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Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTEREST IN FLIGHT

AEROSPACE SAFETY

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SPECIAL FEATURES

REGULAR FEATURES

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It is customary at this time of year to wish everyone a Merry Christmas. This year we are changing the script slightly. We do wish all of you the best this Christmas season and a happy and prosperous New Year. But we'd like to add a Happy Post Season message, which is simply this: Start the New Year cautiously. Chances are, except in SEA, you are enjoying a couple of weeks with work activities at a low ebb. You've shopped for the kiddies, partied and put on a few pounds from all those goodies. So you will be a little rusty — like an athlete who breaks training. You won't find him trying to break a record the first day back, and you're probably not going to be quite as sharp at herding the old tub around the sky. Just be a little more attentive to details and get the old feel back before you go all out. Merry Christmas!

To a pilot the term RCR (Runway Condition Reading) is simply an indicator — an abstraction — that he must work into his formula for landing and takeoff. If the number given is from 19 to 25 he doesn't worry. From 13 to 18 he may sweat a little, depending on the end of the scale reported. Below 13 he knows he has problems down to the point, about 6-7, where he'd better take the option of that alternate he has tucked away.

We are now in the season when readings on the low end of the scale will prevail much of the time at many bases. "That Was the Winter That Was," page 1, discusses the cold, ice and snow scene and offers suggestions for making the most of tools available to help the pilot herd his machine safely to the chocks. ★

THAT WAS THE WINTER THAT WAS

- last winter.

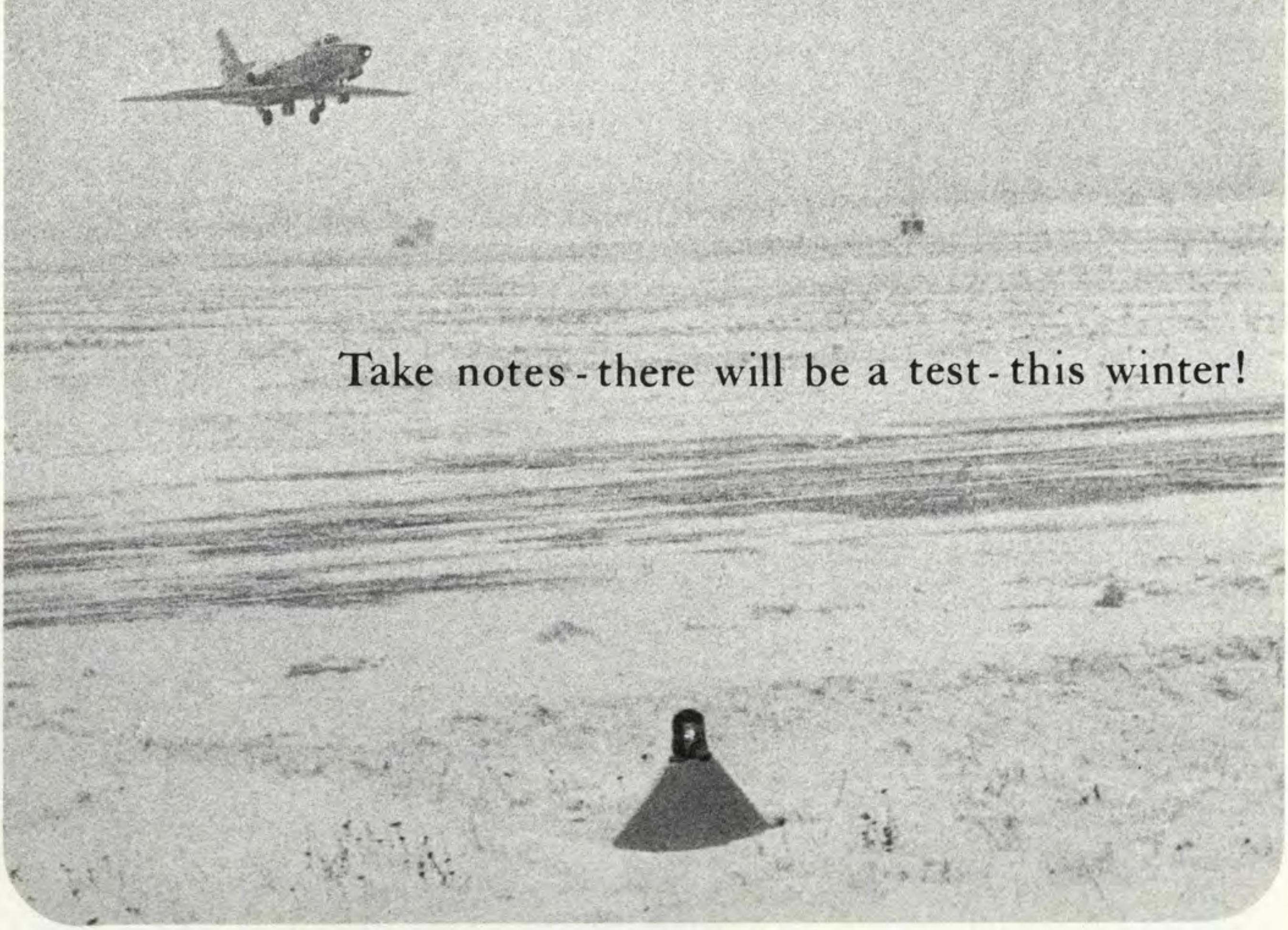
Last winter, like every winter since 1903, there were some pilots who ran into trouble when they crossed swords with icy, slippery runways. Some got away with no more than a good scare, sliding briefly out of control and then pointing their machines back down the runway again. Others, less fortunate, found themselves whistling off the pavement (sides of runway, end of runway) in strange and unusual attitudes and configurations (sideways, backwards, one gear collapsed, two gear collapsed).

Some pilots found themselves confronted with conditions plainly beyond their control. In a number of instances the runway slipping factor changed, or was different from that reported to them. In other cases, better knowledge and understanding of airplane handling on slippery runways could have kept the pilots out of trouble.

THAT HELPLESS FEELING

Take the case of a T-33 pilot from a southern base. After dropping off a passenger at a snow-country base one evening in mid-January, he taxied back to the runway for takeoff. He'd experienced no difficulty on landing, RCR was reported at 14 with packed snow and sanded icy patches. The 40-degree left crosswind was only three knots.

Everything went smoothly until about 30 knots below takeoff speed, when the T-Bird began to drift to



Take notes - there will be a test - this winter!

the left side of the runway. The runway centerline stripe was obscured by snow. In the dark, the pilot didn't realize he was drifting until he was 40 or 50 feet from the side of the runway.

He had a few anxious moments, but quickly realized that his directional control was improving with airspeed. He pressed on, electing to take advantage of increasing rudder effectiveness, instead of taking chances with the variable and unknown factors of surface condition and braking action during a high-speed abort.

On snow-covered runways the RCR reading is too often taken only in the center, where most of the traffic has been. The RCR is lower and you have less steering capability when you stray from the center into deeper or slicker snow on the sides. If you're unfortunate enough to be on a high-crowned runway, have a high strut or uneven tip tank fuel, or if the crosswind is stronger than reported—you're coming close to trouble. A combination of the above, and you're likely to be in trouble before you realize it.

When you find directional control on the runway marginal, and are considering an abort, don't forget airspeed and rudder effectiveness. It's not the only consideration, but it's one you seldom think about during an abort for any other reason on a dry runway.

BELLY-DEEP IN SOFT SNOW

Another snow-country adventure last January, this time a little farther north, involved a T-39. During his approach for landing the pilot was given an RCR of 19 with loose snow on the runway. Weather had been reported as intermittent light freezing drizzle.

He touched down smoothly out of a GCA, at computed touchdown speed, about 1500 feet down the runway centerline. With the nosewheel on the pavement, he gently checked brakes and got a positive braking feel. The center of the runway loked good and free of snow. When he tried the brakes a second time, about 2000 feet after touchdown, he felt the Tiny 'Liner veer to the left. The sensation of a skid disappeared momentarily when he fed in some right rudder and right aileron, but that didn't last long.

With full rudder and wheel to the right, the bird continued to the left. Right brake had no effect. Sliding sideways, with the nose still turning left, the aircraft swung through 190 degrees, stopping belly-deep in soft snow about 25 feet off the runway. Only when they got out and looked, did the crew learn their left tire was blown—and that the entire runway was covered with a thin film of ice. A quick check taken immediately after the incident revealed an RCR figure of 07 instead of 19, as reported to the pilot. The temperature was 22, dew point 18.

The post-mishap weather observation, recorded 14 minutes after the incident, still showed RCR at 19. The next weather sequence, 45 minutes after the T-39 slid off the runway reported RCR 06.

Plainly, this pilot was led astray by the RCR reported to him, which at a 19 figure isn't terribly alarming. Had he received 07—or even 10 or 12—we can assume his approach and landing would have been different. Certainly his braking technique would not have been the same. Maybe his decision to land there at all would have changed!

Base Ops types pick up most of the tab for this one. The freezing drizzle should have alerted someone to the possibility that the RCR would change—downward. And that frequent runway checks were in order.

TWO AND ONE-HALF HOURS

Three nights later another T-39, again from the Southland and landing up north, encountered similar RCR problems. Starting his approach shortly after nightfall, the

Snow or ice on the runway requires advance planning for approach and landing. The pilot must know what to expect before he gets there!

pilot was given an RCR of Wet Runway, 16. Landing out of a GCA, his touchdown and rollout were normal until about 2000 feet down the runway when he tried brakes and the bird began to skid. Four thousand feet later the left wheel locked and the tire blew. The airplane went sharply left and the pilot found himself stopped pointing 80 degrees to the runway with all three gear in the mud.

A little checking revealed that the Wet Runway 16 reading had been taken two and one-half hours before the mishap occurred—before sunset, as a matter of fact. When the Base Ops folks got out on the runway after the incident to take another RCR, they came up with a reading of 02 and Ice on Runway!

The incident report stated that rapidly clearing skies and surface radiation caused ice to form on the active runway, although no apparent temperature change occurred at the representative observation level.

C'MON TEAM!

This is a team thing. The people responsible for runway checks, the weather station people, and even people who are working on the ramp should run intereference for the pilot who's going to be carrying the ball. Unless they're watching the play develop and do some effective blocking when it's needed, the ball carrier is likely to get hurt —and the yardage gained may not be in the desired (or approved and proper) direction.

Base Ops, you're the team leader on this RCR thing. Get the other members working with you, and you'll have up to date RCR information whenever you need it.

- How about working out an agreement with the Base Weather folks defining the weather conditions or changes you'd like them to bring specifically to your attention? Sure, you're supposed to be watching the telautowriter, but it would help if Old Stormy could give you an extra tap on the shoulder when he sees trouble coming.
- Transient Alert is on the ramp all the time. Ask them to give you a holler when they suddenly find it's getting difficult to remain on their feet because all that rain and slush on the runway has turned to a sheet of ice.
- Have the guy who makes the runway checks take RCR readings on the sides as well as the center of the runway. This is 'specially important when traffic for the past few hours has dusted off the center and left snow, ice or slush on the sides.
- And get next to the people who work the Base Ops dispatch desk. If the RCR has changed significantly since the last one—have them get it to the folks who use it, pronto! It'll do no one any good unless you hurry it along to Approach Control, Tower and GCA. In the two T-39 incidents we've described here, the drastically changed RCR didn't get out to those who needed to know until it came out on the next scheduled weather sequence. That was about 45 minutes in both cases. Don't forget, Weather doesn't disseminate RCR to local agencies. It is appended to the next regular weather sequence for inter-base information. All intra-base notification of RCRs must come from Base Ops.

- **If you plan to fly nothing but tail-hook equipped aircraft —**
- **If you will land only on runways with arresting systems capable of stopping your bird —**
- **If you know you'll never have to land on wet, icy or snow-covered runways —**

. . . Then skip the next two pages . . . HOWEVER . . .

- If the preceding discussion of last year's snow-country antics tweaked your imagination —
- If you saw yourself in one or more of those landing or takeoff situations — (horrors!)
- If you're anticipating an encounter or two with the slick and slippery this winter —

. . . Then read on — (yes, there will be a test).

THAT WAS THE WINTER THAT WAS

MAKE RCR WORK FOR YOU

It would be nice if we could relate Runway Condition Reading (RCR) directly to the distance it will take you to stop, or the degree of control you'll have over your chariot on the ground. Unfortunately, this isn't the case. Without a conversion table in hand you can relate RCR to braking conditions or stopping distances only in general terms: Good, Medium and Poor, or Dry, Wet and Icy. If we had the tools for it, a system that would give you a stopping distance factor would make a lot more sense. An article in our August issue ("RCR or SDF", by Major Dave Elliott) discussed such a system which would give a multiplier to apply to your computed dry runway stopping distance.

Since the relationship between RCR and stopping distance must be derived from tables, it is primarily a preflight planning tool. This is particularly true in single-pilot airplanes.

So until we have something better, for this winter at least, let's make the most of it.

Applying RCR during preflight planning computations gives you a starting point. It describes a degree of wet or slippery and allows you to convert that to feet of rollout.

But you must understand the variables that surround the stopping problem to make RCR do honest work.

MAX BRAKING

When the runway is getting truly slick (low RCR—say, below 16) we're concerned about stopping before running off the far end. We start thinking about a minimum distance stop and right off the bat we have the first variable. Few of us have ever made a full-fledged minimum run stop with or without anti-skid. The landings we make day after day are far from maximum braking situations. We don't practice them because they leave you a pretty narrow margin for error. Directional control, tire wear, possible blowouts and max demand on the anti-skid all make the maneuver critical. When we're suddenly faced with doing it all right the first time, the many variables of individual interpretation and guesswork enter the problem.

Remember, the stopping figures in the Flight Manual were derived under ideal test conditions. Some of us may come close to max effective braking the first time, but most of us will still be going strong when the barrier snags us—or we run off the end.

Aside from the special case of a maximum braking situation, normal stopping also includes a host of variables. When the margin begins to narrow down, you must take all of them into account.

TOUCHDOWN SPEED

The most significant factor in stopping is touchdown speed. This determines the actual amount of energy you must dissipate before you can bring your bird to a stop. Fuel weight enters into this, so you want to have fuel at a minimum safe figure. Most important, you want to control approach and touchdown speeds with great care and feeling. A five-knot increase in approach speed in an F-100 will increase stopping distance about 500 feet!

THE LITTLE THINGS

If you're really serious about stopping in the minimum possible distance, you had better consider all the little items you often shrug off on a dry day: runway gradient, runway surface, obstacles in the approach path, turbulence on final, or crosswinds. Add half the gust factor, and you're faster than minimum-run landing speed. Start to weathervane in a crosswind, and use differential braking to stay on the runway, you're getting less than best braking performance.

TOUCHDOWN POINT

Ground roll, of course, starts at the point of touchdown. Don't let yourself think in terms of the approach end threshold. Most of us shoot for touchdown at about the 500-foot point on normal days. But

Imagine the unhappy result of having one brand new tire and one that's badly worn.

unfortunately, the weather conditions that make us look at RCR charts and stopping distances are frequently the same ones that make us land long.

Tests have shown that if you stay on a precision glide path to minimums (100 feet) with most contemporary aircraft (excluding the carrier-landing types), your average touchdown point will be 1500-2000 feet beyond where the glide path intercepts the runway (GPIP). If the GPIP is 750 feet from the threshold, you're talking about a 2200 to 2700 foot touchdown!

Remember this: the worse the weather, the longer you're going to land most of the time. Compute your stopping distance from a realistic touchdown point.

TIRE CONDITION

Tire condition may be the one factor in stopping distance and control on slick runways that is most often ignored. It can throw off all your calculations faster than anything else!

The coefficient of friction for a good rib-tread tire on a wet (RCR 12) runway is about .15. Wear off a good bit of that tire, try stopping with only 1/16 inch of tread remaining, and the coefficient of friction is something like .05. This can mean as much as 100 per cent increase in landing roll! Like 14,000 feet instead of 7000. This fact is seldom mentioned in our handbooks.

Now, imagine the unhappy results you'd get with a brand new tire on one main wheel and a badly worn one on the other.

Tire inflation and tread condition also have considerable effect on hydroplaning. If the runway is wet, instead of snow or ice-covered, the condition of your tires may make a lot of difference.

(For more on hydroplaning see "And Away We go!" June '68, and "Slippery Runways and Crosswinds," Oct. '68.)

USE IT, WITH CARE

RCR can do a lot for you if you take it for what it is. Treat it as a reference, a guide. And remember that the stopping distance figures you derive from RCR are based on ideal conditions. Beyond that, you're on your own.

Never consider RCR alone as the final determination of the suitability of a runway for landing. ★

Landing Distance...

- -increases 3½% for each 1000-foot increase in altitude.
- -increases 10% for each 10% increase in gross weight.
- -increases 25% for each 10% increase in touchdown velocity.

Runway Condition Reading (RCR)	Equivalent Braking Action	% Increase In Landing Roll
00-- 05	Nil	100% Or more
06 - 12	Poor	99% to 46%
13 - 18	Fair (Medium)	45% to 16%
19 - 25	Good	15% to 0

STAY DRY... STAY SAFE

Lt Col Robert H. Bonner, USAF, MC
Directorate of Aerospace Safety

During several safety surveys it was noted that aircrews are extremely reluctant to wear anti-exposure suits when flying over water, even if the water temperature is below 50°F. This is particularly distressing to life support specialists and flight surgeons whose major roles are directed toward reducing aircrew injury or death. There are good reasons for the wearing of an anti-exposure suit ("poopy" suit), as the following case illustrates.

The PC-1 and -2 hydraulic systems failed on an F-4C. Both pilots went through the Dash One checklist and discussed the possibility of and preparation for ejection. It was decided that ejections would be initiated separately, with the rear seater going first.

The rear seat pilot was wearing an anti-exposure suit. He tightened the suit wrist straps but did not tighten the neck seal because he was afraid it might restrict his breathing. He ejected.

With very little imagination you can see the consequences of an improperly worn exposure suit . . . or none at all!

He deployed his survival kit and the life raft did not inflate. His preoccupation with attempting to inflate the life raft caused him to forget to inflate his underarm life preservers.

He hit the water hard and went deep. At this time he deployed his life preservers. Water temperature was 43°F. The pilot did not carry exposure suit gloves or hood. By the time he reached the surface, his hands were so numb that he couldn't release his right riser and could not use the releases. He finally released the riser by crossing his arms and releasing the right riser with his left hand.

The pilot's hands were cold and numb from the time he entered the water. By the end of the first half hour, his feet were numb. During the second half hour, his body was cold to the point of shaking. His exposure suit was full of water due to the loose neck seal.

After an hour in the water, he managed to get signal equipment from the survival kit by opening the kit with his teeth. He used the same method to open the equipment bag. Then he had trouble popping the seal of the flare because of his numb hands. With the seal popped, he had to use his teeth to ignite the flare. He lit the smoke end first, then he ignited the night end. As a rescue helicopter approached, he ignited a second flare with his teeth.

The rescue helicopter dropped a sling but the pilot in the water was unable to swim or move toward it so he waited until they dragged it to him. He got first one arm and then the other arm into the sling and realized that it was on backwards. Since there was some slack available, he was able to twist the sling around. He did not feel that he could have turned over. He was hoisted up to the helicopter after being in the water for one hour and 25 minutes.

Although this individual was wearing an anti-exposure suit, he wore it improperly and, in effect, it offered no protection; therefore, his experience was the same as the individual who had no anti-exposure suit. This pilot was lucky. It doesn't take too much imagination to see the consequences of an additional 30-minute immersion.

Survival time in water varies with the temperature of the water and the type of protection afforded the aircrew member. With no protection—wearing a wet flight suit—at a water temperature of 50°F, an individual has one hour of safe time where his efficiency in assisting in his survival is not decreased. If the water is 40°F, he has only 30 minutes of safe time. In the case above, the individual had approximately 35-40 minutes before he developed problems.

At 40°F, after two hours the average individual will succumb to the cold. With protection at 40°, the individual with no difficulty or with minimal discomfort can be submerged for 220 minutes, or three hours and 40 minutes. This is considerably longer than the 30 to 45 minutes safe zone experienced without the suit. This is because the dry suit prevents conductive heat loss.

When an individual is immersed in cold water, there is a direct exchange through conduction of heat from the body to the cold water. The greater the cold, the faster the heat loss. After a period of time, the heat production centers activate and produce shivers and shaking. Increased metabolic rate is not capable of keeping up with this loss of body heat, and the body's temperature drops. When this occurs, metabolic processes slow down and, if severe enough, stop.

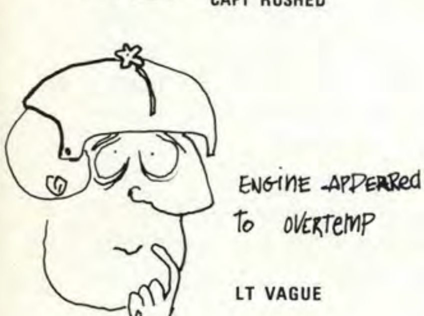
Even survival time in a raft is much greater if the individual has the advantage of a dry suit. An individual in -40° temperature air can comfortably survive in a raft for five hours. Without the anti-exposure suit, his comfortable survival is less than an hour and further exposure markedly decreases his chances for rescue, because of loss of heat due to radiation and convection. Air movement on the ocean is usually brisk. Where movement occurs, a wet body causes a rapid loss of heat. A dry suit protects the individual from air movement across his body and markedly reduces the heat loss due to convection. An individual whose body is wet can radiate heat directly to the environment. If he is wearing an anti-exposure suit, the radiated heat is trapped inside the suit and assists in maintaining his body temperature.

Much research has proven beyond any doubt that an anti-exposure suit makes survival in cold water more successful as well as more comfortable. The experience of the British in the English Channel attests to this fact. Pilots with anti-exposure suits were being recovered; pilots without anti-exposure suits were never found. So there you have it: the chances of survival in cold water increase markedly with wearing the anti-exposure suit. ★

HOW WELL DO YOU PERFORM AT

YOUR END OF THE STREET?

CAPT RUSHED



LT VAGUE

MAJ BLANK

"Communication," semanticists are fond of saying, "is a two-way street, involving a sender and a receiver." And the "ologists" — psychologists, sociologists, even philogolists — agree that those on both ends of a message must understand the words of that message in order to act on the contents.

Undoubtedly many of the ills of the world today result from misundertandings of what the other fellow means or intends. The same is true in the area of communication between pilots and maintenance people. One would think from reading some Form 781As that the pilot's entry was written by a preschooler. The result is a scrawl that even the pilot himself could not decipher at some later time.

When this happens the results can be predicted. Nobody, other than the originator of the squawk, knows what was wrong and who can say whether anything was fixed? Certainly, no one but the man who signed off the form. And his meaningless scrawl will give few clues as to the source of the signature.

We might label this pair as Captain Rushed (he can't take time to print legibly) and Sergeant Ditto (he couldn't read the entry on the form and rather than check it out he made a cursory inspection of what he *thought* it *might* be and emulated the originator).

Then there is Lieutenant Vague. He is a hell of a stick and rudder man but he's a little hazy about the intricacies of the machine he flies. Consequently when there is an indication that there is something wrong he plays it safe by being as brief and vague as possible, assuming that Maintenance can figure out what the problem is and how to fix it. So he writes up something like "Engine appeared to overtemp."

He doesn't say how much or how long, or in what phase of operation. Maintenance would like to know more than simply that the engine was overtemped. Was it for five seconds? Ten seconds? Longer? Or did the pilot just happen to catch the gage on the way down? What was the pilot doing at the time? Cruising? Climbing? In AB? Were there any other symptoms?

They certainly won't get any answers from Lt Vague's writeup.

Probably the worst pilot offender of all is Major Blank. He does just that—leaves the form blank. He ignores the hard landing that jarred his molars. There are a lot of members of the Blank family. Most of them are pretty nice people but they tend to be a bit thin skinned and don't like to advertise any performance that could reflect on their image of perfection. One member has particularly big feet and rides the brakes pretty hard. Does he ever report overheated brakes? Of course not—he assumes the airplane was built to handle anything. One of his relatives is a hamhanded type that yanks the bird around the sky like a bronc buster. Sometimes he pegs the G meter and pops a rivet or two. Being a bit sneaky, he keeps this to himself . . . "So why write up an overstress?"

The fact that others have to fly these machines after members of this family and reap the woes that such unreported treatment produces is beside the point, irrelevant and ignored by the various members of the Blank family.

The result of the types of write-ups discussed is that Maintenance receives little or no information or what it gets is garbled.

Sometimes, of course, the maintainers can get hold of the pilot and verbally ascertain what the trouble was, such as during a maintenance debriefing. But this is not always the case and it is doubtful that the right fix to the correct item is accomplished. Unfortunately, the maintenance people are put at a disadvantage in this game because the monkey is placed on their backs when pilots accomplish hurried, incomplete, vague or no write-ups. Maintenance supervisors can testify to the many phantoms their people have chased in trying to decipher the write-up and perform proper corrective action.

But there is another side to this coin—or the other end of the communication line, if you please. When a pilot takes the trouble to write up a complaint concisely and specifically he expects the problem to be investigated and corrected promptly and efficiently. But occasionally he runs into such types as Sergeant Shiftless. He is representative of the small but dangerous school that doesn't believe in digging too deeply into a problem. It's too much work. Or he has a big date and can't stick around any longer than absolutely necessary. Or he's just plain lazy or inept. This type may make a cursory check that reveals nothing. So he answers the squawk with an "Ops checked okay."

One sort we could do without is Airman Shy. He doesn't want to commit himself; that might be dangerous. So he scribbles some unintelligible words on the form and signs it with an egg beater.

Then there are those who esteem it a mark of sophistication to write illegibly. Some years ago someone did an analysis of presidential signatures. Seems that when a man first takes the highest office in the land that his signature is at least fairly legible. The pressures of office and lack of time evidently contribute to his signature becoming something resembling a sine wave on an oscilloscope.

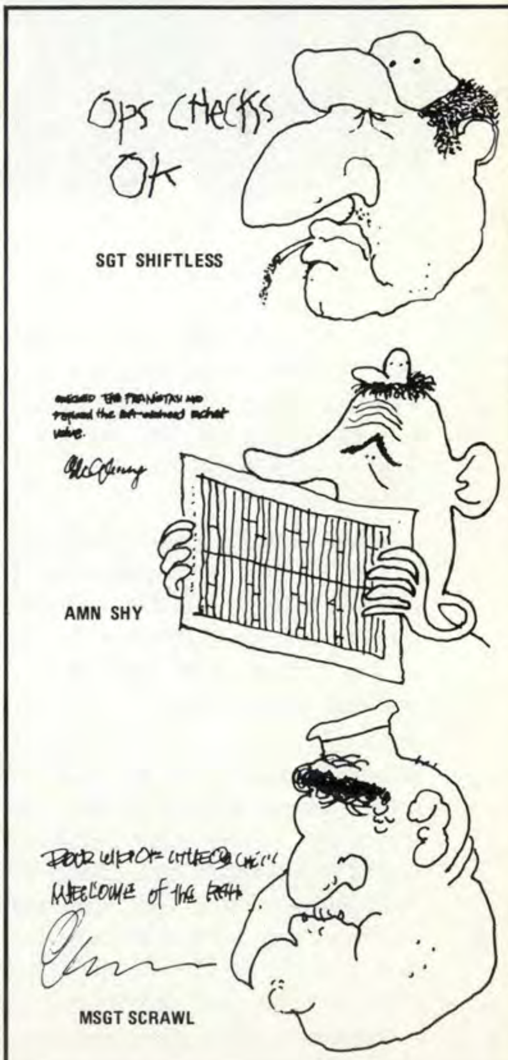
So Sergeant Scrawl does just that —he scrawls the details of the fix and his name to impress others that he is a busy man and that he has been around long enough that everyone ought to recognize his writing, whether or not they can make out what he said. Besides his reputation is such that his actions are above question, so no one really needs to be able to read his words.

No use proceeding further along this line. We all recognize the types. Unfortunately there are far too many of them in the Air Force. Many of them are good men, capable and demanding of both themselves and others. But when it comes to that very important task of writing up squawks or corrective actions they seem to change personality in a kind of Jekyll-Hyde manner.

If you are one of these you might not even know it. Check yourself next time the occasion arises. If you are a pilot, you want the aircraft in tip-top shape and you bet your life on the maintenance man doing his job correctly. So help him to help you.

If you are the man who makes sure the crews have good machines, print your fixes clearly and concisely so that the next pilot can tell exactly what was done to correct the previous squawk.

The pilot and the maintenance man are two terminals in a communications link. When one end breaks down the other can't function properly. But when both are sending and receiving clearly they make an unbeatable combination. ★



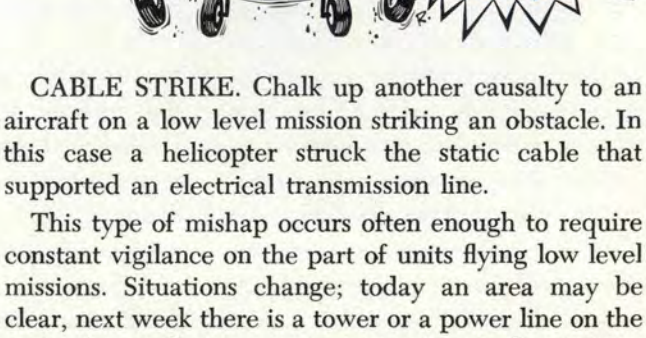
REX RILEY'S CROSS COUNTRY NOTES

DON'T ACCEPT MALFUNCTIONING EQUIPMENT. When you discover something about your equipment that isn't proper, right then is the time to do something about it. In the following case the pilot made out all right, but things could have turned out differently.

When he put on his mask he noticed that the mask collapsed when he breathed in. Nevertheless, he took off even though he had to suck oxygen out of the mask. Passing through 15,000 feet he began to feel warm, one of his symptoms of hypoxia, and at 32,000 he developed tunnel vision.

Now this pilot was convinced that he either was hypoxic or that his oxygen was contaminated. He shut off the normal oxygen system, used oxygen from emergency source, and began a descent. At low altitude he began to feel better, so he decided to burn down excess fuel. But during a GCA approach he began to feel confused and seemed to have trouble with his coordination. He decided to get the bird on the ground without delay and did so successfully.

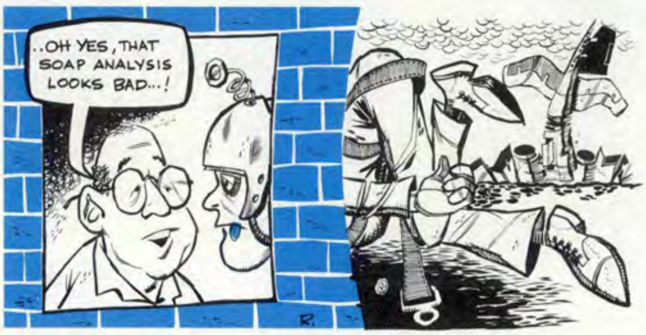
Apparently this pilot was the victim of what the docs call a classic case of a sticking exhalation valve. This causes the victim to become somewhat hypoxic and, in breathing harder against the restricted oxygen flow, he hyperventilates.



CABLE STRIKE. Chalk up another causalty to an aircraft on a low level mission striking an obstacle. In this case a helicopter struck the static cable that supported an electrical transmission line.

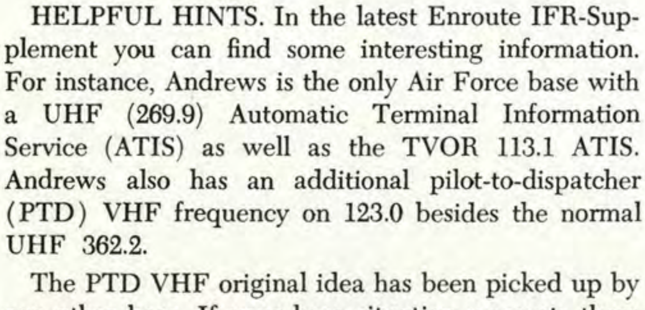
This type of mishap occurs often enough to require constant vigilance on the part of units flying low level missions. Situations change; today an area may be clear, next week there is a tower or a power line on the route. A crop duster may start operating in the vicinity, or a small airport appear. Perhaps you recall a warning published a year or so ago about a ski lift cable being stretched across a mountain pass in the Sierras. The possibilities are many and the results of a collision can be catastrophic.

Frequent review of low level route charts to insure they reflect actual conditions is a must. Whenever a new obstacle appears charts should be updated and pilots advised immediately.



A LITTLE LATE. During a dual training mission a T-37 lost an engine due to bearing failure. The following day the AMA SOAP manager called to say that, because of the results of SOAP analysis of a sample taken three flying hours before the failure, the engine should be grounded.

This incident underscores the benefits to be derived from local base SOAP analysis capability.



HELPFUL HINTS. In the latest Enroute IFR-Supplement you can find some interesting information. For instance, Andrews is the only Air Force base with a UHF (269.9) Automatic Terminal Information Service (ATIS) as well as the TVOR 113.1 ATIS. Andrews also has an additional pilot-to-dispatcher (PTD) VHF frequency on 123.0 besides the normal UHF 362.2.

The PTD VHF original idea has been picked up by one other base. If your base situation warrants these extras they may be available.

Andrews AFB was responsible for another original idea which no doubt has paid off. This was to place SIDs in Transient Alert vehicles and aircrew taxis. Can your base use these ideas?

PAX BRIEFING. How long since you've carried a passenger in the back seat of your super special swept-wing? Those who are in the business of hauling passengers are familiar with pax briefing requirements. But if you fly fighters or a trainer of some kind with two seats, you may seldom have a passenger aboard unless he is a rated crewmember. So when you happen to find yourself playing chauffeur to a non-rated type, emphasize the need for him to keep his hands to himself. Otherwise, you may find yourself exposed to the cold when he pulls a handle and blows the canopy, or, like the jock in a recent incident, be the victim of "bombs away" when your passenger jettisons the external tanks.

SAY AGAIN? A C-123 in SEA had just leveled at 1500 feet when Nr 2 engine backfired three times and the torque started to unwind. The pilot shut down the engine and landed without further difficulty. On the ground, engine specialists checked for torque, took oil samples and inspected oil screens, but could find nothing amiss. On runup the engine checked out in accordance with the T.O. The aircraft was released for flight. All crews in the squadron were briefed on the incident and told to be on the lookout for further malfunctions.

That's the way the report came across my desk—honest! No FCF, no further checking, no restricted status until the trouble is found—cleared to carry passengers in a combat environment.

Maybe the report didn't tell the whole story. Maybe there was more to the incident investigation than the message described. Maybe the Ops Officer went over and had a short talk with the Maintenance Officer.

I hope so. ★

Some

GOT OFF SCOT FREE...AND

George looked pretty upset when he stormed into the pilot's lounge. I had a feeling he was looking for someone to sound off to. Once he started talking, I was sure of it.

"Well Happy Christmas – or Merry Birthday – or something, you guys! What a swell day!

"I wasn't rushing things, it was normal-normal all the way. I had planned to go into town after flying and do some shopping for my wife's Christmas. Now I've spent the whole stinking day out here."

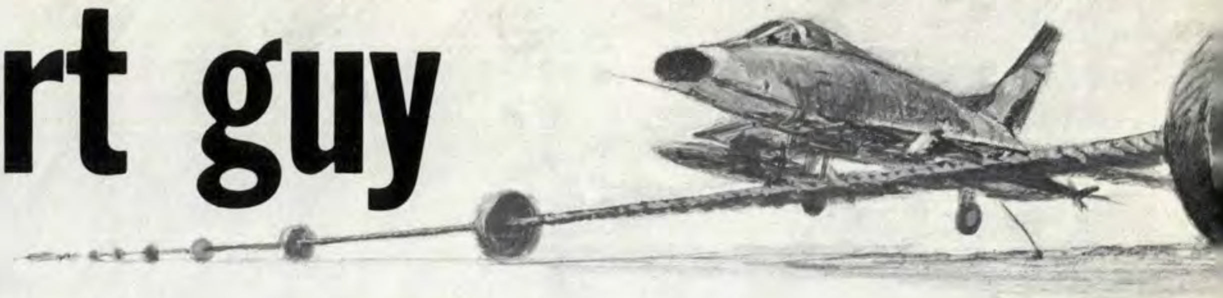
His tone stopped all other conversation in the room. But as he went on, it became difficult to make out just what his problem was.

"But that's not what I'm really upset about." He drifted to the coffee pot and bent over to fit his cup under the spigot, leaving the rest of us staring at the back of his head.

When he turned back toward the room, stirring the two lumps with almost fierce determination, he sensed the impression he'd made on the rest of us. We were waiting for more.

"Look, George," I decided to explain to him. "We just came in for night flying. And it's apparent you're talking about something we know nothing about. What's happened around here today – and

smart guy



GEORGE TOOK THE RAP

what in the world are you so upset about?"

"Oh, didn't you know?" As he looked around the room he saw that we sure didn't.

"I just about lost one on takeoff this morning. Damn near ran off the right side of the runway." He started to speak faster. "Everything looked fine on the runway, I'd had no trouble taxiing, and the first part of the roll was fine. But when I got up to about 140 knots it started pulling to the right. I mean really!

"It kept getting worse and worse —you know, just a few seconds, but seemed longer—and I knew if I tried to abort, heavy weight and all, I'd be in worse trouble. Knew I couldn't keep it on the pavement and get it stopped. So I continued the takeoff.

"They said there weren't any tire marks off the side, but I would have sworn my right wheel was on the grass before I finally got the bird in the air.

"Well, anyway, it must have looked pretty spectacular from Mobile. Jerry was out there and he didn't say anything until I was airborne. Then he asked me what had happened. But that's not the big part. The Colonel was out in Mobile too!

"He was showing a couple of visiting dignitaries around. And he was the first to meet me when I made the approach end barrier engagement.

"Oh yeah, you didn't know about that either?" We all must have registered surprise. He stopped when he saw our faces.

"Since I'd had so much trouble on takeoff, I decided to burn down fuel and take the cable. I didn't want to try rolling the length of that runway again. Jerry checked my gear on a couple of flybys and we talked it over and decided it was the best thing to do.

"And it worked perfectly. Just like the book. Nice, smooth deceleration—and stopped. Nothing to it.

"But then the Old Man was waiting for me as soon as I got unstrapped and out of the bird. He had a few words about a guy with my experience in the Hundred, and having flown off a lot worse runways overseas, and all that. Then, just before he drove off in his car, he asked me if I'd gone to sleep after I lit the burner—or what!

"Well, that left me in just a great mood. All set to zap off into town and do some Merry Christmas shopping.

"I didn't. Instead, I went back out to Maintenance—after I got finished explaining it all up in the Ops Office.

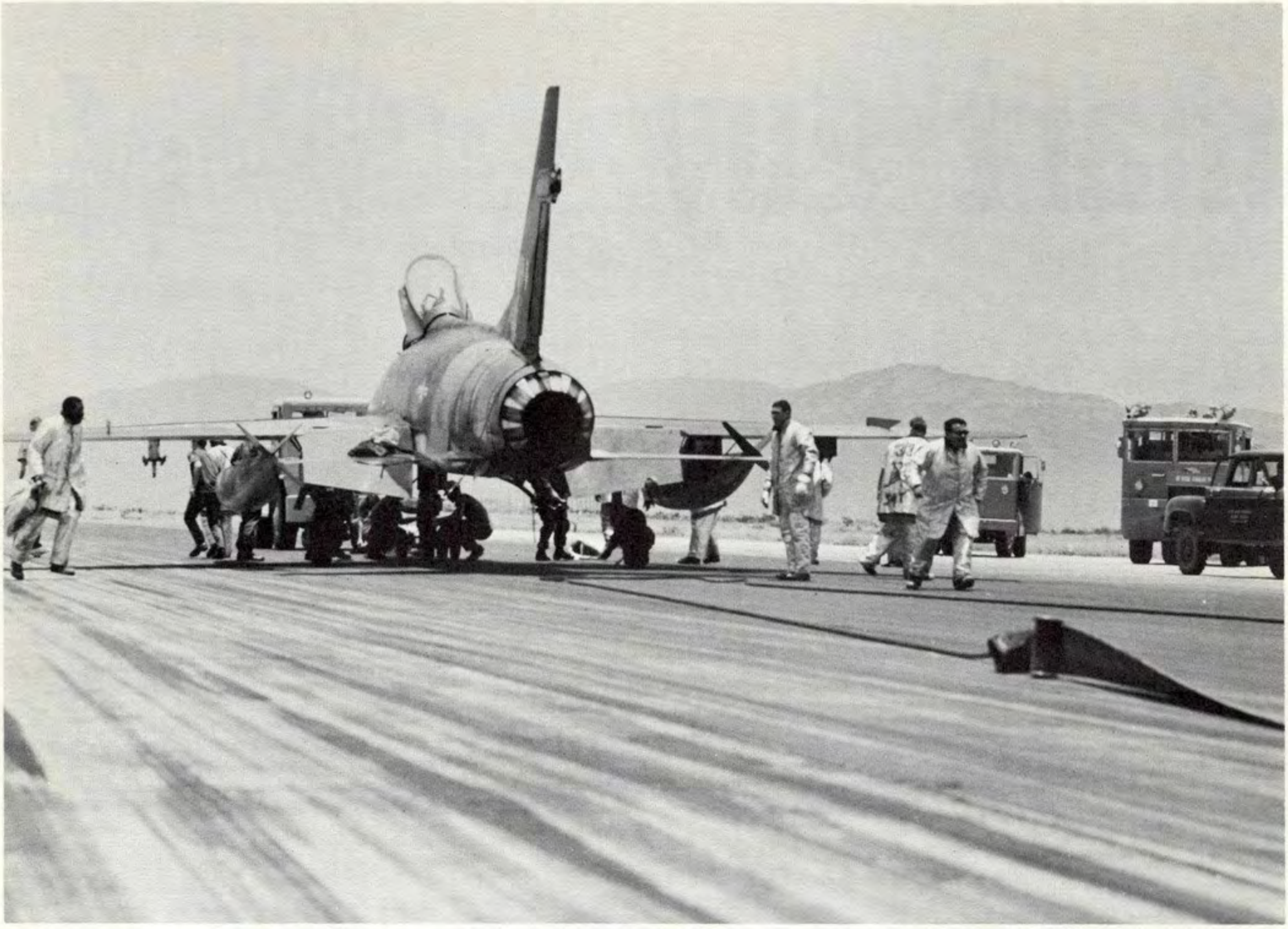
"By the time I got out there, they had the right wheel off the bird and a bunch of them were crowded around looking at the brake. It didn't take them long. Some of those guys have been around these things a long time. They could tell by just looking that the brake had been badly overheated at one time. The rotor disc had warped, and was obviously dragging during my takeoff.

"So now the Wing Commander thinks I habitually go to sleep on takeoff roll and some smart guy around here who went to sleep on final, landed long and had to stand up on the binders, has gotten off scot-free.

"Like I said, I don't know who it was, and I'm not going to check, but whoever it was — thanks a heap!"

Looking back on it, maybe he didn't just stumble in there by accident. Maybe he came in to tell us his story on purpose, knowing that we were night flying this week—and that one of us probably flew that airplane last night.

None of us thought about it that way when he walked in on us. As a matter of fact, the more I think of it, George is pretty shrewd. ★



WHO WANTS TO BE ARRESTED?

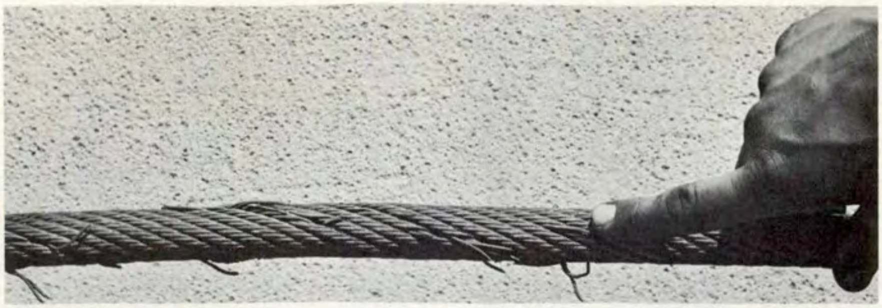
Harrie D. Riley, Directorate of Aerospace Safety

Not many people want to be arrested, but there are some. Who are they? Pilots of high-performance jet fighters. Particularly when they have a problem. When that happens – brake, tire or drag chute failure, airborne emergency – the pilot wants someone to insure he's arrested pronto!

The success rate for arresting systems was on a steady increase until 1968. Then it started to decline. And a major cause of the decline was inadequate maintenance or adjustment of the various systems.

Every airfield inspection checklist includes a check of the barriers. But how many of us who perform airfield inspections know what to look for?

On these pages you'll find some of the important checks you should make. ★



Broken strands weaken the arresting cable, leading to possible failure. Max allowable is four broken wires within six inches.

The point where pendant cable meets tape requires careful inspection.

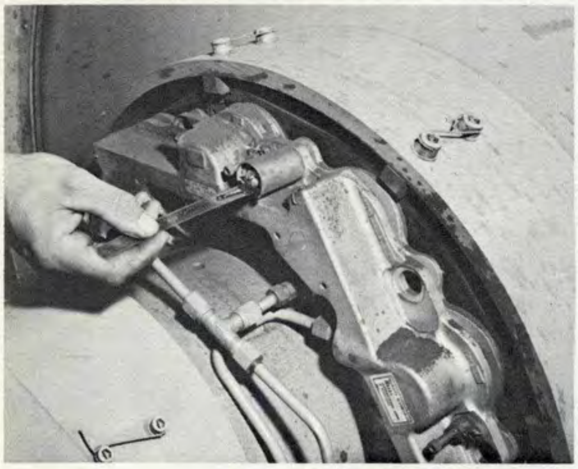
The automobile tire, used to reduce wear and scraping on paving and arresting gear, can itself cause fraying of the tape.

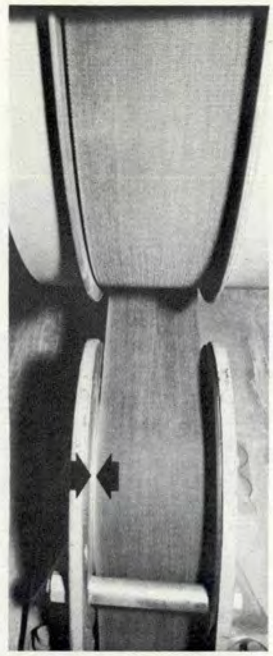
While tape is slack, check reeve block for security, proper rig. Check tape for wear.

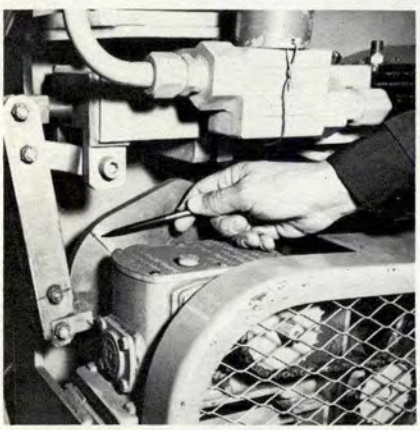
Worn, tired or broken donuts allow arresting cable to sag, reducing opportunity for the hook to catch it.

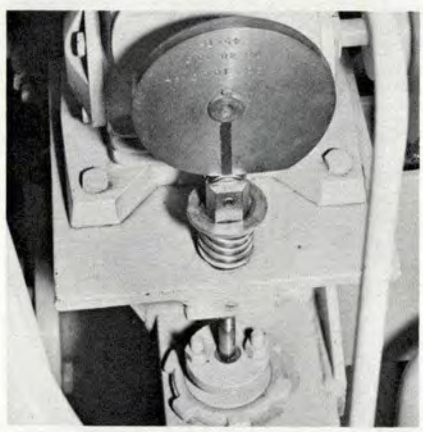
Check runway-edge sheave rollers free while tape is slack. Frozen, they can cause tape failure during runout.

WHO WANTS TO BE ARRESTED?









Inside the pit of either a BAK-9 or BAK-12 several critical points can be visually checked without difficulty:

Each BAK-12 brake has 6 brake wear pins (12 per engine). Check brake wear with a depth gage—9/16 inch wear is max, brakes must be changed.

Arresting engine or tape sheave misalignment causes wear and fraying, shows up when tape rides to one side of sheave.

Cams control runout distance on both BAK-9 and -12. Alignment marks, scribed on BAK-12 cam and painted red on BAK-9, should point to center of bolt head on each unit.

Housekeeping is important. Ventilator and dehumidifier systems must keep moisture at minimum—corrosion causes trouble. Dust accumulation after each engagement must be cleaned up promptly.

Check leaks around hydraulic accumulator on BAK-9 engine.

Thanks to Sgt Bernard Kaelin and SSgt C. B. Ewer, 479 TFW at George AFB, for their assistance in shooting these pictures.

IS IT THE LITTLE THINGS?

Maj Bryant Heston, Directorate of Aerospace Safety

Take the case of a tire failure after refusal speed.

How many times have you heard some supervisor (or safety officer) say, "OK, you guys, there'll be inspectors on the base tomorrow and I want to see everyone carrying their checklist — opened to the correct page, by the way"? Have you ever thought to yourself, "It takes me longer to read the checklist than it does to get to the end of the runway"? Did you ever think that reading the checklist might interrupt your habit pattern, causing you to forget something you learned in a different sequence?

Thoughts like these are sometimes heard at happy hour by the incumbent "bar ace" and, unfortunately, are practiced by more jocks than care to voice their opinions. Many times the deviations and shortcuts are not life and death items, or so you think, but are you really qualified to make that determination? Listen to this one.

The conditions include a heavy weight takeoff requiring afterburner and water injection. It was a hot day, and the last thing the pilot needed was a blown tire—just after refusal speed—but he got it. Now his decision must be immediate and it must be right. Nevertheless it is one that still can provide controversy.

> **CAUTION**
> Always use 100% oxygen for takeoff, landing and during air refueling to protect against possible cockpit contamination.

What's that got to do with the price of eggs? We're talking about a guy who has a serious problem on his hands. He doesn't have time to worry about the position of an oxygen diluter lever. Anyway, the last time I took off on 100 per cent oxygen I forgot to go back to normal on the after takeoff/climb check, and boy, did I have a delayed ear block! I promised myself I'd never do that again, because it's too easy to forget. Waking up in the middle of the night and trying to clear blocked ears is like nowhere!

OK, let's forget the oxygen for now and get back to the problem. POW! Left tire's blown—170 kts—DECISION—PRESS ON. OK, get rid of some weight (dammit, I wish they had selective jettisoning on the left side instead of just a panic button. I've heard that center line stores may not clear the tail—too late to worry). Punch—airborne — left wing is dropping — TANK DIDN'T COME OFF—not going to make it. Thud!!

The rest of this attempted takeoff involves a skid to a stop, aircraft breakup and fire. CAUSE: failure of the left drop tank to jettison caused an uncontrollable situation at a critical phase of flight. EFFECT: one pilot badly burned, but rescued—for the time being. Oh, incidentally, one aircraft scratched.

Hours of discussion would end with an impressive list of advantages and disadvantages for either abort or for continuing takeoff. The fact that the situation occurred well above refusal speed speaks well for the decision to continue the takeoff and face the problem later when, incidentally, the aircraft would be lighter, void of external fuel tanks and ordnance.

> **CAUTION**
> Always use 100% oxygen for takeoff, landing and during air refueling to protect against possible cockpit contamination.

How did that business creep in again? We are right in the middle of a hairy accident.

Just thought you might like to know that although the pilot had first and second degree burns, he also suffered internal lung damage due to inhalation of hot gases and smoke. It would be difficult to say whether he would have lived had he not had lung damage, but then we'll never know, will we, since his diluter lever was on NORMAL.

Is it the little things? ★

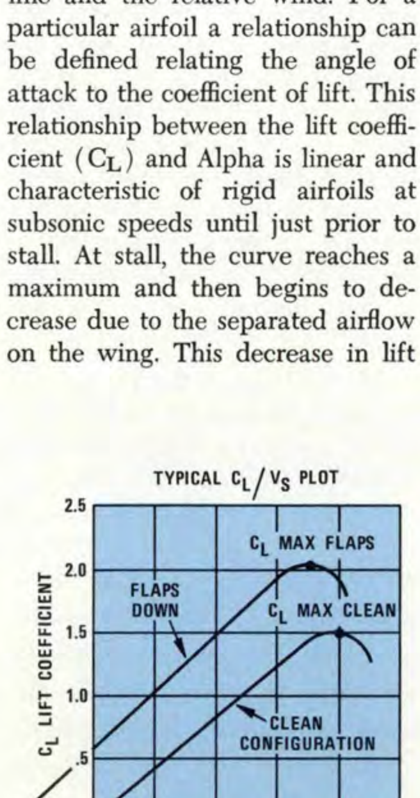
What's Your ANGLE?

Lt Ronald L. Lambdin, ASD, Wright-Patterson AFB, Ohio

During the past few years a number of evaluations have been conducted relative to the use of angle of attack for aircraft control during various flight phases. These studies have shown that angle of attack, when used in conjunction with other flight instruments, can provide a system that will enhance performance and safety in all Air Force fixed wing aircraft.

Even with the results of these studies and evaluations and the occurrence of a number of accidents that have been attributed to stalls and/or spins, the use of an angle of attack instrument for aircraft control remains controversial and has not been fully accepted. This lack of confidence derived from (1) the existence of a number of "so called" angle of attack systems in the Air Force inventory, none of which provide a sensitive, repeatable, and accurate system; (2) the problem of development of a suitable angle of attack display that is acceptable to the Air Force; and (3) a lack of pilot understanding and indoctrination in the proper use of angle of attack for aircraft control.

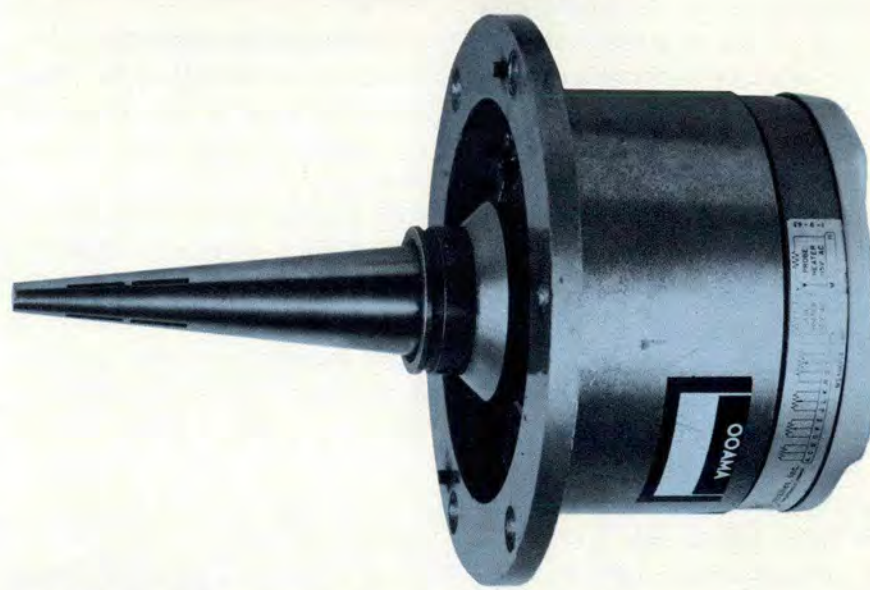
For a better understanding of the use of angle of attack a brief review of the theory is necessary. Angle of attack (Alpha) is defined as the angle formed by the wing chord line and the relative wind. For a particular airfoil a relationship can be defined relating the angle of attack to the coefficient of lift. This relationship between the lift coefficient (C_L) and Alpha is linear and characteristic of rigid airfoils at subsonic speeds until just prior to stall. At stall, the curve reaches a maximum and then begins to decrease due to the separated airflow on the wing. This decrease in lift coefficient causes a decrease in the lift force acting on the wing. At the point on the curve where the lift coefficient reaches a maximum, the stall angle of attack can be defined. This stall angle of attack is fixed for the particular airfoil under consideration and is a function only of the aircraft and airfoil configuration (flaps, slats, icing, gear, etc.) and certain air data parameters (mach number, ground effect, etc.) and is not a function of aircraft gross weight. This characteristic provides the advantage of utilizing angle of attack rather than airspeed for aircraft control.



At stall coefficient of lift reaches max, then decreases as increased alpha causes flow separation.

From basic aerodynamic relationships it can be derived that stall airspeed in unaccelerated flight varies in proportion to the square root of the aircraft gross weight. This parameter is very difficult to monitor, so to effectively use airspeed, the pilot must first make an estimate of the gross weight of the aircraft. By utilizing angle of attack, the errors encountered in making this estimate and the resultant workload on the pilot can be avoided. The angle of attack parameter is completely independent of gross weight.

F-4 angle of attack indicator works in conjunction with approach indexer lights; both have been widely accepted by pilots.



Holes located 90 degrees apart in F-4 angle of attack transducer sense local flow pressures. Differential pressures position potentiometers to provide signals to the indicator.

SYSTEMS VARY

There are a number of different types of angle of attack systems available commercially and some have found application on Air Force aircraft. The problem is that each system senses and displays the angle of attack function in a different manner. This lack of commonality between systems has resulted in confusion and misunderstanding in the proper use of angle of attack. The following paragraphs include a brief description of systems that are currently in use in USAF aircraft and the problems that have been encountered.

A system that has been widely accepted by Air Force pilots is the one currently used on the F-4 aircraft. The system includes a round dial type indicator driven by signals from a null-seeking differential pressure sensor. The indicator dial is graduated from 0 to 30 units angle of attack as the probe of the differential pressure sensor is rotated throughout the range of angle of attack.

The sensor is mounted on the side of the fuselage of the aircraft with its axis normal to the direction of airflow to be measured. Holes located approximately 90 degrees apart on the sensor sense local flow pressures. Air passages in the probe lead from each hole to separate compartments of a paddle chamber. When the holes are assymmetrical with respect to the local flow direction, a differential pressure causes the paddle to rotate until the pressures are equalized in the compartments. Potentiometers provide the input signals to the indicator. Inside the indicator are a set of mechanical switches which operate a set of approach indexer lights designed to give the pilot a visual indication of angle of attack during the approach mode. These indexer lights are situated above the instrument panel in such a manner that angle of attack information is in the pilot's field of vision during that portion of the approach mode when his vision is directed outside the aircraft and on the landing area. These indexer lights have proven valuable during the approach-landing mode of flight and a number of Tactical Air Command (TAC) F-4 pilots have recommended that indexer lights be included as a part of any future angle

What's Your ANGLE?

of attack systems to be used by the Air Force.

In August 1967 Aeronautical Systems Division (ASD), as a result of several accidents involving F-4s, began to study ways to improve the angle of attack system on the F-4. These accidents were attributed to a loss of aircraft control and resultant stalls and/or spins. It was decided prior to this investigation that there was a lack of adequate angle of attack stall warning information available to the pilot. At the conclusion of the investigation it was decided that a number of steps should be taken to provide the F-4 pilot with a suitable angle of attack system.

The recommended modifications to the system were as follows: (1) provide a repeater indicator in the aft cockpit so that both pilots could monitor angle of attack, (2) modify the indexer light system so that the lights will operate not only in the approach mode with the landing gear down but in all flight regimes of the aircraft, (3) provide a small vertical tape angle of attack indicator in the forward cockpit above the glareshield that would enable the pilot to monitor angle of attack at times when it would be necessary for his attention to be directed outside the cockpit.

ASD has acted to incorporate the first two changes mentioned in all aircraft in the F-4 fleet. A small vertical tape angle of attack indicator was installed above the glareshield in one F-4 aircraft at Nellis AFB and one at Edwards AFB and flight tested during October 1968. This flight test resulted in a decision by ASD and TAC that the additional vertical tape indicator was not necessary and that the current round dial angle of attack indicator with a repeater in the aft cockpit would be adequate for this aircraft.

Experience has shown that the F-4 angle of attack system has other problems. Since air must enter and be exhausted from the paddle chamber of the sensor, the probability of foreign matter ingestion is high. Also considerable difficulty has been experienced with potentiometer failures on the F-4 angle of attack transducer. Another problem is that there is no compensation of any type in the F-4 angle of attack system. To have a valid system it is necessary that at least flap and gear position be provided as inputs. A change in flap setting can cause significant changes in the angle of attack characteristics of the aircraft. It is also desirable to include other aircraft configurations and air data parameters as inputs to optimize the system.

In 1965, TAC established a requirement for an improved angle of attack system on assault type cargo aircraft, including the C-123 and C-130. The system chosen by TAC consisted of a horizontal stall margin indicator mounted above the glareshield, a small computer that accepts angle of attack and flap and gear position inputs, and a wing mounted vane-type transducer. The horizontally mounted indicator was selected over a vertically

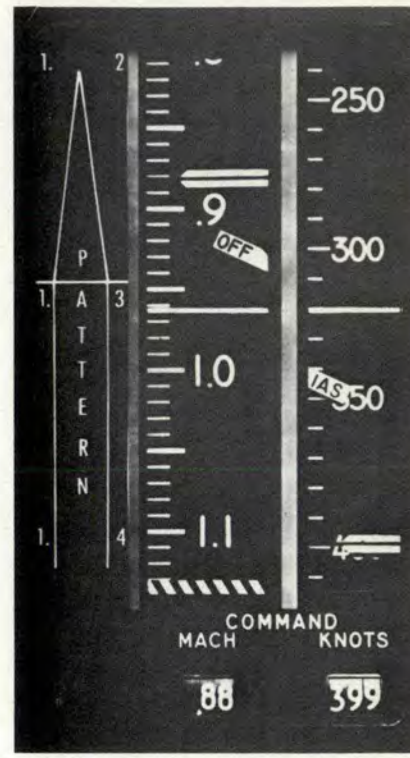
Components of angle of attack system installed in C-123 and C-130 aircraft.

mounted indicator to avoid blocking the pilots' forward vision. This system has been installed on all C-123s and is currently programmed for installation on the C-130. The wing mounted vane-type transducer senses local airflow over the wing and converts this to an angle of attack signal to drive the indicator. The indicator is graduated in units of stall margin (V/Vs) and is used for a stall warning indication.

The system as designed is suitable only for use in the low speed flight regime and is not suitable for use on high speed fighter-type aircraft because there is no compensation included for compressibility effects at Mach numbers greater than 0.6. The sensor is mounted in an area where compressibility has a large effect on local angle of attack flow characteristics. Pilots have expressed some disagreement on the suitability of the type of display used. Since the indicator is mounted horizontally, it is very difficult to use the display for "command" angle of attack information.

Other Air Force angle of attack systems utilize the standard fuselage mounted vane-type transducer. This transducer incorporates a free-floating bearing mounted vane which automatically aligns itself downstream from the axis of rotation. The supporting shaft is geared to the shafts of two synchro transmitters which convert the angular position of the vane to electrical signals compatible with indicators and/or correction computers. Damping to minimize oscillations and counter balancing of the vane are provided internally. This type of transducer has been used successfully on a number of USAF aircraft, including the F-105, F-106, C-141, and the B-58. Transducers of this type can be used to drive either vertical tape or round dial displays.

Vane-type angle of attack transducer.



Vertical tape angle of attack display.

Since vertical scale angle of attack displays can be adapted to present "command" information, pilots have expressed a preference for the vertical scale indicator. A display of this type was designed for use on several aircraft—the F-105, F-106, and C-141 and was included as an integral part of the flight instrument panel along with acceleration, Mach number, and airspeed. On this type of display the scale or tape moves and the value is read against a fixed reference line.

These systems, including that used on the C-141, have had problems which may be related to excessively expanded scale factors. The display as presented is erratic and difficult to read. The inputs to the angle of attack indicator are provided by the standard Air Force vane-type transmitter which also provides inputs to the Rotation-Go Around (RGA) system which, in turn, provides a very flyable pitch

What's Your ANGLE?

steering command on the pilot's attitude director indicator. Along with the RGA system, the vane also provides the basic input to the stall prevention computer which drives the angle of attack display. As stated previously, the vane when used in conjunction with the RGA computer, has provided a successful system; however, when the vane is used with the stall prevention computer and angle of attack indicator, the display presented is unsatisfactory. Based upon the difference in adequacy of performance of the two systems, and previous discussions with the airframe manufacturer, it is felt that the erratic angle of attack display is a result of problems with the stall prevention computer. This erratic motion has resulted in a directive from MAC to disregard the angle of attack tape on the C-141 aircraft.

Another angle of attack system that has limited USAF use is the B-58 system. This system also derives its inputs from a standard angle of attack vane transmitter. The system is composed of the vane transmitter, a round dial angle of attack indicator, and a set of approach indexer lights. The vane-type transmitter offers an adequate signal to the cockpit display; however, the display sensitivivity to gusting and noise results in an undesirable presentation which is difficult to fly. Also the B-58 angle of attack system is poorly designed from a human engineering standpoint, since the display shows increasing angle of attack with a clockwise movement of the dial pointer. This increasing angle of attack automatically corresponds to decreased airspeed. However, the airspeed indicator shows decreasing airspeed counter clockwise. Therefore, these indicators move in opposite directions and when used to supplement one another can be confusing. The indicator should have been designed with the pointer moving counter clockwise to indicate increasing angle of attack.

B-58 angle of attack display.

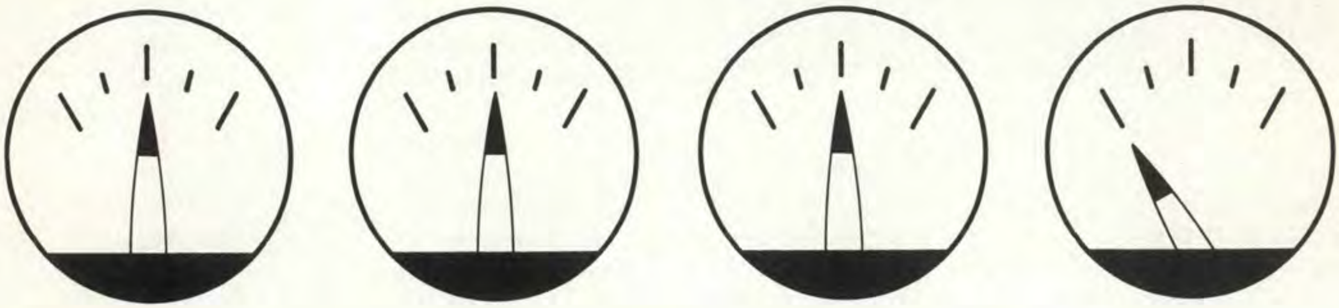
From the above descriptions of a few examples of angle of attack systems currently in the Air Force inventory, it is easy to see why there is a large amount of controversy relative to the use of angle of attack for flight control. Recognizing this problem, the Directorate of Aerospace Safety established a requirement for a standardized angle of attack system and display. Instruments Division, Aeronautical Systems Division, had already initiated a program which would meet all requirements outlined by the directive and would provide the Air Force with an angle of attack system that could be standardized for use on all aircraft.

This program began during January 1968 and was divided into two steps: (1) Feasibility study and definition phase to define the requirements for a system of this type, and (2) design, development, fabrication, and flight test of hardware. Step One of this program was completed in January 1969 and Step Two began in April 1969 with contract award expected by the end of this year.

The present goal of this program is to define a standardized angle of attack system that can be used on all Air Force aircraft and will provide an optimum system that will solve many of the problems that have been inherent in angle of attack systems. Once a standardized system can be defined, it will be necessary for Air Training Command to incorporate angle of attack training as part of the undergraduate pilot training program to alleviate confusion and lack of understanding in the use of the angle of attack parameter.

As a result of this development program and the current Air Force plans to increase training in the use of angle of attack, the Air Force will at some time in the near future have in its inventory a standardized angle of attack system that can be used on all USAF aircraft. This system and training in its use will benefit the pilot in the areas of aircraft performance and flight safety, and dispel the large amount of confusion that exists relative to the use of angle of attack. ★

THEY WON'T RUN ON FUMES!



**Lt Col Robert G. Clithero, 100 SRW,
Davis-Monthan AFB, Arizona**

It was a typical milk run for the two staff courier pilots until it was garbaged up by a last minute divert to Oddball Aux – when the cargo was really at Oddball Main. At last things were ironed out, and the old bird was humming homeward with absolutely no discrepancies.

Well, maybe one.

Just before departure on the final leg, the copilot noticed Nr 4 fuel tank was 50 gallons lower than the other three. He didn't mention it, figuring the flight engineer certainly had a firm grip on the situation. Nr. 4 fuel gage is hidden from direct copilot gaze by the control wheel, but Nrs 1, 2 and 3 gages looked just fine to the copilot during his periodic scan.

The left seat pilot and the engineer apparently missed Nr 4 fuel gage altogether, what with their many other concerns: getting good music on the coffee grinder, synchronizing props, and shaving minutes off of ETAs.

Later – on downwind leg for GCA–Bloop! Nr 4 engine sputtered and quit. Tanks 1, 2 and 3 were reading 100 gallons and Nr 4 tank showed zero. They feathered the engine, declared an emergency and set up a short base leg to final. The flight engineer attempted to restart Nr 4 engine but no fuel pressure could be obtained. The copilot noted that only the Nr 4 crossfeed lever was ON, so he told the FE to knock off restarting and finish the landing checklist. They were now in good shape on three mile ILS final, anyway. The landing was normal and uneventful, except for three red-faced crewmembers. When things calmed down, and with Nr 3 *and* 4 crossfeed levers ON, the engine operated perfectly. "Well" said the pilot, "we know the fuel gage is accurate."

Would you believe? The two pilots were highly qualified instructor-types. The lesson–complacency, lack of crosscheck, and assuming the other fellow will follow through on a noted discrepancy.

Under different circumstances, this could have been serious or even tragic. One other item of note is the flight engineer's failure to know his systems well enough to get a restart under other than normal conditions. Why Nr 4 engine burned more fuel than the others has yet to be determined. The fact that it *was* burning more should have been a red flag to an alert crew.

Events such as this do happen. When they end as happily as this one they often aren't reported. This crew took it as a personal lesson and maybe a blessing. It shook them into realizing that apathy, overconfidence and complacency can happen even to the old pros–if you let 'em. ★

the I.P.I.S. approach

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

IPIS APPROACH ARTICLE INDEX

This index covers the IPIS Approach since its inception through November 1969. Copies of the index, and each item listed, are available from IPIS. Persons with questions on any subject listed are invited to write to IPIS or to the Editor, *Aerospace Safety* magazine.

NEW VISIBILITY DETERMINATION PROCEDURE. Effective 1 January 1970 the runway visibility (RVV) and the runway visual range (RVR) will both be determined using the high intensity runway light (HIRL) setting *currently in use*. This will replace the old system of computing the RVV on the maximum HIRL available but not necessarily in use.

Lt Col Bruce M. Elvin
Air Weather Service Liaison Officer
Directorate of Aerospace Safety

THERE IS A DIFFERENCE. During a cross-country mission a jet bomber crew landed at a southern base. Aircraft servicing included a request for water. When the crew departed the next day everything was normal until water augmentation was initiated on takeoff. All engine EGT gages pegged. After the aborted takeoff, it was discovered the aircraft had been serviced with anti-detonation injection (ADI) water-alcohol. All engines were required to be changed.

The use of water injection on jet engines and the use of ADI on reciprocating engines provides a method of obtaining power in excess of the normal rated power of the engine. However, the water-alcohol mixtures must not be interchanged.

Even though the use of the water-alcohol mixture in the different engines produces the same result, the manner in which the power is increased varies. In jet engines the water or water-alcohol mixture increases engine power primarily by increasing the mass flow of gases through the engine. In reciprocating engines the water cools the cylinders, suppressing detonation, which allows power to be increased.

Vaporization of the water accounts for the increase in the mass flow of gases through the jet engine. In those engines using a water-alcohol mixture, the alcohol provides the additional heat required to vaporize the water and keep the EGT from being lowered. Since the alcohol is needed only to vaporize the water, close control must be maintained over the percentage of alcohol used to prevent excessive EGT and resultant damage to the engine. Depending on the type of alcohol and planned rate of flow, 22.5 per cent to 28 per cent of alcohol is used. In jet engines which use demineralized water and no alcohol, a capability for increased fuel flow during water augmentation provides the additional heat required to vaporize the water and keep the EGT from being lowered.

The use of ADI in reciprocating engines does not increase the engine power output by thrust augmentation. The ADI mixture is used as an internal coolant that allows the engine to operate at a higher brake mean effective pressure without excessive cylinder head temperature and resultant detonation. The ADI mixture is composed of 50 per cent water and 50 per cent alcohol.

The ADI mixture should never be used in any jet engine nor should jet engine water-alcohol be used in a jet engine requiring demineralized water. To do so will cause hazardously high EGT and overspeed conditions.

Lt Col Harold T. Stubbs
Directorate of Aerospace Safety

FILING AN OHR AGAINST ATC? In several recent instances, Air Force pilots have used the aircraft tail number rather than the tactical radio call sign in filing OHRs which required investigation by FAA. This has resulted in much confusion in attempting to locate flight progress strips and recorded conversations between the pilot and the air traffic controllers. Local times have also been used in OHRs despite the fact that all times used by ATC facilities are based on the 24-hour Greenwich clock.

Please help to make the detective work a bit simpler for the FAA by filing your OHRs with the correct call sign you were using at the time of the incident.

Walter J. Wrentmore, Jr
FAA Liaison Officer
Directorate of Aerospace Safety

FLIGHT PLANNING. The importance of thorough flight planning was recently brought out by a copy of an OHR forwarded to *Aerospace Safety*. The author of the OHR arrived at an Air Force base during bad weather and was surprised to find that the PAR was inoperative. Apparently he got on the ground all right and was informed that the PAR was NOTAMed out. "__stated that it is NOTAMed out, and it is, but it is impossible to find. The NOTAM is in the IFR-S. This is not sufficient . . ." He added that another pilot had the same experience at the same base at about the same time.

Apparently this pilot did not know that NOTAMs in effect for more than 30 days are removed from the Temporary General NOTAMs and listed in the IFR Supplement. A check of the Aerodrome/Facility Directory in the Supplement for the base in question revealed that the PAR was listed as out of service until further notice. Whether this notice is sufficient may be a matter of opinion, but the IFR Supplement is a primary document for flight planning and its proper use should prevent surprises such as that experienced by the originator of the OHR mentioned above.

HEEL AND TOE. Immediately after touchdown the F-101's left main tire started to smoke. The tire blew 265 feet farther down the runway. Using nosewheel steering and right brake, the pilot was able to keep the bird on the pavement and bring it to a stop 4000 feet later.

Talking to the pilot after he was back at the squadron, the Ops Officer learned the pilot had landed with his heels up on the rudder bars.

It takes a conscious effort to keep your toes off the brakes when you're landing an airplane this way. And there's really no reason to put the number twelves up there until your wheels are on the ground and you want to use brakes.

'Nuff said?

SURPRISE! Fifteen minutes after takeoff, the F-4E pilot noticed some unusual instability in his bird. Then the cabin pressure dumped and the bus tie light came on.

He started to dump fuel, preparing to return and land. The dumping stopped shortly after he started it. Then the rest of the electrical systems began to fail. And the interphone quit. In short order he had all

AEROBITS

(continued)

indications of a complete electrical failure.

Setting up a straight-in for an approach-end barrier engagement, he lowered gear and half flaps by emergency systems. But shortly thereafter his wingman saw the flaps retract to full up.

Making the necessary mental adjustments about air speeds and such, the Phantom crew continued the approach as a no-flap, planning to engage the BAK-12, 1400 feet down the runway. Much to their surprise, the airplane slowed dramatically as they crossed the threshold. It settled firmly to the runway and rolled into the BAK-12 for a successful engagement.

You guessed it (didn't you?)—with their high, no-flap angle of attack, they dragged the hook across the BAK-9 cable located at the runway threshold. The cable broke after three-fourths of the tape was pulled out. Their no-flap airspeed, coupled with a fairly high gross weight, exceeded the BAK-9's capability.

Investigation on the ground revealed that the Nr 1 and Nr 2 supervisory panel had failed. In the E-model, with no RAT, this is serious business — you suddenly find yourself in great need of some VFR, or better yet, a runway and an approach-end barrier.

This one ended happily. But it still provides some food for thought for tail-hook equipped tigers. Not all runways have two barrier systems located as they were on this base. And when the threshold barrier is an MA-1 (anchor-chain variety) it is usually removed from the approach end just because this type of incident might occur. But it's when everything else in the cockpit is going wrong that something like this can pop up unexpectedly and ruin an otherwise perfectly-executed reaction to an emergency. ★

"SPEED PERMITTING"

Regarding your September issue of Safety magazine, "Aerobits" section, page 26.

If you have heard any controllers using the "speed permitting" phraseology, this has been out of date for quite some time. According to FAA Handbook 7110.8 Para. 347, correct phraseology is: "If able . . ." which should help to clear the old "speed permitting" misunderstanding.

SSgt P. B. Murray
2066 Comm Sqn
Myrtle Beach AFB, SC

You're absolutely correct — now that we recheck with our air traffic experts — but the lesson still holds: Don't be talked into rushing off the runway unless you know you can do so on a taxiway.

HH-43 HOIST CABLE

Good Grief! ! A 1000 pound fire suppression kit on a hoist cable designed for a max load of 600 pound? (Aerobits, Sept '69.) No wonder it went "pop."

Maj Philip S. Prince
ACSC, Wing I (AU)
Maxwell AFB, Ala..

Obviously we hadn't spent enough time observing. (The FSK is slung beneath the fuselage, not on the hoist cable.)

COVER PHOTO, SEP. ISSUE

We neglected to credit Aerospace Audio-Visual Service for the cover photo used on the September issue. It was from the film "Here There Are Tigers — evasion and escape in Southeast Asia" (TF 6226), available at base film libraries.

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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 Accident Prevention Program.

Major Elmer E. Peters
Pilot

Major Peter R. Bowman
Navigator

609th Special Operations Squadron, APO San Francisco 96310

During a night armed reconnaissance mission in an A-26 aircraft on 17 November 1968, Major Peters and Major Bowman observed their Nr 2 generator overheat light illuminate, indicating imminent engine fire. Major Peters immediately shut down the Nr 2 engine. In a controlled descent, they notified GCI and nearby aircraft of their problem. When the overheat light went out, they restarted the engine in an attempt to shear the generator shaft, and regained lost altitude while a FAC located and marked a target. Anticipating a recurrence of the overheat, the crew elected to expend their ordnance to reduce weight and accomplish their mission.

During their initial run on the target, just prior to release, the generator light came on again. The generator shaft had not sheared and an inflight fire was again imminent. Nevertheless, Major Peters and Major Bowman continued their strike, delivering their ordnance 100 per cent on target.

After the strike they again shut down Nr 2 engine and shut off unnecessary electrical equipment, but misfortune struck again. The remaining generator failed, leaving them with only battery power. While still over hostile territory on their return to base, the batteries failed, plunging the cockpit into total darkness. The crew was committed to navigate home in total darkness depending completely on the standby compass. With complete electrical failure and the ground obscured by darkness, only three vacuum instruments located on the navigator's instrument panel were available to maintain flight attitude. Major Peters flew the aircraft holding a flashlight on his airspeed indicator and altimeter. Major Bowman, handling the Nr 1 engine throttle and propeller control, held a flashlight on the vacuum-operated compass and attitude indicator. With all aircraft radios inoperative, the two majors contacted the tower using a survival radio. By employing the highest degree of aerial skill, crew coordination and ingenuity under extreme adversity, they made a safe approach and no-flap, night, blackout landing without further incident. WELL DONE! ★

seasonal hazard