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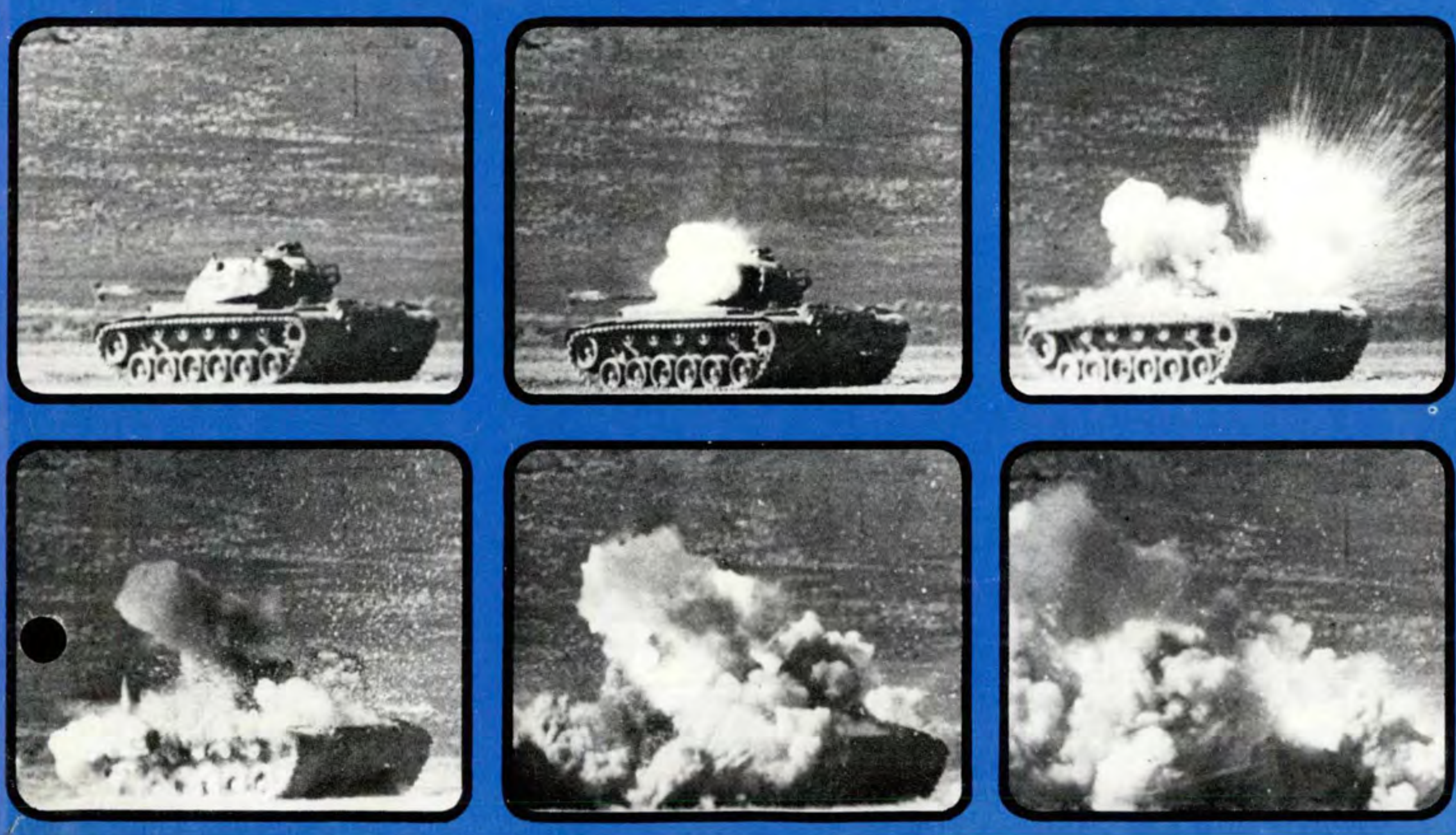
SAFETY JANUARY 1977



UNITED STATES AIR FORCE

aerospace SAFETY

JANUARY 1977

THE MISSION - - - - - - SAFELY!

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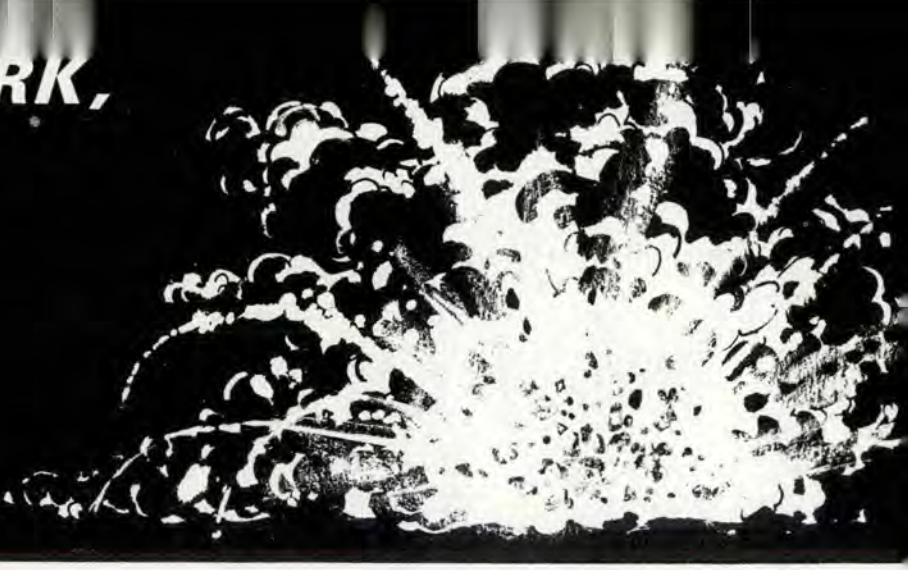
DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

JANUARY 1977 AFPR 127-2 VOLUME 33 NUMBER 1

IT WAS A DARK, DARK NIGHT



CAPTAIN JOHN E. RICHARDSON
Directorate of Aerospace Safety

Lieutenant Dan Smith walked slowly across the ramp toward his T-38. The setting of the sun had relieved some of the heat of the Arizona afternoon and it would be a clear, cool night.

This would be Dan's fourth night ride in the T-38. He was confident of his abilities as he checked the aircraft forms and did the walk-around. He quickly strapped in and soon the characteristic whine of a J85 engine echoed across the darkening ramp. As Dan looked out he could see the lights of his classmates' aircraft as they completed their before-taxi checks.

Soon a line of lights marked the procession of T-38's toward the active. "Cushy 343 night solo ready for takeoff." Dan requests and receives his clearance and then lines up on the runway.

The rumble of the engines becomes a roar as the throttles are advanced. Then the slight pause and the afterburner lights, twin jets of bright blue flame, leap from the rear of the aircraft as it accelerates down the runway and lifts gracefully into the desert night.

Gear and flaps up, afterburner out, and climb established on the departure. Dan Smith is quite busy for a few minutes doing all the things necessary to get a jet aircraft off the ground and up to cruise altitude.

Soon, though, he reaches his altitude of 29,000 feet and begins the first leg of the round robin flight. It is a beautiful night. The lights of Phoenix stretch out toward the horizon. The dark mass of the Superstition Mountains looms in the distance—more felt than seen. The sky is perfectly clear with the stars brightly shining. There is no moon tonight to dim them.

As Lieutenant Smith sails smoothly through the night he thinks of the descriptions he has read of the beauty and grandeur of night flying. All too soon the T-38 is approaching the IAF and the time for daydreams is over. Now comes the descent check and preparation for landing.

The descent track was carefully planned for safety and noise abatement. It came in over the desert well clear of the populated areas to the North and West. Lieutenant Smith was very busy now with checklists and descent procedures and since it was rather dark, he turned up the cockpit lights to see the checklist.

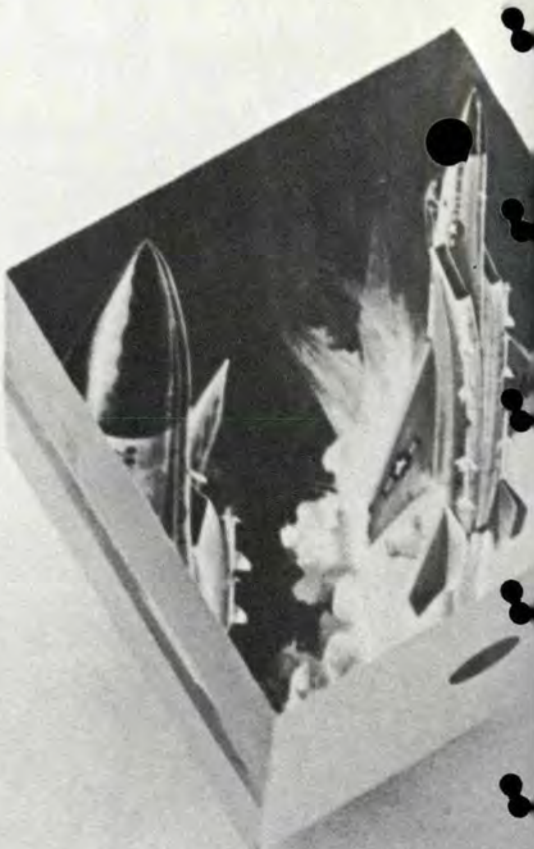
The T-38 smoothly descends to low altitude and starts the arc toward the final approach. Lieutenant Smith is busy with approach checks and other cockpit duties when a light blinks on the caution and warning panel.

Dan concentrates on the panel trying to determine just which light had blinked. He is not paying attention to his altitude and doesn't notice the descent. Then something outside the cockpit catches his eye and he looks up. It's hard to see because of the bright reflection of the cockpit lights, but Dan suddenly realizes that what he saw was a *tree*. He yanks back frantically on the stick and shoves the throttle forward. But then there is a thump and a grinding, tearing sound and a spinning, tumbling sensation as the right wing smashes through some trees and hurls the T-38 to the ground.

A few minutes later a classmate of Dan's making the same letdown reports a bright fire on the ground. It takes the crash crew almost 2 hours to get to the wreckage because of the rough terrain, but by sunrise they have all the pieces identified from Dan Smith's last flight.

This flight is fictitious. Yet it contains elements of several real accidents. Although Lieutenant Smith is a student pilot, many of the accidents involved highly qualified, experienced crews. This is the kind of accident that can only be prevented by the pilot. We all can be distracted or become complacent. It's a trap which we must work to avoid because one lax moment at the wrong time is all it takes. ★

Is It Worth It?



MAJOR THOMAS R. ALLOCCA
Directorate of Aerospace Safety

Decisions, decisions. You own a 1966 Ford with 120,000 miles on it and you're about to make a coast-to-coast trip. Should you have the engine overhauled?

You're enrolled in an off-duty graduate program and there's an end-of-course quiz coming up . . . should you study for it?

Decision making. Of the infinite variety of human behavioral patterns, none is more pervasive than decision making. We all do it—all the time. The examples cited above are the kinds of decisions we make daily and may rightly be considered trivial. But not all decisions are so. Many involve vast sums of money or even life and death. For example, "should the Air Force spend millions of dollars to outfit its entire fleet of aircraft with a ground proximity warning system?" or "should the attitude-indicating system of a wide-bodied transport be modified to provide increased system reliability?"

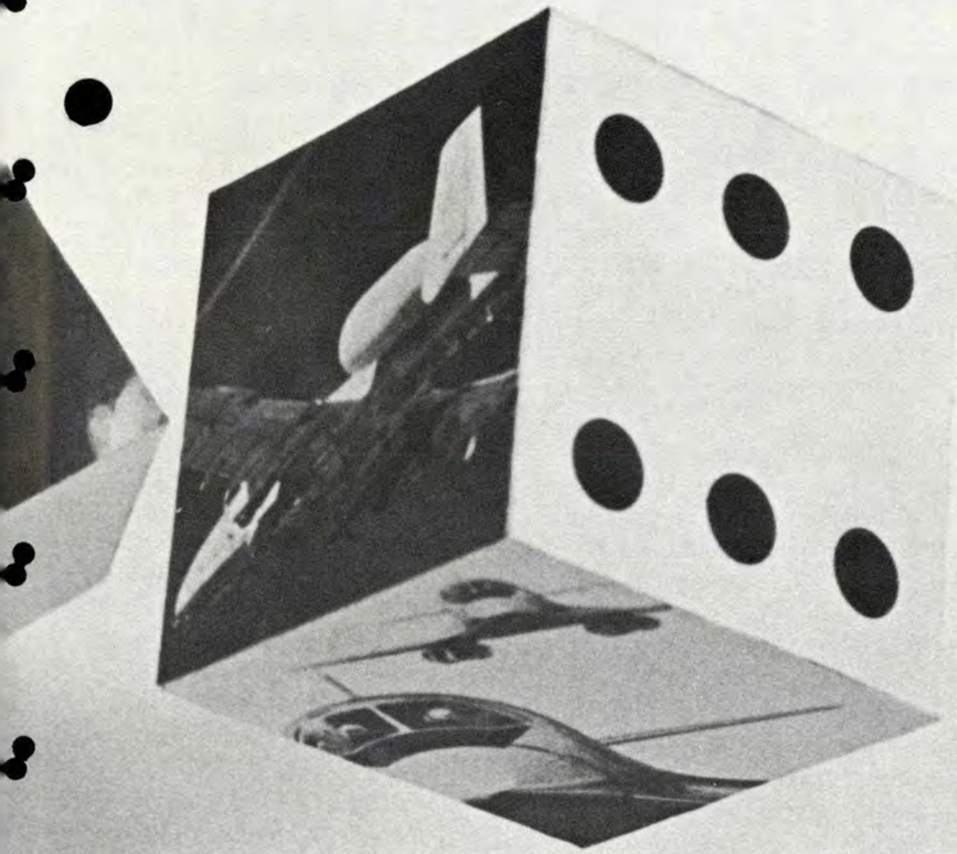
The readership of this magazine will surely contain many managers and soon-to-be managers who may, some day, be called upon to pass judgment on such questions. And when they are, how should they react? Let's begin by briefly discussing decisions in general.

A decision must never be called a "good one" or a "bad one" solely on the basis of how things work out. The decision to repair the Ford's engine may appear foolhardy if the car is totally wrecked a week after the repair investment is made. But this is Monday-morning quarterbacking at its worst. Conversely, if we make a highly speculative decision which, by all odds, has little chance of working, we should not credit ourselves with "good" judgment if things turn out well.

The ambiguity here involves a distinction between two decidedly different things: the merit of the alternative chosen (viewed as either "good" or "bad" by the Monday-morning quarterback) and the merit of the *method* used to select the alternative. While we (particularly those of us in the safety business) can never be sure that a particular decision will turn out right, we owe it to ourselves and the Air Force to be sure that the *method* used to make the decision was the best available. With this thought in mind, let's return to the wide-bodied transport's attitude-indicating system reliability problem.

Should we spend X number of dollars to improve the reliability of the attitude-indicating system? To answer this question, with the above discussion in mind, we must consider the concept of the "expected cost of an accident."

Obviously the issue of whether or not to modify the system was raised as a safety concern. If the existing



system completely fails at a time (night/IMC flight periods) when pilot recovery attempts will be unsuccessful, . . . well, we've lost one very expensive wide-bodied transport. But, and in this austere era this is a crucial but, what happens if we spend X number of dollars (which could have been spent elsewhere) to prevent an accident which may never happen? Either we spend the modification monies or we don't —a tough decision. But let's remember the "soundness of the method" discussion.

If we make the modification we're betting that we'll save (in dollars not lost in accidents) more than we spend. That one sentence contains the entire rationale of the "expected cost of accidents" enthusiasts. To properly understand this rationale, a brief discussion of "expected values" is appropriate. And to best understand a concept built upon the laws of chance, a "game of chance" example is both illustrative and appropriate.

A "good" buddy offers you this deal: you pay $1 to roll two dice. If you roll two sixes, you get your $1 back plus two dollars. If you roll a six and a "not-six," you get back your dollar plus one dollar. If you roll two no-sixes, you lose your dollar. Before you decide, you clearly have two alternatives—to play or not to play. But which of these alternatives is the "best bet?"

Decisions such as these require some knowledge of the laws of probability. In this game there are two acts—play or don't play—and three events: 2 sixes (you win $2); 1 six (you win $1) or zero sixes (you lose $1). What are the chances of: rolling 2 sixes in the roll of 2 dice? Rolling 1 six in the roll of 2 dice? Or, rolling zero sixes in the roll of 2 dice? They are 1/36, 10/36, and 25/36 respectively. Now a realistic decision must consider both the odds and the payoffs. The most satisfactory method of combining odds and payoffs is simply to weight each payoff by the odds that it will occur, add the weighted payoffs for each act, and choose the act that has the highest weighted average. This is done below.

		ACTS			
		PLAY		DON'T PLAY	
EVENTS	ODDS	PAYOFF	WEIGHTED PAYOFF	PAYOFF	WEIGHTED PAYOFF
2 SIXES	1/36	+$2	+ 2/36	0	0
1 SIX	10/36	+ 1	+10/36	0	0
0 SIXES	25/36	— 1	—25/36	0	0
		WEIGHTED AVERAGE —13/36			0

In this game the weighted average (also known as "expected value") is $-13/36$, or approximately -36 cents for playing and 0 cents for not playing. So, *in the long run*, you will lose 36 cents for every dollar played and you'd best tell your "good" buddy you'd rather not play. Now let's apply this same kind of reasoning to the modification decision.

The question—and we'll use numbers for illustrative purposes only—is this, "should we spend $500,000 to improve the reliability of the attitude-indicating system of a wide-bodied transport?" The acts are obvious: modify or don't modify. But the calculation of the events warrants a brief discussion.

We're obviously thinking about this modification because of the safety implications: we don't want to lose a wide-bodied transport because of a complete failure of the attitude-indicating systems. What is the likelihood that this will occur? To answer that question we must first address this question:

"What is the probability of losing a wide-bodied transport due to a complete failure of the attitude-indicating systems during a flight phase from which pilot recovery attempts would be unsuccessful?" And this question involves these three independent probabilities:

a. Probability of a complete system failure (assumed to be 2.0×10^{-5} per flight hour, or twice in every 100,000 flight hours);

b. Probability that the failure will occur during night/IMC flight periods (assumed to be .50; that is, that 50% of all penetrations and landings are made during night or IMC conditions);

c. Probability that if a and b occur the pilot will *not* be able to effect a safe recovery (assumed to be .50).

Now the likelihood that a, b and c will occur simultaneously is given as a times b times c or $(2.0 \times 10^{-5}) \times (.5) \times (.5) = .5 \times 10^{-5}$ or this event (loss of a wide-bodied transport) is likely to occur once each 200,000 flight hours.

For illustrative purposes, let's assume we have a fleet of 100 wide-bodied transports and it is predicted that each will fly an additional 10,000 hours before retirement from the active fleet. Therefore, the fleet will fly 100 X 10,000 or 1,000,000 more fleet-hours. Since the "expected loss rate" is one each 200,000 hours, we can expect to lose 5 wide-bodied transports to attitude-indicating system failures over the life of the fleet. If we assume the cost of each transport is $5 millions, then our "expected cost of accidents" is computed as $25 millions. Therefore, it would appear that the $500,000 investment would be well spent. Why do I qualify the statement? Because we must know what degree of improvement (in terms or decreased likelihood of accidents) we can expect from the modification.

Let's assume the proposed modification (to build redundancy into the existing system) will result in a likelihood of system failure of $.25 \times 10^{-5}$ per flight hour, or a complete system failure once each 400,000 flight hours. This in turn must be multiplied by b and c above (which have not changed) to yield the "modified" likelihood of the accident: $(.25 \times 10^{-5}) \times (.5) \times (.5) = .0625 \times 10^{-5}$ flight hours or the accident is likely to occur approximately once each 1,600,000 flight hours. Since the entire fleet will fly an additional 1,000,000 hours the likelihood of the kind of accident we've been discussing becomes $\frac{1{,}000{,}000}{1{,}600{,}000}$ or .625. Since the wide-bodied transport in question costs $5,000,000 the "expected cost of accidents" is computed as .625 X $5,000,000 or $3,125,000 with the modified system. Now the modification argument can be expressed thusly:

a. If we don't modify, the expected cost of accidents is $25,000,000.

b. If we do modify, the expected cost of accidents is $3,125,000.

The modification decision is perhaps made a bit easier when viewed in this light and from this perspective: *in the long run* we can expect to save (in dollars lost in accidents) more than we'll spend on the modification.

"Should the Air Force develop a less flammable hydraulic fluid for use fleet-wide?" "Should all single-place fighter aircraft be outfitted with high intensity strobe lights?" These are tough questions made even tougher because every dollar spent thusly cannot be spent somewhere else. But regardless of the awesome complexities of such questions, they must be answered.

This short discussion has highlighted one analytical technique available to the decision-maker. Such techniques are not substitutes for judgment; rather they are aids to the person who must select from a group of alternatives. Questions such as those addressed in this article must be approached in a logical, rational manner . . . to this end the "expected cost of accidents" may be helpful in deciding if "it's worth it."

The author wishes to acknowledge that ideas presented in this article were extracted from portions of the text, Business Decision Theory, *by Jedaemus and Frame.* ★

DOOPHER* THE INSTRUCTOR

OR...how to give a hazardous briefing

LT COL HELMUT OBERBRINKMANN, GAF • Directorate of Aerospace Safety

> *** Translation:**
> **Doopher (Dooper)**
> **Usually a word that is used when you cannot think of the correct wording or nomenclature.**

. . . Again 6 o'clock briefing for me (how come I'm always the poor F-104 student in the first briefing slot of the day?). Being already late I find myself filling out the data card with all the necessary information on a Ground Attack 1 Mission. Rushing through my typical fighter breakfast of one cup of coffee and one doughnut, I manage to reach the briefing room a split-second before instructor fighter pilot John Zipper walks in 10 minutes late.

Smoking his early cigar, John Zipper glances into the doopher guide and starts hammering his highlights of flight into our heads. He stresses taxi spacing (I'm just listening to the seventh technique to maintain 150 ft) while I'm wondering when he wants me to accomplish my before takeoff checks. Reaching the meat of the mission, Zipper tries to give an impression of the individual switch settings for each event. He turns this doopher, he switches that doopher, opens the bomb doophers, re-checks the doopher in the manual position, makes sure that the rocket doopher is in the doophing position, selects the doopher in the stand-by position, pushes the doopher for a green light and squeezes the trigger to hit the doopher in the bomb circle . . . STOP!

Start to think, IP. You are on the range and your foreign student cannot release his weapon. You are responsible to re-ensure the correct switch settings for that particular event. But how can you ever achieve with your doopher method, and especially airborne, the help you need to give—screaming doopher positions? Or how do you explain to your student how to emergency-jettison his napalm bombs?

But it may even get worse for you, John Zipper. Flying on downwind, your student sees an engine oil low-level light. He pulls the nozzle handle with no reaction on the nozzle. Now there you sit, famous briefer, trying to doopher the aircraft in distress to the nearest doopher. Halfway, your student may not understand your fast spit-out doopher information anymore and calls you on the radio: . . . I'm leaving the airplane with my doopher! ★

TECHNOLOGY IS ONLY

MAJOR JACK SPEY • 475 ABW

History cannot tell us when polynesian seafarers first sailed beyond the sight of land. A bold venture it must have been with only the sun to provide directional guidance. Over the years these daring skippers learned that stars could provide bearing information. Time also taught them that wave patterns could at times be relied upon for steering. Observation of certain birds, departing their feeding grounds at sea, soon became accepted as a reliable directional indicator, pointing toward an island. With a "seat of the pants" feel, these early mariners soon were able to detect a reflected wave superimposed in the primary wave train, thus providing evidence of an unseen land mass beyond the horizon.

These bold men soon were capable of making an accurate landfall after days or sometimes weeks without having seen the sight of intervening land and without use of man-made instruments. Orientation was maintained by visual observation of their environment—their sea and sky; the most subtle signs were noted, processed, and stored in their brains. This highly developed skill, requiring total dedication and a highly developed sense of observation, permitted them to navigate successfully uninstrumented and with the same accuracy obtainable after the invention of the compass, timepiece, and sextant.

Until the invention of the compass, the mariner's first instrument, the Captain had no technology on which to rely. His success or failure as master of his ship rested completely on his skills. Decisions were based on what he had learned, sometimes painfully, over the years by observation of the sea and his vessel. Even while off watch, the motion and sound provided clues to changes in the wind, sea, and conditions of rigging. It is easy for all of us to picture a ship's master standing squarely on a rolling deck. His face ruddy and lined, with eyes intently studying the sea and sky, as spray bathes his face.

In 1903 at Kitty Hawk, man achieved a life-long dream. Two humble men succeeded in joining the eagles. The conquest of air and space had begun. For the next 20 years early aviators had little technology to help them. As with the mariners of an earlier time, the first aviator had to rely solely on his o

AN AID

knowledge, the fundamentals of flying, and observation and perception of the sky. His abilities permitted him to pioneer transcontinental air travel. In combat over Germany he dominated the sky, all without Gyro or radio. The achievements of the early aviators must be regarded as remarkable since they were performed with little aid from technology.

In 1920, we saw the first electronic navigation aid—a simple radio beacon; and in 1929, Jimmy Doolittle demonstrated all-weather capability by flying an aircraft solely on instrument reference during IFR conditions. In the early thirties, we also saw the introduction of a lightweight radio, reliable enough to be a worthwhile aid for a pilot. The technological advances in aviation have vastly improved the reliability and safety of flight, and permit us to do our tasks faster and in poorer weather conditions.

When was the last time you had to "cage" an engine on a C-141 in flight? When was the last time you had to abort a takeoff for low power? Fifteen years ago, flying "Old Shakey," this was often the rule rather than the exception. Today, critical emergency situations still occur, but less frequently. If we are not careful, we can be lulled into complacency by this reliability and be caught napping during the few seconds in which the situation can escalate beyond our control.

Low power on takeoff, requiring an abort, still happens. Critical emergencies such as engine failure or fire at lift-off still occur. Engine fire during cruise, requiring immediate action, is rare but can escalate out of control if not dealt with promptly and correctly.

Technological advances in aviation have vastly improved reliability and enhanced safety of flight, but critical emergencies—those that can kill us if not handled promptly and correctly—are still with us. Fundamental action is required to solve these problems and it varies little from aircraft to aircraft. In the past, today, and in the future, sound knowledge of the fundamentals continues to be essential. The pilot who fails to master the fundamentals and to know and understand his aircraft has a questionable future. To borrow an adage from the mariner: "Be prepared for the worst, the best takes care of itself." ★

OUT OF THE PAST

CAPTAIN JOHN E. RICHARDSON • Directorate of Aerospace Safety

There are few new mishap causes. Each year the accident files contain the same types of mishaps, so perhaps we should follow the advice of Santayana and study the mishaps of the past. This page contains accident briefs and Ops Topics from the *Aerospace Safety* magazine files.

The pilot of the F-86H entered a normal landing pattern, dropped the gear and flaps and made the "gear down and checked" call. However, the pilot did not really check the gear and, although the doors opened, the gear did not extend. Fortunately, the mobile control officer spotted the malfunction and sent the aircraft around. A rather embarrassed pilot recycled his gear and made an uneventful landing.

* * *

A student pilot completed his night solo mission with a reasonably good landing. However, halfway down the runway he discovered that the T-33's right brake was inoperative. As a result, his ride terminated with a barrier engagement. (One of the required checks in the T-33 checklist was a brake check prior to landing. This was not done.)

* * *

After completing a normal duty day at their administrative jobs, a pilot and copilot were scheduled for a 2000 departure in a C-45 to make some parts pick ups. A maintenance delay prevented the takeoff until 0035. The aircraft made its first destination with one intermediate stop and departed after 5 hours ground time. The next RON stop was at 1835. The crew took off the next morning at 0645 and, after two more enroute stops, started the final leg home at 1555. Forty-five minutes later the pilot declared an emergency because the aircraft had lost a propeller. He stated that he was going to land at a field 10 minutes away. Shortly after, the pilot transmitted that he had the field in sight and was preparing to land. While on approach, the aircraft stalled and crashed, killing the pilot. Although the loss of the propeller is the prime factor in this accident, the fact that the pilots had only 4 hours sleep in the previous 60 hours is definitely a part of the cause. No one can be fully capable with as little crew rest as that.

* * *

The RB-66 was making a standard jet penetration. The pilot acknowledged completion of the procedure turn at 7000 feet. Approximately 2 minutes later the bomber, flying straight and level, slammed into a hillside at *1620 feet.* There was no evidence of malfunction. The minimum descent altitude on the approach was 3000 feet.

* * *

The jet transport was at FL 350, Mach .82, 278 KIAS. The copilot was busy filling out forms. The panel engineer called the pilot's attention to an indication of generator difficulty. No one noticed that the generator OFF light had come on simultaneously with the onset of the generator problem. In the next 2 minutes over 1000 feet of altitude were lost, Mach increased to .86, heading changed 40 degrees and bank angle reached 30 degrees. During the recovery the g meter registered 2.9 g.

* * *

Shortly after passing S-1 speed the pilots of the KC-135 noticed that the instrument panel was ajar. Immediately after rotation the top of the instrument panel fell toward them. The pilot and IP sitting in the right seat caught the panel after about 4 inches of movement; and the IP flew the aircraft while the pilot refastened the panel. This was the first flight for this aircraft since its return from depot. It seems that depot personnel had neglected to secure the panel. ★

FOOD FOR THOUGHT!

Recently an experienced IP gave a J-85 engine the opportunity to prove that it is tougher than a Low Altitude Enroute Chart. During climb to cruise altitude the IP opened the front cockpit map case to get a low altitude chart. About the time he found it, his excellent cross check picked up a 300 foot overshoot of level off altitude. The IP assumed control and applied the appropriate stick movement, resulting in a momentary negative-g condition.

After landing, the checklists were accomplished and the canopies opened. The IP shut down the engines when he heard an unusual hissing noise from the left engine. Maintenance found a low altitude chart wadded against the inlet guide vanes. The J-85 had shredded the chart, but received no damage. With a complete cleaning and inspection, the engine is flying again.

The instructor and student failed to see the possibility of something having floated about the cockpit during the less than one-g condition. The chart probably floated, unnoticed, to a position on or behind the front seat. When the canopy was opened, the charts followed the law of selective gravitation: "Any item dropped will fall in the worst possible place."

Each pilot should carefully consider the events of each mission and inventory cockpit and personal equipment in detail prior to opening the canopy. The mirrors can be used to check the top of the seat. The back seat occupant can check the top and back of the front seat. If any doubt exists, taxi back in with the canopies down, select ram dump, shut the engines down, and then open the canopies.—14th FTW Flight Safety Bulletin, no 22, 26 October 1976. ★

RED FLAG - Part II

CAPTAIN RONALD E. VIVION
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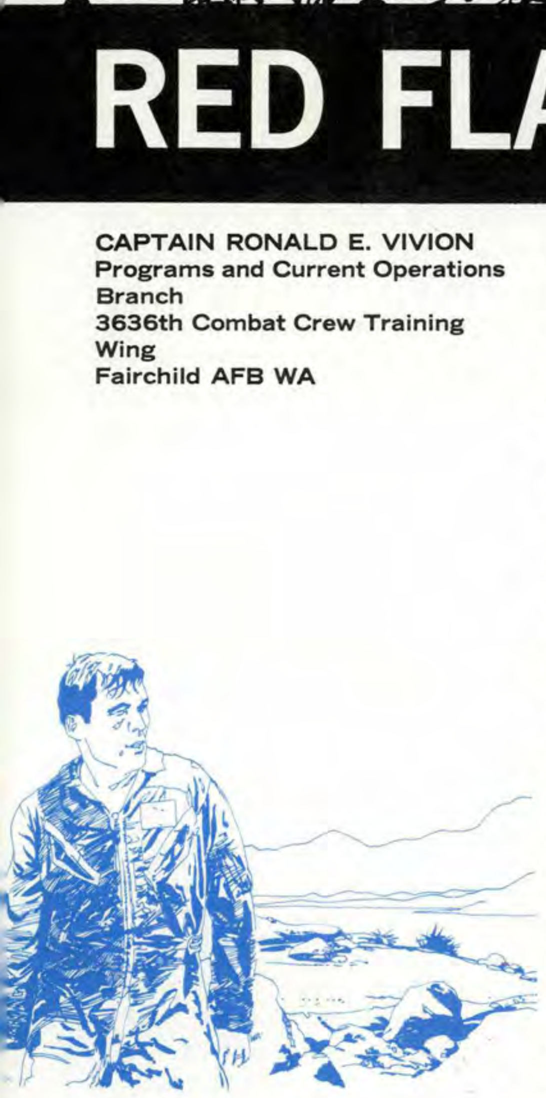


In my last SURVIVAL article, I discussed a scenario at the Red Flag exercises where two crew members were inserted and subsequently rescued as a planned part of that exercise. I also stated that a few mistakes were made and that they would be discussed in detail this month.

Since the writing of that first Red Flag article, we've added a few new twists at Nellis and we're presently reviewing our findings. When we have finalized our conclusions about the results of the new scenarios, we'll report back with another article. But the thrust of this one is to analyze the errors made and discuss how to prevent them.

The first error the Captain made last month was to get shot down. We can't comment on that except that, if you always land in the same aircraft you take off in, the chances are that you will never need survival knowledge—at least not on the job. My point is that preparation for survival definitely includes becoming the very best at your job.

In the prebriefings for the SAR scenario, we have found a number of crews that weren't sure about the URT-33 beacon. This small radio transmitter can be extremely valuable and we definitely recommend you keep it. Make certain it is turned off—as a helpful hint, "What you see is what you get." If "off" is visible, it's not transmitting. Even though you can't receive on this piece of gear, there is a possibility that your survival radio transmitter may be inoperative or your radio may not work at all. The beacon can provide an alternate communication device, so it should be kept with you.

The next area of confusion appears to be what to do with the excess material you will have at the landing site. We still teach that before you throw anything away make certain you will never need it again. This obviously gets into an area of marginal return because every single item you have with you at the landing site can be improvised and used again. But is it worth it?

The prime question remains, "Can I do without the item in favor of reducing bulk and weight?" These decisions need to be made quickly and accurately. You would help yourself greatly if you decided in advance. As an example, over water the life raft will be of prime importance but in the mountains is it vital? In an E&E situation you certainly don't want anything hindering your progress, so choose carefully.

Once the decision is made to scrap some of the items, a serious mistake is often made. In the survivor's concern about giving away the landing site, the decision is often made to carry the excess baggage with him and discard it along the route of travel. Unwittingly, this confirms the route of travel to the searchers. If they are following a trail and find buried material, they are then sure that they are on the right track.

Probably the best technique for disposing of excess equipment is to hide it under a bush, a rock, in a shadow, etc., at the landing site. Burying it should probably be a last resort because of the time required and the difficulty of digging in most terrain without a shovel. To aid in hiding the gear, you might also consider wrapping it up in the green or brown parachute cloth. Since most of the landing areas of the world are those colors, it will be hard to find.

Once the landing site is secure, it is imperative that a great deal of care be given to leaving the landing site. The chances are that the "Last of the Mohicans" won't be tracking you, but if you stomp off without making any attempt to hide your tracks, even the most novice individual will be able to follow. Hiding your tracks isn't that tough, but it does require concentration. Never relax or forget you've got to hide your route. If you do it well, a search party must comb all quadrants for tracks, thus taking time and manpower. You should make their job as tough as you possibly can by picking the hardest route available and not traveling in a straight line. Move slowly, and stop, look, and listen. Sound can travel great distances, especially when you, the enemy, and the tweety birds are the only ones out there making noise. And when you travel, have an objective in mind.

Many individuals who have actually evaded have experienced that sickening feeling when they discovered that they had E&E'd right back to the same spot where they had been previously. The best technique is to pick a spot and travel to it then pick another, etc. The compass you have in your kit can be a very helpful device. Even though it may look small and inaccurate, it can spell the difference.

In choosing your travel route, use all available means to hide yourself. At Fairchild, we still teach the military crest route, or ⅔ to ¾ of the way up a ridgeline. In most environments this is the type of terrain the enemy would least prefer to move in and will usually provide cover. But by all means, don't use it if there is no cover there. In a desert environment it would be much wiser to travel in a dry creek bed or washes —but not in the bottom. Parallel the bed of the creek and travel slightly up the slope. There will often be vegetation in this area and the terrain will help mask your position.

In hostile territory, survivor should leave as few clues to his presence as possible. Footprints are prominent on soft ground in photo, above left. Hide equipment under a bush or in rocks, as at right. See the gear?—in the center of photo.

Each piece of gear takes only one hand, as demonstrated in these photos. In each case, survivor is using two items at once—survival radio and mirror or smoke.

The problems I mentioned last month with vectoring and signalling still remain. The biggest area of concern is that crews can operate each separate piece of equipment individually, but when they are all put together, it gets busy. Remember that each piece of gear only takes one hand. Theoretically, you can even talk on the radio and flash with the mirror simultaneously. It just takes practice. The mirror, by the way is probably the simplest and most effective means of showing the SAR force where you are. Survivors have often been seen on the first flash in the desert. But make sure that first flash doesn't hit the ground and tell the bad guys where you are—start high!

Your smoke (MK-13) flare is good but if everything isn't just right, its effectiveness is lessened. Remember, in a fast-moving SAR it is vital that the flare is prepared well in advance. If you wait until the Jolly arrives to prepare it, he may be well past your position before the smoke is out. And think about how you'll operate the flare one-handed. For that matter, give that line of thought to all your equipment. You may well have a medical problem that will prevent your using both hands. A good hint for pulling the flare lanyard with an injured hand is to use your foot. Step on the lanyard and pull. Please, please, don't use your teeth!

Communications on the radio can be critical. Things happen fast and the tendency for most survivors is to get in a hurry. Keep calm and keep talking. Don't give away your position on the radio and if there are several of you on the ground, it is mandatory that you establish your pecking order before you get into a survival situation. We've had several situations where multiple crews didn't coordinate their SAR beforehand and the resulting garble on the radio was mind-boggling—so much so that rescue was definitely hampered and probably would have been prevented in an actual combat SAR.

The techniques that I have provided should have been very evident when you read last month's article. The difficulty remains that there are people out there who aren't getting the word. Even though Red Flag is being conducted in a desert environment we haven't found an item yet that doesn't apply to almost any area. The key appears to be to pass the word and think about survival. In SEA, crews spent a good deal of time directly concerned over the equipment they carried because they knew that their turn could be next. The chances today aren't that much slimmer. Granted, nobody out there is playing real-live shoot-em-up, but that potential still exists. The old saw about "preparedness" is definitely in order and Red Flag tries to provide that. But you must do the rest.

If you have any questions or comments concerning the materials in this article, please feel free to call or write to us. Our address is:

3636 CCTW/DOO
Fairchild AFB WA 99011
AUTOVON 352-5470 ★

It's not just good sense...
IT'S THE LAW!!

MSGT R. A. SMITH
Armament Development and Test Center
Eglin AFB FL

Sound familiar? You've heard it on TV in reference to the 55 mph speed limit, now let's apply that same idea to technical data and maintenance on aircraft away from home station. When you consider the variety and complexity of the aircraft in the Air Force today, it makes sense that our maintenance personnel must use the proper tech data to inspect transient aircraft on the ground. After all, would you operate your sophisticated bird without the flight manual and associated checklists? TO 00-5-1 and other publications direct that the use of tech data is mandatory for all actions, regardless of their apparent simplicity; so it's quite clear that it's not just good sense—it's the law.

Most transient alert sections maintain enough tech data for those types of aircraft which frequently visit the base; however, they cannot be expected to maintain a file for each type of aircraft in the Air Force inventory. We're back to that good sense part again. Guess that's why TO 00-20-1 requires (it's the law) that aircraft scheduled for cross country or TDY missions have the servicing checklists and inspection work cards carried on board.

This doesn't pose a problem for those aircraft which are required to have a "G" file aboard but it requires some action on your part if you're driving one that doesn't. In order to ensure that your bird receives its due attention and to avoid lengthy delays, ask the maintenance troops if those important pubs are aboard prior to your next departure. Don't forget to find out where they're stowed so you can pass them on to the guys in white at your enroute stops, in case they don't have your particular model on file. If you want to really show them you're up tight and out of sight, whip the reference of TO 00-20-1, para 4-12e on them.

With the right tech data, the transient troops should be able to provide you the safe and timely service you deserve. This will most likely result in happy faces for all —the TA troops, maintenance management, the safety experts, quality control and YOU. ★

THE IFC APPROACH

By the USAF Instrument Flight Center
Randolph AFB, Texas 78148

A NEW YEAR'S NOTE

With the advent of the new year, every Air Force pilot should personally resolve to make this year accident/incident free. The "IFC Approach" articles are intended to help pilots accomplish this goal. If there is a subject or question you would like to see addressed in an "Aproach" article, please write to the USAF Instrument Flight Center and let us know. One of our primary goals is to provide Air Force pilots with the most current information available concerning instrument flying and we use the "IFC Approach" articles extensively to accomplish this function.

REVISION OF "IFC APPROACH" ARTICLES

Each year the Instrument Flight Center reviews past "IFC Approach" articles for currency. Articles considered current are those published after December 1973. Since many of our readers keep copies of our articles and use them as a review for instrument checks and also as teaching aids for annual instrument school, we publish this revision each January.

A limited number of booklets of reproduced articles is available for distribution to those who wish to start an "IFC Approach" article file. A set of the articles will be mailed to you upon request. If additional copies are needed, they may be reproduced locally. Your request should be addressed to:

USAF Instrument Flight Center/ FSD
Randolph AFB, TX 78148

The following changes and deletions to previous "IFC Approach" articles should be made as indicated.

September 1974—Delete entire article.

October 1974—Delete last question and answer.

November 1974—Delete the 1st, 2nd and 4th question and answer under Radio Calls.

April 1975—Delete the third and fourth question and answer. Change the definitions of Minimum Safe/ Minimum Sector Altitude to read:

3. Minimum Safe Altitude. Established for all procedures within a 25-mile radius of the navigation facility. Provides at least 1000 feet of obstacle clearance for emergency use.

3a. Minimum Sector Altitude (MSA). MSAs are established for all procedures within a 25-mile radius of the navigation facility. A radius of 30 miles from the airport may be used when the primary facility exceeds 25 miles from the airport. When the procedure does not use an omnidirectional facility, i.e., LOC BC, the primary omnidirectional facility in the area will be used. A common safe altitude may be established for the entire area around the facility or sector altitudes may be established to offer relief from obstacles. Sectors will not be less than 90 degrees in spread. The sector altitude established shall also provide 1000 feet of obstacle clearance in the adjacent sector or periphery area within four miles of the sector division or the periphery boundary line.

July 1975—Delete the 2nd question and answer.

August 1975—2nd Question and answer, change reference to read "FAAH 7110.65, para 773."

4th question and answer, change to read, ". . . highest obstacle within 5 NM. . . ."

5th question and answer, change reference to read "FAAH 7110.65, para 236."

6th question and answer, change reference to read "FAAH 7110.65, para 20, 233, and 236."

7th question and answer, change reference to read "FAAH 7110.65, para 1192."

10th question and answer, change reference to read "FAAH 7110.65, para 604."

December 1975—3rd question and answer—change reference to read "FAAH 7110.65, para 233."

4th question and answer—change reference to read "FAAH 7110.65, para 233."

Clearance #5: Change to read, "POST 20, DESCEND NOW TO . . . ."

The pilot . . . to descend now to FL 240.

January 1976—2nd paragraph, last sentence change to read ". . . ADVISE YOU CLIMB TO (ALTITUDE) IMMEDIATELY."

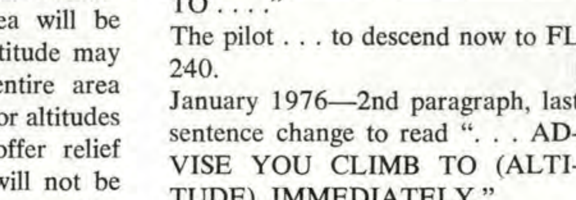
March 1976—Delete 1st Question and answer under Lost Communications Enroute (See September 1976 article for correction.)

August 1976—Change answer d. of question 10 to read, "All of the above."

September 1976—Change next to last paragraph to read, ". . . 4. Instrument maneuvering (normally 1.4Vs) 5. Final Approach (Normally 1.3Vs) 6. Landing (Normally 1.1Vs) . . . ." ★

NAME THAT PLANE

Northrop XP-56 (First flight Sept. 6, 1943)
Take off weight 11,350 lbs.
Max speed 467 mph, cruise speed 375 mph.
Range 450 miles, service ceiling 33,000 ft.
Armament—(4) .50 cal guns, (2) 20 mm cannon.
Power—1 P & W R-2800B, 2 Curtiss electric counter-rotating propellers.
First all magnesium, all welded airframe in history.



Two Tales

LT COL HELMUT OBERBRINKMANN, GAF
Directorate of Aerospace Safety

The two narratives that follow are true stories. They show how easily human failures, sometimes caused by shallowness, carelessness, ambition or vanity can lead into incidents or disaster.

After a flight with a twin engine jet, the pilot in command wrote up the nr 2 engine oil pressure and one of the ground crew commenced straightaway with troubleshooting. With reference to the entry in the Form 781, his first step was interchange of the pressure gauges, because he was a smart man. After engine check, he found out that only the instrument had failed and not the whole system. Therefore, only exchange of the instrument became necessary and that was the instrument mechanic's job.

On his way to the hangar, after shutting down the engine, he met the instrument technician. Without mentioning the gauge exchange, he told him in passing, "Triple X has a write up for false oil pressure gauge indication on the nr 2 engine." Now the instrument mechanic took a new gauge, hurried to "Triple X" and replaced the nr 2 engine oil pressure gauge. After a new operation check, he signed off the discrepancy in the Form 781. The next day "Triple X" was technically released for flight. A new aircrew took the aircraft and noticed during runup on the runway that the nr 1 engine oil pressure was higher than the upper limit, so the mission was aborted. The pilot now remembered having read the write up on the nr 2 engine due to oil pressure malfunction from the day before. He left the aircraft shaking his head and had a strong discussion with the ground crew.

In this case shallowness and carelessness and extremely bad teamwork led to the incident. I guess all pilots know and all technicians should know that a well-qualified and conscientious working technician-crew is better for aircrews and passengers than the best life insurance.

The second story may demonstrate how dangerous human vanity can be. The incident occurred to a European NATO pilot.

For some reason—maybe it is tradition for some well-educated men of west European kingdoms—it is a habit to wear a moustache, and some men place a high value on its proper maintenance. To do this, our pilot used a special hair balsam. With his so-attended moustache the pilot did his preflight and oxygen system check with his oxygen mask on. While he was checking the 100% supply, the greasy moustache became connected with pure oxygen and ignited, causing facial burns.

This case demonstrates as well that it's not the procedures that are wrong, but, rather, the man. Pilots and technicians will be instructed early in their careers that oily and greasy objects combined with pure oxygen lead to explosion and fire. Therefore, learn your lessons and keep yourself under control at all times. To avoid human failures, make the words of a famous European statesman your motto:

CONFIDENCE IS GOOD,
CONTROL IS BETTER. ★

616 SQUADRON

In your issue of July '76, MSgt Sylva writes "... Germany produced the only operational jet fighters of the war. . . ."

If MSgt Sylva is as interested in military history as your writeup following his "The Air Force Story" indicates, he will be very interested to know that The Royal Air Force also had an operational jet fighter in WWII.

616 Squadron, RAF, was operational with the Meteor in the summer of 1944 and scored many successes against the V1 "Doodlebug" beginning in August of that year. 616, I believe, lays claim to being the first operational jet squadron in the world; a claim with some validity, the Luftwaffe being unable to use the Me 262 as a fighter initially because of Hitler's insistence on its use as a bomber. A 262 squadron was only formed in early '45 as a last ditch effort.

Capt WJ McWilliams
Canadian Forces Base Europe
CFPO 5056

"DON'T BREAK THE GLASS"

The article "The IFC Approach" in the September 76 issue of *Aerospace Safety* dealt with the problem of blocked pitot and static systems. I found the article most interesting and informative, but I must disagree with one of the recommendations.

Please don't try to break instrument glasses!

Long ago I was flying night fighter Mosquitos in the other Canal Zone. One dark night I was climbing over the equally dark Sinai desert when I realised that all was not well with the pressure instruments. I deduced that the static line was restricted and was becoming more so (my mental processes are not outstanding; I simply had 90 minutes fuel left and I knew the Mosquito pretty well—time and experience were on my side).

mail call

Send your comments and questions to:
Editor, Aerospace Safety Magazine
AFISC/SEDA
Norton AFB, CA 92409

In accordance with the current teaching, I asked my navigator to break the VV1 glass with the point of the crash axe. He made a couple of blundering attempts—he had to use his left hand—before I snatched the axe from him and had a go myself. On my third attempt the axe bounced off the glass and went through the attitude indicator. Long silence!

Fortunately at that time we used to practice patterns using power versus attitude, exactly as described in your article. Fortunately, again, in those days the pilot had no scope to blind him so I was able to discern the horizon sufficiently well to be able to get safely to the longest runway within range.

The lights on the airfield and in the Nile Delta gave me sufficient attitude reference to apply the approved technique and I knew that the airspeed indication would be near correct at low altitude; nevertheless I added a few knots because that would be opposite to any likely error. It worked!

I don't think my boss, and his boss, really believed my tale. They didn't say much, but the Wing Commander had the VV1 extracted from the aircraft and then attacked the glass with a ball pene hammer. Fortunately, yet again, it kept bouncing off the glass and I was able to sneak quietly away before he hurt himself.

The cause of the problem was a bug which makes a nest of rotten vegetation in small tunnels. We found some part finished nests the next day in other aircraft—it must have been the mating season.

What did I learn?

a. Relevant to the article, the first noticeable effect of blocked static during the climb is a reduced rate of climb, not a reduction of airspeed. You try to maintain the normal indicated speed but as a result of the higher (lower level) static pressure you are carrying you fly too fast and the climb rate is lowered. A blocked pitot source will give the same effect, but in this case because you are actually flying slower than intended.

b. An ILS or GCA approach would be better, even in VMC, because deviations from a smooth flight path would be more apparent. I believe we never had GCA or ILS in Egypt, probably because it was CAVOK for 364½ days a year—and it was a long time ago.

c. A formation lead would be best, but as lonely night fighters we did very little formation practice.

d. Assume all instrument glasses are designed for pressurised cockpits, as mine was; I believe most pressure instruments are nowadays, for standardisation in production and supply. And anti vibration mountings give a good trampoline effect.

e. Navigators are not always stupid—sometimes the axe is in the other hand!

f. This is the one case where in an emergency you don't break the glass.

g. Finally, don't relax until you're out of the aeroplane. Taxiing back, greatly relieved, from this incident I very nearly collided with another aircraft on the unfamiliar ramp.

May I just add that we find *Aerospace Safety* a most useful and interesting publication and, as you can see, it is very widely read.

Group Captain W E Kelly
Headquarters Strike Command
Royal Air Force High Wycombe
Buckinghamshire ★

OPS TOPICS

STUCK SWITCH

An F-4 crew used cartridges for engine start when scrambled in support of a local exercise. Everything was normal through the ground exercise until the crew noticed that the lox gauges were reading zero. The aircraft was shut down, written up for lox servicing and then recocked. About 4 hours later when the AC attempted to verify the status of the lox by moving the nr 1 engine master switch to on for electrical power, the nr 1 starter cartridge fired. The engine start switch had stuck in the left engine position during the previous cartridge start. The moment electrical power was applied through the master switch it fired the cartridge.

THEY'RE EVERYWHERE

A T-39 was making an approach to a western air base in a dense traffic area. The visibility was about 3 miles. As the T-39 was on glide path (about 5 miles final), the radar final monitor called out traffic at one o'clock. The pilot saw a light aircraft co-altitude traveling in the opposite direction. The aircraft passed off the wing about 300 feet away.

IF YOU DON'T KNOW—DON'T

The KC-135Q crew was tasked, as part of their mission, to deliver a NORS part to another base. Since the crew chief would not be going and the crew was not familiar with the fuel system, the crew chief briefed the crew briefly on how to refuel before departure. After the aircraft landed at the transient base, the number 2 refuel valve switch, located on the copilot's panel, was placed in the open position by the copilot. Positioning of **this switch** had not been discussed with the crew chief before departure, but the crew thought this valve corresponded to the manual refueling in the right wheel well and it should be open to refuel through the left SPR. The proper position should have been closed. Next, the boom operator told transient alert personnel to top off the main wing tanks and that fuel flow would stop automatically when the tanks were full. The boom operator indicated no one would be in the cockpit. Tech orders were available but instead the TA crew relied on the boom operator's instructions. Transient maintenance personnel connected the fuel to the left SPR and began to transfer. The fuel was routed through the open number 2 valve into the aft body tank. No cockpit fuel panel monitor was available to detect the fuel flow to the incorrect tank. The tail support strut had not been installed as required. After 25,000 pounds of fuel had been transferred into the aft body tank, **the aircraft settled on its tail** with $48,870 worth of damage.

NEW TRAINING SYSTEM (MUTES)

ASD has developed a new training system for air combat called Multiple Threat Emitter System (MUTES). It is a computer that simulates signals generated by enemy radar, missile and weapons complexes. The advantage to MUTES over previous systems is the realism that MUTES can transmit five different signals at once. This allows the Air Force to simulate a true combat environment when the crew is faced with numerous hostile threats simultaneously. The MUTES is a highly adaptable system. As new threat parameters are discovered, all that is necessary is a computer programming change. The system is now undergoing OT&E at one of SAC's radar bomb scoring sites.

OPS TOPICS

CHANGES TO THE NOTAM SYSTEM

During the past several months, there have been some changes in the NOTAM System. Anyone flying now is aware of the new hourly update system. This system has given us some real benefits in terms of error reduction and expeditious posting of NOTAMs. One other innovation of particular interest to pilots is that bases establishing prior permission required (PPR) status are requested to include an AUTOVON number for contact as part of the NOTAM. In other changes, the European and Pacific NOTAM facilities will be deactivated and the Central NOTAM facility at Carswell will assume worldwide responsibility. This action will be complete by April 1977. Further into the future, crews can look for elimination of the present NOTAM boards. Instead, computer and high-speed printer systems will prepare a printed copy of requested NOTAMs for the aircrew.

QUESTIONABLE ABORT

A three-place flight of A-6Es was aligned in starboard echelon on the 150-foot-wide runway. Clearance for takeoff was received and the leader on the far left side of the runway began to roll. Prior to this the leader had switched the flight to departure control frequency. No radio checks were conducted on departure control. Just before the leader commenced his takeoff roll, he had switched his UHF to the squadron base radio frequency to give the SDO a takeoff departure call.

After 5-10 seconds of takeoff roll, the leader elected to abort because of a left generator failure. He transmitted "505 is aborting." This was SOP and should have alerted the other two aircraft as to the leader's intention. However, in this instance, the leader had neglected to switch back from the base radio frequency to departure control. Therefore, his vital transmission was not heard by the other two aircraft. Number 2 who was lined up on the centerline of the runway, waited 5 seconds after the leader commenced to roll before commencing his takeoff. At about 80 knots, No. 2 noticed he was closing on the leader and reduced power 2 or 3 percent. Shortly thereafter, he realized that No. 1 was aborting and he decided to abort also. He transmitted: "503 aborting, too." When it became obvious that he was going to overtake the leader, No. 2 moved slightly to the right to ensure wingtip clearance.

Number 3 did not receive No. 2's abort transmission and began his takeoff roll 5 seconds after No. 2. At 95-100 knots No. 3 noticed a slight closure rate on No. 2. Almost immediately No. 3 realized that the leader and No. 2 were aborting. He too was committed to abort as No. 2, having steered right to avoid the leader, was a hazard to No. 3's takeoff. Existing weather was good and the loss of one generator was not considered an extreme emergency requiring an immediate abort. Additionally, consideration should have been given as to what effect the leader's abort would have on the other two aircraft taking off.—*Weekly Summary*/10-16 October 1976.

CORRECTION

In the November issue the OPS TOPIC "Too Much Trouble" contained an error in type of aircraft. The type was a CH-53 owned by another service not an ARRS HH-53.

OPS TOPICS

INVISIBLE TORNADO

You have all heard of the "white tornado." How about the "invisible tornado?" During the last 5 years, there were 76 accidents and 19 deaths caused by wake turbulence. For you new folks in the flying business and any old timers who are still nonbelievers, here is a little story from an NTSB Safety Bulletin:

The Cessna 150 was on downwind to Runway 5R with the student pilot flying, when the instructor observed a KC-97 on short final and another KC-97 about 7 miles out. The instructor requested a short approach between the two KC-97s. The tower cleared the Cessna for the short pattern and cautioned about wake turbulence. At about 200 feet the Cessna encountered wake turbulence from the landing KC-97 and began to roll—first to the left and then to the right. The instructor added full left aileron and full power. The wings started rocking uncontrollably with the left wing low and the aircraft drifted swiftly to the right in spite of all the instructor's efforts. The Cessna's left wing tip struck the ground; and the aircraft slid to the left and forward. The nose gear sheared and the aircraft slid to a stop. The occupants were uninjured but the aircraft was badly damaged.

WHAT RADAR DOESN'T DO

The crew of an AC-130 was cleared by RAPCON to descend from 9,000 to 6,000 feet MSL to commence multiple GCA approaches. While passing through 7,500 feet MSL, the crew saw a light aircraft passing over the top of the AC-130, missing the aircraft by only 50 feet. An immediate call to RAPCON confirmed no reported traffic in the area and **RADAR SHOWED NO TRAFFIC.**

A MATTER OF PRIORITY

Recently, an official USN message carried the following report of rescue operations involved in a major flood. "During the 4 days and nights of operations the SAR helos from NAS Northwest evacuated 108 people, 8 dogs, 2 cats and 5 marines."—*Approach*/November 1976

COLLISION COURSE

A formation of nine C-130s was making a VOR approach to Runway 34 and was level at 5,000 ft. A locally based KC-135 was cleared to hold at the IAF and then, as the aircraft approached the fix, was cleared for a high TACAN to Runway 34 to maintain 6,000 MSL. The KC-135 pilot acknowledged the clearance but failed to acknowledge the altitude restriction. Approach Control then issued clearance to a transient T-38 for a straight-in TACAN approach to Runway 34. The KC-135 pilot copied the clearance meant for the T-38 and read it back to Approach. The Approach Controller failed to catch the mix-up and advised the KC-135 of the C-130s at 5,000 ft. The C-130s were also advised about the KC-135 that would be passing at 6,000 ft.

The pilot of the KC-135, believing he was cleared to descend, narrowly missed the nr 2 C-130 at 5,000 ft. At the time of the near miss, Approach Control was working two sets of aircraft with the same two digit call signs. This may have prevented the controller from recognizing the pilot's error in not fully identifying himself when acknowledging a clearance. When using a call sign be sure it is complete so that you will be positively identified. ★

We're Going Where?

CAPTAIN MICHAEL FARSON • Directorate of Aerospace Safety

Never dropped in at Podunk or Evertight Airpatch? No sweat. Here's a new program that shows you the set up before you ever take off.

Kaneohe Bay MCAS, Hawaii

Runway 31, NAS Alameda, California

Runway 21, Kirtland AFB, NM

"Hey Jack, where are you headed?" "Barbers Point." "Say Joe, have you ever been there?"

"No, but I hear they have this slide tape program at the Operations Center that tells about the field."

That's right guys. You're talking about MAC's Airport Qualification Program (AQP). This is MAC's way of trying to reduce the risks associated with operating into unfamiliar airfields. The AQP was conceived as a result of the C-141 crash at La Paz, Bolivia. MAC training developed the program to prevent similar accidents by increasing the aircrew's awareness of potential airfield hazards. A slide-tape module was chosen as the most cost effective way to brief those hazards to aircrews.

The standardized program begins by describing the airfield location, listing alternate airports, and highlighting hazardous terrain and obstacles. Then, significant airport characteristics such as possible illusions, taxi hazards, and unusual local weather phenomena are covered. The program concludes with sequenced photographs taken on final

AQP package contains charts showing prominent terrain features.

Also possible hazards near runway are shown.

approach to each landing runway and usually lasts from 5 to 10 minutes.

Currently, MAC has selected approximately 120 airfields for production, and 30 of these programs have been completed. The rated officer producers are quick to point out that they aren't trying to tell crews how to fly approaches. They merely want to make crews aware of the threats in the airfield environment.

The AQP modules have great flexibility. They can be incorporated into local and simulator training programs. They also provide useful information prior to unit deployments, exercises, or contingency operations. MAC plans worldwide distribution of these programs, along with easy access to them so they can be reviewed whenever a crew requests.

The Airport Qualification Programs are available upon request through the USAF Central Audiovisual Library System distribution system.

Should you include this program as a necessary part of your accident prevention plan? The 5-10 minutes invested may indeed be time well spent. ★

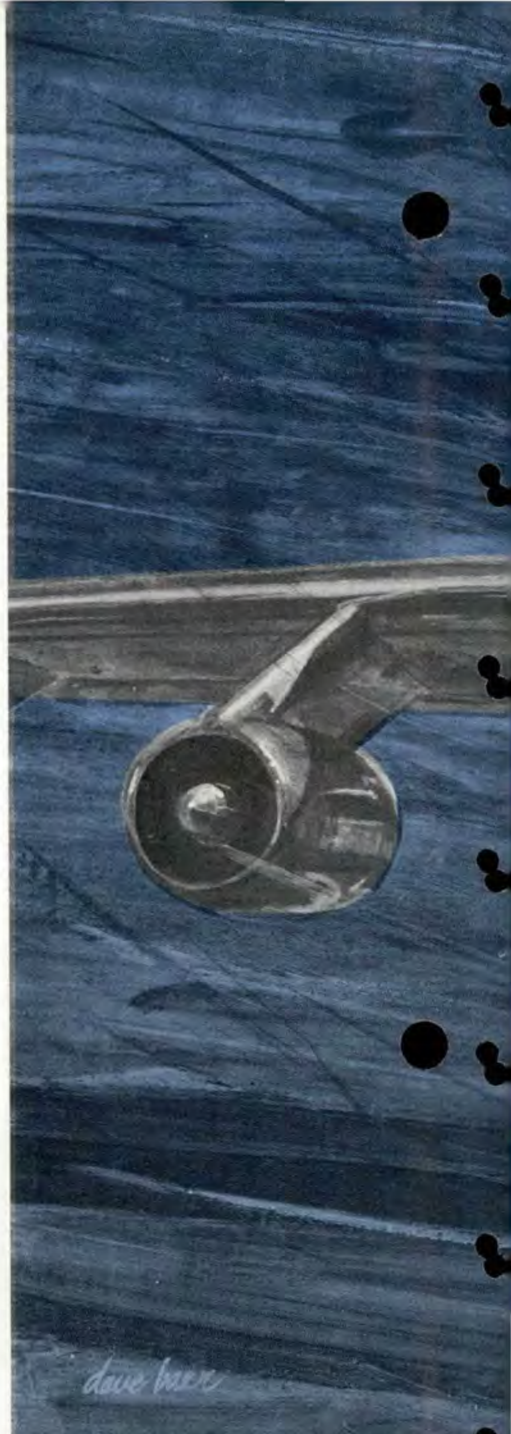
NAS Alameda in San Francisco Bay. Runway 7-25.

Relationship of runways to hills is shown for this base.

Standard runway depiction.

Throttles retarded, spoilers deployed, nose up pitch . . . the C-141 still was descending at 8000 feet per minute . . . it was a . . .

Wild Ride in a Big Bird



Events of the past year in both civil and military aviation indicate a need for reminding aircrews of the vicious nature of thunderstorm weather and the need for its avoidance.

Our educational campaign began with the article "Low Altitude Wind Shear" in the October issue. Following is a first person account from the October 1969 AEROSPACE SAFETY magazine of a C-141 encounter with a violent thunderstorm over the Pacific. The author was Capt Charles L. Pocock —now Lt Col Pocock, C-141 project officer in the Directorate of Aerospace Safety.

The wheels folded into the belly of the giant C-141 as we started turning to 090 degrees, heading out over the long white beaches and away from Danang. As the blue-green South China Sea fell away, the hurrying ships, airplanes and men of busy Danang once again seemed far away.

The 30,000 pounds of filthy and broken retrograde cargo in this giant silver bird seemed strangely out of place. The ten, perpetually tired, sweat soaked marines in their green utilities basked in the air-conditioned comfort and started to look for a place to sleep. These men who had come to this green hell a year ago as boys now started to think 24 hours ahead to when they would be home.

An hour later, we received clearance to climb from flight level 270 to 370. As the pulsating engines started to grasp for altitude again, we entered solid cirrus clouds at FL 290. At level off, the cirrus was so dense that the radar was giving returns from only about six miles ahead. The navigator assured me that the radar was functioning, but dense ice crystals were preventing returns.

The VHF radio was now totally unusable and the HF radio was little better. Other aircraft, on UHF, Company frequency, advised that the cirrus extended from below 20,000 feet to above 41,000 feet. As we pressed on, I knew that the typhoon

moving north from the Philippines was going to cause problems until we were well north of Okinawa.

Kilo Whiskey (KW) beacon was the next fix. World 397 had just advised Taipei Control that he would be deviating 30 miles south of track for thunderstorm avoidance, but I didn't have any idea where he was. I hoped our radar would give us some warning if the storm was on our track.

Ten minutes south of KW, we encountered moderate turbulence. I turned on the continuous ignition, retarded the throttle three hundred pounds fuel flow per engine, disconnected altitude hold on the autopilot, and announced on the PA system that everyone should fasten their seat belts.

"What do you see on your radar, Nav?"

"Nothing."

Immediately the airplane was in a 60-degree bank. The attitude indicator showed 30 degrees nose up pitch. The vertical velocity indicator and altimeter were climbing and the airspeed was falling rapidly. I disconnected the autopilot, pushed forward on the yoke, and when the dot on the attitude indicator was approaching the horizon line, rolled the aircraft level. The throttles were at takeoff rated thrust and even though I had 10 degrees nose down pitch, the vertical velocity was still indicating an 8000 foot per minute rate of

Wild Ride in a Big Bird

continued

climb with 200 knots airspeed.

Milky rime ice was building up rapidly on the airplane and the hail sounded like skeletons on a tin roof. Lightning and Saint Elmo's fire made the whole airplane sparkle and everyone's hair was standing on end.

The turbulence was so bad, I thought the instrument panel was going to shake off. I locked the shoulder harness and pulled the straps tight. That helped a lot. Holding the airplane with my left hand, I started swatting at anti-ice switches with the right, hoping I could get enough on before we fell out of the sky.

As the altimeter went through 43,000 feet, I realized we had been in the storm for about 20 seconds and the way out was behind us. I started a left 15-degree bank. As this 125-ton monster grudgingly responded, the noise from the hail was deafening.

The navigator called out, "Slow the airplane down before we peel the radome off."

And the engineer announced, "You're overboosting the engines and we are almost at stall speed."

I knew that more than 15 degrees of bank would probably stall the airplane. But I didn't want to use more than 10 degrees nose down pitch because we would probably be in the down cell momentarily. The windshields now had iced over except for about nine-inch squares in the center of each.

As we passed 48,000 feet, we started to descend, more suddenly than we had started to climb. Everyone was hanging by his seat belt. Briefcases, tech orders, oxygen masks, pencils and anything else that wasn't tied down was on the ceiling and floating through the cockpit. I knew we had changed cells from the updraft to the downdraft and immediately pulled back on the yoke.

As we went from 10 degrees nose down pitch to 15 degrees nose up, the overspeed warning sounded. I had the throttles retarded and the spoilers deployed to the flight position, but we still had 8000 feet per minute rate of descent with 15 degrees nose up pitch. We were now on a reciprocal heading from which we entered this storm. I rolled the wings level and hoped we would soon be out.

The navigator said, "Why are we in a 45 degree bank?"

Again I felt the adrenaline surge and replied, "We're not."

"Look at the copilot's attitude indicator and HSI," he said.

As I glanced across the cockpit, the realization that one set of instruments had failed almost made me sick. (For some reason, the thought passed through my mind: I wonder if the Marine Corps taught these kids to swim.)

I made up my mind to follow my instruments come what may. I checked my BDHI and saw that it was indicating a turn from west to north (if that was true, we were going right back in the storm). But I thought the copilot's attitude indicator said left bank. Quickly I glanced across the cockpit. Left bank and right turn—his instruments have failed and mine are OK. I felt better now and went back to other immediate problems.

Still high airspeed, but slowing, still 4000 feet per minute with nose high attitude, but not nearly so rough. Heading pretty close to south —we should be out soon. We better be—now 22,000 feet. Then as rapidly as it began, it stopped. We were in smooth air once again, now at 19,000 feet and below the cirrus.

As the ice started to sublimate and peel off, I slowed to about 220 knots and began a slow VFR orbit. We began to make a damage assessment. Luckily, our passengers had their seat belts on and the cargo had been well secured. The copilot had been in the lower bunk. He had his seat belt fastened and remained there throughout the encounter with the thunderstorm. That was a good thing, he might have been injured.

The navigator checked the tail surfaces with his sextant and they appeared to be undamaged. We found no damage to the leading edge of the wings or to the engine nacelles and the radar seemed to be working normally now, so I knew the radome was intact. The copilot's attitude indicator was still locked in a 45 degree bank, but seemed to be slowly correcting. The Nr 2 C-12 compass had failed, but by placing the mag/DG switch to DG and slaving it to the correct heading, we were able to re-engage the autopilot.

I requested and received clearance from present position, somewhat south of KW, to Kadena at FL 190. As we started northeast toward Kadena, we could see the bottom half of this fearsome adversary. It was about 70 miles in diameter. This time we passed well clear.

As we approached Kadena, they reported thunderstorms with heavy rain, so I elected to proceed straight on to Yokota, our original destination. Although the crew and passengers were obviously shaken, that big, beautiful airplane had come through unscathed. The flight recorder indicated that design limit loads had been exceeded twice but examination proved that no elastic limits had been exceeded.

I have always respected thunderstorms and given them a wide path, but after this experience whenever the weatherman mentions thunderstorms he has my attention—right now! ★

DEBRIEFING A STEP IN THE RIGHT DIRECTION

FRED C. MUELLER • McDonnell Field Service Engineer

This story relates to an incident which emphasizes that very important ingredient in effective maintenance—communication between people who fly airplanes, and people who keep them ready to fly. This vital link, in more simple terms, is called "debriefing."

The need for good, effective debriefing is amplified when we are confronted with repeated inflight discrepancies that cannot be duplicated on the ground. When problems like this arise, the discussion of the problem between two professionals, a pilot and a maintenance man, usually becomes the primary source of information with which to confront the problem. This focus on "communication" is what debriefing is really all about.

Some time ago we ran into a recurring compass error problem on one of our Phantoms. The initial discrepancy was a write-up that indicated an inflight compass error of approximately 50 degrees. The problem could not be duplicated on the ground; however, a functional check of the compass system was routinely performed. Predictably, everything checked out fine.

The technician tested the sensitivity of the compass transmitter by moving a metal object (in this case, a tool) back and forth under the compass transmitter location (Door 197). The compass did not appear to react to this stimulus. On the strength of this check the compass transmitter was changed. The aircraft was then taken to the compass rose and calibrated.

The aircraft flew one good flight but the problem repeated again on the next flight. Moisture was found in the compass transmitter electrical connector on the aircraft wiring side. The connector was dried out (or so we thought) by blowing shop air into it.

A couple of good flights later the problem cropped up again; once more moisture was noted within the connector. This time gaseous nitrogen was used to dry the connector. The compass transmitter cable was reconnected, the aircraft stood overnight, and the next day moisture was again found in the connector. Again we went through the drying process, only to have moisture reappear a few hours later. Eventually the connector was replaced.

The airplane flew trouble-free for several days, and we thought the problem had been whipped. But sure as the sun comes up in the

". . . debriefing is where the money is in the maintenance game." Crew above, at George AFB, is surrounded by debriefers intent on getting accurate account of any discrepancies discovered by the crew.

morning, the original trouble (a 50 degree compass error) popped up again, although replacement of the connector seemed to have resolved the problem of the moisture in the connector (exactly why we kept finding the moisture remains one of those unsolved mysteries).

At this point we steered away from the compass transmitter and began checking the other system components. By the time we were done we had replaced each and every component in the system at least once besides running these components across the test bench. At the same time, several more good flights were recorded on the aircraft only to find the compass error cropping up again.

By now you're probably wondering why we were engaging in apparent "shotgun" troubleshooting. Why couldn't we pin the problem down to a more specific area? The answer is that we simply did not have, at any time, a good, clear, and concise picture of what the discrepancy was. All we had were the aircraft write-ups which simply informed us that the compass was off a certain number of degrees (the amount of the error varied from flight to flight). Though the aircrews were debriefed after each flight, no good, usable information was gathered. Debriefing forms were dutifully filled out (the yes/no questions were checked off, etc.), but the remarks area did not contain that extra bit of information that would help us analyze what was actually happening during the flights.

We finally arranged for a special flight of the aircraft. The aircrew was briefed before the flight, and then was debriefed following the flight. A special checklist was developed for the aircrew to use as a guide for checking out the system. A wealth of information was accumulated during the aircrew debriefing—data from which we were able to ascertain, with reasonable certainty, that the compass transmitter signal was being interrupted.

How was this determined? We found that the compass reading remained unchanged in the compass mode and the error remained constant in the slaved mode. In addition, the error varied with the number of degrees of any turn in the DG mode, and the compass could not be synchronized with the sync indicator needle remaining centered at all times. This was a reasonable indication that there was no compass signal from the compass transmitter. The fact that the sync indicator needle would not go off center seemed to bear this out. The only movement of the compass indicators seemed to come from the gyro source, but none was evident from the transmitter.

Armed with this information, we found the rest of the trouble analysis (and solution) to be easy. All three legs of the compass transmitter signal were found to have loose splices in the CF-3 splice area. The wires were respliced, and the problem was solved.

Is it possible that this story might have had a different complexion if the full data had been made available during the first debriefing? Maybe that might be indulging in rather pointless speculation; however, I believe we can say that it was, in the end, debriefing-type information that enabled us to resolve the problem.

Our point: debriefing is "where the money is" in the maintenance "game." Inadequate debriefing costs time and money; effective debriefing provides important savings. It's your move.—Product Support Digest

The mission is over—not quite. Whether it was a long, tiring overseas flight or just a quick out-and-back to the range, there's one more thing—maintenance **debriefing.** Okay, so let's take a look at this subject from the positive side. First is the question of the value of the debriefing, which can be answered very briefly: It depends on the amount of smarts and effort put into it. Assuming a lot of both, the debriefing can be a definite contributor to both corrective and preventive maintenance.

What are the ingredients of a good debriefing? Here are some ideas supplied by debriefers of the 4th Tactical Fighter Wing which operates F-4s.

• Aircrews should go directly from their aircraft to debriefing. The debriefing section is manned and programmed to debrief aircraft/aircrews in the order they appear on the printed flying schedule. Delays in reporting to debriefing sometimes cause bottlenecks for other crews, debriefers and the accomplishment of required maintenance actions.

• If all debriefing stations are filled when the crews arrive, they should be seated in the lounge and use the waiting time to double check takeoff and landing times and discuss system malfunctions within the crew. They should avoid talking to crews already in the process of debriefing. These conversations lead to confusion and omissions.

• Aircrews should be thoroughly knowledgeable of all facets of their responsibilities with respect to the 781 and 781H with particular emphasis on takeoff, landing and flight duration times. Incorrect entries will reflect erroneous aircraft utilization and corrections waste manhours. It is absolutely essential that flying time recorded by maintenance and operations agree.

• Both aircrews and debriefers should review all open writeups in the aircraft forms prior to entering system discrepancies in order to avoid duplicating existing entries.

These techniques are considered as "openers" to the detailed discussion that should characterize the debriefing procedure. Debriefers are usually the leaders in this exchange as the standard debriefing checklist is being followed. Additional questions from the debriefer reflect his knowledge of current failures and corrective actions.

Aircrews should "listen up" and participate. This is a real opportunity to ensure that total systems interrelationships are thoroughly understood by the debriefers. Aircrews should also keep in mind that additional specialists can be rapidly dispatched to debriefing (including specially formed groups such as flight control teams). The maintenance debriefer has extensive knowledge in specialized areas, but may need help in total systems integration and analysis. The debriefing process should not be rushed. If effectively accomplished, it will save many mandays of valuable labor. ★

SMSGT DAVID BUZARD, Air Weather Service, Scott AFB IL

You've just "completed" a trying flight, circumnavigating thunderstorms en route, shooting an approach to minimums, and landing a hot jet on a slick runway. All you had to do was finish your rollout and taxi in. Why, then, are you sitting dazed beside the runway in a busted bird? Because you lost control of your aircraft and slid off the runway—that's why.

IR08, WR//, SLR16P DRY, LSR-18, RCRNR, PSR12 SANDED

Do the above characters, letters, and numerals mean anything to you? As a pilot, you should recognize this sampling of the many runway surface conditions (RSCs) and runway condition readings (RCRs) which may be appended to USAF surface weather observations when transmitted over global weather circuits. Did you know that weathermen do not determine RSC and RCR?? You didn't!! Well it's a fact—they do not. The determination of RSC and RCR (as applicable), when runways are partially or completely covered with water, slush, ice, or snow, rests with the Chief of Airfield Management.

The role that weathermen play is in the **dissemination** of RSC and RCR data: They include the RSC and RCR report in verbal aircrew weather briefings, to include appropriate ramp/taxiway data.

When the RSC and RCR report is received from base operations, weathermen transmit the report via global weather circuits as a remark either in a single element report or appended to a Record or Special surface weather observation in progress. They then continue to append the RSC and RCR report to hourly observations until the data are amended or cancelled by base operations, or until base operations closes at a limited duty airfield. When base operations closes, "RCRNR" (indicating no report) is appended to the hourly surface observation. (This remark may be omitted if the runway is known to be completely dry.) "RC-RNR" is discontinued when base operations reopens. The RSC and RCR data are not included on surface weather observations when disseminated to local (on base) using agencies.

The RSC/RCR reported relates to the present condition of the runway and not always to the present weather condition and temperature reported in the surface weather observation. Therefore, as a pilot, if you keep abreast of your destination weather, you aren't surprised when you land under a 5,000 foot scattered deck, 15 miles visibility, with no weather or obstructions to vision reported and still have a wet runway under you.

For those of you who couldn't decipher the RSC and RCR remarks at the beginning of this article, the following is provided:

IR08— Ice on runway, decelerometer reading 8.

WR//— Wet runway (decelerometer readings are not reported for wet runway conditions.)

SLR16P—Dry slush on runway, decelerometer reading 16, patchy; remainder of runway is dry.

LSR18— Loose snow on runway, decelerometer reading 18.

RCRNR— Base operations is closed; a RSC/RCR report is not available.

PSR12 SANDED—Packed snow on runway, decelerometer reading 12, runway has been sanded. ★

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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.

CAPTAIN

Robert G. Downs

CAPTAIN

Robert S. Coombs

366th Tactical Fighter Squadron
4th Tactical Fighter Wing
Seymour Johnson Air Force Base, North Carolina

On 8 April 1976, Captain Downs, aircraft commander, and Captain Coombs, weapons systems officer, were flying a training mission in an F-4E. Although no thunderstorms were forecast and no evidence of heavy precipitation was seen on the aircraft's radar scopes, the aircraft rolled and yawed and the crew heard two loud "cracks" and saw a bright flash of light. Although in the weather, Captain Downs was able to maintain formation, disengage stability augmentation, and check engine instruments and attitude indicators. All three systems were in disagreement and the associated heading systems were spinning. Unable to maintain formation position, Captain Downs initiated lost wingman procedures, rechecked engine instruments and noted the right engine unwinding to 60 percent rpm. The airspeed read zero, vertical velocity was frozen at minus 500 fpm, the altimeter was stuck at 6000 feet, and the AOA indicator was frozen at 9 units. After two airstart attempts the right engine recovered. Captain Downs selected afterburner, centered the turn needle and ball, and started what he felt was a climb to VMC. The VVI still read minus 500 fpm; but the altimeter began to increase erratically. The rear ADI was close to being logical but still could not be trusted. Captain Downs began to orbit for a rejoin but could not maintain VMC. Afterburner was selected once more and another climb initiated. With assistance from Approach Control, Lead acquired a radar contact and was able to confirm Captain Downs' airspeed and heading from a 10-mile trail position. Following rejoin in VFR conditions, Lead advised Captain Downs that an 8-inch by 4-feet piece was missing from the top of the vertical stabilizer, but otherwise the aircraft appeared undamaged. Penetration and approach on the leader's wing was accomplished with a drop off on short final for a single ship landing. The teamwork and professional airmanship exhibited by Captain Downs and Captain Coombs possibly saved a valuable aircraft and two valuable lives. WELL DONE! ★

The Unessential Man

★ *To his first shirt, he is one of the men that can best be spared for a base beautification detail.*

★ *To his shop chief, he is another piece of paper work.*

★ *To a flight line mechanic, he is some boob to scrounge off of.*

★ *To maintenance control, he is just another body to be deployed wherever needed.*

★ *This is the unessential man. Why is he unessential?*

★ *The unessential man does not forecast weather, replace electrical circuits, control air traffic, or even work on jet engines. All he does is pack parachutes.*

★ *A Parachute Rigger goes to school for several weeks to learn his trade. The government spends a few thousand dollars to train a man to save the life of a pilot worth several thousand dollars.*

★ *The egress system is designed to get the pilot out of a plane. The parachute is that pilot's last chance for life.*

★ *A Parachute Rigger is seldom thought of when there is a successful ejection. The next time a pilot has to punch out of a bird, thank God and your Parachute Rigger when you look up and see a good chute.*

Artie D. Thrower
Luke AFB, Arizona

A Parachute Rigger