flying

SAFETY

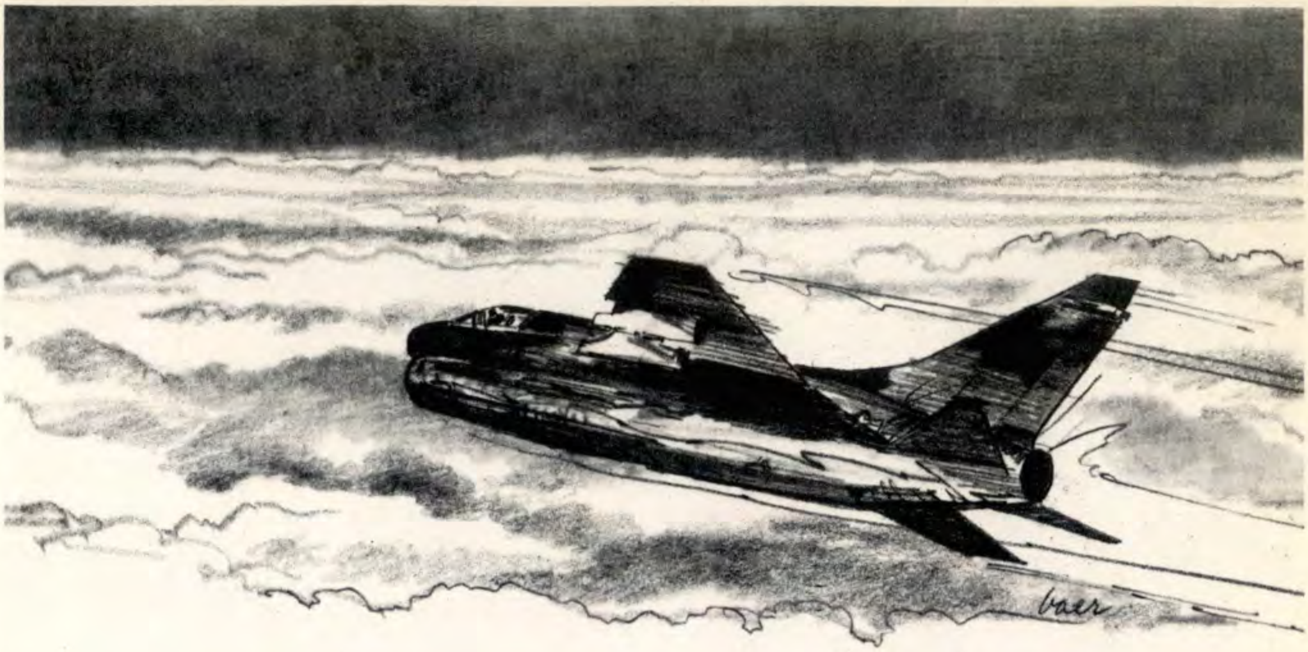
NOVEMBER 1988

Icing Guidelines For Pilots

What Is Your IIQ?

The Trouble With Alcohol

Wild Fires



THERE I WAS

■ Beware!!! Sometimes when things are going better than "just right," Murphy is lurking, knowing he has the sun at his back and you in his 12 o'clock.

I was scheduled for a routine cross country to deliver an airplane to the depot at McClellan AFB, California. It was a beautiful, clear day. That is why I didn't pay close attention to the WX brief for the "current McClellan condition is . . ." The forecast for my arrival time was CAVU. That arrival time was based on a stopover flight plan where I gave myself 3 hours for a turn at Nellis.

It was a Monday morning . . . As luck would have it, there were not many transient birds trying to get out of Nellis, and the super transient alert crew gave me a very quick turn. The people at the weapons center happened to be in, and even had time to offer a cup of coffee while we discussed two issues in our squadron tactics program that needed some professional advice. Things were going too well. Engine start was an hour earlier than originally planned.

I had blown off the weather update for my stopover flight plan at Nellis. It was time for a relaxing short hop and some sightseeing. It was beautiful to see the snow on the mountain tops glistening in the bright sunlight. Times and fuels for the leg were right on the money. Lake Tahoe and the surrounding area are magnificent sights from the air or ground. Things were going too well.

"Hawk 71, this is McClellan approach. The current weather is 200 obscured and 1/8-mile visibility. What are your intentions?" Murphy had fired a Fox 2. The morning fog, which is fairly common for northern California, had not yet burned away.

Fortunately, I had not made the mistake of taking on less than a full fuel load at Nellis. Options were available, but having to divert in a case like this involves swallowing a lot of pride. It's very hard to clean your oxygen mask when you have egg on your face.

Luckily, this time Murphy had not been in the heart of the envelope. I entered a holding pattern and recomputed my fuel. I could hold for 15 minutes, make one approach, and still have fuel to divert to the Air National Guard base at Reno. The fog started breaking up rapidly, and the story ends with a much wiser aviator being able to share a little hangar flying with those who choose to read the story.

There is just no substitute for discipline and following the regulations which, for the most part, are based on good common sense and experience. When you are up there about to "touch the face of God," Murphy may slap your hand. ■

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FRONT COVER

Our thanks to Lt Col John Lucas, AFISC/SEFB, for sacrificing a certain portion of his anatomy in the name of safety. Posing on a 300 pound block of ice for an hour while the art director and photographer shout instructions and other staff members laugh takes a special kind of . . . shall we say, dedication? Boy, was he surprised when we pushed that block of ice out the back of the airplane with him still strapped on top.
Fly, John, Fly!! ■

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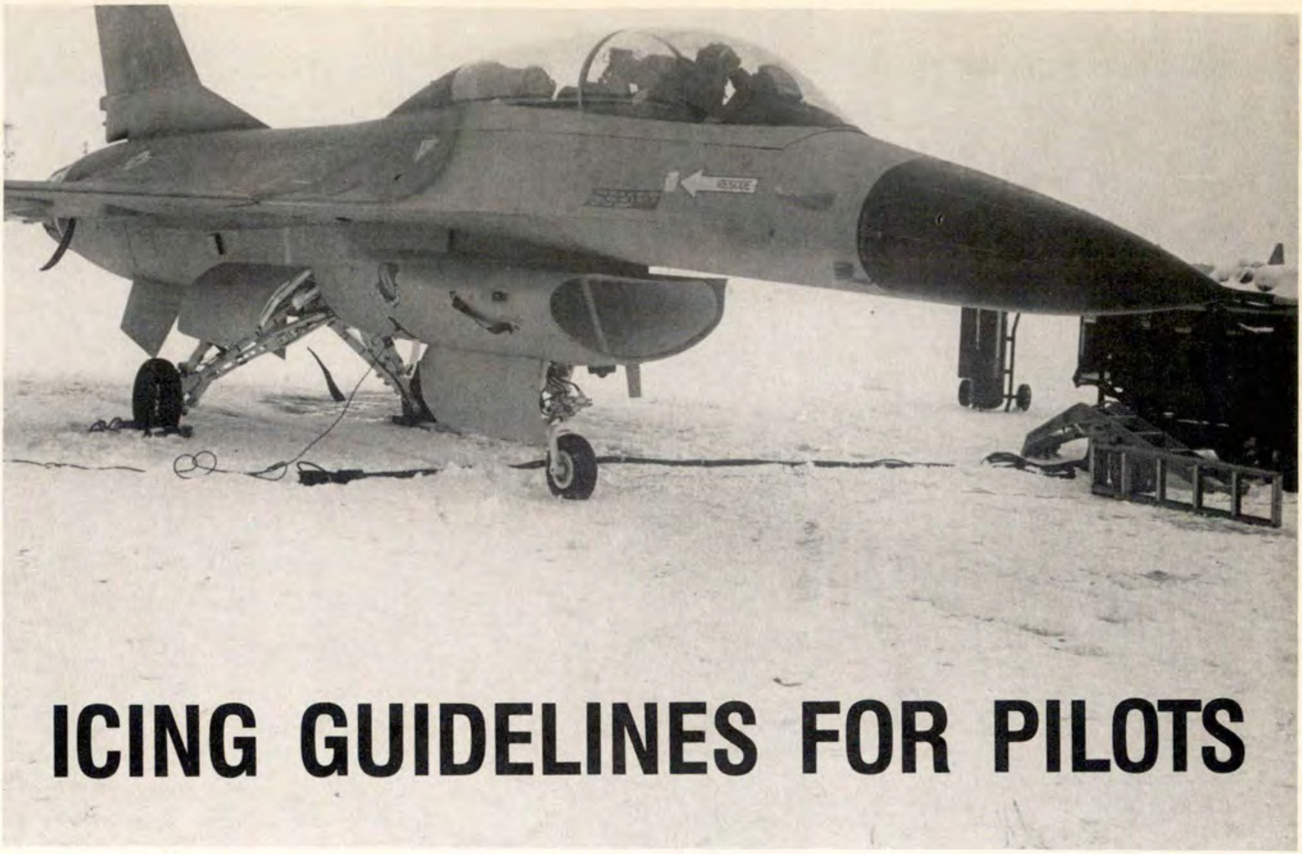
SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, OSAF

PURPOSE — *Flying Safety* is published monthly to promote aircraft mishap prevention. Use of funds for printing the publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. Facts, testimony, and conclusions of aircraft mishaps printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in mishap stories are fictitious. The contents of this magazine are nondirective and should not be construed as regulations, technical orders, or directives unless so stated. **SUBSCRIPTIONS** — For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Changes in subscription mailings should be sent to the above address. No back copies of the magazine can be furnished. **REPRINTS** — Air Force organizations may reprint articles from *Flying Safety* without further authorization. Non-Air Force organizations must advise the Editor of the intended use of the material prior to reprinting. Such action will ensure complete accuracy of material amended in light of most recent developments. **DISTRIBUTION** — One copy for each six aircrew members. One copy for each 12 aircrew support and maintenance personnel. Air Force units must contact their base PDO to establish or change requirements. AFSP 127-2 is entered as a publication at the Second-Class rate (USPS No. 586-410) at San Bernardino Postal Service, 1331 South E Street, San Bernardino, CA 92403 and additional entries.



ICING GUIDELINES FOR PILOTS

CHARLES R. TENNSTEDT

What to expect under varying conditions, how to handle icing when you can't avoid it, and how to get rid of ice — here are valuable rule-of-thumb recommendations from a pilot's 35 years of airline operations and research.

■ Pilots should know as much as possible about icing and how to handle it in case they cannot avoid it. Perhaps I can assist you with observations and rule-of-thumb generalities from my years of airline piloting and research. The latter includes a study of temperature zones and freezing as related to airlines of the mid-1950s, when the parameters approximate those of a broad spectrum of the general aviation fleet today.

All described conditions in the observations which follow are based on the premise that the precipitation begins as snow in the upper levels, is completely or partially melted, transiting the warm air which exists at some intermediate levels, and subsequently modified by the cold air next to the surface. Any values assigned to the depth or thickness of the temperature zones must approximate the combination of these and other variables.

Condition A: Freezing Rain or Drizzle and a Subsurface Temperature of About 28 Degrees Fahrenheit

To have freezing rain, a layer of below-freezing air must exist next to the surface. Above this must be a stratum of warmer air. The surface layer of cold air may be from a few hundred feet to about 4,000 feet in depth. The warmer air zone might extend to approximately the 8,000-foot level.

Expect clear ice in the lower levels, carburetor or air inlet icing throughout until well into the colder and dryer upper air, and light rime ice in the clouds of the upper cold air.

You will encounter wet snow in the upper portion of the warm air. Flight plan 4,000 to 8,000 feet or higher. Climb through the freezing levels at a high power setting.

Condition B: Freezing Rain Mixed With Sleet

The warm air stratum in this case will be somewhat shallower and closer to freezing than the condition described above. It should be approximately 2,000 to 4,000 feet thick. About 4,000 to 6,000 feet should put you in the warm air, or go higher into the cold air. Clear ice can be expected in the lower levels and rime ice in the upper levels.

Condition C: Sleet

In this case, the layer of lower cold air may be thicker, and the layer of warm air may be thinner than the examples previously discussed. Expect icing to increase in intensity as you climb toward the warm air. Try 5,000 feet or above.

Condition D: Wet Snow and a Surface Temperature of About 34 Degrees Fahrenheit.

The warm air is next to the surface in this case and is probably not more than 2,000 feet thick. Aircraft icing on climbout should be relatively minor.

Expect to have carburetor or air inlet icing well into the upper cold air. Cruise below the cloud base or get well into the cold air. Expect light rime in the clouds.

Condition E: Wet Snow and Surface Temperature at or Below Freezing

In this case, we can expect a shallow layer of cold air next to the surface, probably less than 1,000 feet thick. Above this, there will be a relatively shallow (2,000- to 3,000-foot) layer of above-freezing air and colder air above. An altitude of 6,000 feet or higher would be recommended in this case. Expect light rime in the clouds.

Stay Out of Icing Conditions Unless Your Aircraft is Properly Equipped

Keep the angle of attack at a low value. Maintain extra speed during climb, while holding, or during periods when you would normally be at a minimum speed.

Use high power to leave the icing or to maintain a flat attitude in the icing. Don't wait until you're loaded with ice to apply power — at that point, you'll just drag along with more exposed surface, and all options will be gone.

Air friction causes a temperature rise as a function of airspeed. This rise may be about 2 degrees centigrade at 130 knots and about 6 degrees centigrade at 250 knots, assuming an ambient temperature near zero. Changing the indicated airspeed can sometimes be used for control.

With deicing equipment, allow the ice to build to a thickness of about ¼ to ½ inch before actuating the boots. Once cleaned, turn off the boots and repeat the process again when necessary. (This prevents buildup of ice over inflated boot position.)

Ice is a great insulator. If equipped with anti-icing equipment, surfaces reach high temperatures much sooner, and runback is reduced if a light coating of ice covers the surface when the heat is applied.

If it's a propeller airplane, keep the blades clean with heat or alcohol. Keep air inlets and inlet guide vanes clean if jet powered. Use pitot heat at all times, including a period prior to takeoff sufficient to clear pitot and static heads of any ice and water.

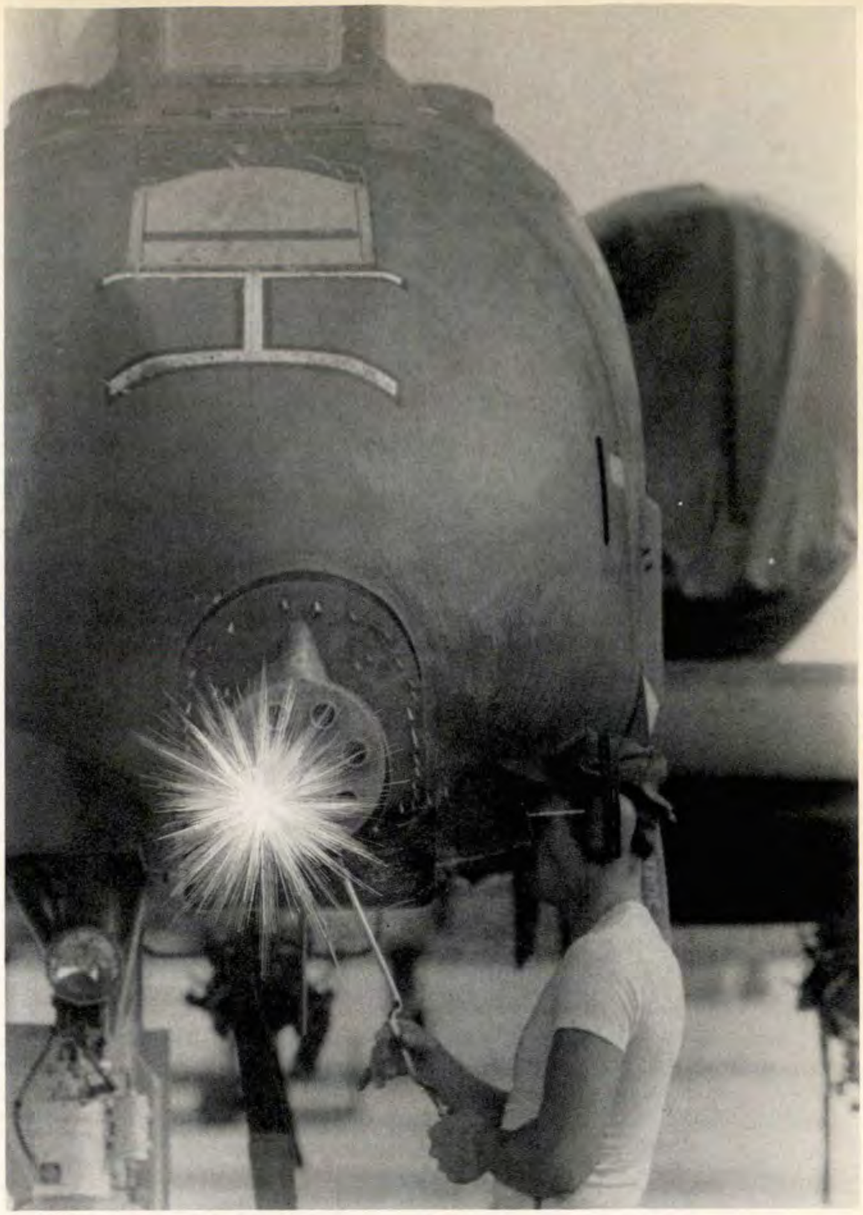
If you have a low performance airplane and you're flying in the warm air toward and over the warm front, stay above the frontal surface as long as possible. As the warmer air lifts along the frontal slope, the strata of above-freezing air thins to the point where it reaches freezing or below as a result of the adiabatic process.

At that point, a descent of 4,000 to 5,000 feet should put you well into the cold air below. Maintain a high descent rate to minimize icing in the transition zone since you won't be able to get rid of the ice in the cold lower air except by sublimation (direct evaporation), which takes a long time. The procedure should be reversed if flying across a warm front from the cold air side. ■

—Adapted from *Flight Crew,* Fall 1980

Editor's note: The bottom line for Air Force and aero club operations is avoid icing conditions. Air Force regulations spell out the acceptable limits for flying in icing — follow them. Weather briefings and preflight planning are important steps in avoiding icing problems. Finally, be prepared. If you suspect you may encounter icing, remember that anti-ice equipment should be turned on to prevent, *not remove, ice.*

WILD FIRES



■ Damage to equipment and injury to people have occurred during all stages of working with explosives — from the storage area to the flightline. Some mishaps have resulted from mechanical failure or malfunctioning equipment, but the vast majority are the result of a broken chain of events, carelessness, or haste.

Many readers of this magazine, either on our flightlines or inside armament system shops, work with the gun system of their respective aircraft. Regardless of the type of aircraft, those who work on or around "gun systems" need to treat them with respect. Consider the following two mishaps.

▪ The first mishap began with an A-10 pilot who was returning from the range. Noticing a "gun unsafe" light, the pilot declared an inflight emergency (IFE) and returned to base. The aircraft taxied to the hot gun dearm area where a munitions crew installed the gun safing pin.

The crew next attempted to rotate the gun using aircraft hydraulic power but were unsuccessful. So they directed the pilot to shut down the aircraft.

To manually rotate the gun, they removed the gun drive and turnaround unit. But when the gun still wouldn't rotate, the crew determined it required disassembly to clear the stoppage.

When they observed spent rounds coming out of the transfer unit, the crew thought the gun was clear of any live ammunition. But the dearm crew failed to actually verify that no live rounds were in the gun in accordance with the tech order "warning." Once the IFE was terminated, a maintenance crew towed the jet to its parking spot.

Although they were notified by the maintenance operations center of an IFE for gun stoppage, Quality Assurance didn't report to the aircraft to determine if the gun should be impounded.

Specialists from the base armament systems shop and the Air Force Engineering Technical Service office inspected the gun in the aircraft. Based on the same criteria used by the dearm crew, these individuals also determined the gun was clear of any live ammunition. So the gun was downloaded and delivered to the armament shop for "in-shop" maintenance.

Believing the gun was safe for maintenance, an armament systems shop crew removed the transfer unit, lock/unlock cam, safing and firing cams, and midtrack and transfer assembly.

Using two prybars to facilitate bolt assembly removal, the shop crew attempted to rotate the barrel. As soon as they applied pressure, the gun fired a 30mm round! Fortunately, no one was injured.

▪ Our second gun mishap began when, ironically, another A-10 "rolled out" of a phase hangar back to the flightline with a 36-round gun functional check due prior to any ammo uploading.

Due to some confusion during work assignments, a load crew was dispatched to the aircraft, not to perform the 36-round check, but to upload the ammo. When the crew arrived at the aircraft, they couldn't find the forms, so they contacted their shift supervisor.

The shift supervisor, forgetting that he had been briefed by the preceding shift supervisor on the requirement for the 36-round functional check, told his crew the aircraft was safe for loading. Yet he never checked the forms.

Halfway through the upload, the supervisor realized his error and informed his crew to download the ammo so the maintenance crew could perform their 36-round check. About this same time, the maintenance crew arrived at the aircraft and informed the load crew that the 36-round functional check could be performed without downloading the ammo.

The maintenance crew backed approximately 10 rounds out of the gun, pulled the gun safing pin, and disconnected hydraulic power to check the gun safing solenoid. But the solenoid didn't operate.

After reapplying hydraulic power, the maintenance crew reinstalled the gun safing pin, cycled the ammo into the gun, and backed approximately 10 rounds out again.

Stopping to check the circuit breakers, the maintenance crew discovered the gun system circuit breaker "pulled," so he reset it. Forgetting that hydraulic power was still applied, the crew pulled the gun safing pin and depressed the gun trigger to check the operation of the gun safing solenoid.

You can probably guess what happened! The gun rotated, cycling the 10 empty elements and firing 3 live rounds before the trigger was released.

Fortunately, the bullets impacted in a grassy area about 140 feet from the aircraft parking spot and ricocheted into an unpopulated area.

The primary lesson to be learned from these mishaps is "always assume the gun is loaded." Every weapons system operation, especially those involving aircraft guns, requires coordination and communication with others. Be absolutely certain everyone involved is positively aware of what will happen during each stage of the operation.

Other explosive mishaps have taught us the following lessons:

1. Use the proper checklist.
2. Take your time and never rush.
3. Use all of the proper equipment, and never use damaged equipment.
4. Have the necessary trained and certified people to do the job.
5. Read the aircraft forms and communicate clearly with others.

In the final analysis, the only way we'll achieve a good safety record is for everyone to recognize and **accept** a fair share of the responsibility. ■

Any type of maintenance or functional system checks on aircraft gun systems should never be taken lightly. A "business-as-usual" attitude can easily lead to an explosives mishap.

Could This Happen To You?

GPWS Procedures

■ The commercial airliner arrived at its destination, in good weather, and the first officer was flying the approach. The captain positioned the flaps to 20 degrees, then lowered the gear as called for by the first officer. Everything was fine until the first officer called for flaps 25 for landing.

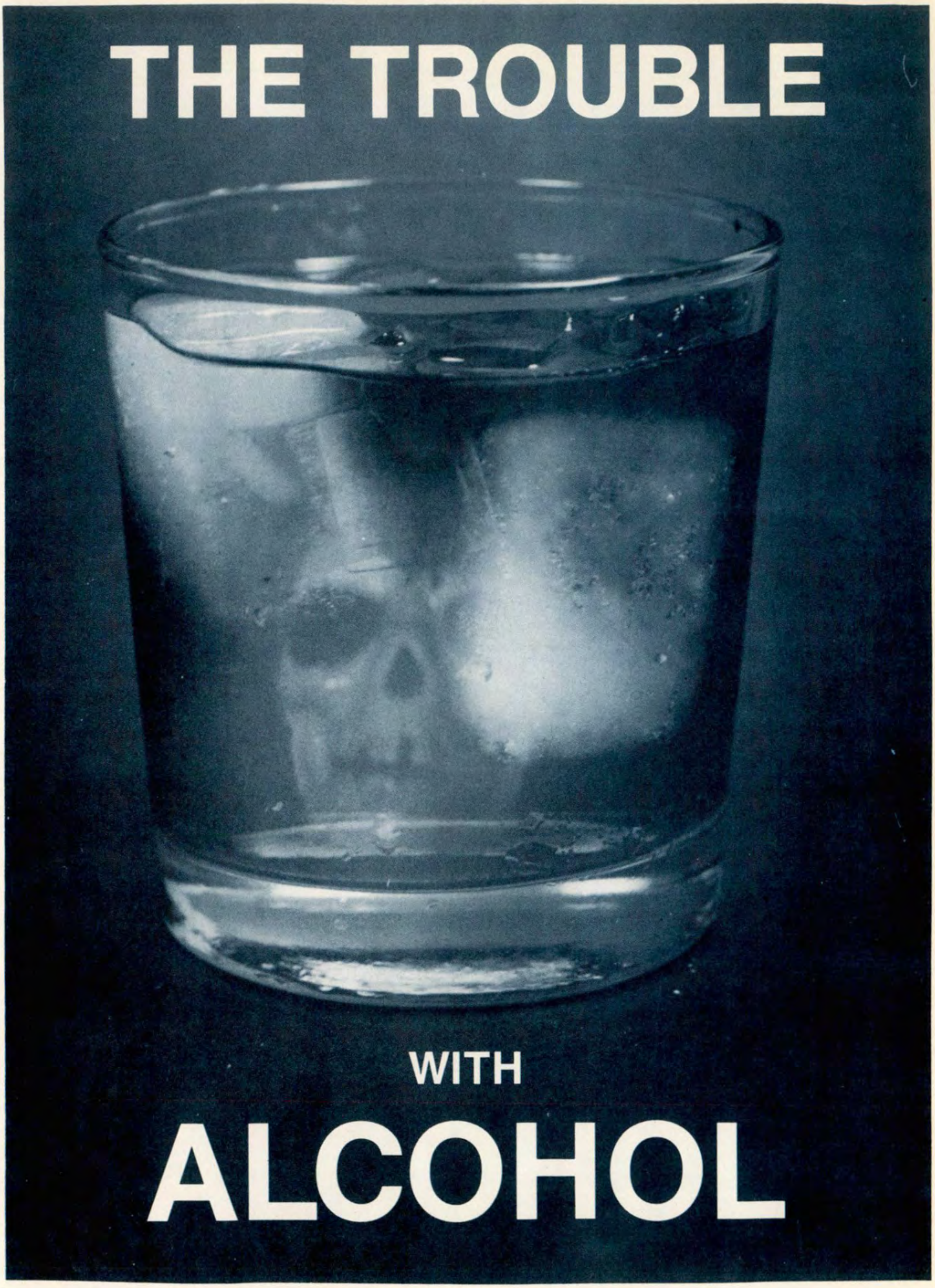
The captain moved the flap lever to what he thought was the 25-degree position, but in the activity of also operating the radios, etc., he let the flaps overshoot to 30 degrees. When he saw the mistake, the captain moved the flap lever to "Up" to get back to 25 degrees of flap.

Meanwhile, the flight had been vectored to a short final because of traffic. While in the final turn, the GPWS "Whoop-Whoop — Pull Up" started as the aircraft passed over a cliff near short final. This was caused by less than 200 feet terrain clearance with the flaps not in the landing configuration. The GPWS "Pull Up" warning was continuous until near touchdown (approximately 18 seconds).

The flight engineer, who was monitoring the approach, realized the flaps were still coming up and shouted, "The flaps are up to 10 degrees." The first officer added power, continued to fly the aircraft, and maintained the turn and descent toward the runway. The captain then reversed the flap lever toward "Down," attempting to get back to the 25-degree landing flap setting.

At touchdown, the flaps had reached about 15 degrees. Without GPWS, would the crew have discovered the flap mistake in time? Would you? How good is your crew coordination? ■

THE TROUBLE WITH ALCOHOL



As crewmembers, we must be especially aware of the problems associated with alcohol. Flying performance can be severely degraded by alcohol levels that show *no* effect on "terra firma."

PEGGY E. HODGE
Assistant Editor

■ As we approach the holiday seasons of Thanksgiving, Christmas, and New Year's, we anticipate a time when friends, neighbors, and co-workers offer their holiday greetings with a toast — normally to include alcohol! This is a good time to review the trouble with alcohol as it may affect our ability to perform the mission. The more we understand about this substance, the better off we will be. Let's look at how our body processes alcohol, the potential trouble it may cause us, and some rules to help us out.

The Processing

Absorption Alcohol is one of the few substances that can be absorbed, unchanged, from any place in the gastrointestinal tract. This means that the minute a drink hits our stomach, it starts being absorbed. And once it gets to the intestine, we absorb it rapidly and completely.

Food in the stomach will slow absorption because alcohol is absorbed more slowly in the stomach, and the food keeps it in the stomach longer.

Once absorbed, alcohol primarily affects our central nervous system — the brain and spinal cord — until it is eliminated from the body.

Elimination Our bodies eliminate alcohol through two routes: (1) Unchanged through the lungs and kidneys or (2) degradation by the liver. The lungs and kidneys account for *only* 10 percent or less of the total, and the remaining 90 percent or more is handled by the liver.

This is where the problem starts. The liver can break down only a limited amount of alcohol during any given period of time. This means it will take a fixed amount of time to eliminate the alcohol, regardless of how many gallons of coffee we drink or how many cold showers we take.

The Potential Trouble

Alcohol's effects range from alcohol in the blood, but not intoxicated, to acute drunkenness and alcoholism. Few of us will fly while intoxicated, but how many have flown just a little hung over or slightly fatigued?

We know from our mishap records that actual alcohol involvement in aircraft mishaps, as documented by blood tests, is quite minimal. What isn't known, however, is how many mishaps involving faulty perception, slow reaction times, or judgmental mistakes have been caused by the aftereffects of a bout with alcohol.

Hangover Most of us are familiar with the hangover syndrome of loss of appetite, heartburn, thirst, tremors, headache, and fatigue. We also realize there is a compromise in flying safety when any crewmember is below maximum capability because of self-imposed stress.

Even if there has been enough time for all the alcohol to be eliminated from the body, a hangover may persist for up to 36 hours. The crewmember who has a hangover may experience more than the usual fatigue and headache. That person may also be compromised in the cockpit with increased susceptibility to spatial disorientation, decreased ability to solve problems, and possibly hypoglycemia.

The cause of hangover has not been determined but is related to substances called congeners. All alcoholic beverages, except vodka, contain congeners, which are assorted mixtures of compounds such as aldehydes, ketones, esters, other alcohols (methanol and others), and fusel oils. These products give different types of alcoholic beverages their different tastes. They also cause breath odor; pure alcohol has no odor.

Some different types of alcohol have been studied for their hangover potency and were ranked in the following order from worst to least: Brandy, red wine, rum, whiskey, white wine, and gin.

Fatigue Perhaps one of the most insidious aftereffects of alcohol is fatigue. It is often endured relatively unconsciously, but it is the most consistently present aftereffect.

One of the reasons for this fatigue is lack of rapid eye movement (REM) or dreaming sleep. Drinking prior to sleeping can decrease or prevent REM sleep. Although research is still being done on the problem, it is fairly well established that deprivation of REM sleep tends to not only contribute to fatigue, but also may impair concentration and memory and produce anxiety and irritability.

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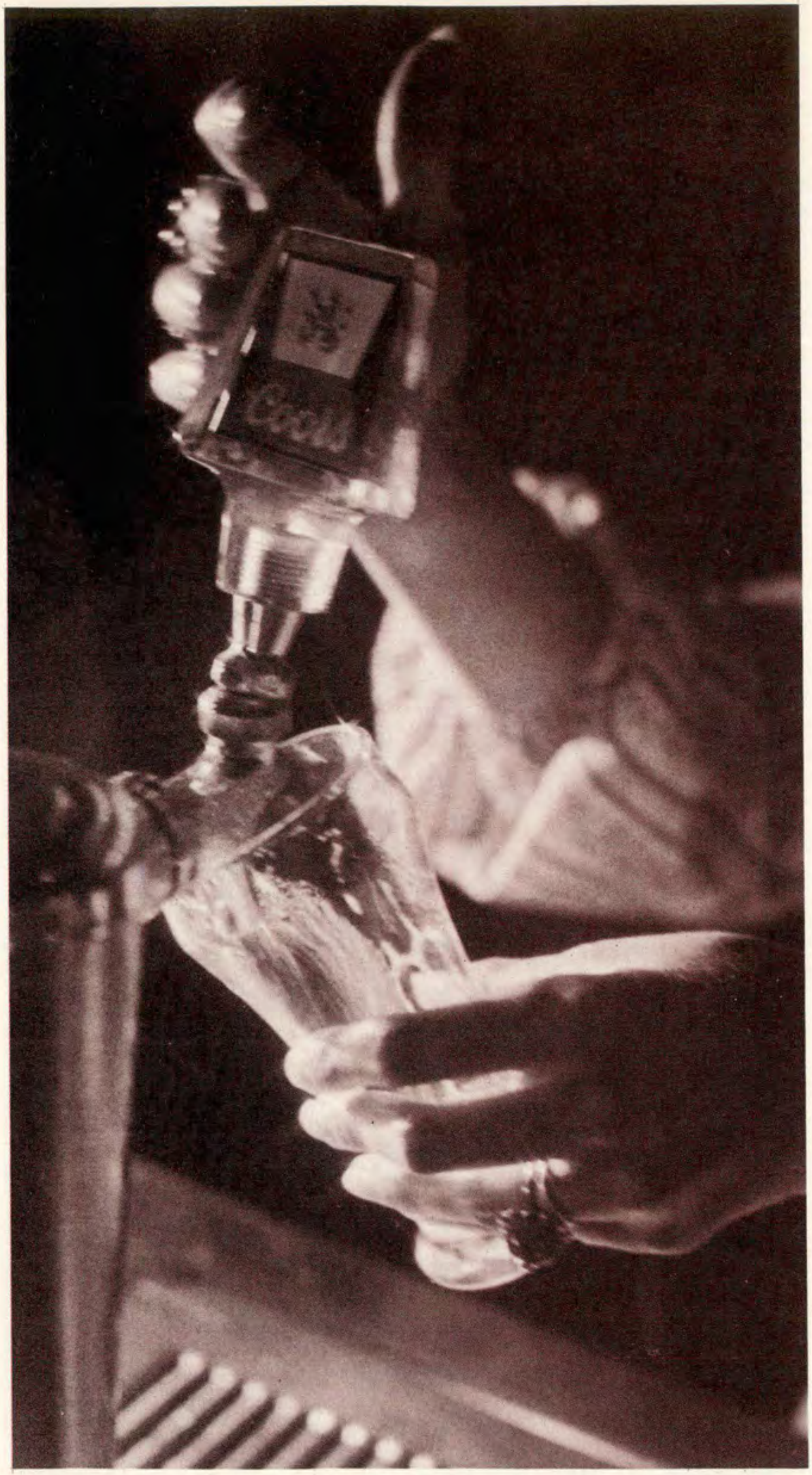


Before you buy that second drink — **Remember,** if you have an early go, you may be flying with a greatly increased susceptibility to hypoxia, vertigo, and spatial disorientation.

Double Trouble

The effects I have described above can only mean double trouble for us. Flying is a task with an extremely complicated control problem. Consequently, it is clear alcohol can significantly degrade our flight performance at much lower blood alcohol levels than are required to produce equally dangerous results on the ground. As little as one drink can be critical for the flying task.

For us, as crewmembers, there is also an increased susceptibility to hypoxia and vertigo and a decreased ability to track a target while pulling Gs and to perform complicated tasks such as shooting an ILS approach. Also, our field of vision is constricted along with a decreased ability to see under dim lighting.

Another factor which compounds our problems with drinking is atmospheric pressure. As atmospheric pressure decreases, the effect of alcohol increases. For example, at 8,000 feet, one ounce of alcohol exerts the effect of 2 ounces at sea level. (There is ½ ounce in a shot of 100 proof.)

Finally, because of the uncertainty of hangover effects, its potential hazards should be emphasized. Also, we must remember blood alcohol levels can exist, and affect performance, even though we may *not* be aware of any effect. During this time, flying performance can be significantly degraded by alcohol levels that show no effect while on the ground.

The Rules

As previously mentioned, alcohol exerts its primary effect on our central nervous system. The effect here is directly related to the blood alcohol level. The blood alcohol level is a result of total alcohol ingested and time available for elimination. By knowing the amount of alcohol ingested and the time since ingestion, we can determine our blood alcohol level and possible effects. Here is an easy way to remember the stages of alcoholic effects.

Remember one mixed drink is about equal to one beer or one glass

Chart 1
Stages of Alcoholic Effects

Stage	No. of Drinks	Effect
1	0-2	No apparent effect (although some capabilities are already compromised)
2	2-4*	Primarily affects behavior — euphoria, talkativeness, and sociability
3	3-4 or more	Definite changes in coordination and speech
4	12-16 or more	Unconsciousness or death

*This is a very dangerous state because there has been a decrease in coordination and ability to perform.

Chart 2
Length of Time Necessary to Reach 0 Blood Alcohol After A Certain Effect is Noticed

Stage	Effect	Hours
1	No apparent effect	5 to 10
2	Changes in behavior	10-15
3	Changes in speech and coordination	In excess of 15
4	Dead	Never

of wine.

There are four easy stages to remember: (1) No effect and possibly dangerous, (2) noticeable effects and dangerous, but legal (which may vary from state to state), (3) illegal, and (4) unconsciousness or death.

The first stage occurs with one or two drinks. There will be no noticeable effect although some capabilities are already compromised.

The second stage develops after two to four drinks. This is also a very dangerous stage because there is a decrease in coordination and ability to perform. Due to the effect on behavior and decrease of inhibitions, a person thinks he or she can "do it better" and will try even though it can't be done.

The third stage extends from about three or four drinks on up to lethal quantities. The symptoms include decreasing coordination, decreasing judgment, stupor, unconsciousness, and death after about 12 to 16 drinks.

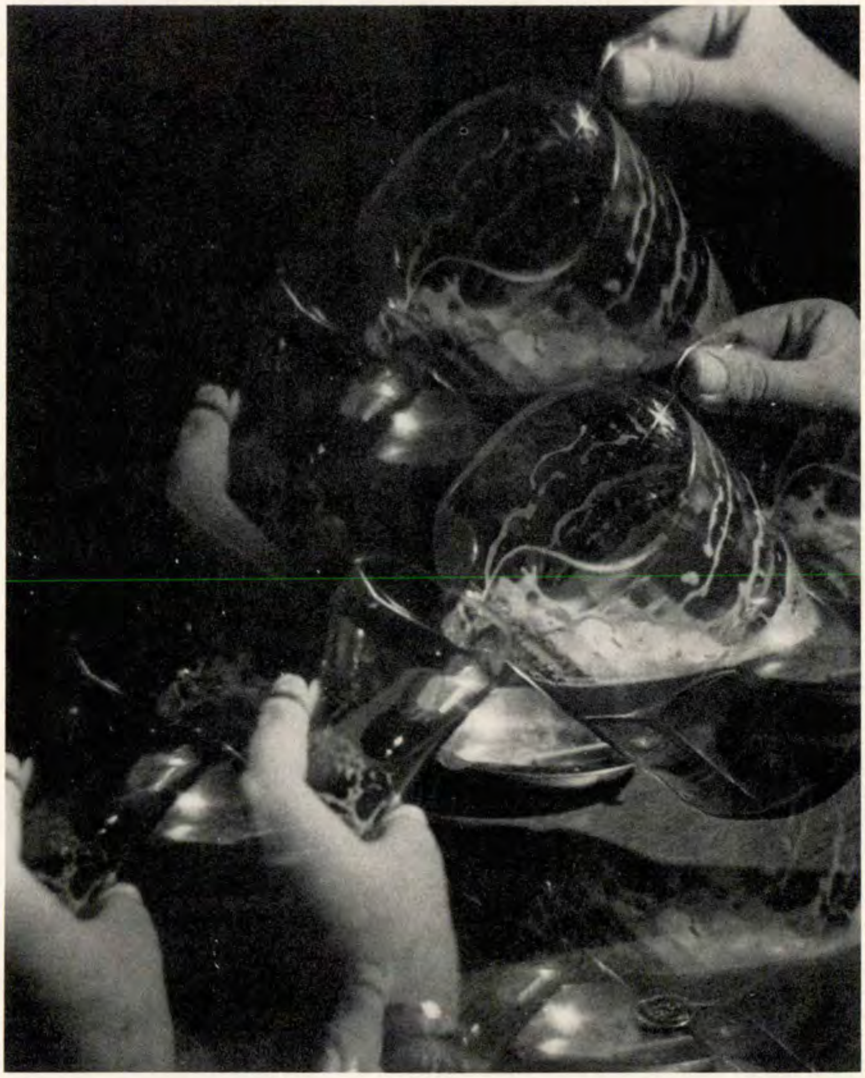
The charts above may help you remember the symptoms and approximately how long it takes to get rid of the alcohol when those symptoms are present.

If you drink to the first stage where no effect is felt, it will take between 5 and 10 hours to eliminate the alcohol. In the second stage when the first effect is noticed, it takes between 10 and 15 hours. In the third stage, it takes in excess of 15 hours. And in the fourth stage — never!

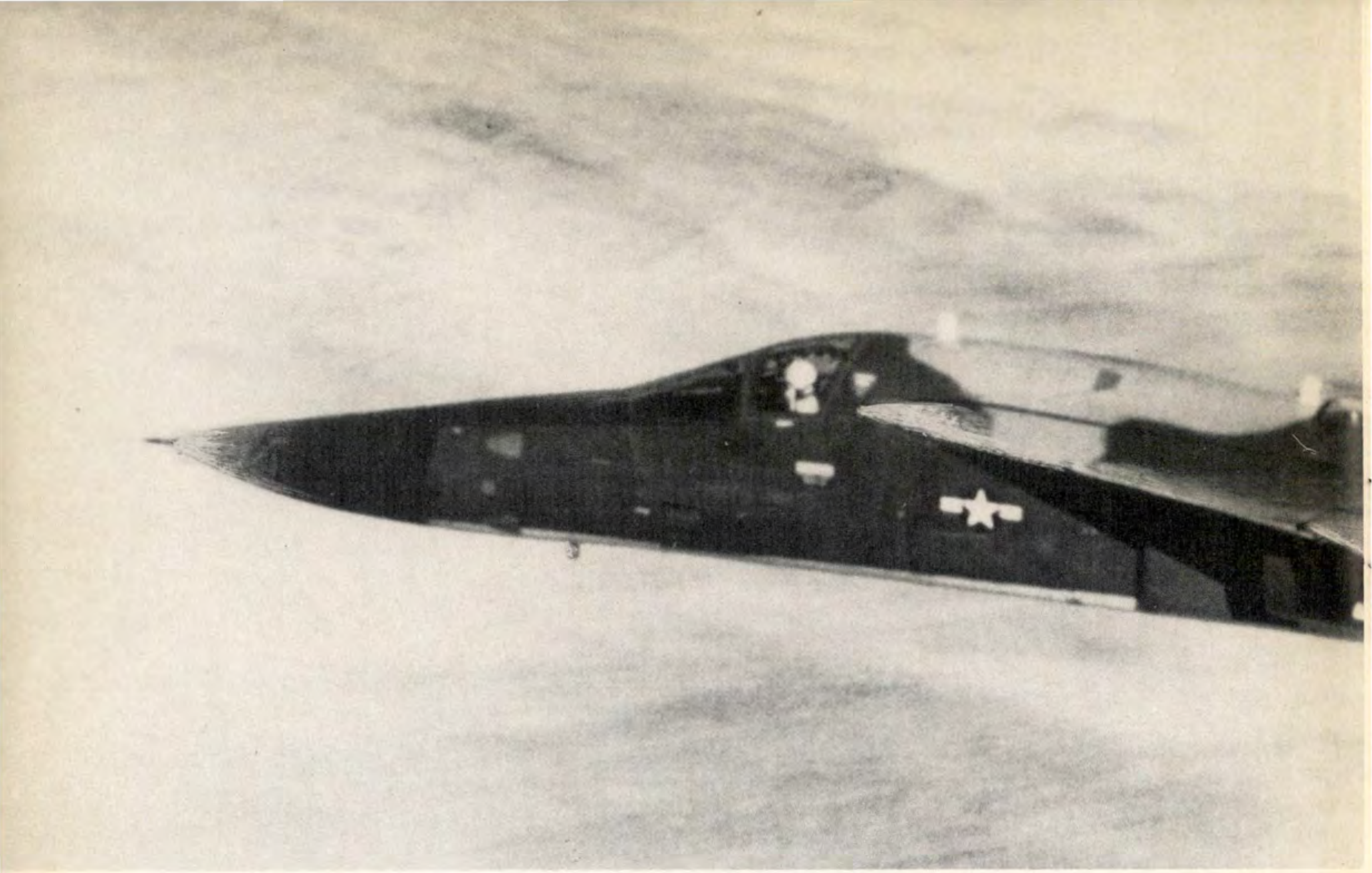
During the latter part of sobering up from the second and third stage, you go back through the first stage. These numbers clearly illustrate the old caveat, "12 hours from bottle to throttle" is without merit.

The Sure Cure

Our inability to compromise with time — the only sure cure for the effects of alcohol — lays the foundation for potential problems. This holiday season, or whenever you drink, remember your guidelines for alcohol use. ■



This person is obviously in no condition to fly, but how long will it take to recover? The answer is — Much longer than you think. Recovery is more than just reaching a zero BAC.



What Is Your IIQ?*

*ICING INTELLIGENCE QUOTIENT

■ Over the years there have been several tragic winter-related mishaps in both civilian and military aviation. The Air Force has a good record, but we continue to have mishaps as a result of cold weather operations. We cannot afford to become complacent about winter flying. We must do all we can to avoid the pitfalls of winter weather.

Since knowledge is the key to avoiding winter weather traps, the following quiz was developed to test your understanding of aircraft icing and its effect upon aircraft performance and flight characteristics.

Adapted from an article written by Major Kurt P. Smith in Dec 82 while he was assigned to the Directorate of Aerospace Safety.

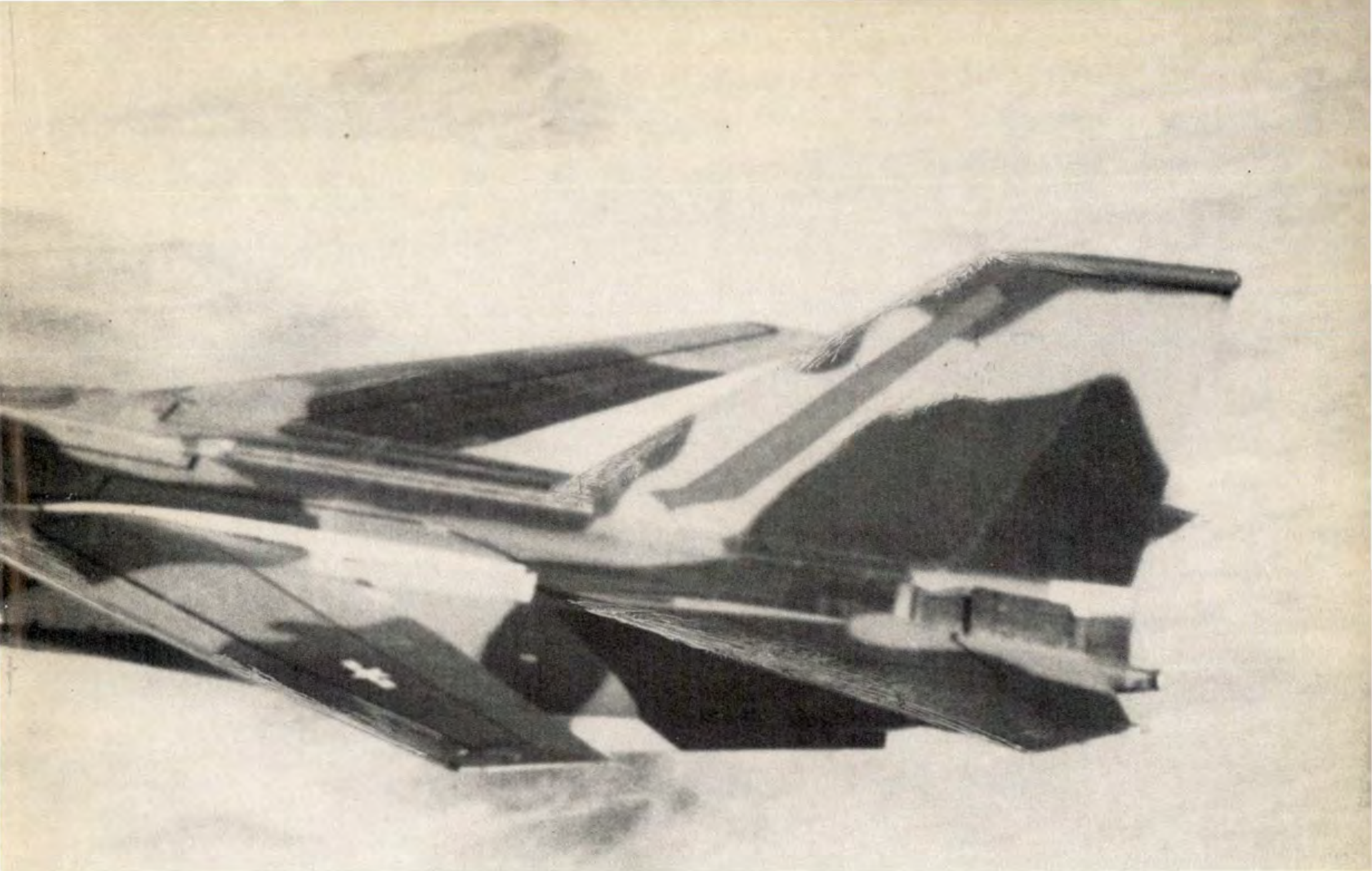
T [ ] F [ ] Slight surface roughness can have significant effects on stall speed and power required to achieve or sustain flight.

T [ ] F [ ] Surface roughness on the afterbody of a wing can have the same effect on aircraft performance as roughness on the leading edge.

T [ ] F [ ] Increasing surface roughness due to ice formation on the leading edges and afterbodies will produce additional drag and further reduce lift.

T [ ] F [ ] Aircraft certified for flight in icing conditions cannot take off with ice formed as a result of ground storage or operations.

T [ ] F [ ] Ice formation on the wing surfaces decreases stall angle of attack and, in some aircraft, the stall will occur prior to activation of stall warning devices.



T [ ] F [ ] Icing changes the aircraft's stall characteristics and, depending on aircraft design and the nature of the ice formation, can either cause violent stall or a slower progression of stall.

T [ ] F [ ] Ice on wing leading edges may increase pitchup and rolloff tendencies.

T [ ] F [ ] Icing may reduce controlability and require greater stick deflection for maneuvers or stall recovery.

T [ ] F [ ] Power available may be reduced due to ice formation on jet engine inlets.

T [ ] F [ ] Ice has been known to cause control surface flutter.

T [ ] F [ ] Trim effectiveness can deteriorate with the accumulation of ice.

T [ ] F [ ] Aircraft ice protection systems are designed basically to cope with the supercooled cloud environment, not for ice formation while the aircraft is on the ground.

T [ ] F [ ] Avoid positioning your aircraft in the exhaust of aircraft ahead of you when precipitation is present.

T [ ] F [ ] Deice areas in view of the pilot first so that he or she may have assurance that other areas of the aircraft are clean. (The pilot can monitor the area deiced first.)

T [ ] F [ ] Power failures may occur due to ice ingestion.

T [ ] F [ ] Ice formation can reduce the efficiency of communication and navigation equipment.

T [ ] F [ ] Ice formations, under certain conditions, may not have noticeable effects on aircraft performance and flight characteristics; however, the effects may become quite apparent in the event of an engine failure or other emergency.

T [ ] F [ ] Ice formation may result in airspeed, altitude, and IFR instrument errors.

T [ ] F [ ] Use of reverse thrust can result in blowing snow adhering to the aircraft.

T [ ] F [ ] Close inspection for ice formation just prior to takeoff remains the most important factor for assuring a safe takeoff when conditions conducive to icing are present.

Hopefully, you answered all questions as *"True."* If not, the quiz may have sparked further study. A little knowledge now can make a big difference later for successful winter decision making. ■

They Do Care

■ *We received this "Dear Chief" letter from a pilot who just had a crew chief find one of those "soon to be catastrophic" hydraulic leaks. The pilot went through a fast aircraft swap, launched and flew a successful mission. By the time the aircraft recovered, the crew chief had gone off shift and the pilot realized he hadn't thanked him. The pilot did find the chief the next day and thanked him, but also wrote us a letter. We're passing it on because we think some maintenance folks lose sight of their part in the mission and feel "unappreciated" by the flight crews. They do care!*

Dear Chief

Thanks for saving my tail! In these days of personnel turnovers, detached organizations, and quick turns, I may never get to meet you and thank you personally, but I want you to know that I appreciate what you're doing. I'm talking about all the folks from the "inview" crew chief or his assistant, to the "behind-the-scenes" shop technician or POL truck driver. You are responsible, as much or more than I, for the bombs on target, the missile up the opponent's tail pipe, the completed air refueling, or the on-time critical resupply cargo mission. Unfortunately, in most cases, you are like the healthy patient after recovery — you never get to see the product of your labors — the mission accomplished.

Anyway, I want to again tell you that I appreciate your efforts. I will probably show up at the airplane in a rush and seem totally preoccupied with getting off the ground. Nevertheless, when you tell me about the aircraft or put something in the 781, I do pay attention and care, because you know more about the condition of the patient than I. Don't be intimidated by mission "press-itis" or "on-time" fever or rank or anything. Write it up or tell me what I need to know before "your machine" becomes my life! I like to talk about nothing more than flying your aircraft.

Let me tell you a little about myself. I may fly four times a week or only once a month. I may have 8,000 hours of flying time or only a few hundred. I can be a full-time flyer or maybe the staff type who can only get out of the office occasionally to keep my hand in. Like you, I come in all ages, sizes, shapes, colors, sexes, educational backgrounds, and experience levels. I am married, single, divorced, or separated and have most of the same problems you do. I may not be exactly where I want to be or doing exactly what I want to be doing.

We are not that different. Granted, a lot of you are frustrated at the bleak promotion outlook for fiscal year 1989, and many work long shifts and do it with fewer people and sometimes, with outdated equipment. But one thing we do have in common is the desire to put the safest possible aircraft in the air to accomplish the mission. I guess that "mission responsibility" is what keeps most of us on board.

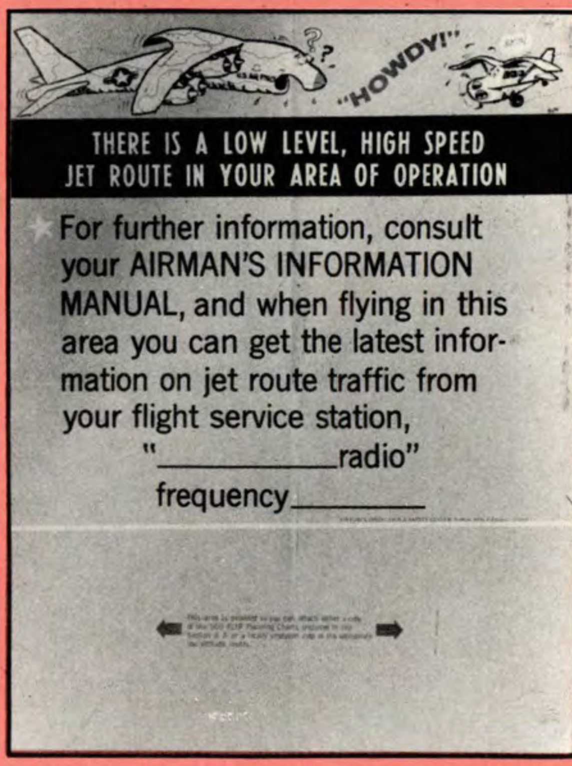
I ranted and raved a bit, but my bottom line is "thanks." Despite all of the above, you do good work and I wanted to let you know that I care. Hang in there! We need you to keep 'em flying! ■

Appreciative Crewmember

Adapted from *Maintenance* magazine, Summer 1980.

SAFETY POSTERS

HURRY!! HURRY!! Be the first safety officer in your area to have these genuine classics. We have a limited quantity of these 16- by 21-inch posters. They are available only by direct mail and will not be available in retail stores. Call us at AUTOVON 876-2634 or write to POSTERS, AFISC/SEPP, Norton AFB CA 92409-7001. Get yours today. This offer will not be repeated!



Safety Warrior

HE FLEW ALONE

CMSGT AUGUST W. HARTUNG
Technical Editor

■ "Lindbergh Does It," proclaimed the banner headline of *The New York Times,* Sunday, 22 May 1927. Charles Lindbergh had flown 3,600 miles across the Atlantic Ocean, and he did it alone. The duration of the flight was 33 hours, 30 minutes. Newspapers throughout the world hailed not only the success of the flight from New York to Paris, but also a new hero.

The Early Years

Charles Lindbergh's background was tinged with glamour and excitement. He was born in Detroit, Michigan, and was brought up in Little Falls, Minnesota. By the age of 20, he had decided on a career in aviation. During his sophomore year, Lindbergh dropped out of the University of Wisconsin to enroll as a flying student with the Nebraska Aircraft Corporation. To him, flying combined perfectly the best of nature and science, to which he was equally drawn.

After attending flying school, he barnstormed for 2 years as a flier and "wing walker." The first plane he owned was a war surplus Jenney, which cost him $500. Traveling through Mississippi and Texas, Lindbergh would stop at small towns, offering passenger flights at $5 apiece to the many crowds that gathered.

But only the military offered opportunities to pilot the high performance aircraft that Lindbergh wanted to fly. So in 1924, he enlisted as a cadet in the U.S. Army Air Corps. Because the Army didn't have enough money to pay its young officers, he was commissioned as a second lieutenant in the inactive reserves.

Settling in St. Louis, he was appointed Chief Pilot of the Robertson Aircraft Corporation and supervised the setting up of the new airmail route to Chicago, flying the first run in April 1926. Airmail pilots, such as Lindbergh, flew their primitive planes in all weather, both night and day, with no navigational aids and few instruments.

Newspaper accounts of his career never overlooked the fact that Lindbergh had made four emergency parachute jumps. Thus, he became one of the early members of the Caterpillar Club, a group consisting of those who have made an emergency escape by parachute from an airplane.

After careful consideration, Lindbergh concluded that a transatlantic flight would be no more dangerous than a winter of flying the mail. And so began the preparation for a flight that was to change the history of aviation.

The Preparation Begins

During the early months of 1927, the most spectacular race of all time was on as four other planes were preparing to fly the Atlantic. The incentive? A $25,000 prize that had been put up by Raymond Orteig in 1919. To Lindbergh, however, the money was secondary. The flight itself was what counted.

Among the other contestants was Navy Commander Noel Davis who seemed likely to start first, but was killed with his copilot during a trial flight. Another attempt was launched by French war ace Charles Nungesser and his copilot, who took off from Paris in early May, 1927, and were never heard from again.

Now, besides Lindbergh, two competitors remained. One was Charles Levine, a wealthy businessman. Since he was not a pilot, Levine obtained the services of an experienced airman. The final challenger was Commander Richard Byrd, the polar explorer.

Although Lindbergh knew the type aircraft he wanted, he faced many obstacles. One was financing. By comparison to his competitors, Lindbergh was something of a poverty case. Still another problem was the aircraft companies, who feared risking their reputations on what they considered a foolhardy venture. They would only build multi-engine aircraft for such a venture. To fly a single-engine plane was suicide. Furthermore, few believed that any pilot could stay awake for the estimated 40-hour flight. Such a flight would require a crew of at least two or three men.

Finally, after much campaigning, Lindbergh convinced some St. Louis businessmen and little-known Ryan Airlines of San Diego that a single-engine monoplane would be best. With a Wright Whirlwind engine to power it, the plane's total cost would come to $13,000. Lindbergh's investment was $2,000.

Taking an active part in the design of the plane, Lindbergh ensured all nonessential features were eliminated in favor of maximizing the 450-gallon fuel load needed for the flight.

On 28 April, 60 days after the order had been placed, the aircraft, a modified Ryan M-2, was test flown and performed splendidly. It was named *Spirit of St. Louis* for the city where men had given money for the flight.

To prepare for his flight over the Atlantic, Lindbergh flew in darkness nonstop from San Diego to St. Louis. His flight time of 14 hours and 25 minutes set a new speed record. Overnight, the unknown pilot became a nationally recognized aviator. The next day, 13 May, Lindbergh flew on to New York where the remaining competitors, Richard Byrd and his crew of three, and Clarence Chamberlin and Charles Levine patiently waited for the fog to clear.

It's interesting to consider the

continued

As an Army flying cadet, Charles Lindbergh graduated first in his class in 1925 with the commission, Second Lieutenant, Reserve.

Lindbergh and fellow airmen of his era came close to being heroes without honor. They flew the mail in primitive, under-powered airplanes without navigational aids. The bulky leather flight suits kept them from freezing.

Lindbergh's *Spirit of St. Louis* was rolled out on 28 April 1927, exactly 60 days after work on it began. Two weeks later, he set a new nonstop speed record from San Diego to St. Louis and became a nationally known aviator.

SAFETY WARRIOR:

HE FLEW ALONE

continued

things Lindbergh would take with him on his transatlantic flight.

- Extra clothing? He could buy that in Paris. In fact, he had made his own flying boots out of some light material.
- A parachute? Why bother. That weighed 20 pounds. And since his planned route was over water, he would probably drown if forced to bail out.
- A radio? No, the big Navy type was too heavy.
- Fuel gauges in the cockpit? No, he would keep track of his fuel supply with a watch and a record of engine revolutions.
- A rubber raft? Yes, he could float on that if his plane went down, and he'd take a pocketknife, matches, and red flares to light so that a ship might see him.
- His only food supply would consist of five tins of emergency Army rations, plus a gallon container of water.

Although aircraft companies strongly opposed the idea, Lindbergh was firmly convinced that a single engine would provide greater range and safety due to the streamlining of design.

The Flight

Although the final tests and preparation were completed, the weather delayed takeoff. On the evening of 19 May, with 4 more days of fog forecast, the coast suddenly began to clear. Lindbergh decided to start at daybreak and prepared through the night. At 7:40 a.m., he started the plane's engine. Twelve minutes later, the *Spirit of St. Louis* was in the air.

Lindbergh's greatest problem was the threat of sleep. He had not slept for almost 24 hours before his takeoff. At times he would be startled into wakefulness by an abrupt change in the plane's altitude or direction.

It was not until the flight was in its 27th hour, when the coastline of Ireland appeared, that the craving for sleep left him. After traveling more than 3,000 miles, Lindy was only 3 miles off course. This was remarkable considering his only two compasses had acted up.

Although he was beginning his second night aloft, Lindbergh knew the remaining 6-hour flight to Paris would be simple. He considered what he would do when he landed. He did not speak French and, being ahead of schedule, did not know if anyone would be waiting at the field — Le Bourget.

He flew over the French farmland until a soft glow appeared in the distance, the lights of Paris. A few minutes later, he circled the Eiffel Tower. Not being familiar with the airport, he circled several times until he spotted some hangars and a windsock. And something else — long lines of automobile headlights, an endless traffic jam.

Lindbergh landed, stopped rolling, and turned the plane toward the hangars. After 33½ hours in the air, he was again a creature of earth. It was precisely 10:24 p.m., Paris time, on Saturday, 21 May 1927. He cut the engine and rubbed his eyes in disbelief. In seconds, the plane was engulfed by a surging crowd. Wooden strips of the *Spirit of St. Louis* cracked under pressure while souvenir hunters tore away the fabric. The crowd dragged Lindy from the cockpit and carried him on their shoulders, shouting in strange accents: "Lindbergh! Lindbergh! Lindbergh!" No longer a private citizen with a dream, Lindbergh had become a hero and symbol of aviation success.

His average speed had been 107 miles per hour, only a little less than his speed from San Diego to New York. Though he had no opportunity to check his fuel tanks carefully before the crowd closed in, Lindbergh was convinced the *Spirit of St. Louis* could have gone on for another thousand miles. (Actually, 85 gallons of gasoline remained in the tanks, enough to fly another 1,040 miles in zero wind.)

But what of himself? The reporters wanted to know. Could he have flown another thousand miles? Wasn't he dead for sleep? He denied that he was.

"I could have flown half the distance again," he answered. To their questions, he went on, "You know, flying a good airplane doesn't require nearly as much attention as a motorcar."

This flight marked the beginning of a very special era. Although the Orteig prize had already been won, other aviators were still determined to make their flights.

In June 1927, Clarence Chamberlin and Charles Levine would fly their plane nonstop from New York to Eiselben, a city only 118 miles from Berlin. Commander Richard Byrd and his crew of three would make the crossing in the Fokker a few weeks later, although the Byrd craft would be forced down 200 feet from the French coast. During the next dozen years, pilots and airplanes would establish new records in distance, altitude, speed, and endurance, and then break their own records with new ones.

The aircraft, whose official designation was the Ryan M-2, was about the size of a single-engine Cessna or Piper and was literally nothing but a flying gas tank with wings.

Significance

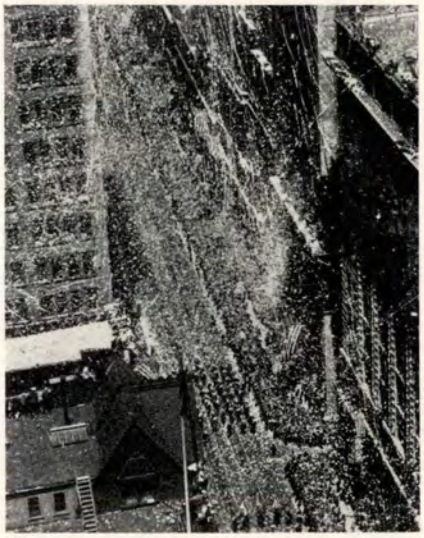
The history of aviation changed when Lindbergh flew into the history books. Americans felt that if Lindy could fly nonstop between New York and Paris, the airplane couldn't possibly be as dangerous as everyone previously thought.

Lindbergh's epic flight made flying respectable, and with his achievement came a growth in air travel that has never ceased.

In the year following Lindy's flight, commercial use of airlines quadrupled as public confidence

continued

Numerous receptions and honors followed the heroic flight. In New York City, a blizzard of ticker tape filled the air, while four million people cheered in the streets. In less than 1 month, "Lucky Lindy" was elevated from an unknown pilot to an international hero.



SAFETY WARRIOR

HE FLEW ALONE

continue

was built up. Within 5 years of his transatlantic crossing, aircraft manufacturers were building modern transports like the Douglas DC-1. And 6 years after that, the Nation's airlines were carrying a million passengers a year.

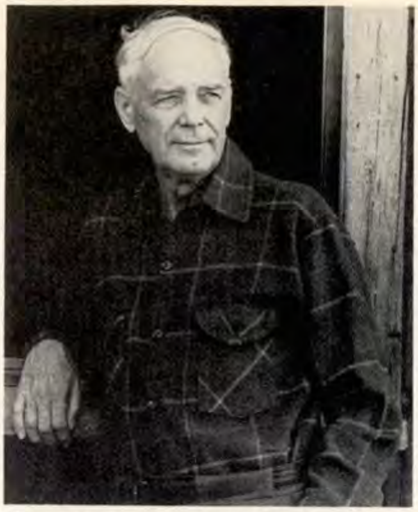
In 1969, Neil Armstrong "took one giant step for mankind" as he walked on the moon and, in 1986, Dick Rutan and Jeana Yeager flew their *Voyager* around the world nonstop on a tank of gas!

To his credit, Lindbergh never tried to capitalize on his fame in any financial sense. Instead, he used his fame in the best interest of commercial air transportation. His major goal was to make flying safer.

Comparisons with Today

It's interesting to pause and reflect upon the evolution of air travel by comparing Lindbergh's flight with aviation today.

Modern by the standards of six decades ago, but primitive by today's, the *Spirit of St. Louis* defies imagination as a vehicle for a transatlantic flight. Lindy's plane was about the size of a single-engine Cessna or Piper and was literally nothing but a flying gas tank with wings. The 450 gallons of fuel he crammed into the tanks would only be two-thirds the amount of fuel inside a single external fuel tank of a jet fighter today. The fuel weighed more than the plane did empty at 2,150 pounds. Its gross weight on takeoff 20 May was 5,250 pounds —



Charles A. Lindbergh left behind a very simple legacy — one of faith in aviation.

115 pounds more than the plane was designed to carry. The top speed on Lindy's flight was less than 120 miles an hour, the landing speed of a modern jet. In the 6 hours it takes the typical eastbound transatlantic flight today, the *Spirit of St. Louis* had gone only 600 miles with more than 27 hours of flight still ahead.

Lindbergh's decision to take off was based on a single weather forecast, which turned out to be dangerously inaccurate. Ocean-crossing jets today receive up-to-date weather information from more than 30 different sources.

The Lone Eagle's altitude in the flight ranged between 50 and 10,000 feet. Today's jets cruise at 30,000 to 45,000 feet. The SR-71 Blackbird flies at more than 85,000 feet at over three times the speed of sound.

Other comparisons with today's aircraft provide even more evidence of how far aviation has progressed in 60-plus years. A four-engine jetliner burns more fuel in the first 3 minutes after takeoff than the *Spirit of St. Louis* did on its entire flight. The $13,000 to build Lindy's plane would buy a radome for a C-141 Starlifter today.

Lindbergh's primary navigational device was a newly developed earth inductor compass, along with a magnetic type for a backup. Although he hit the coast of Ireland only a few miles off his planned course, he remarked later that this was mostly luck. His cramped cockpit contained only 11 instruments, compared to some 200 of a jetliner today that include computerized navigation equipment.

The cockpit switches that Lindbergh had to contend with were minimal compared to aircraft today. In the F-15 cockpit, there are over 300 switches, including 11 on the control stick and 9 on the throttle. Complexity on this mind-boggling scale would have been inconceivable to the pilots of Lindy's era.

In the year of Lindbergh's flight, all of the airlines combined carried a mere 6,000 passengers, and most of them rode on the top of mail sacks. Within two-thirds of a century, we have progressed to 400-passenger giants that cross the Atlantic 80,000 times a year, carrying more than 12 million people, as well as reusable space shuttles.

The Spirit Continues

Charles Lindbergh died 26 August 1974, on the island of Maui, Hawaii. He faced death, from a painful form of cancer, with the same courage he displayed in life. During his life, he was given many honors for his contribution to aviation.

The *Spirit of St. Louis* has been honored, too. It is in the National Air and Space Museum in Washington DC, not far from that first small plane flown by the Wright Brothers at Kitty Hawk.

Lindbergh was more than just a brave and skilled pilot — he was an aviation giant who left the world with a dedication to safe flight that continues today. ■

Most of the material for this article came from the books "The Hero," by Kenneth S. Davis and "The Last Hero," by Walter S. Ross.

Within 5 years of Lindbergh's flights, U.S. airframe and engine manufacturers were turning out modern transports. He, more than anyone else, had boosted public faith in flying.

Photo courtesy United Airlines

FSO's CORNER

PILOT ALERT!

CAPTAIN DALE T. PIERCE
919th Special Operations Group
Eglin AFB Aux Fld 3, Florida

■ All Air Force bases have a midair collision avoidance (MACA) program. Most center around some form of public information, air space coordination, and mutual cooperation. Some bases put out posters depicting working areas, low-level routes, or other awareness topics; provide speakers to local aviation groups; and participate in a local MACA board. With the exception of the local MACA board, most activities are "single shot" efforts that may or may not be repeated even annually.

The folks at Columbus AFB, Mississippi, have a particularly difficult situation. With a flying training wing located amidst 23 civilian airfields, a viable MACA program is a must. They adopted all the usual features of a MACA program but went on to develop an enhancement that enables wider and more frequent distribution of MACA information in a form recognizable at a glance.

The enhancement to the Columbus AFB MACA program keeps the program before the eyes of local military and general aviation fliers. It's called Pilot Alert. Pilot Alert is implemented on a monthly basis to present a problem area or aviation/air traffic control area of interest.

Pilot Alert uses a special 8.5- by 14-inch form created for ease of use and recognizability. At the top are the words "Pilot Alert." Below is a blank box, approximately 7 by 7 inches, for text. The size of the text area is small enough to ensure long-winded speeches are avoided, and long enough to get a well-worded message across. At the bottom are the usual form identifiers.

Once completed, the form is reproduced and distributed to affected on-base agencies and surrounding civilian airports for posting.

With some cooperation between flight safety and air traffic control personnel, a monthly topic isn't difficult to find. It's always possible to come up with one worthwhile topic per month regarding MACA, flight safety, or air traffic control services.

TSgt Bennie J. Wells provided this month's FSO's Corner idea. He's the Chief of Standardization and Evaluation for the Air Traffic Control Branch at Columbus AFB.

The FSO's Corner needs your ideas. If you have something in your program that could help other FSOs if they knew about it, call me (Dale Pierce) at AUTOVON 579-7450; or send your name, AUTOVON number, and a brief description of your program idea to either 919 SOG/SEF, Duke Field, Florida 32542-6005, or Defense Data Network (DDN) mailbox: AFRES .919SOG-SE@GUNTER-ADAM .ARPA. ■

CHECK 6: When to Ship, When to Fix

CMSGT AUGUST W. HARTUNG
Technical Editor

■ Lately, an area of concern has come to the attention of those involved with flight safety: When are aircraft maintainers authorized to "take apart" a component, and when should they ship it to the depot for repair?

Periodically, those working either on the flight line or back in one of our many repair shops have good intentions of fixing a suspected problem on an aircraft component. Like a skilled surgeon, they may disassemble the part, determined to get to the cause. But unlike someone skilled in the medical profession, the maintenance person will sometimes stop halfway through the surgery.

After finding disassembly too complicated or unauthorized at the unit level, or even perhaps having found the suspected cause of failure, the individual stops. That person or someone else in the unit may box up all of the pieces and *then* ship it to the applicable logistics repair center. Sometimes the *disassembled* part is accompanied with a request for a material deficiency report (MDR). Consider the person at the depot repair facility who opens the box and finds the pump, valve, or "widget" in various pieces.

So back to the original question. When are we authorized to "take apart" a component, and when should we ship it to the depot?

The answer can be found in the applicable -6 inspection and maintenance requirements manual for each aircraft. For example, if we wanted to know if a base-level repair was authorized on the pressure regulator/shutoff bleed air valve on the F-15A aircraft, we would review the applicable section of TO 1F-15A-6.

The -6 manual would tell us that local repair of a system component was either not authorized or that it was limited to a specific area of repair or replacement; e.g., base-level maintenance on our F-15A bleed air valve is limited to the replacement of a solenoid and filter only, and nothing else.

The important thing to remember, especially during the request for an MDR, is to not destroy the evidence. Some people can't wait for the professional investigation to find out why something failed, so they examine the part themselves. Even mishap investigation boards have unwittingly destroyed evidence this way.

Remember, you may not have the equipment or know-how to perform a complete teardown. Also, you can bet that the folks at the depot facilities will be more receptive to performing the deficiency analysis and/or repair of a component if it arrives intact.

Proper maintenance begins with the knowledge of when to take apart and when to ship. It begins with us checking the -6. ■

Technical Assistance Capability

MAJOR DONALD THOMAS
Directorate of Aerospace Safety

■ Many times when formal mishap investigation boards are formed, the majority of the membership have had little or no training for this function. This can lead to unnecessary delays and may lead to incomplete analysis during the investigation. In the Safety Education and Policy Division at AFISC, we are concerned that mishap boards or individual investigators are not aware that different types of analysis are available to them.

The following list will aid the wing chief of safety, the flying safety officer, or the mishap investigator. This summary list should be kept at the wing safety office. It should be used for the annual board presidents training or included in the quick reaction kits that are located at some wing safety offices. The final objective is for those individuals who are tasked to conduct investigations to know what agencies or services are available to help with some of the technical aspects of investigations.

The list is oriented towards the flight arena, but all environments (flight, ground, weapons, space, missiles, etc.) can use the service of these experts. The list is not all-inclusive but should give mishap board members an idea of what is available. These experts are to assist in determining the mishap cause and will not be requested solely for damage assessment requirements.

Once the mishap board has determined that technical assistance is required, follow instructions given in AFR 127-4, paragraph 3-8b(2), Investigating and Reporting US Air Force Mishaps, and AFP 127-1, Vol 1, chapter 5, US Air Force Guide to Mishap Investigation. ■

TECHNICAL ASSISTANCE CAPABILITY SUMMARY

All Aircraft Subsystems
Alloy Analysis
Aerodynamic Analysis
Arresting Systems
Avionics

Brakes
Barriers
Batteries
Bearings
Bird Identification

Canopy Failure Analysis
Chemical Analysis
Communications Assistance (Hammer Ace)
Composites
Crash Injuries
Crash Survivability
Crime Lab — AFOSI

Ejection Systems
Electron Microscopic Analysis
Explosives Properties
Engines

Fatigue (Aircrew)
Failure Mode Analysis
- Composites
- Electronic/Electrical
- Metals
- Structural

Federal Aviation Administration
Federal Bureau of Investigation
Fabric Analysis
Fire Damage/Pattern Analysis
Flammability
Flash Point Analysis
Film/Photo Development
Flightpath Analysis
Fuels Analysis

Human Factors
- Anthropometric Data
- Sensory Limitations

Hydroplaning

Instrument Analysis

Landing Gear
Life Support Systems

Lightning Strike Analysis

Missile Propulsion
Mortuary Affairs

Naval Support
- Laboratory
- Salvage
- Sonar

Paint Analysis
Particulate Contaminant Analysis
Pathology
Plexiglas Failure Analysis
Propulsion Systems
Propellant Laboratory
Pyrotechnics Capabilities

Radiation Hazard Analysis
Radiographic Analysis
Rocket Propulsion Components
Rubber, Plastics, & Adhesives Lab
Runway Slipperiness

Sealant & Adhesive Characteristics
Search & Rescue
Soft Aluminum
Survivability
Structures and Materials Analysis
Spatial Disorientation
Spectrographic Analysis

Tensile Strength Analysis
Textile Test Lab
Tires
Toxicology
Turbulence

Vibration Spectrum Analysis
Video Tape Analysis
Voice Print Analysis

Wake Vortex
Weapons Effects
Weather Analysis/Forecasting
Wind Shear
Wreckage Distribution Analysis

OPS TOPICS

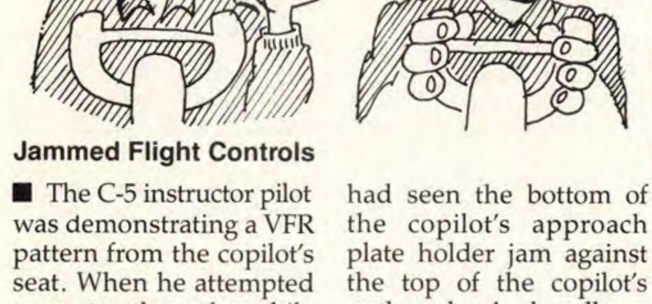
Jammed Flight Controls

■ The C-5 instructor pilot was demonstrating a VFR pattern from the copilot's seat. When he attempted to center the yoke while turning downwind, he met resistance which he could not override.

The IP feared jammed ailerons and worked the yoke back and forth. This freed the controls, and he encountered no more binding.

On downwind, another pilot on the crew said he had seen the bottom of the copilot's approach plate holder jam against the top of the copilot's outboard yoke handle.

The C-5 chart holders tend to become loose over time and can move forward and jam the yoke. At present, they can only be tightened with a Phillips head screwdriver. Be aware of this danger and ensure the holders are tight and remain free of the controls.



No Fuel, No Brakes

After a normal takeoff, the RF-4 crew noticed the center line fuel tank was not feeding. The pilot turned the external transfer switch to off and then discovered the internal wing fuel would not transfer, either.

The crew lowered the landing gear as directed by the checklist, and the internal wing fuel began to transfer. They returned for a normal landing, deployed the drag chute, and the pilot checked that the brakes were working.

When the aircraft began drifting left, the pilot tried to correct with brakes and nosewheel steering, but found that both had failed. He disengaged antiskid and selected manual brakes. However, he was unable to stop the heavy aircraft before the left main gear and nose gear departed the runway without damage.

A faulty right main gear scissors switch kept the fuel from feeding because the system received false inputs that the aircraft was still on the ground. This switch was also the culprit in the brake and steering failures because these systems are wired through the scissors switch to provide touchdown protection during landing.

The lesson is to be aware of this possibility. The Dash 1 doesn't cover this situation adequately.

A Minor Pain

After completing the second low-level mission in 2 days, the radar navigator (RN) debriefed and went home. He was feeling a little more fatigued than normal and was feeling chilled. The stomach ache he had first noticed on mission planning day, 3 days prior, was still bothering him. He decided to seek medical assistance and was diagnosed as having appendicitis.

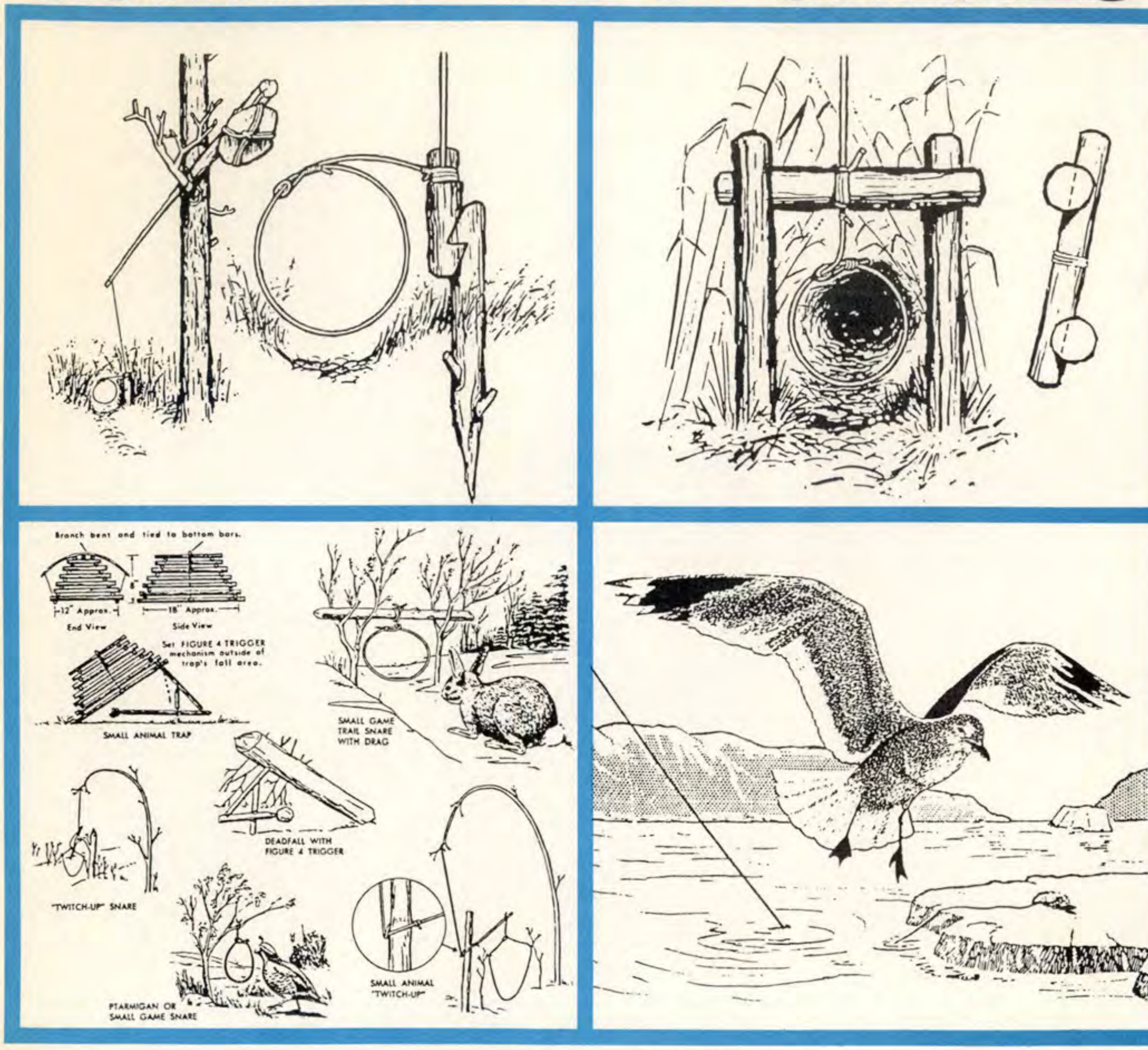
The following morning his appendix was removed. The appendix was close to bursting, but fortunately, had not done so.

After 5 days in the hospital, the RN was released for a normal convalescence.

The RN never told anyone else on the crew about his slight, but continuing stomach ache. It never noticeably affected his performance. However, he was flying with a time bomb inside him, and it came close to detonating.

The Air Force has provided us with highly trained flight surgeons to make sure we're fit to fly. Let them do their job and decide if you're really up to it. Don't fly if you're not 100-percent up to par. ■

SURVIVAL TIPS: ***SNARES***



USAF Survival School
Fairchild AFB, Washington

■ For years, people have used traps and snares to catch animals for their hides and furs, but in a survival situation, traps and snares become a valuable tool that could provide you with food and make your situation more endurable.

Small animals are usually more abundant than large animals and will most likely be a survivor's main source of food. Setting snares is more advantageous than hunting the animal because snares work 24 hours a day and require less of a survivor's energy. "By setting snares, you conserve valuable time and energy to take care of your other survival needs such as shelter, water, and fire," said Sgt Stephen D. Knecht, an Air Force survival instructor.

All traps and snares should be set at midday because most animals are less active at that time. Check them twice daily, preferably just after sunrise and before sunset. The more snares that are set, the greater the chance of catching an animal. "When checking your snares, you should look for any signs of activity and reset snares if they have been moved or tripped," said Sgt Knecht.

"Snares should be placed along game trails, watering and feeding areas, and bedding areas," said Sgt Knecht. The material you use for the snare should be made into a slip loop with the loop slightly larger than the animal's head. "Anchor the end of the snare to something solid that the animal will not be able to drag away," added Sgt Knecht.

Remember, careful attention to setting and checking snares may mean the difference between eating well and not eating at all. ■

MAINTENANCE MATTERS

ASK A FOOLISH QUESTION

■ Following certification training in loading AIM-7 and AIM-9 missiles, a no. 2 man was involved in his first integrated combat turnaround (ICT). In addition to his fellow crewmembers, an evaluator from the base's weapons loading standardization crew (LSC) was present.

The load crew had completed the upload without any problems. But the download was a different story.

The no. 2 man went to station 3 to begin downloading an AIM-7. After retracting the umbilical, he pulled the LAU-106 safety pin. Upon seeing this, the LSC evaluator told the individual to put the pin back in and explained the importance of not pulling the pin too soon.

Once the pin was inserted again, the evaluator took his eyes off the no. 2 man, who proceeded to remove and reinstall the explosive cartridge breech caps.

Believing the missile to be safed, the no. 2 man again pulled the LAU-106 safety pin. Not sure if he had retracted the umbilical, he decided to check by physically attempting to retract it.

When he mistakenly inserted his speedhandle into the manual release socket instead of the umbilical socket, and rotated it, the AIM-7 dropped to the ground. Fortunately, no one was injured, but damage cost to the missile exceeded $25,000.

What are the lessons learned? Knowing this was the no. 2 man's first ICT following initial certification, the LSC evaluator and load team chief might have maintained closer supervision over the individual. Without the weapons loading jammer placed under the missile, there was nothing to support it during the manual release. Also, the individual, who was not sure of a particular procedure, should have stopped and asked for help.

When it comes to safety, particularly on ICTs, the old adage is true: "The only foolish question is the one you don't ask."

REMEMBER THE BASICS

Since the unit was preparing for a mobility/generation exercise, many folks assigned to the swing shift were released early to rest, return the next morning, and mobilize. To provide another jet for the upcoming exercise, the remaining skeleton crew felt an urgent need to install and ops check an aircraft engine. Only one member of the installation team, a 7-level engine technician, was qualified on this task.

Once the engine was installed, quality assurance was called. They inspected the installation and rated it a perfect zero defect job.

Although only one tool box was used for the installation and engine-run prep, no one performed a tool box inventory prior to the leak and ops check, and no intake inspection was done because a flashlight was not available. Less than a minute into the run, a ground crew member yelled "Fire!" The engine operator initiated emergency procedures and shut down the engine.

Investigation revealed the engine had ingested two pair of pliers at a cost of $70,000 in damage to the blades. Sadly, the crew who worked so hard was right back to where they started at the beginning of their shift — with an engine change.

How often do we feel that need to complete just one more task, especially in preparation for or during an exercise? Maintenance people are a proud and determined group of folks. Yet we have to be smart enough to know that pride and determination can get in the way of common sense.

Our ability to do our jobs depends not only on our many talents and skills, but also on safety. It's a good feeling to get that last plane back in commission, but let us not be so determined that we forget basic things like inlet inspections and tool control.

Let's remember the basics.

THREE DOWN

With the crew chief and a specialist as a fireguard in their proper positions, the pilot started the right engine of his F-15. Once the crew chief correctly removed the nose gear safety pin and placed it a few feet outside the left main gear tire, the pilot started the left engine.

After visually confirming with the crew chief, the fireguard pulled the gear, pylon, and AIM-9 launcher pins on the right side, along with the missile fuse and nose covers. The fireguard then placed the pins with their hanging streamers and fuse cover in the missile nose cover, and tucked the nose cover under his right arm. When he moved forward into the danger zone of the operating right engine, it ingested the three pins from the missile cover he carried. Before you say this was just another foreign object damage story, read the events that led up to this $30,000 mishap.

Five days prior to the mishap, the fireguard had completed a 3-week field training detachment course with duty hours 0600 until 1600. On the following day, he worked a swing shift from 1500 until 2300, and then had the weekend off. When he reported to the swing shift at 1445 on Monday, there was some confusion in the section. His supervisor reminded him that he had been assigned to the 2300 to 0700 servicing shift, and to report back for duty at 2300.

Although given the opportunity to get adequate rest, the specialist was not tired and, therefore, was unable to sleep. At 2300 hours, he reported back for duty.

Now you can see how the stage was set. Near the end of his shift, he was asked to assist as a fireguard during the morning aircraft launch. Although the specialist, who was now very tired, was aware of the danger areas around the intake, no one had ever instructed him on the duties or responsibilities of a fireguard.

The lessons to be learned from this incident are apparent. Inadequate training and rest led to the individual's reduced performance, and thus contributed to his loss of situational awareness.

Even with the typical jet engine operating at idle, suction at an inlet area is greater than 300 pounds. This suction is enough to pull almost anything, including you and me, into a spinning compressor.

As supervisors, we communicate clearly with our workers about duty hours, situational awareness, and the responsibilities of various job taskings.

We are all in the privileged position of contributing to keeping our Air Force a strong deterrent body. However, never forget that we are also sometimes in a position to prevent a costly mishap. Safety is everyone's business.

CONSTANT VIGILANCE

During climbout in a twin engine fighter, the pilot saw the master caution and left fuel pressure lights illuminate. Then the left engine flamed out.

Ten seconds after he got the left engine started, the left and right fuel pressure lights illuminated. Fortunately, he diverted to the nearest suitable field and landed his stricken jet.

During the postflight inspection, maintenance people found the left fuel filter bypass rod extended, and both left and right fuel strainer filters contaminated with cloth fibers. Investigating further, they found a deteriorated rag wrapped around the impeller shaft of the left boost pump.

This was the eighth sortie since a phase inspection. During the inspection, the aircraft underwent extensive fuel system maintenance after a leak was discovered in the forward cell.

This mishap reflects the requirement for good housekeeping, which entails keeping track of not just tools, but all materials and loose articles introduced into the work areas of aircraft.

Take a look at how you perform maintenance and make an honest evaluation of your housekeeping practices. Constant vigilance by everyone is vital if we are to prevent mishaps such as this.

THINGS GO BUMP IN THE NIGHT

A night maintenance crew was preparing a bomber aircraft for a modification. This required removing a dozen screws from the vertical fin panel. But to gain access to the screws, the horizontal stabilators had to be repositioned.

To provide power for moving the stabilators, the 7-level team chief and his 5-level assistant went to the cockpit and turned on the aircraft auxiliary power unit.

The team chief then pulled the control stick back to the full aft position, and with his assistant, held it there. This action moved the front of the stabilator down, which now allowed access to the tail panel screws.

On the ground, meanwhile, two 5-levels moved a B-2 stand into position in front of the stabilator with the top of the stand at a right angle over the stab's leading edge. Then one of the 5-levels climbed the stand and began removing the screws. The other worker remained on the ground to maintain headset communication with the team chief in the cockpit.

Suddenly, the worker on the stand saw the stabilator slowly move upward toward the bottom of the stand. So he quickly went down the stand to move it. But it was too late! The top front edge of the stabilator hit the bottom of the B-2 maintenance stand, damaging the bomber's left stab.

Obviously, letting the stand project over the stabilator versus re-

continued

MAINTENANCE MATTERS

maining parallel was a factor in this mishap. Also, there may have been a breakdown in communication between the workers on the ground and the folks in the cockpit.

In addition to reviewing the lessons learned, this unit also submitted a TO change requiring the use of a pitch control lock set to keep the stabilator in an angled position during maintenance.

Remember to use caution when working around flight control surfaces with power on. And don't forget to communicate. If we plan ahead for safe maintenance, things won't go bump in the night.

JOB WELL DONE!

Too often on this page, you may read about maintenance related mishaps where someone violated tech data or took a short cut. Well, here's a chance for us to praise someone. Read on.

Fifteen minutes after normal engine start, the F-15 crew chief noticed fuel dripping from underneath the right engine bay. He called for an engine specialist and lowered the access panel. After finding a high pressure fuel spray coming from the upper rear compressor variable vane (RCVV) actuator fuel line, the crew chief immediately directed the pilot to shut down.

Further inspection revealed a circumferential crack in a line going into the RCVV actuator. Had this aircraft taken off or the line broken in flight, the spraying fuel pressure might have caused the engine to stall and not restart, or worse yet, started a fire.

Thanks not only to the crew chief and engine technician for their alertness in this potential flight hazard, but also to the countless other maintenance people on flightlines and in repair shops around the world who contribute daily to our Air Force safety program. Well done!

ALERT BIRDS

During flight, the crew of a heavy aircraft noted the cabin low air flow light illuminate, followed by a loss of cabin pressure. After directing his crew to go on oxygen, the aircraft commander returned with his crew to home base, where the plane was impounded for a long-term problem of cabin pressurization.

During the extensive troubleshooting that followed, the impoundment maintenance team used a borescope from the engine shop to check some of the plane's environmental system ducting.

Would you believe they found a compacted bird's nest in a ram air scoop duct? Searching further, they found a second nest in the precooler unit. Once they removed the nests, the aircraft environmental system checked good.

Isolated case, you ask? Not hardly! Three weeks after this incident, another aircraft lost cabin pressure. It, too, had a bird's nest lodged in a ram air duct. So if the nests weren't built while the aircraft were in flight, how did it happen?

Both planes had sat on alert for extended periods of time. The various ducting covers were off of the aircraft, giving adequate opportunity for English sparrows and finches, which often feel at home in manmade objects, to build their nests.

Lessons learned? Whenever possible, use the inlet plugs over any aircraft openings. It's also a good idea to inspect not only alert birds (no pun intended!) on a frequent basis for nests, but those aircraft that are down for extended periods of maintenance, too.

Help prevent incidents like the ones these two crews experienced. Stay alert for birds.

DOING IT RIGHT

Often, in safety publications, we read about the things that went wrong and consequently contributed to a mishap. But here's another example of doing it right, which is how we do it most of the time.

An F-15C, loaded with a GBU-10 bomb on station 2 of the left conformal fuel tank, taxied to the end of the runway. The aircraft was a unique, specially modified Eagle designed to test weapons carriage and separation. When the end-of-runway (EOR) crew pulled the *electrical* safety pin from station 2, the impulse carts fired in the MAU-12 rack.

Because the EOR crew followed tech data by removing the rack *electrical* safety pin first, and not the *mechanical* safety pin, the weapon was prevented from releasing onto the ramp. Later investigation disclosed a defective relay in the air-to-ground relay panel allowed direct voltage to reach station 2.

This EOR crew was praised by their unit for following tech data and preventing a potential mishap. Safety is a full-time, 24-hour-a-day job, and one of the Air Force's finest proved it. That's doing it right! ■

MAIL CALL

EDITOR
FLYING SAFETY MAGAZINE
AFISC/SEPP
NORTON AFB, CA 92409-7001

■ In my capacity as a member of the RAAF Directorate of Air Force Safety, I have, among other duties, to peruse publications pertaining to safety. Amongst those publications is the USAF *Flying Safety* magazine which is read with enthusiasm by all members of this Directorate.

Naturally, if something is published that appears not to agree with information already in hand, our job is to query the discrepancy. I refer, specifically, to the article "Could You Survive?" that appeared on page 7 of the November 1987 edition of the *Flying Safety* magazine. The method shown to establish a true east/west position line is, in my opinion, very misleading. The sun does not travel in a straight east/west line unless you are situated at 0 degrees latitude and at the correct time of year, i.e., March/September when the sun is directly overhead the equator at noon local time, at which time there would be no shadow. At most places on the surface of the earth, the shadow, when plotted, would produce a parabola shape, not a straight line.

The only way that the method shown would be correct was if a mark were made at noon (local time) ± X hours; the *two* points obtained, when joined, would produce a true east/west position line.

At school (many years ago), I was taught how to trace the sun's movement by marking the shadow at regular intervals. The noon (local time) shadow was the shortest and produced a true north/south position line when a line was drawn from the mark to the base of the stick producing the shadow. This is correct for any place on the earth's surface.

Would you please forward these comments to the author of the article for any responding remarks on my observations.

G.J.K. SUGARS
Flight Lieutenant
Directorate of Air Safety
Canberra

Dear Colonel Martin

I apologize for the late response to your letter concerning Survival Tips published in the November 1987 *Flying Safety* magazine. The Survival Tips were written from information contained in AFR 64-4, Survival Training, Volume 1. The article is only incorrect because it states that the line drawn is a "true" east-west line. The article should have stated that this is an "approximate" line.

The diagram that was printed in the magazine with the Survival Tips is also incorrect. The diagram shows the shadows casting a straight line. This shadow would, in fact, be curved as Flight Lieutenant Sugars' letter states.

Flight Lieutenant Sugars is technically correct, but a person can find an *approximate* east-west line with two shadows. How to find an "approximate" east-west line is what we are trying to teach people, not how to find a "true" east-west line.

I hope this clarifies everything. Please extend our appreciation to Flight Lieutenant Sugars for pointing out our mistakes.

DONALD D. HARBERTS, SRA, USAF
Public Affairs Specialist
3636 CCTW
Fairchild AFB, Washington

Our thanks to both of you for helping clarify the article. Ed. ■

Our photographer tested this method by taking a series of photos and superimposing the negatives. As you can see, the solid line connecting the ends of the shadows is slightly curved. So, it would not be a true east-west line, but a close approximation.

CAPTAIN
Victor A. Jones

CAPTAIN
Keith H. Offel

MAJOR
Damon G. Stephens

TECHNICAL SERGEANT
Steven R. Snell

FIRST LIEUTENANT
Peter A. Donnelly

FIRST LIEUTENANT
Daniel H. McCauley

92d Bombardment Wing
Fairchild AFB, Washington

■ On 25 August 1987, the B-52 crew had just taken off from Nellis AFB on a Red Flag mission. Major Stephens, aircraft commander; Lieutenant McCauley, pilot; Captain Offel, radar navigator; Lieutenant Donnelley, navigator; Captain Jones, electronic warfare officer; and Sergeant Snell, gunner; were in the midst of flap retraction when a sharp bang was heard and felt. Seconds later, at 2,600 feet AGL, a louder screeching sound was heard, and the aircraft began to vibrate.

The aircraft rolled violently out of control and began rapidly losing altitude. The right flap appeared stuck at 90 percent, while the left flap continued to track normally. Lieutenant McCauley immediately placed the flap lever off, then down, trying to regain symmetrical flaps. At this point, the crippled aircraft was tracking towards a 9,775-foot ridge line, 10 miles away.

Captain Offel and Lieutenant Donnelly began to issue altitude and heading advisories. Major Stephens was countering the uncommanded roll and descent by using full aft yoke, full left rudder, full left spoiler, airbrakes two, and asymmetric thrust. These inputs regained aircraft control, brought the bomber to 30 degrees of bank, and stopped the descent.

With terrain a serious problem, Major Stephens initiated a 200- to 300-FPM climb and gentle right turn. The airspeed slowly increased to 210 knots and altitude to 8,000 feet. The ridge line passed 2 miles off the left wing. Captain Jones and Sergeant Snell began searching for and relaying flap malfunction and structural damage information.

A chase aircraft informed the crew that the right inboard flap was missing and fuel was streaming from the wing. The gauges confirmed a loss of 8,000 pounds of fuel from the no. 3 main, while the right outboard and external had drained empty. Lieutenant McCauley emergency defueled the no. 3 main to 5,000 pounds, stopping the leak. Realizing the aircraft would have to be landed at a higher-than-normal airspeed, the crew headed for Edwards AFB, California, 50 minutes away.

The crew consulted technical advisors who told them very little data was available on this type of emergency. They were on their own. They performed a controllability check and transferred fuel to the left wing to alleviate some of the control pressures. Working with sluggish, but acceptable controls, Major Stephens flew an ILS approach with full left lateral trim, 4-degrees left rudder trim, and 20-degrees left yoke. The landing was uneventful.

The quick reactions, outstanding crew coordination, and sterling airmanship of this crew resulted in the safe recovery of a valuable aircraft and irreplaceable crew. WELL DONE! ■

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UNITED STATES AIR FORCE

Well Done Award

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

FIRST LIEUTENANT
John D. Ramsey

CAPTAIN
Jack J. Akenson

336th Tactical Fighter Squadron
Seymour Johnson AFB, North Carolina

■ On 31 July 1987, Lieutenant Ramsey, aircraft commander, and Captain Akenson, weapon systems officer, were flying an F-4E on a low-level mission. Initially, the flight went as planned, with the external fuel tank feeding out normally. However, on the fourth leg of the low level, Lieutenant Ramsey noticed the fuel totals reading much lower than planned.

Lieutenant Ramsey and Captain Akenson immediately recognized the limited fuel available, discontinued the mission, and started a climb. Suspecting trapped fuel, they accomplished emergency procedures for fuel transfer failure. These procedures did not solve the problem, and the fuel quantity continued to decline.

They continued the climb to conserve fuel while determining the most suitable emergency airfield. The primary alternates were both too far away for the usable fuel remaining. Captain Akenson located a civilian airport which had 6,800 feet of runway.

The crew executed a minimum fuel descent to the field. Extremely hazy weather prevented Lieutenant Ramsey from seeing the runway until they were approximately 1.5 miles from touchdown. At this time, approach control told the crew there were no overruns on the runway, and to make things worse, there was a gorge at the end.

Lieutenant Ramsey and Captain Akenson planned to touch down as near as possible to the approach end of the runway and use maximum braking. They coordinated a plan to eject if they were unable to stop the aircraft on the runway. Upon landing, Lieutenant Ramsey immediately deployed the drag chute and applied maximum braking, bringing the aircraft to a stop with approximately 300 feet of runway remaining.

The superior airmanship and crew coordination demonstrated by Lieutenant Ramsey and Captain Akenson saved a valuable combat aircraft. WELL DONE! ■

Write A Dumb Caption Contest Thing

Once again we give you the opportunity to beat our dumb caption. If you send us the best caption, we'll send you our cheap little prize and also plaster your name all over our February magazine. How's that for a big deal? Wow!!!

Write your caption on a slip of paper and tape it on a photocopy of this page. DO NOT SEND US THE MAGAZINE PAGE. Use "balloon" captions pointing to the speaker, or use a caption under the whole thing. You may also submit your caption on a plain piece of paper. Our panel of experts on dumb humor will meet 21 December to select this month's winning entry. All decisions are relatively final.

Send your entries to: **"Dumb Caption Contest Thing" • *Flying Safety* Magazine • HQ AFISC/SEPP • Norton AFB CA 92409-7001**