at some of these accidents and their causes.

A sergeant was killed when his single engine aircraft crashed shortly after takeoff. While on a cross-country flight, he had arrived at the airport on the preceding afternoon and prepared to depart shortly after dark. However, he returned within a few minutes and RON'd. He was killed the following morning when he took off and crashed in the before-dawn darkness.

This man was considered by his instructor to be an average student but somewhat over-confident. He had no instrument training and very little night time during his 65 hours, 25 of which were solo. He had been briefed not to fly except during daylight hours.

The cause of this accident was that the pilot probably over-extended his capabilities by taking off at dawn toward a dark area in which there was no visible horizon.

A multiplicity of factors may explain why a young officer ended his career against a hillside in a small two-place aircraft. Although he was a rated navigator, he had only 20.3 hours of flying time and was working toward a private license.

During his second solo cross-country he flew from homebase to another airfield an hour and a half away. The crash occurred approximately one hour after takeoff on the return leg. Impact was at 2500 feet in weather reported as being 1500- to 1900-foot overcast with 10 miles visibility. A resident near the crash scene stated that the peaks were obscured by fog and haze. Another student made an emergency landing because of the weather.

The possible causes of this accident are several. Lack of experience with weather of the type that existed at the time was considered to be one factor. Contributing were anxiety because the pilot had duty the next day—this may have led to gethomeitis. Possibly he was over-confident due to his experience as a navigator in which he had participated in many IFR flights.

Many experienced military pilots have fallen victim to disorientation, so there is no reason to believe that inexperienced private pilots are immune to this phenomenon. Our third example concerns a captain who crashed during a night VFR cross-country. From takeoff at about 7 p.m. until 30 minutes before the crash, he apparently had no problems. Then he was heard on the radio saying he was uncertain of his position and that he was going to descend to see if he could spot some lights. Shortly after this, a man heard an aircraft fly low over his house and ran outside. He testified that he heard the engine go to full power then saw a ball of fire as the aircraft crashed.

Evidence at the scene indicated the right wing tip struck the ground first and the aircraft then cartwheeled. Weather at the time was indefinite 100-foot ceiling, obscuration, visibility one-half mile, variable in fog. This pilot with only a little over 100 hours total time and only 24 hours solo flying was a patsy for this kind of weather and did what you would expect an inexperienced pilot foolish enough to get into such a situation to do: he flew the aircraft into the ground.

While the type of accident illustrated by the above examples predominates, others brought about by different causes were just as avoidable. One young airman with 24 hours total time, including only four hours solo, landed and parked his aircraft. There was a 20 knot wind blowing (which probably should have precluded flying for a pilot of his experience) so he pulled the control stick back and buckled the safety belt in the right seat around the stick. Later, on takeoff the aircraft reached flying speed and went into a steep nose-high attitude. After climbing about 50 feet, it stalled, spun and crashed. What happened is obvious. Also clear is the fact that the pilot failed to perform a proper preflight.

Another airman with 38 hours total time, who hadn't flown for a month, flew into a mountainside in very poor visibility. Most probable cause: spatial disorientation in instrument weather.

A qualified pilot, while intoxicated, struck a tree at night about 75 feet above the ground and crashed.

It doesn't take much of an analyst to see that the major factors in these light aircraft accidents are lack of judgment compounded by inexperience. These are tough to combat. Recommendations included special meetings and safety material for light aircraft pilots, suggestions that they confine their flying to the aero club. These are certainly valid, but the burden of responsibility must be on the individual. One reason for printing this article and giving the several examples is to bring to the attention of those light aircraft pilots who haven't yet had a serious accident the fact that others of like experience and enthusiasm have bought the farm.

The examples cited should indicate to the man intelligent enough to learn to fly that motor skill will never replace judgment. The ability to coordinate stick and rudder is good but not unusual. Monkeys can coordinate hands and feet. But do they have the judgment to make a one-eighty when the weather ahead looks threatening?

The FAA recently announced that the general aviation accident record was the best in history in 1965. Let's keep it improving by

• Recognizing as well as possible our limitations and not exceeding them,

• Not substituting audacity for good judgment. ★

Rex Riley

CROSS COUNTRY NOTES

HAVING AN ACCIDENT IS NO ACCIDENT. Double-talk? Not at all.

Webster defines "accidental" as "happening by chance." In practically all instances, investigation of mishaps reveal that they happened by design. Each was caused by some overt act which the individual involved knowingly committed or a set of conditions which were knowingly generated.

Simply stated, most accidents don't just happen, THEY ARE CAUSED either by an individual or a group of people who, although they should know better, commit the act or acts which result in the mishap.

For example, consider the sequence of events that led to injury or death to the individual and to damage or destruction of property in the following case studies.

Take the case where a group of airmen went out on

the town one night, drinking to excess at several bars into the early morning hours. The driver, whose thinking becomes irrational under the influence of alcohol and who is fatigued, is spurred on by his cohorts and drives along winding country roads at speeds in excess of 100 mph. Yes, the result was a head-on collision after the driver lost control of the vehicle. Two vehicles were demolished, two people killed and several others seriously injured.

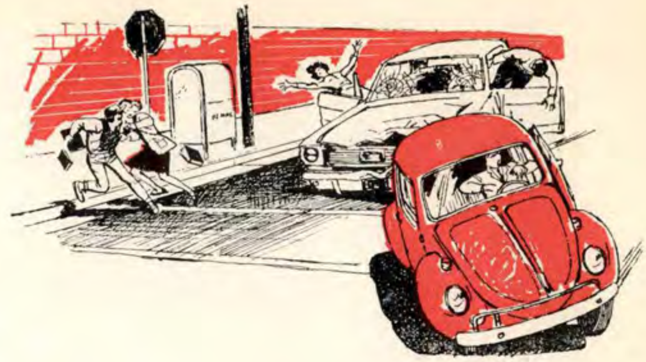
Was this an accident? Hardly, for the resultant mishap was inevitable. The individuals set the stage for this one. It's as simple as one and one makes two—mix drinking, fatigue, driving, speed and recklessness and the result, practically without exception, is DISASTER.

Or, consider the parent who tells his child to mow the front lawn with a power mower. The child, eager

to please, cranks up the motor and starts to cut the grass. Unfortunately, the parent didn't supervise the operation, or he would have seen that his child was barefoot, that the grass was slightly wet, that other children were around and the task became one big game. You see, the child didn't know any better, but—THE PARENT SHOULD HAVE. Yes, I'm sure you already know the result for it was inevitable. The child slipped and fell with his foot caught under the mower's blades. Cost: loss of the child's toes which were cut off by the power mower. This was hardly just a happening, it was no less than should have been expected—an act of negligence.

Or, review the events that occurred at another base during an aircraft maintenance operation. Contrary

to tech order procedures, a maintenance team attempted to check gear retraction on one gear of a B-52 that was fully loaded with fuel. Oh yes, jacks would not be used, but they would secure the remaining gear with down-locks. Stupid you say? Doesn't make sense? Well, I agree, but facts are facts and in practically all instances of maintenance malpractice mishaps, similar stupid, nonsensical acts were committed. Where was the supervisor? Of course, he was directing the operation. You might say that he was the one that masterminded the whole "comedy" of errors. As you have probably gathered by now, the aircraft settled when the gear collapsed causing extensive damage. The down-lock had fallen out. Accident? Not by any stretch of the imagination. This mishap was caused, perpetrated and engineered by the personnel who committed unsafe, unauthorized acts.



Lastly, I would be remiss in this account of people caused accidents if I did not highlight for you what I consider to be the most ridiculous seat belt mishap of the year. Can you imagine anyone not using seat belts after he had been in a prior auto accident and sustained injuries because he was *sitting* on the seat belts? Well, our records reveal just that. This individual, within a three-month period was involved in *two* vehicle accidents in which he sustained injuries which could have been prevented had he used the seat belts. Some people just never learn.

In closing I should like to point out that the above examples are not isolated cases. Rather, the acts of omission and commission that are ridiculous and unbelievable are continually being revealed in accident investigations. These acts are being committed by people who know better, by the very people who thought that only the other guy would have the accident—surely not themselves. With this in mind, I would like to set the record straight. Accidents *can* and *do* happen. They *can* and *will* happen to you if you cause them.

However, I know that you will not commit those foolish acts. I know that you will use and follow checklists. I know that you will use only published procedures. I know that you will exercise caution, moderation and common sense in all activities. I know that you will prevent accidents and I know that you will enjoy the good life throughout the coming year and all the years to come. Have a safe and sane Holiday Season, with our best wishes from everyone at Aerospace Safety. **(Contributed by Lt Col Murray Marks, Directorate of Aerospace Safety.)** ★

THE HOOK VS. THE BARRIER

Lt Col Richard R. DeLong, Directorate of Aerospace Safety

WOULD YOU BELIEVE . . .

• The BAK-9 is no longer being procured for USAF use and hasn't been since 1962?

• The BAK-12 is the current USAF standard arresting gear, is still being procured and over 100 units are in operation, as opposed to approximately 190 BAK-9 units? (As of 31 Aug 66.)

• The BAK-12 has a higher overall capability, but, in most aircraft, it must be engaged at a lesser speed than the BAK-9, at the same aircraft weight?

• The pilot handbooks do not contain recommended engagement speeds for the BAK-12?

• Some handbooks do not contain recommended BAK-9 engagement speeds for all aircraft weights, but only give a maximum or approximate maximum?

• The lighter the aircraft, at a given engagement speed, the higher the G loads? (The one exception is the F-4C when engaging the modified BAK-12. BAK-12 units in SEA are to be modified to upgrade compatibility with the F-4C aircraft.)

• Barrier engagement weight/speed limitations are of mixed origin? In some cases, the barrier is the limiting factor, in others it is the limit strength of the aircraft arresting hook.

Just where do we stand in this business of aircraft arresting gear, or *barriers* as they are most commonly called? Other than the operational procedures involved in preparation for and engaging a barrier, it is probable that the average pilot is not the world's greatest expert on the subject.

Let's discuss some of the "would you believe" statements above.

There are 190 BAK-9 units in the field. As they wear out and replacement parts are depleted, we will have to reinitiate BAK-9 procurement or replace BAK-9 units with the BAK-12.

In the meantime, all new installations are BAK-12. During the period April through August 1966, BAK-12 units in the field increased by approxmiately 50 per cent.

The BAK-12, in simple terms, is a beefier system than the BAK-9 and has a higher energy absorption capability. With the same nominal runout of 950 feet, the increase in capability also causes slightly higher aircraft hookloads. Accordingly, the maximum allowable engagement speeds for the F-101, F-102, F-104, F-105 and F-106 are somewhat reduced when engaging the BAK-12 from those allowed for the BAK-9 (see appropriate aircraft charts). The F-100 and F-4C maximums increase for the BAK-12, due, in both cases, to higher strength of the aircraft tailhook.

Discounting the limiting factor of aircraft tailhook

FIG. 1

	BAK-9	BAK-12
Installation	Fixed	Optional (Nomally Portable)
Energy Absorption Capability	55 Million foot-pounds	65 Million foot-pounds
Nominal Runout	950'	950'
Tape Strength (Ultimate)	70,000 pounds	105,000 pounds
Cable Strength (Ultimate)	84,000 pounds	84,000 pounds
Max. Engagement Speed (Barrier Dynamic Limit)	190K	190K
Max. Allowable engagement weight at 190K	28,000 pounds	43,000 pounds

strengths, figure 1 shows BAK-9/BAK-12 comparisons:

The G load imposed on an aircraft during a barrier engagement is of some importance to a pilot. Perhaps you can get an idea of what to expect from the accompanying charts. Notice that these forces can run from 4.85 at the top of the F-104/BAK-12 column (Chart B) to .9 at the bottom of the F-105/BAK-12 and BAK-9 (Chart A). If you snatch the BAK-12 at 190K in a lightweight F-104, take our advice and lock your shoulder harness! The G loads are the result of the aircraft overcoming resistance offered by the barrier. The heavier the aircraft, at a given speed, the easier this resistance is overcome. Even though hookloads increase with aircraft weight (at a given speed), the increase is not comparable. For instance, on the BAK-9 at 160K engagement speed, a 20,000-pound aircraft experiences a 45,000-pound hookload. A 30,000-pound aircraft under the same conditions experiences a 52,000-pound hookload—a 50 per cent increase in aircraft weight and a 15 per cent increase in hookload.

We will not devote much time to the shortcomings of the pilot's handbooks. The charts that appear herein will be forwarded to the appropriate agencies and will be included in the handbooks at some future date.

Note that the engagement speed charts give speeds for two hook strengths, design and yield. To a pilot this means one thing: If you engage on the design strength chart, aircraft inspection in accordance with appropriate T.O.s is all that's necessary. However, if you exceeded the design hook strength, make sure the hook is replaced! At home base you shouldn't have to worry about this, but on a trip it may be helpful. In any case, if you exceed design hook strength, include this fact in your form 781 write-up.

Taking the barrier at yield hook strength limits is acceptable and, all things considered, is safe. By "safe" we mean: the hook won't break and the barrier won't break. By "all things considered" we mean: provided the barrier is properly maintained (including adjustments) and the aircraft hook has not been previously damaged.

There are numerous safety factors built into the aircraft/barrier systems. For instance, the BAK-9 limiting factor is a tape tension of 38,000 pounds; the ultimate tape strength at the sewed attachment loops is 54,000 pounds; the BAK-12 limiting factor is cable tension of 50,000 pounds; the ultimate cable strength is 84,000 pounds. As for aircraft tailhooks, the ultimate tensile strengths in pounds are: F-100, 126,000; F-101, 100,000; F-102, 70,500; F-104, 90,000; F-105, 75,000; F-106, 82,200 and F-4C, 247,000. A barrier engagement is an emergency procedure. If for some reason you find yourself in the position of engaging the barrier in excess of the Chart B limits for your aircraft, we suggest you do it! It sure beats ejecting on the runway, if that's the only alternative. Chances are, within ultimate tensile strength limits, that you'll walk away from it.

The charts on the following pages provide information which we feel has been needed for a long time. Speeds are based on extrapolated test data. Loads are given to the closest .05 G. If and when you have to use this information, remember what has been said about aircraft hook integrity *and* barrier maintenance. Without these—no guarantees and no refunds.

FIG. 2
F–100 MAXIMUM BARRIER ENGAGEMENT GROUND SPEEDS

	CHART A	DESIGN HOOK STRENGTH, 84,000 LBS.			CHART B	YIELD HOOK STRENGTH, 96,500 LBS.		
Acft Weight	BAK-9	Acft G Load	BAK-12	Acft G Load	BAK-9	Acft G Load	BAK-12	Acft G Load
24,000	190K	3.0	190K	3.1	190K	3.0	190K	3.1
26,000	190K	2.85	190K	3.0	190K	2.85	190K	3.0
28,000	189K	2.7	190K	2.9	189K	2.7	190K	2.9
30,000	187K	2.55	190K	2.8	187K	2.55	190K	2.8
32,000	185K	2.35	188K	2.6	185K	2.35	190K	2.65
34,000	183K	2.25	187K	2.45	183K	2.25	190K	2.55
36,000	181K	2.1	186K	2.35	181K	2.1	190K	2.45
38,000	179K	2.0	185K	2.2	179K	2.0	190K	2.35
40,000	177K	1.9	183K	2.1	177K	1.9	190K	2.3
42,000	173K	1.8	179K	2.0	173K	1.8	190K	2.25

LIMITING FACTOR: Barrier, Both Charts.

FIG. 3
F/RF–101 MAXIMUM BARRIER ENGAGEMENT GROUND SPEEDS

	CHART A	DESIGN HOOK STRENGTH 67,000 LBS.			CHART B	YIELD HOOK STRENGTH 77,000 LBS.		
Acft Weight	BAK-9	Acft G Load	BAK-12	Acft G Load	BAK-9	Acft G Load	BAK-12	Acft G Load
30,000	181K	2.25	173K	2.25	188K*	2.55	184K**	2.55
32,000	179K	2.1	171K	2.1	186K*	2.35	182K**	2.4
34,000	177K	1.95	170K	1.95	184K*	2.25	181K**	2.25
36,000	175K	1.85	168K	1.85	182K*	2.1	179K**	2.15
38,000	173K	1.75	166K	1.75	180K*	2.0	177K**	2.0
40,000	171K	1.65	165K	1.65	177K*	1.9	176K**	1.9
42,000	167K	1.6	161K	1.6	173K*	1.8	172K**	1.85
44,000	163K	1.5	157K	1.5	169K*	1.7	168K**	1.75
46,000	159K	1.45	153K	1.45	165K*	1.65	164K**	1.65
48,000	155K	1.4	149K	1.4	161K*	1.55	160K**	1.6
50,000	151K	1.35	145K	1.35	158K*	1.5	157K**	1.55
52,000	148K	1.3	141K	1.3	155K*	1.45	153K**	1.57

LIMITING FACTOR: Tailhook, Chart A; * Barrier, ** Tailhook

FIG. 4
F/TF–102 MAXIMUM BARRIER ENGAGEMENT GROUND SPEEDS

	CHART A	DESIGN HOOK STRENGTH 47,000 LBS.			CHART B	YIELD HOOK STRENGTH 54,000 LBS.		
Acft Weight	BAK-9	Acft G Load	BAK-12	Acft G Load	BAK-9	Acft G Load	BAK-12	Acft G Load
20,000	163K	2.35	155K	2.35	174K	2.7	161K	2.7
22,000	161K	2.15	153K	2.15	172K	2.45	159K	2.45
24,000	159K	1.95	151K	1.95	170K	2.25	157K	2.25
26,000	157K	1.8	149K	1.8	168K	2.1	155K	2.1
28,000	155K	1.65	147K	1.65	166K	1.9	153K	1.9
30,000	153K	1.55	144K	1.55	164K	1.8	151K	1.8
32,000	151K	1.45	141K	1.45	162K	1.7	149K	1.7

LIMITING FACTOR: Tailhook, Both Charts

FIG. 5
F–104 MAXIMUM BARRIER ENGAGEMENT GROUND SPEEDS

CHART A
DESIGN HOOK STRENGTH 60,000 LBS.

Acft Weight	BAK-9	Acft G Load	BAK-12	Acft G Load
14,000	188K	4.3	181K	4.3
16,000	186K	3.75	179K	3.75
18,000	184K	3.35	177K	3.35
20,000	182K	3.0	175K	3.0
22,000	180K	2.7	173K	2.7
24,000	178K	2.5	171K	2.5
26,000	176K	2.3	169K	2.3
28,000	174K	2.15	167K	2.15

LIMITING FACTOR: Tailhook, Chart A; * Barrier, ** Tailhook

CHART B
YIELD HOOK STRENGTH 69,000 LBS.

BAK-9	Acft G Load	BAK-12	Acft G Load
190K*	4.4	190K*	4.85
190K*	4.0	189K**	4.3
190K*	3.65	187K**	3.85
190K*	3.35	185K**	3.45
190K*	3.15	181K**	3.15
188K**	2.85	179K**	2.85
186K**	2.65	177K**	2.65
184K**	2.45	175K**	2.45

FIG. 6
F–105 MAXIMUM BARRIER ENGAGEMENT GROUND SPEEDS

CHART A
DESIGN HOOK STRENGTH 50,000 LBS.

Acft Weight	BAK-9	Acft G Load	BAK-12	Acft G Load
28,000	159K	1.7	151K	1.7
30,000	157K	1.65	149K	1.65
32,000	155K	1.55	147K	1.55
34,000	153K	1.45	145K	1.45
36,000	152K	1.4	143K	1.4
38,000	151K	1.3	141K	1.3
40,000	149K	1.25	140K	1.25
42,000	145K	1.2	137K	1.2
44,000	141K	1.15	133K	1.15
46,000	138K	1.1	129K	1.1
48,000	133K	1.05	125K	1.05
50,000	129K	1.0	122K	1.0
52,000	125K	.95	118K	.95
54,000	122K	.9	115K	.9

LIMITING FACTOR: Tailhook, Both Charts

CHART B
YIELD HOOK STRENGTH 57,500 LBS.

BAK-9	Acft G Load	BAK-12	Acft G Load
170K	2.05	162K	2.05
169K	1.9	161K	1.9
167K	1.8	159K	1.8
165K	1.7	157K	1.7
163K	1.6	155K	1.6
161K	1.5	153K	1.5
159K	1.45	152K	1.45
155K	1.35	148K	1.35
151K	1.3	144K	1.3
147K	1.25	140K	1.25
143K	1.2	136K	1.2
140K	1.15	132K	1.15
136K	1.1	129K	1.1
132K	1.05	125K	1.05

FIG. 7
F–106 MAXIMUM BARRIER ENGAGEMENT GROUND SPEED

CHART A
DESIGN HOOK STRENGTH 54,800 LBS.

Acft Weight	BAK-9	Acft G Load	BAK-12	Acft G Load
26,000	169K	2.1	161K	2.1
28,000	167K	1.9	159K	1.9
30,000	165K	1.8	157K	1.8
32,000	163K	1.7	155K	1.7
34,000	161K	1.6	153K	1.6
36,000	159K	1.5	151K	1.5
38,000	157K	1.4	149K	1.4
40,000	156K	1.35	148K	1.35
42,000	153K	1.3	144K	1.3

LIMITING FACTOR: Tailhook, Both Charts

CHART B
YIELD HOOK STRENGTH 63,000 LBS.

BAK-9	Acft G Load	BAK-12	Acft G Load
180K	2.4	173K	2.4
178K	2.25	171K	2.25
176K	2.1	169K	2.1
174K	1.95	167K	1.95
172K	1.85	165K	1.85
170K	1.75	163K	1.75
168K	1.65	161K	1.65
167K	1.55	160K	1.55
163K	1.5	156K	1.5

FIG. 8
F/RF-4C MAXIMUM BARRIER ENGAGEMENT GROUND SPEEDS

CHART A*
DESIGN HOOK STRENGTH 165,000 LBS.

Acft Weight	BAK-9	Acft G Load	Standard BAK-12 1" Pendant	Acft G Load	Modified BAK-12 1 1/8" Pendant	Acft G Load
30,000	188K	2.55	190K	2.8	190K	2.8
32,000	186K	2.35	190K	2.7	190K	2.7
34,000	184K	2.35	190K	2.6	190K	2.6
36,000	182K	2.1	190K	2.45	190K	2.45
38,000	180K	2.0	190K	2.35	190K	2.35
40,000	177K	1.9	190K	2.3	190K	2.3
42,000	173K	1.8	190K	2.3	190K	2.3
44,000	169K	1.7	188K	2.25	190K	2.35
46,000	165K	1.65	184K	2.15	190K	2.5
48,000	161K	1.55	180K	2.1	187K	2.6
50,000	158K	1.5	176K	2.0	185K	2.5
52,000	155K	1.45	172K	1.9	181K	2.4
54,000	151K	1.4	169K	1.85	178K	2.35
56,000	147K	1.35	165K	1.8	175K	2.25
58,000	143K	1.3	162K	1.7	172K	2.15

*NOTE: The F-4C is the only acft in USAF with a tailhook strong enough to accept the capabilities of all barrier systems. No Chart B is required as engagement speeds are the same as Chart A for all systems. All speeds barrier limited.

For those who may have occasion to tangle with the BAK-6, we've included a chart for you, too. Test plotted and extrapolated data are not as complete as that for the BAK-9 and BAK-12. However, if you will take the design or yield hook strength for any aircraft, you can determine the limits that apply. To further assist in this determination, the following is quoted from the BAK-6 test report:

"The BAK-6 in the standard 1500-foot runout configuration will arrest all present hook equipped fighter weight aircraft from 13,000 to 52,000 pounds. However, the design limit of the cables restricts the maximum on-center engagement speed to approximately 145 knots for a 52,000-pound aircraft and approximately 160 knots for all aircraft of 34,000 pounds or lighter."

With that and the aircraft hook strengths in mind, here's the BAK-6 information, figure 9.

FIG. 9

Acft Weight	Maximum Engagement Speed	Hookload
24,000	160K	45,000
26,000	160K	48,000
28,000	160K	51,000
30,000	160K	54,000
32,000	160K	57,000
34,000	160K	60,000
36,000	158K	60,000
38,000	156K	60,000
40,000	154K	60,000
42,000	153K	60,000
44,000	152K	60,000
46,000	150K	60,000
48,000	148K	60,000
50,000	146K	60,000
52,000	145K	60,000

The one final point that deserves discussion is the frequently expressed concern over 950-foot barrier runout versus 950 feet of runout surface or overrun. The 950-foot runout does not mean it will happen on every engagement. In fact, statistics show the 950-foot runout to be practically nonexistent. When it does occur, it happens at such low speeds that aircraft damage does not result unless a sharp dropoff exists at the end of the paved runout surface. During an engagement within barrier capabilities, the 950-foot runout is most often the result of coasting to the end due to not braking the aircraft in the last few feet of runout and/or failure to shut down the engine, again, during the last few feet of runout. If you'd care to try it, hook your VW to the barrier cable and drive away at 10 MPH. Believe it or not, you will run out the full 950 feet! Braking is applied to the barrier-type reels as a function of speed. As the engaged aircraft slows down, the tape reels slow down and braking decreases until minimum reel speed is reached. No further breaking is applied until the maximum barrier runout distance of 950 feet.

Well, that's about it on a large pinhead, but, don't be one! Know your aircraft and barrier limitations, prepare for engagement (time permitting) and hit it square in the center, brakes off.

See you at your next engagement. ★

the personal touch

One of the toughest problems of supervision is ensuring that the instructions, commands and desires of management reach the lowest level concerned and that they arrive ungarbled. The reverse is also true, because managers must know what the people are thinking and doing at all organizational levels. A short time ago a couple of letters were brought to our attention—letters from a wing commander to supervisors at two levels of supervision. The personal touch was evident in that the letters were written in the first person to the individuals' home address. In them, the commander, Col. Robert J. Hill, expressed his feelings on discipline, responsibility and job effectiveness. We understand the letters were well received. Other supervisors may wish to use this same method of communicating with their people, so, with Col. Hill's permission, we are reproducing one of his letters to a shop chief in the 390 Missile Wing.*

Dear Sergeant

I am addressing this letter to you because I know you are the one individual who can most positively assure the success of the program I am going to outline. You are the key supervisor in a line of supervisors that extends from me, the 390th Wing Commander, to the maintenance supervisor on the job. You manage the people who do the work. You set their schedules. You instruct, train and qualify them. You set the standards of quality, and the standards of performance. It is a fact of life that a boss or supervisor will get, with few exceptions, as low a standard of performance as his people find he will accept or as high a standard as they find he demands. Because I believe this, I want you to know that I charge you personally with the achievement of this important objective—to absolutely and positively assure yourself that personnel under your control are adhering 100 per cent to the procedures set forth in our technical data.

Adherence to technical data will make our working environment more safe for everyone and safety is paramount. We owe it to the public who surrounds us and to our military co-workers who are interdependent on each other for their personal safety.

Adherence to technical data will produce a weapon system that will experience fewer malfunctions. It will thereby be a more effective weapon system and produce more alert hours, and I want to emphasize this. The temptation to short cut or deviate from technical data to bring or keep a weapon system "into the green" is an indulgence we cannot afford.

Adherence to technical data will enable us to meet our flow schedules. I am not impressed by someone who can do a job in the shortest time but I am impressed by someone who always does the job properly. Our schedules will be laid out so that we can do the job with the procedures set forth in our technical data and meet the schedule. In short, you must emphasize that professionalism exhibits itself in "how the job is done," not in mere job completion.

You are being charged with a serious and important responsibility. I have no doubt you can execute it successfully.

Sincerely

Robert J. Hill, Colonel, USAF
Commander

*Colonel Hill has since transferred to Frances E. Warren AFB as Commander, 90 Strategic Missile Wing (SAC).

THE B-52

Lt Col Harold E. Brandon
Directorate of Aerospace Safety

April 1966 marked the fourteenth year since the B-52 took off on its maiden flight. Since it entered the USAF inventory in June 1955, the B-52, with its nuclear capability, has been credited by many as the greatest war deterrent force in the history of the free world.

The B-52 airplane came into being as a result of over eight years of research and development. In June 1946, Boeing Aircraft Company was awarded a Phase I contract to proceed with the engineering study and preliminary design work on an inter-continental bombardment airplane. During the period February 1946 through April 1948 several models were designed and proposed to the United States Air Force. These models had various shortcomings in range, speed, altitude and desired fuel consumption. In October 1948 a completely revised airplane that met new concepts of speed and altitude requirements was presented to the Air Force. These new concepts became feasible as a result of new, improved jet engines and extensive high-speed wing research.

In March 1949 the construction of two turbojet airplanes began. The first B-52 airplane (the XB-52) left the factory in November 1951.

For years SAC's mightiest weapon, the B-52 owns a fabulous safety record. Photo upper left shows pre-production model with tandem cockpit.

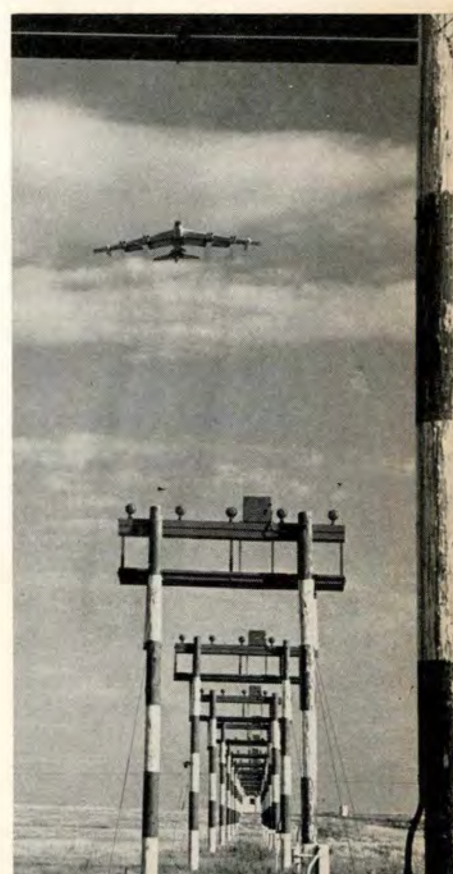
Engines and system ground tests were completed in January 1952, and the airplane was returned to the factory for installation of equipment not previously available. The second airplane, the YB-52, left the factory on March 15, 1952. On April 15, this airplane completed its first flight. It more than proved itself while undergoing the manufacturer's preliminary flight test evaluation program.

August 5, 1954, climaxed eight years spent in the development of the B-52 with the first flight of a production model, the B-52A, the *Stratofortress*. The first B-52A airplane was delivered to the Air Force for tactical use in June 1955. Delivery of the last B-52 H occurred in June 1962 to complete the production of 744 airplanes.

This is only a brief look at the evaluation of this jet bomber and how it was developed to become one of the most potent weapon systems devised for the employment of strategic air power. Its present usage in Vietnam is additional evidence of its flexibility and reliability in its secondary role of conventional bomber.

Since the B-52 was introduced into the active inventory in 1955, it has compiled one of the best safety records of any USAF tactical aircraft. The accident rate shows a near-steady decline through the years from 1956 to 1966. The chart below shows the highest rate was experienced in 1956 with almost yearly improvement to an exceptionally low rate of 0.3 for 1965. The rate, through August 1966, compares favorably with 1965.

While establishing this excellent flying safety record, the B-52 fleet has flown more than 2,953,000 hours. These hours, translated to distance flown, are equivalent to 53,169 times around the earth, or 5608 trips to the moon, using in excess of 73,800,000,000 lbs of fuel. ★



Missilanea

ALL OR NOTHING AT ALL!—There is no second chance for many of the space and research programs conducted by the Air Force today. These are the programs with one payload available, one booster (often specially modified for the effort), and one chance to succeed. Checklists and procedures must be developed, used only once, and then filed away. A single mistake or a materiel failure can cause a complete mission failure. This mission failure results in complete negation of the experiment's outcome and deprives the Air Force and the Nation of vital scientific and technical knowledge.

Many factors contribute to successful program efforts, including safety emphasis on reliability, maintainability, value engineering, or design engineering. Too often, safety considerations are not given the same level of support afforded other elements of the program.

We have heard many times that a program is "Safe" because reliability and maintainability are being stressed throughout the life of the program. These factors aid in promoting safety and accident prevention, but do not guarantee review of design, engineering, and operating procedures with adequate emphasis on safety.

A value in a high-pressure line may have excellent design features and operate within stated specifications. However, location of the valve may create a hazard due to inaccessibility or due to its proximity to electrical sources or a connection in a line containing noncompatible gas or fluid.

• During the first-stage burn, vibration and launch shocks cause leakage of the gases and an explosion occurs; a hoped for space "first" is a failure.

• A replaceable black box may exceed all required design criteria and still be a source of danger to the maintenance man who has to change it because access to the connections is blocked or impeded by lines, an electrical harness, or other chassis.

• A technician trouble shooting in accordance with established procedures is killed by application of power to a bus bar which he is touching. The man who applies the power is checking another system by approved procedures when the accident occurs. (No safety cross-check had been made when the procedures were written to insure one operation would not create a hazard to other personnel because of their working location.)

Mishaps such as these could be prevented by proper emphasis on safety during the design and development of the program. "All Or Nothing At all" not only means we have just one chance for success, but also emphasizes the need for using all of our skills, abilities and training during program design, engineering, and development to insure success. Safety must be an equal partner during a program's development to insure mission success. By THINKING safety, we can change the percentages and make success more likely than failure. ★

Maj Paul S. Wood
Directorate of Aerospace Safety

FALLOUT

continued from inside front cover

SAFETY and thought I would try detecting the U-11's goof, being an off hours birdman myself.

It seems to me that if our friends in the U-11, since they were using a standard instrument departure route, could well have been monitoring the departure control frequency. Even VFR-ing it along, hearing someone behind them get a traffic advisory would have alerted them also to be looking around.

Unhappily enough when flying VFR, many pilots, relieved of the necessity for monitoring these track and reporting positions to ARTCC, set back and "unlax" too much. When the gear is up and locked, often their heads also are.

Enjoy your pubs very much.

LCDR L. A. Johnson, USN
Nuc-Power Dept, Submarine Safety Center
Groton, Conn.

Reference the story of the T-33/U-11 midair (October issue), the U-11 should have been at an odd-plus-500 feet altitude for his direction of flight.

A non-volunteer for O-1s in SEA

Regarding the article about the midair collision of the T-Bird and U-11, being a private pilot, it seems to me that a contributing factor to the collision was that the U-11 was at an improper flight altitude for VFR flight. On a heading of 137 degrees his flight altitude should have been odd thousand plus 500, not even plus 500.

A1C Al Harris
Box 3158
Edwards AFB, Calif

Page 11 of the October issue contained a challenge. The clues to the U-11 goof are:

- both airplanes on same SID,
- U-11, VFR, level at 4500 ft msl,
- T-33, IFR, assigned 5000 ft msl.

The implication is that the SID course is eastbound (based on the odd altitude assigned the T-33). Therefore, at 4500 feet msl, the U-11 was at the wrong altitude, viz., even plus 500, rather than the correct odd plus 500.

Please address your recommendation for flight duty assignment in SEA to Commandant of the Marine Corps, Code AAJ.

Lt Col J. G. Martz III, USMC
JTF-2, Sandia Base, New Mex

Your article on page 10, October issue, asks about the goof of the U-11. It should have been flying at an odd number thousand feet plus 500 on the 137 departure radial rather than the 4500 feet when he started cruising. While in the control zone he should have been monitoring the tower frequency though the tower here on a SID, even simulated, is to hand you over to the departure control frequency. If this had been done it would have allowed him to hear the conversation with the T-33 providing they were also VHF and not UHF.

Just got the article a few hours ago and this has been the first chance I've had to write a note. Hope my reply is the first in.

Rev Charles R. Young
Kingsley Field, Klamath Falls, Ore

ONE TAKER

Reference the October article, you have a taker. If the U-11 was flying outbound on 137 degrees departure radial, the cruising altitude should have been at an odd thousand plus 500 feet (e.g., 5500, 7500, etc). By leveling off at 4500 feet, he was at a VFR altitude for westbound (180°-359°) traffic. However, if the general terrain below was over 1500 msl, he was less than 3000 feet above the terrain and thereby not goofing.

I'll be proud to accept the title of "VFR Pilot of the Month," and I am ready to fly O-1s in SEA. There are two unique factors which you should include in your recommendation: I am presently in SEA (DaNang AB, Vietnam) but I do not have any kind of USAF aeronautical rating. However, I have an FAA commercial pilot's license with SEL, instrument, and certified flight instructor ratings. Further, I am the proud owner of a Cessna 172 which, alas, is being flown by others than me.

Anxious to fly again,
Maj Everett G. Groves
1972 Comm Sq
APO San Francisco 96337

These are all of the replies we have room for, and we're convinced that

1. You folks are reading the book;

2. The Air Force has its share of sharpies.

THE IPIS APPROACH

We have just read the September issue of AEROSPACE SAFETY and must say that your magazine belongs to the four most-read papers at our facility. We receive it regularly in turn for our magazine "The Controller."

Among the most discussed articles are "The IPIS Approach," "FAA Advisories" and "Aerobits."

In respect to the "IPIS Approach" articles we should like to join 1st Lt William N. Payne in his opinion; they are excellent and help us a lot in our controller training. Would it be possible to obtain all the IPIS Approach articles from the USAF Instrument Pilot Instructor School (ATC) at Randolph AFB and what would be the cost?

Looking forward to your kind reply,

Frank W. Fischer
German-ATCA
Chapter: Birkenfeld-UACC
6589 Niederhambach, Boschweiler 20
West Germany

IPIS says a package is on the way.

HELP THYSELF

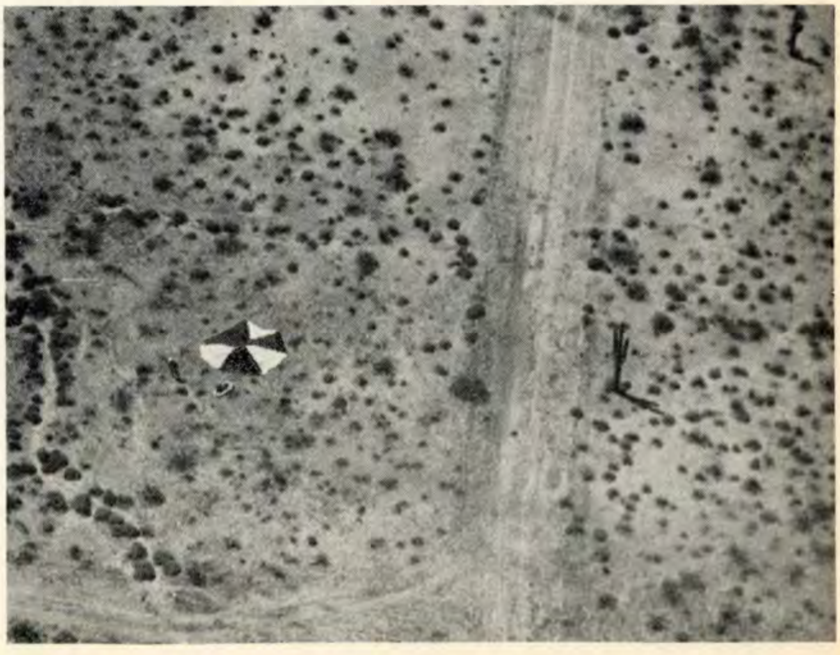
The photograph on page 9 (August issue) helps to illustrate the challenge faced by Search and Rescue (SAR) personnel. It reminds me of the importance of the old adage "Help Thyself" and how much the adage applies to a SAR situation.

Page 18 (in the same issue) is definitely a step in the right direction, however the ultimate has not been achieved. The parachute canopy should be raised vertically as well as spread horizontally and in this instance the cactus at the extreme right might assist in attaining this objective. This would create a contrast on the horizon which is very important in SAR operations since the chances of flying directly over the downed survivor are limited.

Suggest more illustrations in the life support area be included in future volumes of AEROSPACE SAFETY.

Capt George D. Keltner
Wing Physiological Support Officer
Hq 4756 Air Defense Wg (Trng)
Tyndall AFB, Florida 32401

We're planning more PE/survivor illustrations. In fact, see the back cover.



AEROBITS

SNOW ON THE RUNWAY causes accidents every winter season. Early this year a C-131 prop struck a small patch of snow during rollout. The propellers were in reverse and one blade was damaged sufficiently to necessitate a prop change. The runway looked smooth from downwind leg with no indication of patches or ridges. This goof was caused by a poor job of snow removal.

The next day a C-119 pilot used bad judgment in attempting to take off from a strange field at night, knowing that runway conditions were poor. During the takeoff attempt the aircraft struck a snowbank. The pilot lost control, wrecked the aircraft and wound up with a major accident. Careful preparation and constant vigilance by airport managers and increased respect for winter conditions by our pilots can reduce or eliminate this type of mishap.

F-100 COOKOUT—The pilot started his instrument departure with the defrost lever full forward. When he attempted to turn the defrost off, the handle broke leaving the control in the full hot position. The cockpit quickly became uncomfortable so the decision was made to select manual full cold. The pilot accidentally selected full hot and the climate in the cockpit was soon unbearable. He decided to land immediately. High gross weight and a quartering tail wind necessitated a long, fast landing which terminated in a BAK-9 engagement. The externals were jettisoned about 1500 feet prior to contact. Materiel failure was the prime culprit, but the situation was compounded by the mistaken selection of manual full hot with the cockpit temperature control switch. Crewmembers must periodically review all methods of reducing cockpit temperatures, including jettisoning the canopy.

JET ENGINES have to be babied. In fact, like babies, when you feed them the wrong thing, be prepared to suffer the consquencs. Like:

• After the F-104 pilot shut down the engine he took the Form 781 from the top of the bay and discovered that his blue wool cap was missing. The cap couldn't be found anywhere in or around the aircraft, the engine was inspected with the following results: several rotor blades nicked enough to require a compressor rotor change; small bits of cap in the aft stages of the compressor section.

• While the T-38 was taxiing after landing and the rear canopy had been opened, the Nr 2 engine popped, EGT went to above 900 degrees and the hot flag came on. The culprit was a high altitude FLIP enroute chart that blew out of the cockpit and into the engine. Luckily, the chart lodged on the front frame of the engine and caused no damage. Nevertheless, an engine teardown was required and all first and second stage turbine blades were changed because of the overheat condition.

• FOD comes in many forms and visits many places, so engines are not the only vulnerable spot. For example: During formation takeoff roll in a T-38, the

student applied back pressure to rotate but couldn't move the stick aft. He retarded the throttles for an abort, but the IP, suspecting improper throttle technique, pushed the throttles to max power. The student then advised the instructor that he couldn't get the stick back. The IP took over and the aircraft eventually wound up in the barrier. The problem was a 2½ inch paper clip that had been lost in the front cockpit and lodged in the stick well.

If it's loose, nail it down, tie it down, screw it down, bolt it down or put it in a tool box, map case, pocket or other suitable container. Foreign objects near an aircraft are like coyotes at a chicken ranch—you had better not let them loose.

CONTINUED USE OF THE SAME OLD CHECKLISTS AND PROCEDURES can easily lead to complacency and a one-way ticket to oblivion. Yet every crewmember must continue to religiously use the same old checklists and procedures — unless he welcomes hair-raisers such as recently befell one of our USAF crews.

A reconnaissance crew finished its low altitude mission and climbed to FL 300 for the return to home plate. The back-seat driver removed his oxygen mask to blow his nose; he then wiped his glasses and proceeded to tidy up the cockpit. About 15 minutes later he failed to respond to a question asked by the aircraft commander. The AC couldn't see the Pilot Systems Operator in the rear view mirror so he banked the aircraft to get his attention.

After this action he could see his partner's head leaning against the canopy and knew that the PSO was unconscious. Immediate descent, SIF to emergency and MAYDAY to the radar control agency were executed. About this time, the AC noted that the emergency vent knob was out (unless this knob is in. the aircraft cannot be pressurized) and pushed it in; the cabin pressure altimeter read 28,000 feet and was decreasing rapidly. While descending, the AC went to emergency oxygen. The pilot in the rear cockpit raised his arms against the canopy as the aircraft passed through 10,000 feet but he did not go to 100 per cent oxygen until descent to 4000 feet.

Approach Control vectored them to a visual final and advised the aircraft commander to contact tower if he was VMC. After two visual passes at the runway were aborted, he realized that he was dizzy and disoriented, had been breathing hard and rapidly on 100 per cent oxygen, and had hyperventilated. Therefore, he removed his oxygen mask, held his breath, began handling the bird in a normal manner and recovered without further incident. (Life Sciences points out that the pilot's self treatment for hyperventilation is erroneous and very hazardous. Breath holding after a period of hyperventilation can produce "reflex cardiac arrest" (stoppage of heart beat) and unconsciousness as the brain is deprived of blood. The proper corrective action is to consciously resume slow normal respirations at a rate of 15/min. The symptoms will soon dissipate!)

What started it all? The pre-engine start checklist was not followed in sequence because the pilot's attention was diverted by the crew chief who was leaning into the cockpit while standing on the aircraft ladder—the pilot failed to notice that the vent knob was not in. Thus, when the oxygen mask was removed, the Pilot System Officer was breathing ambient air. Oxygen discipline was ignored when the PSO failed to inform the AC that he was removing his mask.

AERO BITS

REMINDER—During this present day of sophistication we must keep in mind that "when the greatest of all navigational systems fail" the pilot still has the job of getting himself and his flying machine home. Needless to say needle, ball, and airspeed is certainly not the desirable way to fly instruments; however, we all know that this system will work for the proficient pilot. Likewise we must keep in mind that pilotage and time-distance navigational procedures are also accurate when properly applied to the problem at hand.

The stand-by magnetic compass will keep you headed in the right direction if you are familiar with its use. This familiarity cannot be called upon instantaneously if you haven't used it for a number of years. Naturally, as professionals we know all about variation, deviation, magnetic dip, acceleration error, and oscillation error, but for those who are a bit fuzzy on the subject it is suggested that you review Chapter 5, AFM 51-37, Instrument Flying, dated 20 January 1966.

Knowing all about your navigational equipment is another life insurance measure that we can ill afford to be without.

Do you know how to use the magnetic compass?

Do you know the variation in the areas where you fly?

Do you really know the forecast winds along your route of flight?

Do you verify these winds while everything is working during the flight?

Have you worked a wind vector problem recently?

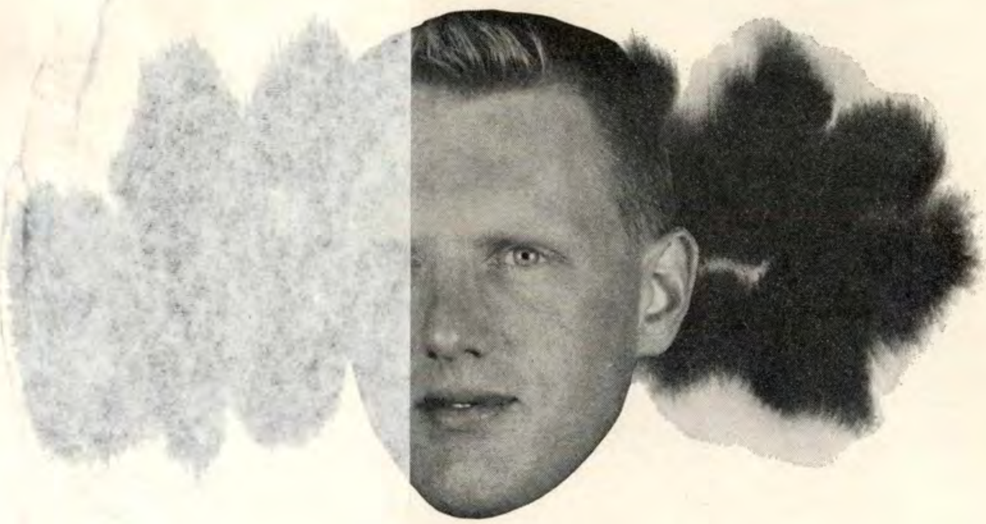
A working knowledge of all of the above, plus some occasional practice will not only provide you with a sense of pride as a pilot but will also help you to complete your mission if some of your sophisticated equipment goes sour and as a by-product this type of navigation know-how may keep you out of serious trouble—such as violations of restricted areas, buffer zones, and prohibited areas.

Lt Col H. K. Boutwell
Directorate of Aerospace Safety

SAFETY OFFICERS—There have been reports that some bases are not receiving their authorized quota of Safety Officers' Kits. You can help the Distribution Office by checking with your units to find out which of the three kits are not being received, and forwarding such information to AFIAS-E4, Directorate of Aerospace Safety, Norton AFB, Calif. 92409. ★

☆ U. S. GOVERNMENT PRINTING OFFICE 1966 251-211/3

WELL DONE



1ST LT AUSTIN P. SNYDER

113 TACTICAL FIGHTER SQ., HULMAN FIELD, TERRE HAUTE, IND

On 14 January 1966, 1st Lt Austin P. Snyder was flying a local night instrument mission in a unit equipped F-84F. He climbed to 20,000 feet and received permission from Approach Control to execute a VFR practice ADF penetration and approach to runway 23. As he was inbound to high station, he noted a C-130 beginning an ADF penetration. On the ADF low approach Lt Snyder passed ahead of the C-130 and shortly thereafter executed a missed approach.

At this time Lt Snyder proceeded to a point approximately 15 miles south of the field and started a climb to 20,000 feet to practice a VFR TACAN penetration and approach. At 12,000 feet, the cockpit lights dimmed twice and the generator failed. Before Lt Snyder could reduce the electrical load and complete applicable emergency procedures, he had complete electrical failure.

Lt Snyder took out his flashlight, placed it between his knees, and used it to complete his emergency procedures and maintain control of the aircraft. He turned in the general direction of the field but haze layers prevented its location. At this point, without the use of navigational aids, due to complete electrical failure, and unable, because of the haze, to find the runway, he remembered the C-130 which he had previously passed and realized that if he could again locate the transport it would be his ticket to final approach and a safe landing.

Fortunately, the C-130 driver had decided to shoot another approach. Picking up its rotating beacon, Lt Snyder was able to follow the transport in on low approach and, finally seeing the runway lights, was able to land.

A successful landing, without engaging the barrier, was accomplished without the use of trim, flaps, speed brakes, or drag chute. Lt Snyder's ingenuity, professionalism and outstanding performance no doubt averted a serious accident. WELL DONE! ★

COMMUNICATIONS TECHNIQUES

PROBLEM: The cover pilot communicating with downed airman uses normal radio techniques and answers immediately when downed airman finishes talking. By the time the downed airman moves the radio from mouth to his ear, the airborne pilot is half way through his message. This requires downed airman to ask for a repeat message and above circumstances repeat.

ACTION: DO NOT ANSWER OR REPLY IMMEDIATELY. GIVE THE DOWNED AIRMAN TIME TO MOVE SURVIVAL RADIO FROM HIS MOUTH TO HIS EAR BEFORE YOU TRANSMIT TO HIM.

NOTE: Downed airman—Turn off beeper when using hand held UHF.

WHEN TALKING TO DOWNED AIRMAN USING SURVIVAL RADIO, HOLD VOICE TRANSMISSIONS UNTIL SURVIVAL RADIO IS MOVED....