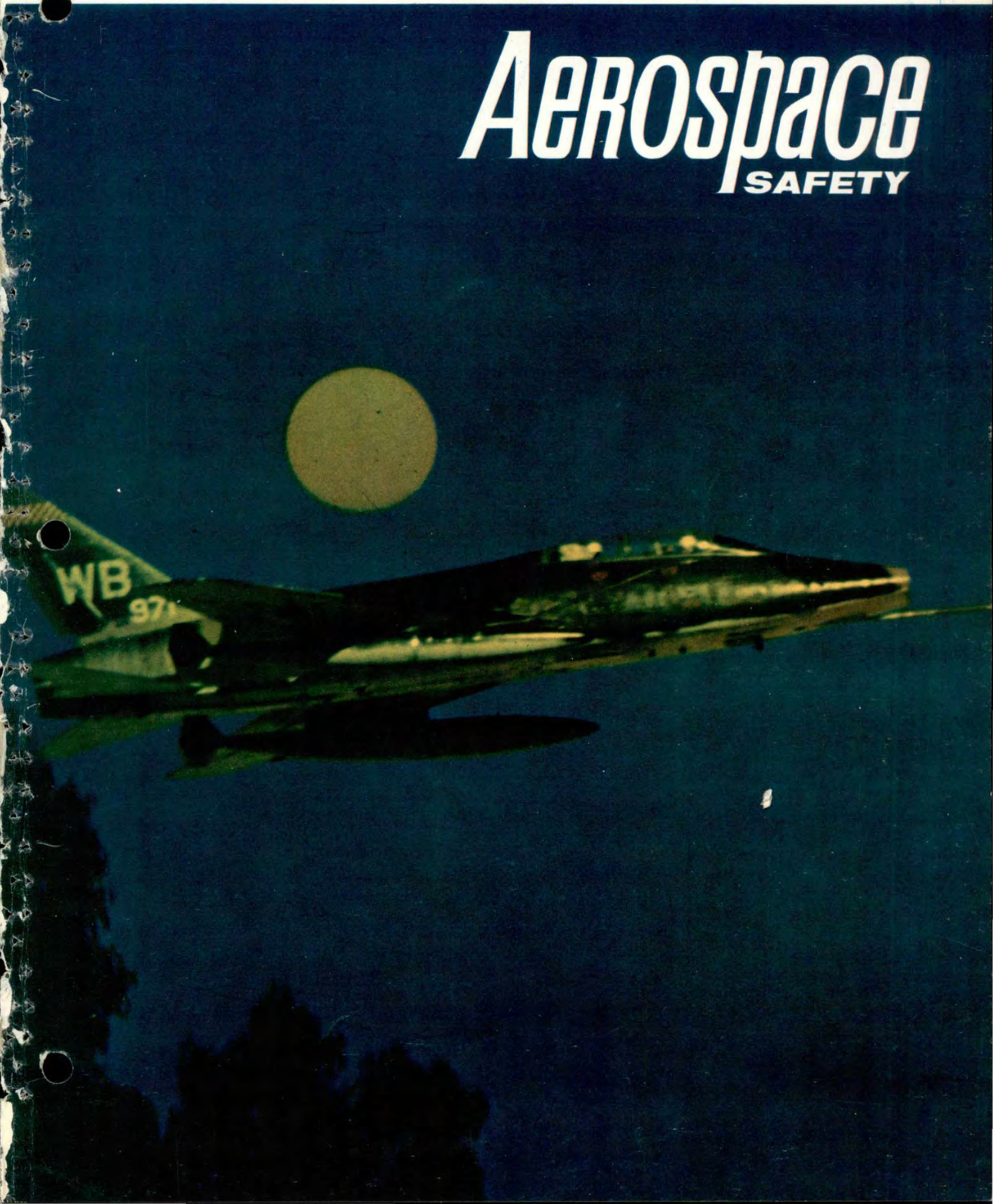
UNITED STATES AIR FORCE • APRIL 1972

Aerospace SAFETY



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UNITED STATES AIR FORCE APRIL 1972

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

APRIL 1972 AFRP 127-2 VOLUME 28 NUMBER 4

THE COMMANDER AND SAFETY

Major General Edward M. Nichols, Deputy Inspector General for Inspection and Safety from September 1969 through February 1972, retired 29 February. One of his last official acts was to express what we consider to be some very cogent thoughts on the role of management in accident prevention. Aerospace Safety *is pleased to present these to our readership, especially those in command and supervisory positions.*

During my very close association with inspection and safety over these past few years I have come to the firm conclusion that "command and its relationship to effective mission accomplishment" are basic to the success of any well run unit. Based upon hundreds of base and wing inspections, UEI teams have found that practically without exception it was the knowledgeable commanders who ran the efficient, well managed, and accident-free operations. By "knowledgeable" I mean that they had gained first-hand information by personal observation and from the management tools available within the various functional areas of their mission. They were able to measure performance, determine status, and take corrective action before the situation got out of hand and produced an accident.

There are internal management audits within each function on a base that will quickly reveal problem areas and overall effectiveness. Quality control and the management analysis section in maintenance, the stan/eval section in operations, and industrial engineering in civil engineering are but a few examples of internal management tools which a knowledgeable commander will use. For example, QC reports provide a review of daily activities, aircraft/missile condition, the job accomplishments in the maintenance complex; and from these can be ascertained work-force inequities and/or mistakes, training weaknesses, and supervisory deficiencies. The commander who is completely familiar with his stan/eval section can assign additional training, schedule his crews more selectively, or accept the toughest mission offered because of the confidence he has in the standards demanded of his pilots.

One thing for sure, no commander is going to get knowledgeable by sitting behind his desk reading and issuing memos. His presence is needed, because in addition to the self-education process, it also serves as an indication of his personal interest. And if he is interested enough to be down in the tire shop, motor pool, engine shop, sitting in on a stan/eval debriefing, or out on the ramp watching the work being done when it is dark and cold, you can bet that the rest of his supervisors will also be there—and with that type of supervision, things just don't go wrong!

In looking at command and its relationship to effective mission accomplishment, we must take cognizance of the fact that approximately 80 percent of the people and money available in support of the mission are in the logistics area. Yet this is where the average commander spends approximately 20 percent or less of his time. This isn't particularly surprising in view of the fact that few commanders have much experience and background in the logistic areas. For this reason I would strongly suggest that a reorientation of priorities by commanders is in order. Agreed, the mission is to fly and to fight. But behind the thunderous crack of the afterburner cutting in, there are the less glamorous aspects of running an outfit that are of direct concern to the commander if he is to achieve any degree of effective management. To a great extent, his knowledge of these less glamorous areas will have a tremendous influence on their management and effectiveness. If his influence is great enough, the end result can only be that the jobs are done right and economically—and if they are done right, they will be done safely. ★

Edward M. Nichols

Major General, USAF
Deputy Inspector General
for Inspection and Safety

go know go

TAKEOFF AND LANDING DATA CARD
CONDITIONS

	Takeoff		Landing
Runway length			
Gross weight			
Runway air temp			
Press. alt			
Surface wind			
RCR			
Headwind/crosswind component			

TAKEOFF

P_t5 (normal)			
P_t5 (anti-ice, as required)			
Critical field length			
†Takeoff: Dist		Speed	
†Acceleration: Dist		†Speed	
Safe 1 eng speed		Decision Speed	
†Single eng takeoff speed			

LANDING

	Immediately After Takeoff	Final Landing
Final approach speed		
Landing dist		
Safe 1 eng speed		

†Takeoff items that need not be completed when the available runway is dry and exceeds critical field length by 2000 feet or more.

It happened last year, the year before, and is happening this year. It's the type of problem that always happens to somebody else. (That's probably what the crews who were involved thought, too.) It's an accident spawned by complacency.

All of us have been guilty of this complacency at one time or another. It happens when we release the brakes for takeoff and become something of a passenger, until a glance at the airspeed tells us it's time to establish an angle of attack and go fly. Unfortunately, a lot of things in a machine can go haywire between brake release and rotation. If we aren't paying real close attention, these things can end up in a mangled mess when appropriate action could have resulted in a no sweat abort.

Most of the problems seem to be the result of trying to stuff round pegs in square holes—pilots abort when they shouldn't or don't try to abort when they should.

One pilot was killed and the other seriously injured because the bird just didn't "feel" right. They were actually airborne, with the airspeed increasing, when the decision was made to put it back down and go for the barrier. The pilot in the rear seat ejected. His immediate assessment of a lost cause saved his life. The front seater elected to pursue this exercise in futility. He died.

Post accident investigation found no evidence of a malfunction that would cause the airplane to not "feel" just right. Based on the survivor's comments, the guess is that the pilot pulled the throttle off on a bird that probably would have flown. At any rate this action by the pilot guaranteed that something very unpleasant was going to happen. He was too fast for a successful engagement so the result had to be a wreck.

Another related type is the fire warning circuit, which almost never comes on before taxi or just after landing but always when you would least like to see it. Take the case of the pilot of a two-engine bird who noticed that red glow just about gear up time. Red warning lights in a cockpit call for immediate action, so he took action. Although the aircraft engines were powerful enough to fly with one shut down, the bird simply will not fly when one fails and you shut the remaining *good* engine down. How many fewer accidents would there have been had the pilot taken only five seconds to correctly interpret what was happening, rather than doing something instantly and possibly incorrectly. Sure some emergencies require rapid response so you have to decide, before it happens, if you are the type guy who can "play it cool" for a few seconds before taking corrective action.

An F-4 pilot was making a heavy weight takeoff when he decided to abort between 150-160 knots and after 3000 feet of roll. It turned out to be a routine abort, snagging the barrier at 50 knots.

After the dust settled a peek in the Dash One revealed that, for the weight of this particular bird, takeoff should have occurred after 4000 feet of roll and at 181 kts. Nose wheel liftoff speed was 160K. No wonder the bird didn't feel right—it wasn't ready to fly. It's rather obvious that nobody spent any time checking the takeoff data. This was a "lucky." Maybe next time the runway will be shorter, the air warmer or reactions by the pilot a bit slower. Any one or all of which could end up causing a broken machine.

How do we prevent a "routine" abort from developing into a flaming wreck? We can't say for sure, but we can safely say, where and when to abort generally will have to be decided before you mount up.

Would you believe that somebody went to a lot of trouble just to provide you with all those acceleration, stopping distance and critical field length charts found in most Dash Ones? If he properly uses those charts, a pilot can determine with a high degree of accuracy where decision points are along the takeoff roll. Unless you have these figures firmly fixed in your mind *before* brake release you have just let some of your life insurance lapse.

Don't sit back after reading this, fold your arms and dismiss the possibility that you will never find yourself in a predicament where the "abort" decision has to be made. The possibility of having to make a rapid decision at or near refusal speed is a fact of life that can happen to anyone. And there isn't any guarantee that, even if you plan carefully and have made all those necessary computations, you won't find yourself between a rock and a hard spot. What we are saying is that you will be much better prepared to determine the most *correct* course of action. After all, this is the only thing we can do in any emergency situation, so take out that extra bit of insurance and plan ahead for the day when you turn out to be the "other guy" that aborts always happen to. ★

the hand is quicker than the brain

Two A-37s were making a night formation takeoff. As Lead took the active and called for the engine runup, he elected to leave his taxi light on for takeoff, thinking to himself that immediately after liftoff he would turn it off.

The brake release call was made and both aircraft accelerated to takeoff speed. During rotation the lead pilot reached up to turn the taxi light off, but instead of putting the landing/taxi light switch in the center or OFF position he moved it all the way up which turned the landing lights on. The wingman, knowing that the landing lights work in conjunction with gear retraction, saw the landing lights coming out of the wing and this was a signal to him that Lead was retracting his gear. Although the landing lights were extending rather than retracting, the signal was noted by the wingman who retracted *his* gear. Fortunately, he was airborne by a few inches.

To complicate the matter further, Lead, having made a motion with his left hand when reaching for the taxi light—similar to that of picking up the gear handle—then reached down and picked up the flaps without raising the gear. As he was accelerating to the gear limit speed of 150 KIAS, he checked the gear handle and indicator lights to assure that the gear was up and locked. This is normally indicated by the red light in the gear handle being out. When he saw the three green down-and-locked indicator lights, it signaled to him that the gear hadn't fully retracted and that he should recycle.

He radioed to his wingman that he was coming back on the power to recycle his gear. The wingman, now realizing that Lead's gear hadn't even started to retract, figured that Lead definitely had a gear malfunction and started to advise him to put the gear handle down and leave it alone instead of trying to recycle. Before the wingman could get it all out of his mouth, Lead reached for the gear handle and found it in the down position. The light dawned, and he raised the gear. After he calmed his wingman, the rest of the mission was flown in a rather uneventful manner.

Where would the fault lie had the wingman settled onto the runway? Flight discipline can become so ingrained that a wingman will follow Lead without question, especially if he has flown on his wing many times before. Complacency and habit patterns also enter in. The wingman, having many hours in the aircraft, reacted according to habit when he raised his gear, even though Lead's landing lights were extending rather than retracting. Lead, knowing he had to move the landing/taxi light switch up, merely flipped it up rather than insuring that he had put it in the Off position. Lead also failed to raise his gear because habit told him that after takeoff, you make one upward motion with your hand, and then pick up the flaps. His upward motion in this case, consisted of moving the landing/taxi lights switch, located above the gear handle, to the Up (landing light) position. When he checked for a gear up-and-locked indication, he saw three green lights which he knew shouldn't be there. These lights registered in his mind in the same manner as a red light in the gear handle.

Let's review some of Murphy's Laws.

- In any field of scientific endeavor, if something can go wrong, it will.
- Left to themselves, things will always go from bad to worse. ★

ELECTRICITY-SAFETY-AND THE MAINTENANCE MAN

Many Air Force people are exposed to electrical shock in performing their jobs, and we are all exposed in some degree in our homes. Last year there were six Air Force fatalities due to electrocution, four off the job, two on. This article, adapted from Lockheed California Company's Fighter Maintenance, *contains information that could save your life. We highly recommend it, regardless of your job.—Ed.*

If you have ever passed close to a high-tension power transmission line on a rainy day, a quiet pause near one of the support poles or towers would serve to make those "Danger—High Voltage" signs more meaningful. There is a hissing, buzzing, crackling sound from the wires where they pass over the insulators that sets the hair on end across the back of your neck—it *sounds* menacing, as it should. We've been taught, as part of our early training in this era of technology, to stay away from bare wires, especially those marked "High Voltage." We've seen movies with electric switchboards in submarines or the laboratories of "mad scientists" turning into fireworks displays as they overloaded or shorted out. In short, we are conditioned to think of high voltage electricity as dangerous, something to be treated with great respect even while we put it to work for us.

Of course, all this is true; if we are to stay alive, continuous caution is vital when we work around power stations, transmission lines, or distribution networks with high voltage potential. But most of the time, most of us deal with "low voltage" electrical equipment which operates on power stepped down by transformers from high voltage sources that are *safely removed,* we believe, from our work stations. We think that because the "high voltage" menace stops at the transformer station, or at the outside of the hangar, we are safe from electric shock—all we're exposed to is 220 or 110 volts alternating current, something we live with every day around the hangar or the house, something the wife can use to wash clothes or vacuum-clean the rugs. So each day, someone who feels "safe," someone who is complacent about "harmless low voltage" is injured or killed because he didn't obey the most fundamental rule for working safely with electricity—*"Never allow your body to offer a path for current flow."* Because it is *current* flowing through the body, *not voltage,* that determines the severity of an electric shock.

When the body is in a position to offer a path for the flow of current, the amount of current which will flow depends upon only two factors—the *resistance* offered by the body, and the *voltage available to push current* through that resistance. We often hear of cases where *low voltage* proved to be a killer because the resistance of the victim's body was *low enough to allow* *heavy current flow* through vital organs, or to cause fatal internal burns. On the other hand, some people have escaped the hazards of *higher* voltage shock solely because their bodies offered *too much resistance* to current flow. Since resistance is so important to survival, we should find out how it varies in the human body, and what effect these variations may have in prevention of electrical shock.

RESISTANCE VERSUS VOLTAGE

Figure 1 illustrates how resistance to current flow through the surface of the skin can vary according to circumstances. Careful study of this chart should leave you with the knowledge that *you can exercise control* over the total amount of resistance to shock when you touch a source of electrical potential. For example, if you keep your skin dry and if while grounded you touch the source lightly with your fingertip (only one-half of a square inch), the resistance to current flow may be as high as 400,000 ohms, and you probably will not feel even the slightest tingle of the shock sensation. But the chart shows much different resistance values on the "WET" side.

To demonstrate this, let's say you've been working hard on a hot day in the unventilated insides of your airplane, and you're sweating heavily. When you grasp anything fully with a wet hand, the increased contact area (up to 15 square inches) combines with the increased conductivity of the moist skin to lower your resistance at the area of contact to as little as 1000 ohms. Should the object you're grasping be a source of electrical potential like the metal case of a defective and improperly grounded electric drill motor, current will flow through your hand, arm or body at the instant you touch another object at ground potential. The shock could be very severe or perhaps fatal, *even if the voltage is relatively "low,"* as you can see by looking at Figure 2. For example, at 100 volts of 60-cycle alternating current and only 1000 ohms resistance, the current flow in most circumstances could be more than 100 milliamperes, and *you couldn't let go or even move a muscle* while the current continued to surge through your body. It takes only one-tenth this much current flow (10 milliamperes) to "freeze" your muscles and thus keep your body in the circuit until it is deenergized.

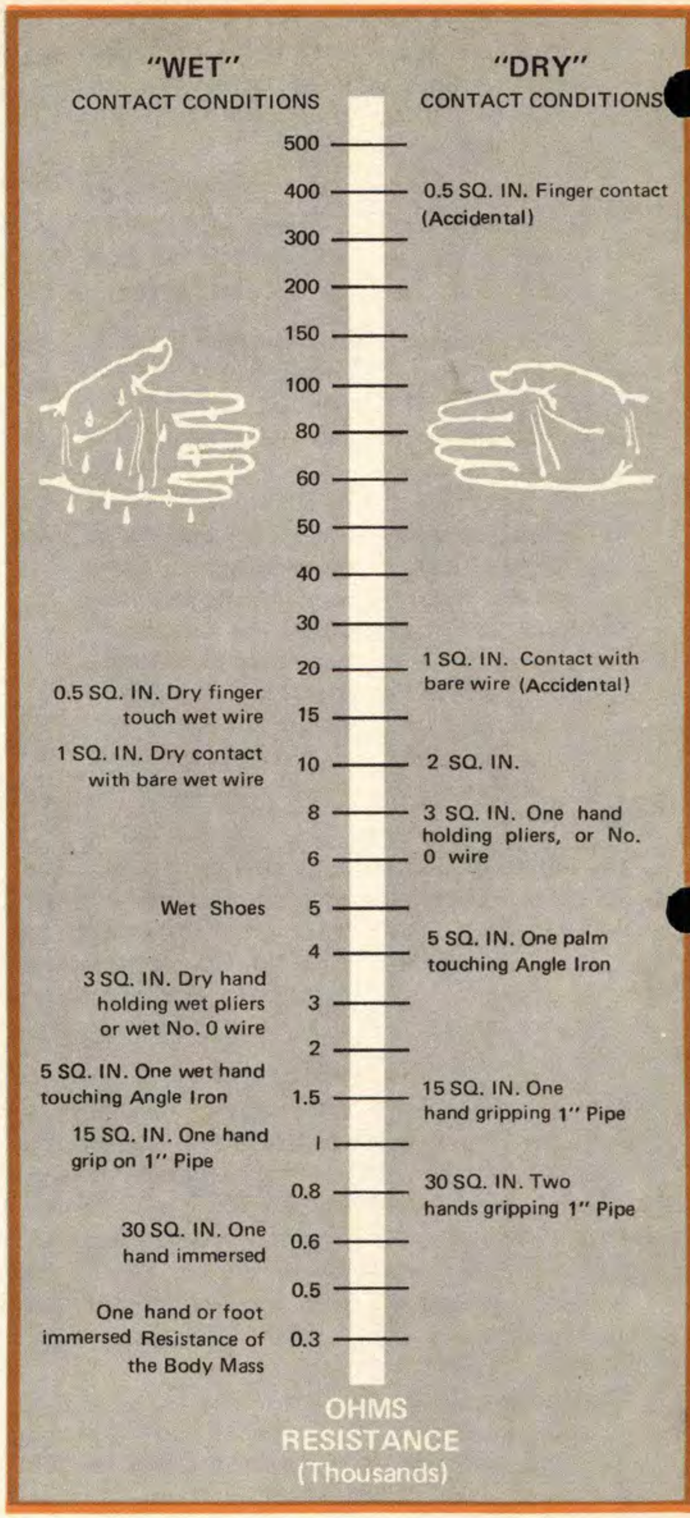


Figure 1 Variable resistance of typical body contacts

HOW RESISTANCE VARIES Having looked at the illustrations and the big numbers along the scales, you may still feel that you wouldn't risk much from shock hazards in the type of work you do or the kind of equipment you normally work with. But you should have learned by now, at least, that the resistance of the human body *cannot be relied upon* to prevent a fatal shock from 115-Volt or even lower voltage circuits. And this is because of the extreme variations in body resistance, almost all of them confined to the external area.

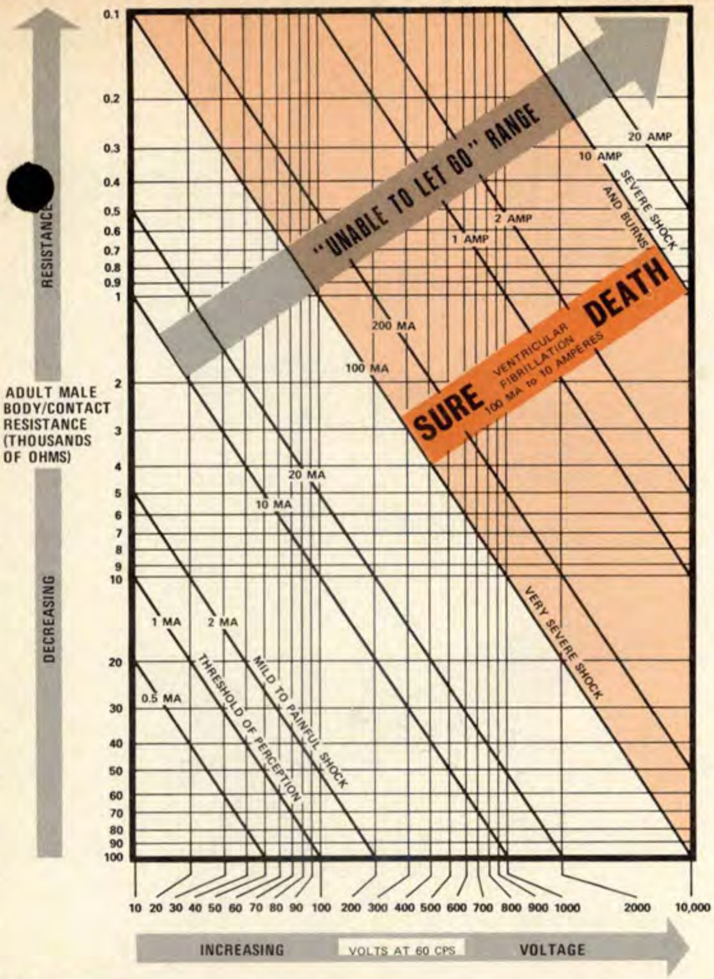


Figure 2 Electric shock hazard—adult males

The internal resistance of the body is relatively constant and relatively low. We are all, inside of us, about 85 per cent water, an excellent and low impedance conductor. Conditions under the inner layers of the skin stay just about the same all the time, so that to find the causes for the variables in body resistance we must look at the skin, and what's in it and on it.

Body skin is made up of two major layers. You already know that dry skin has relatively high resistance, especially if it is thick, such as in the area of a callous. But the inner layer of skin is naturally moist, due to the contact with body fluids, so resistance to current flow falls off rapidly if the inner layers are exposed, or *if body fluids come closer to the surface,* as when a blister forms. And blisters do form in seconds, from *localized heating* when current flows either along the surface of the skin or through a portion of the body, as shown in Figure 3. The effect is cumulative—current flow through skin resistance causes heating, the heating brings moisture to the surface, blisters full of fluid lower the resistance even further, so the current flow increases, producing still more heat, etc. Your total body resistance might be pretty high to begin with, before you suffer a shock. Then as the skin resistance goes down, your total body resistance decays rapidly. And the longer it continues, as shown in this example, the worse it gets. *In three seconds,* while your internal resistance stays constant at only 300 ohms, your skin resistance plunges from 2000 ohms down to 200 ohms, while current flow zooms from 50 milliamperes to 230 MA. And all this time *you can't let go* to stop the vicious circle from completing itself.

Two hundred thirty milliamperes of current flowing through your body through the region of the heart is well within the band of current flows (marked on our chart in Figure 2) labeled "SURE DEATH"—the area where the heart stops pumping and just trembles ineffectually (ventricular fibrillation). Naturally, the effect of current flow on your body varies not only with its intensity but also with the path it follows. Figure 4 shows the five major flow paths through the body and the areas, shaded in red, that are affected most by the damage resulting from the shock.

EFFECTS OF SHOCK

To get an idea of the effects of so-called "low-voltage" shock, let's see what happens when 60-cycle alternating current at 110 Volts passes through a man from hand-to-hand or hand-to-foot. As current flow gradually increases, the following effects become apparent:

1 to 8 MILLIAMPERES—a sensation of shock, not very painful. A man can still let go because muscle control is not lost.

8 to 15 MILLIAMPERES—painful shock, but still he can let go. The hazard up through this amount of current flow often comes from the so-called "fright reaction" or recoil when the shock occurs. Men have fallen from ladders and other high locations, or have bumped their heads hard enough to cause unconsciousness, increasing the possibility of remaining in the path of current flow, prolonging the exposure.

15 to 20 MILLIAMPERES—loss of muscle control begins, and the man *cannot let go* in spite of the painful

Continued on page 26

egress systems update

FOR F-100

FOR F-102

The Air Force has an ambitious program to update a number of older egress systems. It began in 1969 with the formation of an Egress Task Group Review Team consisting of representatives from the Airframe and Life Support systems managers, the Directorate of Aerospace Safety and the using commands. Every type of aircraft with an automatic aircrew egress system was scrutinized, requirements determined and recommendations for improvements established.

As a result of that review a number of update programs have been developed. In this and following articles in *Aerospace Safety* these programs will be described to inform primarily aircrews what to expect for their aircraft. This article will cover the Stencel-DART, snubber and parachute spreading gun system developed for the F-100 and F-102. Other articles in this series will cover the F-104, A-7, B-57, T-38/F-5, F-101, F-105, and T-33. Modification of the F-102 has been completed and work on the F-100 has begun. A similar package with some additions is being considered for the F-101.

The Stencel-DART, snubber and parachute spreading gun system was designed to provide shorter total system operation time and eliminate the problems associated with instability and seat/man/parachute interference. It includes:

- Seat-man stabilization during rocket burn
- Positive seat-man separation
- Positive and predictable canopy deployment
- Rapid canopy inflation.

What makes this system unique are the methods employed to accomplish these features. Stabilization during rocket burn is accomplished by nylon sliplines attached to the aircraft and connected to the seat through brakes fitted to the underside of the seat.

Two other lines, 60 feet long with an additional 15-20 foot stretch, act as a snubber to separate the man and the seat. Another new feature is a ballistic main canopy spreader activated by a lanyard attached to one of the risers. Two additional features have been added for the F-100: a ballistic inertial reel and single motion actuation of the system.

This system is fast—2.5 to less than 4 seconds from initiation to a fully opened canopy (Figure 1). Contrast this with the 6 or 7 seconds and up that were considered fast only a few years ago. However, we want to emphasize that this is not a license to deliberately push the system to the limits of its capability. While the system provides an extra margin, and may save your life under extreme conditions, when possible stick with the Dash One figures for your aircraft.

Briefly, the system operates as follows: The DART (Directional Automatic Realignment of Trajectory), composed of a braking device and four nylon sliplines, provides

FIG I

EVENT	TIME
Trigger Squeezed	0.000
Catapult Starts	0.005
Catapult Separates	0.170
DART Starts	0.3
Rocket Burnout	0.8
Seat-Man Separation	1.0
Snubbing	1.2
EPC Inflated	1.60
Pack Opens	1.80
Spreading	2.90
Inflation	3.70

seat stabilization. As the lines play out through the brake during rocket burn, the lines sense seat movement in pitch and roll. Any adverse movement of the seat, when sensed, causes the DART to force the seat back to the upright position by changing the point of tension application. Meanwhile, the snubbing lines are also playing out. These are two high strength nylon cords whose function is to stop the seat's upward motion and positively separate the seat from the man. This will effectively eliminate the age-old problem of the seat catching up to and striking the pilot or becoming entangled with the chute.

At rocket burnout the snubbing lines cause a no-delay initiator to fire which opens the lap belt just prior to seat-man separation. (The one-second delay initiator for lap belt opening in the original system has been retained as a backup.) Further playout of the snubbing lines starts slowing the seat, with full snubbing coming at final line stretch just after seat-man separation.

FIG 2 Parachute spreader gun; the one on left has been activated. Note extended pistons that deploy slugs which spread parachute canopy.

During separation the parachute is activated through the "gold key" attachment to the lap belt, which releases an external pilot chute. This is a tri-mode system with high and low speed external pilot chutes as well as an internal pilot chute.

In either high or low speed modes, the external pilot chute serves two functions: It tends to orient the man for straight downstream deployment of the main parachute canopy, and it enables rapid extraction of the main canopy to line stretch.

If the external pilot chutes were to fail the parachute would deploy normally with its internal pilot chute.

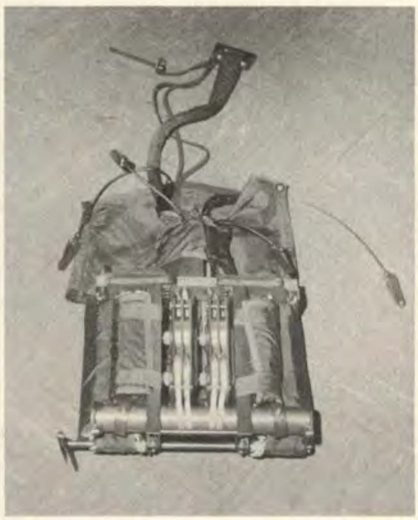
Just prior to line stretch, the main canopy spreader gun (Figure 2) is fired by a lanyard attached to one of the risers, which provides high speed opening. If the gun should fail, the canopy will open aerodynamically.

This briefly is the Stencel-DART snubber and spreading gun system for the F-100 and F-102. While it is new to the Air Force, a similar system has been used by the Navy since 1968. Their experience covers 65 ejections, including 30 below 500 feet. Twenty-six of the 30 were successful, and it is reported that at least nine would not have made it without the capability afforded by this system.

This is just an introduction. Learn the system for your aircraft. Read about it in your Dash One. Talk to your local life support equipment people. Then if you still have questions, call or write to the Life Support System Manager expert at Kelly AFB.

This system provides a greater margin for the aircrew in an emergency. But no system can save you if operated outside its envelope. Studies of USAF ejection experience have shown that the decision to eject has been influenced by the capability of the system. When an escape system has been modified to improve its low level capability, an accompanying increase in attempted use at the lower extreme of the envelope has been noted. Further, the studies disclosed that delay in the decision to eject continues to be a major factor in ejection fatalities. The implication is apparent: the decision must be made and executed within the envelope of the egress system.

When you need it, give the system a chance to save you. Above all don't make the fatal mistake of delaying your decision to eject based on the erroneous belief that, because you have a better system, you should wait longer before you go. ★



Left above, DART brake system on underside of seat. Right, stowage of snubber lines on each side of underside of seat.

SERVICING hazards -- A-7D

CAPT ALLAN V. SHUKLE, 354th Tactical Fighter Wing
Myrtle Beach AFB, South Carolina

The A-7D has been in the Air Force inventory now for two years. It has reached operational status, and will be seen throughout the United States. As in any new aircraft, the A-7D design features pose certain safety hazards, especially for transient maintenance people who are not familiar with the aircraft. Some of these hazards are shown in the accompanying photographs.

The primary hazard areas during servicing or launching are in the wheel well areas. Due to their position, entry and exit to these areas require "ducking" or stooping. The sharp corners of the upper main landing gear doors can cause lacerations while the landing/taxi light in the right well could cause painful bruises (photo #1).

With the engine running, it is important that launch personnel stay near the nose gear when crossing under the aircraft intake to avoid the intake suction. In doing so, one can strike the aircraft's total temperature probe (photo #2) causing injury to the person and damage to the aircraft.

On the right side of the nose gear well, another danger exists. The ram air cooling duct (photo #3) exhausts hot bleed air during ground operation. This air heats the duct surface to 240+°F.

The aircraft's pylons and wing tips can also cause injuries. The pylons have two danger areas; the sharp trailing edge and the sway braces (photos #4 and #5). A drooping wing tip or aileron (photo #6) is low enough to cause head injuries. (Photo subjects are 5'8" and 6'0" tall respectively.) ★

REX RILEY'S CROSS COUNTRY NOTES

Base Ops Officers: How long has it been since you have taken a look at what the Enroute Supplement says about your base? Some transient fighter pilots have complained that they have found that some bases do not have what they advertise and on several occasions had equipment that they did not list. It is possible that this is an oversight, but it may also be that the idea is to discourage some types of transient traffic. Take a good look at what you are telling the world in your remarks section. Does it need to be updated or clarified?

Updating Info: There is no argument that each base has to have some method of monitoring the movement of their airplanes and to keep the pilots informed about the status of the air patch or about deteriorating weather conditions. I'm wondering, however, if procedures are clearly established which will insure that inbound transient pilots get the word as well. Just because the transient doesn't belong to you doesn't mean that the SOF, Base Ops or command center can't help prevent a nasty situation or avert a disaster.

Qualification: How to qualify for the Rex Award is still the most frequently asked question. The easiest way to answer is "do your transient facilities provide the kind of service that will make the transient leave your base with a smile and a feeling that he was glad he stopped there?" If they don't, it's likely that Rex will hear about it. Comments, both good and bad, are kept on file and are the major indicator as to how a particular base is doing. If you are so close to the situation you can't be objective about your own evaluation, my advice is to insure that each transient completes a transient questionnaire. Then you can spot problem areas and nip them early.

Comment from a transient: . . . "Every single person with whom we came in contact displayed a "can-do" attitude and went about their business in a most pleasant manner. We were made to feel like special guests and the Scott people appeared to enjoy helping us—from the supervisors down to the 'wrench-benders' and drivers. All too often, performance such as theirs goes unrewarded because excellence on the job is expected. I hope that everyone involved with us at Scott knows that the crew and passengers of 'Utah 27' appreciated everything done for them. They all reflected credit on their commanders and Military Airlift Command.

"Rex, I hope that your award will continue to inspire this type of performance. Scott truly represents the total base concept you so often discuss in your column, and they richly deserve to hang your award in their trophy room."

—Nice going, Scott! ★

THE

REX RILEY *Transient Services Award*

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Col
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.
RAF MILDENHALL	U.K.

THE I.P.I.S. APPROACH

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

ON COURSE

AFM 51-37, *Instrument Flying*, uses the term "on course" in many different situations. Quite often certain pilot actions are predicated upon being *on course*. For example, when performing a procedure turn from a fix that does not provide bearing information (outer marker, DME fix, etc.), you may not descend below the procedure turn completion altitude until *on course* inbound. The USAF IPIS is often asked for an interpretation of the term "on course."

This problem of interpretation is not limited to one situation. AFM 60-16, paragraph 8-12, requires pilots operating in controlled airspace under IFR to fly the center line of airways and the direct course between navaids or fixes defining the route. This is a rather all-inclusive statement requiring all pilots to fly *on course*. How close must you be to consider yourself on course when flying an airway or a jet route?

This problem assumes greater importance during instrument approaches due to the reduced obstacle clearance in this phase of flight. Any deviation from *on course* reduces the chances of being able to make a normal landing from the approach. This is particularly important when the missed approach point is a fairly large distance from the navaid. Five degrees off course at the maximum allowable distance of 30 NM would place the aircraft 2½ miles from the missed approach point, possibly out of sight of the landing runway. What is the acceptable deviation when flying an instrument approach?

On course can be defined as follows: The aircraft can be considered to be *on course* when, with the desired course selected, the CDI is aligned with the center reference of the course indicator/HSI, or, in the case of RMI-only equipment, the bearing pointer is aligned with the desired bearing. Before you judge this definition as too restrictive, consider the following:

The system accuracy of VOR and TACAN navigation systems is determined by the combination of ground station error, airborne receiver error, and pilotage error. Long experience in the use of these systems has shown that there is at least a 95 percent probability of an accuracy of ± 4.5 degrees or less. The 4.5 degree system accuracy of VOR can be seen in the 4.5 degree expansion of airways when the distance from the navaid providing course guidance exceeds 51 NM. This system accuracy is only achieved when the pilot is attempting to fly *exactly on course*. Any assumption by the pilot that he can accept a certain course deviation as "close enough" will only serve to degrade the system accuracy and reduce the probability that he will remain within primary protected airspace.

NOTE: If that 95 percent figure bothers you, you should realize that secondary areas are established adjacent to primary areas in order to provide a virtual 100 percent statistical probability of obstacle clearance.

AFM 51-37 permits descent below a penetration turn completion altitude when the aircraft is within 5 degrees of the inbound course. It also permits descent below a procedure turn completion altitude when the aircraft is within 10 degrees of the inbound course, if the procedure turn fix provides outbound course guidance. Neither of these criteria for descent should be considered as definitions of *on course*. In both cases airspace is provided which is much larger than that determined solely by system accuracy. To apply the definition of *on course* in these situations would be overly restrictive.

It is unrealistic to expect every pilot to fly his aircraft exactly on course 100 percent of the time. How far can he deviate from on course and still be considered as qualified? This is a question primarily of individual aircraft capabilities and pilot proficiency. Your major air command should establish tolerances for flight evaluations which take into account the factors peculiar to your particular aircraft and mission.

The best means the pilot has of assuring proper obstacle clearance is to fly his assigned route of flight as accurately as possible by attempting to maintain precise indications of *on course*. Instructor pilots and flight examiners must gage that performance against command-established tolerances in order to determine pilot qualification. All pilots must be immediately aware of any tendency to accept a certain course deviation as "close enough" and should take appropriate action to correct such a trend. Anyone flying an airplane should not be satisfied with anything less than his absolute best level of performance. ★

$20.65

WHY BOTHER?

This true story is about an incident that cost the Air Force $20.65 in labor and parts to make a repair. That's not much, is it? Why bother? Why use this space for something so trivial? Let's see what happened before we answer.

The aircraft was a T-33 on a functional check flight. Just after becoming airborne, the bird abruptly rolled left to nearly 90 degrees. The pilot used aileron and retracted the flaps to gain control. He then climbed to 15,000 feet where he made a controllability check. Subsequently, he made a no-flap landing without incident.

Would you believe that this little thriller resulted from confusion over the location of attachment holes in a dust cover between the flap actuator and the flap push-pull rod? When the flap actuator jackscrew was lubricated, the dust cover was replaced by one listed as an acceptable substitute. It differed from the original in that it had only an inspection hole ¾ inch from the end and no mounting holes at ¼ inch from the end. The mechanic drilled another hole opposite the inspection hole so that he could insert the attach bolt.

The problem then was that the bolt could be inserted in the wrong place—between the actuator and the end of the push-pull rod (as illustrated). Unfortunately, if one does not consult the tech data, it is easy to install a bolt that does not attach anything. It becomes merely a link between the two sides of the dust cover. It would look good but it would be worthless.

Now, because of the tight fit of the dust cover, the flaps could ground check okay; they did in this case. However, when air loads were applied on takeoff the right flap retracted.

Similar mistakes are made all too frequently. Sometimes an inspector catches the error and it is repaired before it can cause trouble. On other occasions we find out about it from incident or accident reports. The question is "how do we prevent these errors from occurring in the first place?"

To begin with, we must know that replacement parts are frequently not identical to original parts. Generally these differences are minor, but sometimes, as in the case of our dust cover, modifications are necessary. This requires careful reference to the tech data. A guess is not good enough.

To go back to our question in the first paragraph. Does this incident now seem trivial? Many errors as easy to make as this eventually end up as major aircraft accidents. ★

new tech data *for* phantom fixers

The start of another day. At the far end of the runway a cloud of black smoke marked a flight of two F-4s running up for takeoff. Seconds later, the roar of the jet engines slammed against the maintenance hangar, bounced back and forth between buildings and set up a sympathetic vibration through the walls of Maintenance Control.

The Maintenance Officer drew his first cup of coffee and walked into the control room. He stared at the status board for several seconds, then frowned at something that displeased him.

"What's the story on seven-eleven?"

The NCO at the center console looked up. "Sir, we don't know yet —it won't take fuel. We've had a team on it for an hour and a half."

The Maintenance Officer growled and dived for his desk, rummaged around in his bottom drawer and pulled out a small green book. After a few moments of study he got up and walked back to the control board.

"Call the team on 711," he told the NCO on the board. "Ask them to check the refuel relay circuit."

The sergeant put the call through and the boss headed back to his desk, shaking his head at the pile of paperwork which had already accumulated.

A few minutes later the sergeant came in. "They replaced that relay, sir—it's taking fuel okay now. Be ready to go in 30 minutes."

* * *

The little green book the Maintenance Officer grabbed for was a McDonnell Douglas product support troubleshooting guide—a very effi-

PROCEDURE	NORMAL INDICATION	REMEDY FOR ABNORMAL INDICATION
THIS COLUMN WILL CONTAIN STEPS OF SYSTEM CHECKOUT PROCEDURE	THIS COLUMN WILL CONTAIN EXPECTED RESULTS	THIS COLUMN WILL PROVIDE TROUBLESHOOTING PROCEDURE, OR OTHER REMEDY, FOR EACH ABNORMAL INDICATION

FIGURE I

cient (but very unofficial) maintenance aid. Now wouldn't it be great if our TO library contained something like that? Have faith! Help is on the way, and that handy troubleshooting guide is only part of the story!

Help is coming in two forms: First, there is a program of TO *separation,* wherein each series aircraft (F-4C, RF-4C, F-4D and F-4E) will have its own tech orders; this will allow a massive decrease in the number of flag notes and cross-references, and will make the TOs considerably more usable. Second, there is a program of TO *improvement,* aimed at three major target areas: Checkout Procedures, System Schematics and Troubleshooting.

SEPARATION

. . . is going to involve a lot more shelf space, especially for units with more than one series of aircraft. TO librarians are well advised to make plans accordingly. Changes are planned for the following manuals:

- Separate Organizational Maintenance manuals (Dash Two series) will be provided for each aircraft series.
- The Field Level Structural Repair manual (1F-4C-3-1) will appear as a six-volume set.
- The Illustrated Parts Breakdown (Dash Four series) will separate the RF-4C data from the F-4C/D data.

IMPROVEMENT

Unified Checkout and Troubleshooting procedures: At present, checkout procedures and troubleshooting procedures are separated by many pages. Once a checkout procedure indicates a malfunction, the mechanic must go to a different part of the book to find the troubleshooting procedures. Improvement will take the form of a simple format change which will add another column, "remedy for abnormal indication," to the same page which contains the checkout procedure steps (see Figure 1).

Improved System Schematics: Emphasis has been placed on making the schematics easier to understand and follow, with the user in mind. Some improved features are . . .

- Actual drawings of components and/or location information. System components are not portrayed as simple "blocks" which have no relation to the actual size, shape or location of the actual component.
- The new schematics will contain the consolidated interface connection between the aircraft and the test equipment. Many schematics also provide functional information which tells the technician what the test equipment is checking and where.
- A more-detailed breakdown of the system by modes, functions or conditions, which will enable better understanding and troubleshooting of the entire system.
- Better system definition through the integration of electrical, mechanical, hydraulic and pneumat-

ic portions of systems. If a system is sufficiently complex, follow-on schematics are provided.

• The improved schematics will provide simplified signal/functional flow, enabling the technician to follow the system operation.

• Actual faces of indicators are included on the schematic, as well as any knobs, levers or handles which have a peculiar physical appearance. This should eliminate much confusion and give significant help to OJT programs.

. . . In sum, the schematics are designed to give the user—the technician—all the help possible. Wherever possible, relevant data is included right on the schematic, and the total design more closely duplicates the design of the aircraft system the schematic pertains to.

MASTER TROUBLESHOOTING MANUAL (1F-4(X)-2-34)

The Dash-34 is the official counterpart of that little green book mentioned earlier, and should make life a lot easier for all of us. It features comprehensive symptom indexes, arranged by aircraft system. But the easiest way to explain it is to take you through a sample problem.

Let's say that the pilot has landed his bird and made the following write-up in the forms: "No stall warning tone in forward cockpit." The technician grabs his Dash-34 and proceeds as follows:

(1) Turning to the master list of system indexes, he looks up "Stall Warning System." The master list refers him to Figure 2-6, the Stall Warning System Index of Symptoms.

(2) Flipping over to Figure 2-6, he then scans the list of symptoms until he finds the symptom he's looking for: "No stall warning tone in forward cockpit." Opposite this system is the instruction to turn to paragraph 3-5.

(3) Here's pay dirt! Paragraph 3-5 lists step-by-step troubleshooting actions for isolating the malfunction and correcting it. It also identifies the troubleshooting schematic to be used in conjunction with these steps.

We hope using organizations will be allowed to order multiple copies of the Dash-34. These volumes are sure to see a lot of use!

There's a brief, broad-brush look at some of the things that are coming through the TO system. Much of the information and the examples above were taken from McDonnell Aircraft Company's *Product Support Digest*, Volume 18, 2d Quarter 1971; we gratefully acknowledge their help and refer interested persons to that issue for more information on the new TOs.

Some of the new TOs are already in the field, and the others are on the way, so get ready. Progress is coming! ★

LIFE SAVER

The Flight Surgeon occupying the back seat of the B-57 looked at his watch. It was 0415. The ordnance was dropped and the mission thus far was uneventful, although he felt extremely sleepy. This degree of drowsiness seemed rather profound and difficult to control, but he dismissed its significance after only briefly thinking about it. After all, who would not be sleepy at 0415.

As the plane climbed from its initial altitude of 20,000 feet he had a feeling of detachment, numbness and increased drowsiness. The instruments seemed to fuse into a blurry mass of meaningless dials. Time slowed to a crawl. The Flight Surgeon began to feel nauseated, uneasy and frightened by his inability to comprehend what was happening. His usually analytical mind seemingly could not function.

"How are you doing, doc?" the pilot up front asked.

"Don't feel too good," was the hesitant and slurry reply.

"Say, you sound bad! Check your blinker."

This, however, was not heard by the unconscious back-seater who was slumped in his seat.

The above is a true story. What was a "milk run" night mission could have become a tragedy. The victim did have a severe case of hypoxia. He survived only because the pilot astutely recognized it as such and descended to a lower altitude where the flight surgeon awoke to find his oxygen hose disconnected. At the initial cabin altitude of 14,000 feet the first symptoms of hypoxia appeared—the marked somnolescence—and went unrecognized only to become worse with higher altitude. By this time his mental faculties were too impaired to recognize the problem. This episode provides a lesson of value to all aircrewmen: *unusual, even very subtle, physiological symptoms, should be eyed with suspicion, and early recognition is vital.*

The training we receive is intended to provide the knowledge with which to solve problems. But knowledge not used becomes useless. That is why we have periodic refresher training, including physiological training. It is a life saver. ★

J. K. Richter, Capt MCFS, USAFR

[redacted]

[redacted]

Recently, at a missile launch complex, there was a Two-Man Policy violation that was not immediately reported, as required by AFR 127-4. The squadron commander detected the violation while reviewing a crew commander's report.

The launch control center, which is a no-lone zone, is an area from which one person would be capable of launching or directing the launch of a nuclear weapon or delivery vehicle, and must be occupied by two officers at all times. On this particular violation, the launch crew was alerted to a malfunction in another area of the control center. The crew commander proceeded alone to the other location to investigate the cause of the alarm, leaving the other officer alone at the launch controls. This procedure was contrary to established policy. The crew commander should have informed other members of the crew to check out the malfunction and therefore avoided the violation of the Two-Man Policy. Through the alertness of the squadron commander, a Dull Sword report was submitted in accordance with AFR 127-4.

The seriousness of this type of incident should be stressed. The strength of the Air Force Nuclear Safety Program is dependent on an effective Two-Man Policy.

RELEASE SYSTEM CONNECTOR MISMATCH

Within the last three months, two different bases have reported Dull Swords for identical deficiencies. A release system connector had been mated for conventional release when the aircraft was loaded with nuclear weapons. The fault was discovered during aircrew preflight following completion of loading procedures. Investigation indicated that the connector had been mated to the conventional system receptacle by a contractor depot modification team following completion of a time compliance technical order (TCTO). The TCTO procedures required a final system test that would have detected the fault. Command procedures also required the same test upon return of the aircraft from depot modification. Apparently neither of these tests was performed. This lack of compliance with procedures can be avoided by strict supervision and control.

[redacted]

CROWDED NO-LONE ZONE

A violation of the Two-Man Concept (AFR 122-4) occurred at a Minuteman launch facility, although six personnel—a Combat Targeting Team member and five members of an evaluation team—were present in the no-lone zone of the upper launcher equipment room.

There was a violation because the evaluators are not authorized to fulfill the SAC Two-Man Policy requirement. Apparently the criterion was not fully understood; no matter how many persons are in a no-lone zone, there must be at least two authorized persons who can positively detect incorrect procedures or unauthorized acts by anyone in the zone. This should be a special subject of predeparture briefings and the maintenance team chiefs must be especially alert to situations when personnel who are not authorized to fulfill the Two-Man Policy requirements are present. ★

A TIGER BY [redacted]

LT COL SAM HENLEY, Directorate of Aerospace Safety

It was a cold clear day at a northern base when a "Twin Huey" (UH-IN) attempted to g[redacted] borne—without the crew! I[redacted] sible, you say? Not when yo[redacted] vide all the prerequisites fo[redacted] —except the pilot! Both fuel [redacted] switches were on, and both t[redacted] were above flight idle. Coup[redacted] with a set of engine start s[redacted] in a position where they can [redacted] advertently actuated.

Let's stop at this point and go back to the beginning. The aircraft was down for maintenance due to removal of a UHF radio the previous day. The preflight crew had completed their work earlier. They had used the proper checklist (TO 1H-1(U)N-6WC-1) and completed all checks, which included a fuel boost pump check. In order to complete this step, the engine fuel control switches must be placed "on." A problem reveals itself at this point. The checklist does not require the switches to be placed "off."

Following the preflight, two radio repairmen arrived at [redacted] install a UHF radio. [redacted] rovided a [redacted] r to the aircraft. The [redacted] did not check out, so [redacted] ed to the shop. When [redacted] k to the aircraft a second [redacted] rew chief had left the [redacted] other job. They hooked [redacted] U and applied power to the aircraft. Again the radio failed to check out. The APU was shut off.

After a discussion with the line supervisor, they decided to remove a radio from another aircraft and use it for trouble shooting. Again, the crew chief was not available, so one man got into the left seat of the helicopter and the other man went to the APU and started it. When power was applied to the aircraft, the engines started and the bird immediately swung 90 degrees left and the tail rotor struck the top of an NF-1 light cart, shearing the 90-degree gear box output shaft. The aircraft rotation on the ramp was stopped at this point.

[redacted] d [redacted] held the collective down, the line supervisor got the engines shut down. Stopping the engines was complicated by the fact that when the APU was ripped away from the aircraft, electrical power was lost. In order to rotate the throttles to the shutoff position, electrical power is essential. The line supervisor placed the fuel control switches off, turned the battery switch on, and pulled the fire "T" handles.

This mishap was attributed to the radioman, who was wearing a bulky arctic parka and inadvertently actuated the start switch on the IP panel. The contributing causes revealed where the "real" problem lay.

(1) Fuel control switches left on.

(2) Throttles left above flight idle.

(3) No qualified crew chief at the aircraft while work was being performed.

(4) Suspected faulty design of the start switch on the IP panel. ★

Ops topics

one more believer

Here's a story about a guy who did just about everything right and still ended up in a potentially bad situation. A stroke of luck averted the accident, but there's a real good moral built into the story.

He was an O-2A pilot, preparing to launch from a CONUS Army Air Field on a visual reconnaissance mission. He was mission conscious and safety conscious, so he had his tanks topped off and conducted a thorough preflight, including draining the fuel sumps and checking the fuel for proper coloration.

The fuel was the right color, all right—purple. But it seemed like a very light purple, so the pilot played it safe and sent the crew chief to make sure that the correct fuel had been delivered to the aircraft. The crew chief confirmed that a 115/145 avgas truck had been sent out.

Reassured—and after all, the fuel *was* the right color—the pilot completed his preflight and went on his way. Start, taxi, runup, takeoff and climb were normal and uneventful, and the pilot leveled off at 8500 feet.

About 15 minutes later the front engine began heating up; shortly thereafter the rear engine followed suit. Cylinder head and oil temperatures were still in the green but were both higher than normal. The pilot, evidently still spring-loaded to the CAUTION position, returned to base immediately and landed without incident.

On the ground he wrote up the discrepancy and insisted on having the fuel analyzed. It didn't take long to confirm that the 115/145 truck had really contained JP-4! Initial investigation indicates that the truck really was a 115/145 truck, but it had been filled from a mis-labeled bladder hose.

The pilot should be commended for his suspicious nature, and for getting the bird back on the ground at the first sign that things were going sour. And the moral, of course, is that a suspicious nature prolongs good health.

flip changes

Visual Approach: Visual Approach has been redefined as follows: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions *under the control of a radar facility* and having an air traffic control authorization, may deviate from the prescribed instrument approach procedure and proceed to the airport of destination by visual reference to the surface.

Identification of Heavy Jets: When the allowable gross takeoff weight of the aircraft is 300,000 pounds or more, enter the symbol "H/" as a prefix to the type aircraft designator in item 5 on the DD 175. Examples H/C-141, H/C-5.

radio failure squawk

The investigation of a recent accident revealed a misconception that is evidently widespread. Most of us think, it seems, that if we select Mode three, Code 7600, the radar agency working with us will be instantly alerted to our problem. This is not the case.

Selection of 7600 changes the radar display to a slash. In the high altitude structure the slash is easily seen by the controller, who can then interrogate 7600 to see if radio failure has occurred. At low altitude, however, the slash is easily lost among other returns and clutter. The controller may miss the change—and he won't be alerted to interrogate unless he's talking to you at the time the radio goes out.

So . . . in the event of radio failure, adhere to FLIP procedures. *Do not assume that your 7600 squawk has been received.*

Ops topics
CONTINUED

mystery clearance

A disturbing incident occurred recently when a commercial airliner, en route between two CONUS stops, received traffic clearances from an as yet unidentified source.

The first clearance occurred about 60 miles out from destination. The aircraft was at 11,000 feet, under Center control, when the crew received a weak but audible transmission directing the flight to descend to 1000 feet. The captain immediately asked Center for confirmation and was told that no such clearance had been issued.

A few moments later a second transmission came: "(Correct flight number) descend immediately to 1000 feet. Over." Again, the Center stated that no clearance had been issued.

The "mystery" clearances were not recorded on the Center's air/ground communication tapes, so the signal probably originated from a ground source below Center's line-of-sight. With no positive clues, further investigation will probably prove futile.

In this case, the spurious input was an irritant, nothing more. But put a pilot in the weather on an unfamiliar approach, throw in mountainous terrain, and there *could* be a problem of disastrous proportions! Except for radar approaches, during which we must read back all headings, altitudes and altimeter settings, there is no requirement to repeat ATC clearances unless requested to do so. But it is the responsibility of the pilot to confirm any clearance which is unclear to him, and to that we would add the desirability of confirming clearances which are unusual or of debatable safety—especially in the soup and close to the ground.

(Data from Flight Safety Foundation)

all it woulda took was ...a look in the book

The KC-135 was on a ferry mission in the CONUS. Approaching destination they called the tower for current weather, which was given as 1300 broken, 2200 overcast, three miles with very light rain showers. By the end of the enroute descent, however, the weather had deteriorated to 1000 broken and one mile in heavy rain. The pilot requested a PAR, although no information for that type approach was published in the Enroute Supplement for that field. He was advised that PAR was out and that an ASR approach would be used.

On short final, RAPCON advised the crew that they were one mile out and asked if the runway lights were in sight. The copilot replied that they were; at this time the pilot went visual, observed that they were well right of the extended centerline and made rapid correction to align the airplane with the runway. Correction consisted of a rapid descending left turn, followed by a rapid descending right turn. The aircraft struck the runway in a right-wing-low attitude, seven to ten degrees left of the runway heading (as indicated by the indentations and skid marks left by number three and four engine pods).

This was sheer pressing, trying to salvage a bad approach—but it's even worse than it seems: testimony before the board revealed that no one on the crew was aware that minimum visibility for a KC-135 class aircraft (category E) on this approach was a mile and a quarter!

the evolution of an accident

Printed below are the findings in a recent accident, just as the investigator, in a remarkably competent analysis, reported them. A description of the accident itself seems almost superfluous.

PRIMARY CAUSE: Operator Factor in that the instructor pilot used improper braking techniques, which resulted in the failure of both main gear tires and the subsequent loss of directional control, causing the aircraft to leave the runway.

CONTRIBUTING CAUSES:

(1) Operator Factor in that the IP failed to slow his aircraft to recommended final approach airspeed.

(2) Supervisory Factor in that the element lead positioned the emergency aircraft on final approach at an airspeed well above the recommended final approach airspeed.

(3) Operator Factor in that the student pilot failed to detect the improper installation of the ignition circuit breaker panel during his preflight inspection.

(4) Maintenance Factor in that available tech data was not used, which resulted in the improper installation of the ignition circuit breaker panel. This allowed the left throttle cable and turnbuckle to chafe through the ignition circuit breaker wire bundle, causing an inflight electrical fire.

(5) Maintenance Factor in that failure to secure the ignition circuit breaker wire bundle properly permitted the ignition circuit breaker panel to be installed backwards.

(6) Design deficiency of the ignition panel circuit breaker panel in that it can easily be installed improperly.

There it is, lined up like the clues in a detective story. You can write your own scenario. It's easy to see, looked at this way, that an accident isn't an event —it's a process. Through the clues dropped along the way, the process is easily traced, from the designer who engineered a Murphy, to the technicians who, on two occasions, didn't bother using tech data, to the pilot who made a hasty preflight inspection—all of which led to a situation which was analyzed as dire enough that an immediate landing was necessary. The method of doing this was with higher than normal approach airspeed . . . the man on wing trusted lead and stayed with him . . . and had to lay on the binders because of a hot touchdown! This accident could have been nipped in the bud anywhere along the line, but the little things snowballed and got us again!

nowhere to go

Picture yourself in a T-37 trainer. Now picture a military weather advisory, covering your route of flight, which reads: ". . . tornadoes and locally damaging windstorm . . . severe thunderstorms . . . two percent max instantaneous coverage . . . 40 percent total area affected . . . three-fourths inch hail and SW gusts to 60 knots . . . max tops 520."

Sound like a good day for diverting early and avoiding the rush? Or even staying home by the fire and studying the Dash One? Somebody didn't think so.

The flight was a two-ship—qualified IPs flying both aircraft. The flight continued to get radar vectors to circumnagivate the weather until they were approximately 50 miles south of course, at which time Center advised that, due to opposing traffic, the flight would have to return to course. The flight split up and took separate vectors through the areas of least intensity. Fiberglass surfaces on both aircraft were damaged by heavy rain.

There's a good argument that they shouldn't even have tried the flight in the face of the weather advisory —but having tried it, the pilots passed up every chance to divert or go home until they were boxed in. By the time it became sufficiently obvious that they were headed for trouble, there was nowhere else to go.

COMMANDERS: *Anyone care to join me in wondering who approved this X-C request?* Ro

Tech topics

• Briefs For Maintenance Techs

BEARING BOO-BOO

Until touchdown all had appeared normal with the A-37. But as the weight settled on the main gear the aircraft began to pull to the left (the pilot said it appeared that the left brake was dragging). As the bird slowed it was obvious that the left tire was flat. Directional control was maintained with nose wheel steering and the aircraft stopped on the runway.

Once the bird was released to maintenance, it didn't take long to discover a major goof. The wheel assembly was inspected and found to have two outboard bearings installed. Inside diameter of the outboard bearing is 2.000 inches compared to 1.8125 inside diameter for the inner bearing. The incorrect bearing allowed the wheel to wobble; wobbling caused the tire to rub the brake; friction generated excessive heat and blew the thermal fuse plug.

This wheel assembly had been changed at a transient base. Regardless of where the maintenance was accomplished, attention to detail and the use of tech data by the man performing the work should have been SOP. But, as is often the case, it wasn't—and the inspector failed to detect the original mistake.

COMMANDERS: *Failure to follow tech data and indifferent inspection caused or contributed to many accidents and incidents in 1971. Are your QC troops looking for these deficiencies? Is your corrective action positive and permanent?*

FLIRTING WITH DISASTER

Call it a near miss, a flirt with death. Call it what you wish, but the grim fact is that any time an individual comes so close to an operating jet engine that his hat or ear protectors are ingested he is flirting with disaster.

In this case the crew chief had gone under an F-101 to check for hydraulic leaks. As he departed from the underside near the left intake, his parka hood was pulled toward the intake. He pulled free but his ear protectors were drawn into the engine. If an experienced crew chief can come that close to being ingested, what are the odds against less-experienced people—the mechanics fresh out of tech school? What is being done in your unit to prevent such accidents? Are maintenance supervisors emphasizing the hazards of working in the vicinity of operating jet engines, especially to the new, inexperienced young fellows?

THINGS ARE MORE LIKE THEY ARE NOW THAN THEY HAVE EVER BEEN BEFORE! !

That makes about as much sense as driving your car without your driver's license, OR flying without the 781 Forms and not knowing where they are. This doesn't happen often but when it does it can be very embarrassing. In most cases the guys are unaware of the 781's whereabouts. It has always seemed to be in the cockpit somewhere when it was needed. But not every time! That plastic binder seems to fit in so many places; on the glareshield, in the map case, on or behind the ladder, in the truck, on the wing, or stuck on the nose gear somewhere. It's such a familiar part of the aircraft that it goes unnoticed quite easily.

A few times this year, this form has been found on the runway or blowing down the ramp after having fallen from the aircraft. In a couple of cases, that missing 781 has left telltale marks as to where it had been, such as slight damage to the nose wheel well area. It doesn't want to fit there very well with the gear up.

We all need to be aware of this one-in-an-umpteen times occurrence. Who's fault is it when this happens? The last guy who used them—or the one that is to use them next? (All of the above is the answer.) This aircraft "checkbook" has aroused enough attention to warrant reemphasizing its whereabouts in forthcoming changes to checklists and flight manuals. But it's still up to all of us, specialists, crew chiefs, pilots, refuelers, etc., to keep tabs on this evasive book.

Every cockpit has a place for the Form 781. Let's all team together and "trap" it in its proper place before starting the engines.

(ATC Safety Kit)

ENGINE INDIGESTION

Foreign object damage continues to be "jet engine enemy number one."

Much of the cause is just plain old carelessness. Here's one example.

An F-102 was on alert to support a division ORI. On preflight a flashlight was placed in the right intake during nadar installation and forgotten. During scramble it was ingested.

Another incident involved an F-104 during runway check. The crew chief had removed the tank pins and was directing the aircraft forward to complete the tire inspection when one of the tank pins got lost and was gobbled up by the engine.

Supervisors must demand good work methods, effective procedures, and equipment safeguards throughout the maintenance area. Experience has shown that a well organized and supervised FOD campaign will produce worthwhile results.

QC & AIRCRAFT HARDWARE

Quality Control inspectors: How many times have you found the wrong type hardware installed on aircraft during operational ready or in-process inspections?

During a recent investigation of a C-123K incident, all the flap bracket mount bolts were found with aluminum nuts installed instead of the required steel nuts. The inboard bracket mount bolts on the right outboard flap had pulled out of the aluminum nuts in flight. Can you imagine the controllability problems had the entire assembly separated from the aircraft?

The Dash 4 on each aircraft specifically lists all replacement items, by part number, and this includes nuts and bolts. QC inspectors, when you inspect the aircraft to determine that all hardware is installed do you look a little further to determine that it is of the correct type?

STIFF LEGS

Prior to flight both main landing gear had been inspected IAW TCTO 1T-39A-837 and the struts supposedly serviced per 1T-39A-2-1. The mission was uneventful until final landing, during which the IP was demonstrating use of emergency brakes. Touchdown was to the left side of the runway followed by a veer to the left. The IP immediately selected normal brakes and attempted a correction with nose wheel steering, to no avail. The aircraft was on and off and back on the runway before the IP finally brought the bird to a safe stop.

Failure to properly use available tech data caused this fiasco. Both main struts had been overserviced. This prevented strut compression, which in turn rendered nose wheel steering inoperative due to the open squat switch. Don't just have the TO available, USE IT!

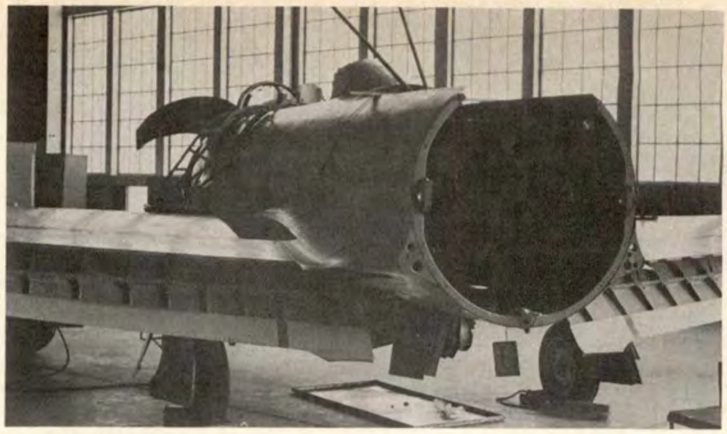
Tech topics

THROUGH THE ROOF

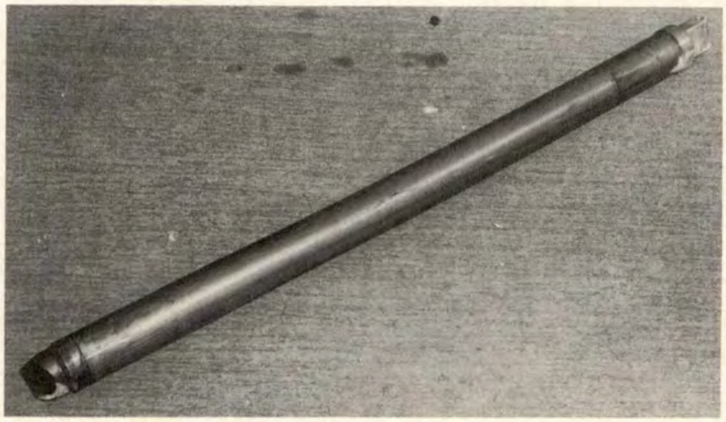
An egress technician with 12 years experience in the business was performing the flow check on the egress system lines of a T-Bird. TO 1T-33A-2 was on hand, and supposedly being used as the supporting tech data. As the technician applied compressed nitrogen, the rear seat catapult fired, exited the hangar through the roof above the aircraft and came to rest on the ramp 60 feet outside the hangar. Fortunately no one was injured.

With a man as experienced as this, and the TO on hand, how could such a thing happen? The answer is simple and all too familiar: **failure to adhere to the tech data.** The technician did not disconnect the seat catapult hose as called for by item 6, Figure 4-20M, page 456W of the TO.

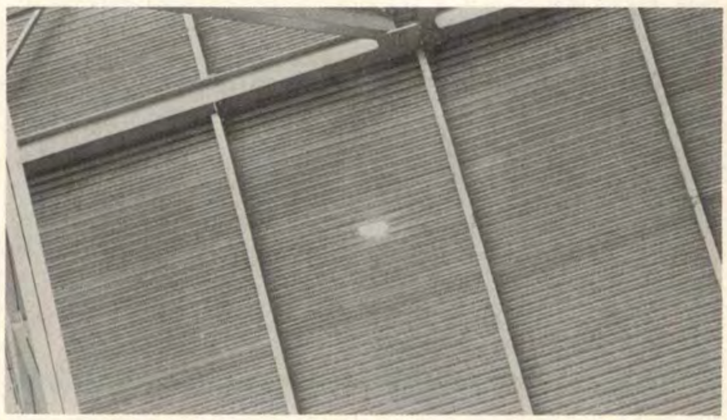
Photos at right show the sequence of events and illustrate the potential hazard of such flying projectiles.



This is the bird



that fired the rocket catapult



that went through the roof

and landed on the ramp in front of the house that Jack built.

TAIL-HEAVY TANKER

"Personnel have been realigned to insure that highly qualified people are available for adequate supervision during all work shifts." "Quality control is re-evaluating all crew chiefs that have been upgraded in the past 60 days on items such as refuel and defuel." "Seven level crew chiefs have been assigned as a training team to increase OJT effectiveness."

Why so many changes in a unit over night? Because a maintenance team which failed to use available tech data set a KC-135 on its tail during defueling. The aircraft was in maintenance when it was determined that it would have to be defueled to complete the work. Due to mission requirements, rapid defueling was selected as the most practical means. The tail stand was removed, number one engine started and the defuel process begun. However, the supervisor had not conducted a briefing before the operation was started, so no one knew who was in charge. Furthermore, the checklist available in the aircraft was not used. During all the rush and confusion, the defueling team failed to maintain proper CG and the mishap became inevitable.

COMPOUND ERROR

The RC-130 was climbing out after a touch-and-go landing when Nr 2 engine went to max power. Throttle movement had no effect so the engine was shut down and the crew immediately returned to base.

It didn't take long to find that the bolt, nut and cotter key that attached the coordination lever to the fuel control were missing. The fuel control had been changed during maintenance prior to this flight. Apparently a mechanic failed to install a cotter pin and an inspector compounded the error by not doing his job.

Granted, the man who did the work failed to do it correctly. But we're inclined to lean on the inspector just as hard as on the original sinner. The inspector, whether he's a QC type or the immediate supervisor of the man doing the work, is the safety link between maintenance and the people who fly in the machine. His is a very responsible job and it takes a responsible man to fill it.

COMMANDERS: *Is your tech data explicit? Do your people use it? Do your supervisors inspect before sign-off? Are your QC people checking for these answers? And what is YOUR action if reports are negative?*

Ro

DISCONNECT DISCONNECTED

During climb to altitude for spin entry, the T-37 IP noticed the left oil pressure indicator reading zero. Some engine vibration was noticed at this time and the engine was shut down and an uneventful single engine landing made at an auxiliary field.

Maintenance bought this one. The oil pressure indicating line quick disconnect was found disconnected, which had depleted the oil supply. Further inspection of the Q. D. showed it to be excessively worn. In fact, it was worn so badly that when it was connected and the lock ring rotated into place, a little jiggle would separate it.

When this engine had been pulled for a test cell run and reinstalled 90 days previously, maintenance personnel failed to comply with 1T-37B-6 WC-5, Card No. 006, item 6, which calls for the Q. D. to be checked for wear. Maintenance also goofed two days prior to this incident in that while troubleshooting an oil pressure fluctuation, they connected a direct reading gage to this fitting and failed to detect the worn condition.

TIRE PRESSURE

Three low approaches had been flown and as the F-111 was rolling on a touch and go landing a vibration was felt by both pilots for approximately three to four seconds; the AC also sensed a slight pull to the right.

After coordinating the problems with the command post, a successful approach-end barrier engagement was accomplished.

Extensive troubleshooting failed to uncover any cause for the vibration, except that a difference of 50 PSI was found in the nosewheel tires. Normal nosewheel tire pressure for gross weight is 215-235 PSI. The left tire had 210 PSI, the right tire 260 PSI.

This incident can be attributed to only one thing. Carelessness—on the part of the individual who performed the preflight, and on the part of his supervisor who didn't demand better. ★

shock. At 25 MA he will be "frozen" to the point of contact.

20 to 50 MILLIAMPERES—severe muscle contractions include those muscles controlling breathing. In addition to difficulty in breathing, the victim may be "knocked out."

50 to 75 MILLIAMPERES—almost certain unconsciousness.

75 to 100 MILLIAMPERES—as current nears 100 MA, the man is almost certain to die. Ventricular fibrillation sets in, the heart no longer circulates blood in the body, and even after the current is cut off, no pulse can be detected. Artificial respiration should be attempted, but unless a trained physician or a doctor can restore the natural rhythmic action of the heart by massage or controlled electrical shock treatment using special equipment usually found only in hospitals, it's almost impossible to save the victim's life. Usually the maximum time limit for resumption of natural heart function under these circumstances is about six minutes.

(Closed heart massage is taught in many first aid courses. This technique applied by a person trained in its use may save a life if used prior to the arrival of Medical personnel.—ED.)

0.20 to 2 AMPERES—this intensity of flow will paralize the nerves near the diaphragm or the nerve centers at the base of the brain. Breathing will be cut off.

2 AMPERES and over—the man will suffer severe burns due to "frying" of the body fluids and to external arcing at the point of contact. In addition, internal burns of the slow healing type will also occur. This latter fact might seem academic under the circumstances, but a peculiar thing sometimes happens when flows of above 10 AMPS occur for very short periods. The severe muscle contractions the man experiences may prevent ventricular fibrillation, and after release, if proper first aid is administered soon enough, he might survive if the heart picks up its regular pumping rhythm again.

The tabulation above is a general guide only. Naturally there will be variations due to individual circumstances. The physical condition of the victim may be a factor. But the important thing to remember is that *fewer low voltage shock victims can be revived than those receiving 1000 volts or more.*

SUMMING UP

With the foregoing facts in mind, we can do a summing-up exercise in relatively few words. Although we must be aware of the many variables in cases of electrical shock and the hazards which cause them, we can make some general statements which apply to almost all circumstances.

- If your body becomes part of a circuit, either as the load or as the conductor and the load, you will get an electrical shock.
- Your body will become part of the circuit if you come in contact with both a source of potential and a ground while your total resistance is low enough to allow a flow of current.
- Current flow is what kills or injures you—voltage only pushes the current through your body resistance.
- Direct current (DC) is generally considered to carry less shock hazard than alternating current (AC) for a given voltage, but it is likely to burn more severely since the arcs from DC are more persistent than those of AC.
- Body resistance is highly variable, principally because of changes in skin resistance from one body area to another due to thickness and amount of moisture on the surface.
- Electrical energy sources (AC or DC) operating with an open circuit potential of 30 volts or more with a capability of delivering 2.5 milliamperes or more into a short circuit are hazardous to you.

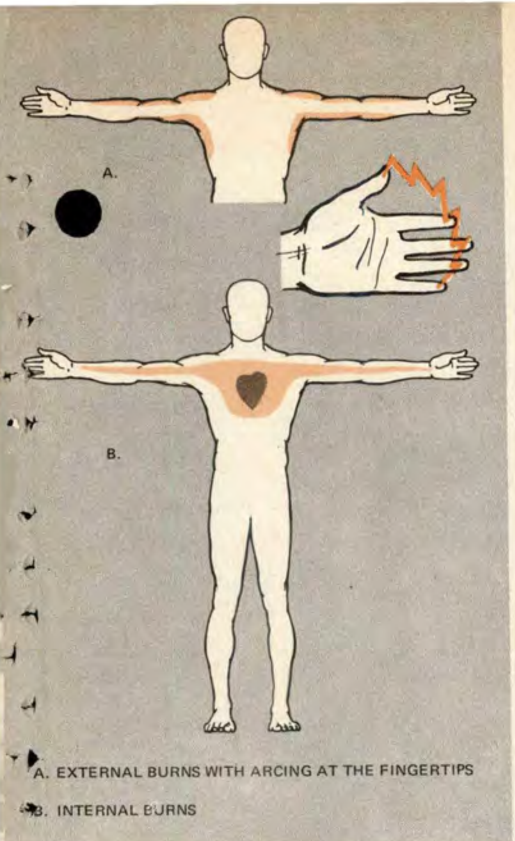


Figure 3 Electrical burns from over 2 ampere current

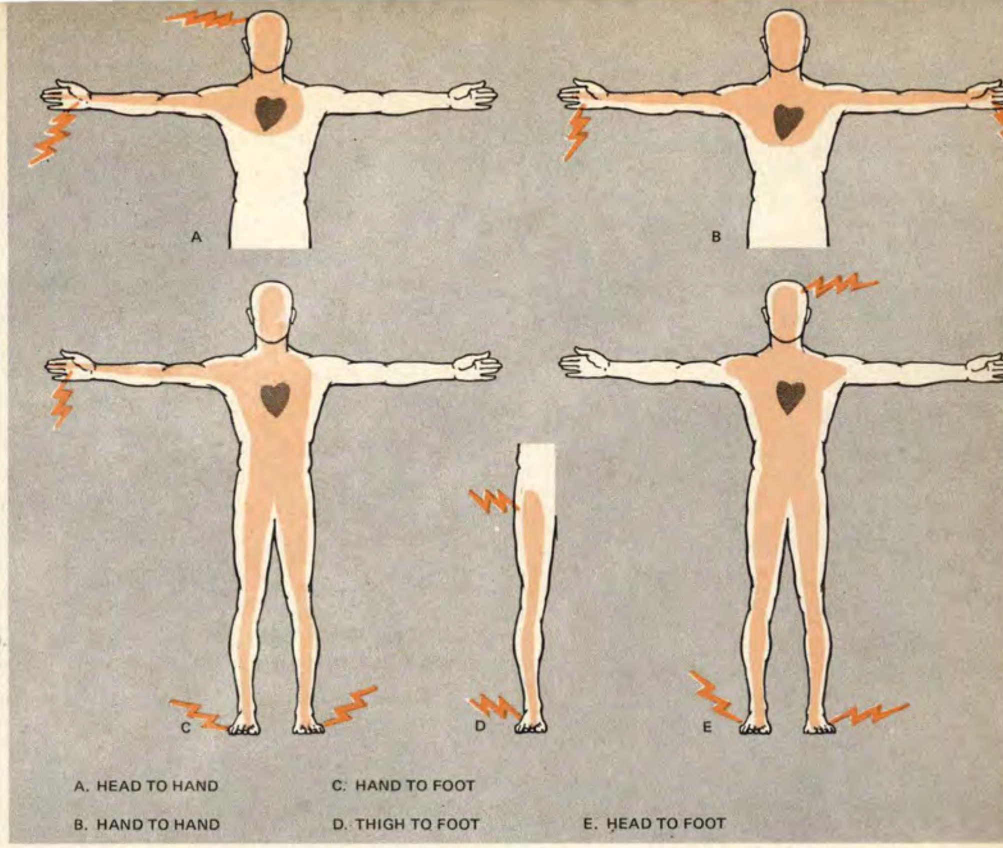


Figure 4 Current path in five basic types of shock

• Low voltage (less than 600 volts) can be more dangerous to you than high voltage. Accurate statistics show that 62 per cent of victims recovered after being knocked out by potentials over 1000 volts; for lower voltages, only 39 percent recovered.

• The seriousness of electrical shock depends on the balance between several factors—the voltage, the body resistance, the amount of current flow and its path through the body, the duration of contact and the condition of the body organs in the current path.

• The most hazardous currents are those in the frequency range from 20 to 100 cycles per second (cps). Currents of higher frequencies are less hazardous because they tend to flow on the surface of conductors rather than through the conductors themselves. High frequency current will cause electrical shock but to a lesser extent for a specific current value.

• The current required to operate just one 100-watt light bulb is **eight to ten times the amount that is needed to kill you.**

SAFETY PRECAUTIONS

There are a number of safety precautions you can take to minimize the degree of exposure and the potential for being on the receiving end of an electrical shock. Some of these precautions involve the equipment you work with—others have to do with your attitude toward your work and your interest in safe working conditions. Let's tick off some of the most time-tested precautions in both areas, as they apply to the mechanic or technician working either on the airplane or at the bench in the hangar or shops.

SAFE PRACTICES Start with *good housekeeping* in your work area. Keep it clear of clutter, stray wires, solder drops, unusable spare parts and unoccupied people.

1. *Don't work on energized circuits.* If you can possibly avoid it, don't touch a live circuit *anywhere*. Of course, some of us must work on energized circuits to do our jobs, but in such cases we should be properly trained and always know for sure what voltages and frequencies we are involved with.

2. *Avoid working alone.* When using electrical equipment, if you can work with or around someone else, you are safer, especially if he knows how to turn off the power, how to get help in an emergency, and how to apply artificial respiration.

3. *Follow the Technical Manual.* Safe procedures for all the technical operations are contained in your approved technical publications. Follow them, and if

there is a checklist for your particular operation, USE IT. Don't depend on your memory, and don't try to take short cuts.

4. *Rig power cables properly.* Never use portable cords or other equipment in such a way that a *male plug* can be energized except when it is in a receptacle. When connecting a motor or other equipment to a power source, first make sure that the switch or circuit breaker is open at the source. Then connect the cord or cable to the equipment you are going to use, and work back toward the power source with dead cable in your hands, making the connection to the source your next-to-last move. Your last move, then should be to turn on the switch or close the circuit breaker while watching to see if there is any evidence of overheating or arcing in the supply cable or the equipment itself. NEVER CONNECT TO A POWER SOURCE FIRST. NEVER MAKE INTERMEDIATE CONNECTIONS UNLESS THE POWER IS OFF.

5. *Keep yourself and your equipment dry.* Moisture is your enemy when you work with electricity.

6. *Make sure that grounding is proper and complete.* Most electrical industrial equipment comes with carefully designed grounding provisions. Most cords use three or four-wire cable to ensure your safety by providing a built-in low-resistance path to ground in case of a short circuit. *Don't guess about this.* If there is any doubt in your mind about the condition or function of any electrical equipment you may have to use, get help from authorized and trained personnel instead of taking a chance.

Grounding is one of the ways we prevent injury from electricity (the other is insulation). Adequate grounding of all non-current-carrying parts of electrical equipment which could become accidentally energized will help to keep you from "frying" when using such simple tools as a drill motor, or such complex ones as an electronic bench test set.

7. *Be familiar with first aid procedures.* If your buddy is not so careful as you, your knowledge may save his life.

8. *Use the right tool for the job.* Don't overload or abuse electrical equipment or circuits beyond their capacity. Don't try to "fool" the circuit by using a fuse heavier than the one authorized, or by "bridging" a burned out fuse with heavier conducting material. Don't replace fuses by hand on live circuits; use a fuse puller.

9. *Use safety lights in closed or fume-laden areas.* Whenever you work in a closed area or in a place where volatile fumes could collect, use only approved, sealed safety lights and explosion-proof equipment. Some explosions in the past haven't killed anyone, but those present were electrocuted by the bare wires whipping around as a result of the big boom.

10. *If someone else becomes a shock victim, don't join him.* Don't become part of the circuit yourself. Turn off the power or manipulate the wires or the victim with something you're SURE is a non-conductor (some rubber items are pretty good conductors). As soon as you can touch him safely, apply artificial respiration. Speed is essential—in 600 cases studied, 70 percent recovered when artificial respiration was applied *within three minutes.* Another minute of delay reduced the figure to 58 percent. Five minutes is too long—the chances are slim.

WORKING WITH 400 CYCLE AC

400 cycle AC electricity HURTS! Ask the mechanic who has been careless, he'll tell you for certain. For removal and installation purposes on the aircraft there is no problem (unless you forget to pull the proper circuit breakers). However, overhauling components on the bench is quite a different matter. Usually it is necessary in the case of actuators, valves, relays, and so forth, to apply power to the component for adjustment/test purposes. *In days gone by, when almost all components were powered by 28 volts DC, working with power applied presented very little danger. However, with the introduction of jet aircraft and the switch to 115-volts, 400 cycle AC, it's a different story. A mistake now presents a danger that could possibly be fatal.*

Extreme care must be exercised during bench adjustments. Turn the switch on your power supply OFF if at all possible while making any adjustment. Be certain that no part of your body is in contact with a possible ground return.

One further word concerning the bench power supply: There are two types in common use at the present time. The latest model employs an "above-ground" transformer and protects the operator from possible feedback through a metal bench or a damp floor. The older model does not afford this protection. It is possible to have full voltage standing between either test lead and any surrounding metal objects. Remember: If you must move a power supply, check it with a voltmeter *after* inserting the wall plug. This will eliminate that moment of surprise (115/220 volts AC, 400 cycle lightning bolt!) ★

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor, Aerospace Safety Magazine, AFISC, Norton AFB, CA. 92409.

Dear TOOTS

My question is this, do we have to make out a new Form 365F for each flight? (C-119G, Class 2 Aircraft). TO 1-1B-50, page 4-3, para 4-17A, Change 6, states: "The pilot will cite previously filed Form F in base ops on DD 175."

TO 1-1B-40, page 3-5, section 3, para 3-20, Change 6, states: "It is necessary to accomplish Form F prior to a flight whenever an aircraft is loaded in a manner for which no previous valid Form F is available."

We do have representative forms on file in base ops.

MSgt John Jesse
T. F. Green Airport
Warwick, Rhode Island

Dear John

You answered your own question when you quoted TO-1-1B-40. You must complete the Form F only when no previous valid form for that individual load is on file at base ops.

Form Fs covering day-to-day operations such as training flights, predetermined loads, etc., should be filed and current in base ops; a new Form F is not required before each flight.

I talked with the technical order systems branch at Tinker AFB and they concurred. They also said that TO 1-1B-40 and TO 1-1B-50 are currently being revised. The revision should be in the field soon and hopefully the Form F area will be clarified.

Toots

Dear TOOTS

A question has developed in our Quality Control and Evaluation Section as to the interpretation of TO 00-25-172 and AFM 127-101 in the area of bonding maintenance stands in a refueling area. We are at odds in interpreting what is meant by the word "used". TO 00-25-172, page 4-BA, sub paras h and d state that if work stands are used they will be bonded to the aircraft. AFM 127-101, page 8-28, para 1(8) states that all equipment used in a refueling operation will be bonded and grounded.

During the refueling (over the wing) of our WB-57C aircraft, a B-4 maintenance stand is used to gain access to the top of the wings. Us good guys contend that the stand should be bonded to the aircraft during the refuel operation. The bad guys contend that the stand should be bonded to the aircraft only if servicing personnel are standing on it while refueling the aircraft.

Since we are at odds (split fifty-fifty) we have decided to ask you for your interpretation, so we may settle the question in this area for all concerned.

MSgt David L. Kutulis
58th WRS
Kirtland AFB, New Mexico

Dear Dave

My interpretation and that of the OPRs for both TO 00-25-172 and AFM 127-101 is that the B-4 maintenance stand will be bonded to the aircraft during all service and maintenance, even though it is used only to gain access to the wing.

Thanks for writing. I hope I haven't made any enemies with my answer!

Toots

EXPLOSIVES

IDIOT'S DELIGHT

foolishness with firearms is deadly

For a few moments following the sudden ear-ringing blast of a pistol shot, the barracks was locked in silence. Then someone telephoned for an ambulance, hallways began to fill with everyone moving toward the source of the sound. As a circle of staring faces formed around the tragic tableau in the dayroom a hoarse cry of "He's dead" again stunned everyone into silence. Suddenly, an ashen-faced young man cried out, "I didn't know it was loaded. I didn't mean to kill him." Then, collapsing into a lounge chair, he began to sob.

Corny fiction out of an old pulp magazine? Not at all. Air Force personnel have played principal and supporting roles in variations of this tragic scene time and time again. Fortunately, most of the victims recovered, but not without pain, hospitalization, and a scar as a reminder of the potentially fatal incident.

LT COL EARLE P. BROWN, Directorate of Aerospace Safety

SAFETY

for munitions, weapons, and egress techs

However, the story never ends at this point. Usually much more is in store for everyone involved. There is the inevitable emotional trauma, subsequent disciplinary or administrative action, and possibly irreparable damage to a future military or civilian career. These are bitter prices to pay for a momentary whim, a bit of foolish horseplay, or deliberate disregard of regulations controlling the possession, handling, and use of firearms.

Air Force experience over the past six years reveals a discouraging number of deaths, injuries, and tragic losses due to firearm incidents. Since 1966 almost 700 have been recorded with 42 ending in the finality of death and more than 640 resulting in gunshot injuries. Costs have totaled $3,338,009—over one-half million dollars annually—and this does not include the loss of production while the injured parties were recuperating from their wounds.

Ironically, a factor found in a majority of cases was the recurring problem of the immature individual who failed to project himself beyond the toy gun stages of childhood. The fact that this individual possesses a real gun does not deter him from continuing such juvenile games as "quick draw" or "stick-em-up" to impress or frighten or intimidate others. Just as mindless is the stupid bravado of Russian Roulette, an often fatal game played by idiots, with idiots, and sometimes watched by idiots who did little or nothing to stop the foolishness before someone was killed or injured. There are documented instances of Air Force personnel who have played and *lost* at Russian Roulette right before the eyes of individuals who could and should have prevented the ultimate tragedy.

Another disturbing element is the fact that most of the individuals involved were either weapon-qualified or assigned to duties regularly requiring them to be armed. Again, immaturity, evidenced by negligence, needless unholstering or toying with weapons, horseplay, or childish pranks, was found to be a significant factor in many of the tragic events.

Seventy percent of Air Force firearms incidents since 1966 were handgun mishaps; 35 percent involved .22 caliber pistols or revolvers. When rifle statistics are included the "deadly 22" accounted for a third of the gunshot deaths and almost one-half of all the injuries. These facts add further substantiation to the premise that most of the individuals involved failed to properly consider a firearm a potentially lethal instrument.

Twenty-nine percent of the injuries and one-half of the gunshot deaths were associated with shoulder weapons—rifles and shotguns of various gauges and calibers. Here, negligence and inexperience took their deadly toll with immature regard for the lethality of the weapon running a close third among predominate cause factors.

Contrary to the current movie or television symbol of masculinity, a gun does not make the possessor a man. The term "man" implies maturity and we can point out 684 examples during the last six years where the proper formula of gun, man, and maturity went awry.

The solution to this problem is obvious and it is expressed by the word "discipline"—that discipline imposed by higher authority and self-discipline. Both are required if we are to eliminate the senseless loss of life and property caused by the irresponsible handling of firearms. ★

"Ricochet," JANUARY AEROSPACE SAFETY

We here at Zaragoza read your article ("Ricochet," Jan 1972) with interest. We had a rash of ricochet incidents/accidents last year, but as the result of some major changes to the range and an increased emphasis on ricochet hazards we have not had one incident since last April. ("Knock on wood.")

When Bardenas Reales Range was reconfigured in the summer of 1970, a strafing range was set up with two acoustiscore targets. From a slow start we built up to over 100,000 rounds of 20mm being fired from F-4s in March 1971. At that time, we were using the standard 55-89 minimums of 5° - 15°, 1600 foot foul line and 50 feet above target. We had at least four ricochet incidents, including a scratched radome, a shattered windscreen (no injury), a ruined J-79 engine and a lodged round inside an intake (three months to repair).

After the last we moved our foul line to 2000 feet as an interim measure, but were searching for a permanent answer. We had several inherent problems. First, the soil at the range is pure clay. With the least bit of rain it would turn to the worst type of sticky mud. This not only precluded the use of the potato-digger but often made it impossible for the cleaning crews of the Spanish AF to walk around to hand pick the areas. As it began to dry it would form large clods which immensely cut the efficiency of the potato-digger. When completely dried out, it would soon churn to powder, offering virtually no resistance to the rounds which often seemed to pass right on through and back into the air at high angles (shown by the large number of undamaged slugs to the sides of the areas).

An answer from the Fighter Weapons Center to 16AF suggested the use of sand. We proposed using sand and the moving of the strafing complex 400 feet down range to give a permanent 2000 foot foul line. The use of sand was approved but we were instructed to stay at 1600 feet.

During the period 30 June to 19 July 1971 the range was closed for a complete renovation. We dug pits two feet deep, 80 feet wide (the width between our poles) and 300 feet long (100 feet short to 200 feet beyond the targets). Into these two pits we put 3100 metric tons of sand (3410 U.S. tons or 2000 cubic meters). It required 137 truckloads by five trucks hauling the washed sand 20 miles from the Ebro River over a two week period. The approximate cost was $8000.

Our original design for the sand was for it to allow the use of the digger in damp or wet weather. This it does, but we have discovered a much more important side effect. The sand, wet or dry, furnishes much more mass which nearly always causes the 20mm rounds to burst on impact. It is almost impossible to find undamaged or intact slugs. They also seem to usually ricochet out of the sand filled area at low angles to great distances down range. It is hard to find slugs at the sides or off the end of the sand, indicating that they don't go up into the air at high angles, coming back down nearby. The mass of the sand precludes deep entry so that at the end of a day's firing, most of the remaining rounds are on or near the surface making "hand picking" efficient and easy. The Spanish AF soldiers comb each side every night and usually find only several hundred slugs, when between 5000 and 10,000 rounds have been fired that day. We also use the potato-digger every Friday.

Along with the sand we have instituted a program including briefings for the TDY F-4 aircrews and strict enforcement of AFR 55-89. Our Range Control Officers (TDY from the 16AF and 17AF units using the range) are instructed to refrain from calling "pressing"; a pilot either fouls or he doesn't. He has the authority to also call a foul when he sees a "slow or lazy pulloff." It is our opinion that more ricochet incidents are caused by an easy recovery and flying through the most hazardous area than by firing past the line. At the direction of USAFE we have recently added an 1800 foot foul line as the minimum firing distance.

Whatever the reason, we feel we have now achieved some measure of success. We aren't going to break our arms patting ourselves on the back, however, as we could pick one up tomorrow. We plan to continue our present procedures, perhaps adding the use of a magnet if it proves successful.

While these discoveries may not be completely new, they were new to us and we aren't sure how many other ranges know this or perhaps have other ideas. Feel free to pass my name and address along to anyone desiring information from us or having information which may help us. We are proud of our recent record and of our range and hope to better it. Our address is: 406th Tactical Fighter Training Group (DOWL/Range Operations), APO New York 09286.

Maj Kenneth D. Deal
OIC Range Operations and
Weapons Liaison Officer

☆ U.S. GOVERNMENT PRINTING OFFICE 1971 789-127/8

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.

LT COL JOSEPH C. BRYDE

184th Tactical Fighter Training Group, McConnell AFB, Kansas

Lieutenant Colonel Bryde was flying as number three on a low-level navigation mission in an F-105D. At 1000 feet AGL and 400 knots, the airplane suddenly began a rapid roll to the left. The autopilot and the stability augmentor were disconnected and right aileron pressure and right rudder applied with no effect. The control stick would not move to the right and the airplane continued to roll to a 100 degree left bank. Lieutenant Colonel Bryde reduced power and applied heavy positive G load which caused the airplane to roll slowly back to the right. The airplane rolled to a 60 degree left bank but upon reapplication of power it again began to roll to the left. Lieutenant Colonel Bryde again reduced power and established a climb to reduce airspeed below rudder lock-out speed, where he was able to maintain wings level flight with nearly full right rudder. He climbed to an altitude above 18,000 feet and declared an emergency.

Lieutenant Colonel Bryde discussed the situation with the flight leader and the mobile control officer and was advised by the flight leader that the right aileron appeared to be full down. He then lowered the left flap to relieve the heavy right rudder pressure. The control stick still could not be moved to the right, but a 10-15° right bank could be established with rudder. He experimented with flap positions and minimum control speeds with the gear down to determine best landing configuration. With the left flap 48 percent down, and the right flap full up, the controllability check was satisfactory and the airplane was landed from a straight-in approach at 235 knots. Touchdown was 2000 feet down on a 12,000 foot dry runway. Aerodynamic braking, the drag chute, and normal braking slowed the aircraft to taxi speed. Inspection found the right aileron to be full down, left aileron neutral and both spoilers closed. Further inspection revealed a small wire bundle clamp support bracket in the right wing had broken from its mounting screw and lodged in the right aileron power control unit, locking the control valve in the extended position and routing hydraulic pressure to the down side of the right aileron actuator.

Lieutenant Colonel Bryde's rapid response in countering the sudden uncontrolled roll at low altitude and his skill in landing without full use of the flight controls prevented the loss of a valuable airplane. WELL DONE! ★

THE AMBULANCE DOWN IN THE VALLEY

'Twas a dangerous cliff, as they freely confessed,
Though to walk near its crest was so pleasant;
But over its terrible edge there had slipped
A duke and full many a peasant.
The people said something would have to be done,
But their projects did not at all tally.
Some said, "Put a fence 'round the edge of the cliff,"
Some, "An ambulance down in the valley."

The lament of the crowd was profound and was loud
As their tears overflowed with their pity;
But the cry of the ambulance carried the day
As it spread through the neighboring city.
A collection was made, to accumulate aid,
And the dwellers in highway and alley
Gave dollars or cents—not to furnish a fence—
But an ambulance down in the valley.

"For the cliff is all right if you're careful," they said;
"And if folks ever slip and are dropping,
It isn't the slipping that hurts them so much
As the shock down below—when they're stopping."
So for years (we have heard), as these mishaps occurred
Quick forth would the rescuers sally,
To pick up the victims who fell from the cliff,
With the ambulance down in the valley.

Said one, to his pleas, "It's a marvel to me
That you'd give so much greater attention
To repairing results than to curing the cause;
You had much better aim at prevention.
For the mischief, of course, should be stopped at its source;
Come, neighbors and friends, let us rally.
It is far better sense to rely on a fence
Than an ambulance down in the valley."

"He is wrong in his head," the majority said,
He would end all our earnest endeavor.
He's a man who would shirk this responsible work,
But we will support it forever.
Aren't we picking up all, just as fast as they fall,
And giving them care liberally?
A superfluous fence is of no consequence,
If the ambulance works in the valley."

The story looks queer as we've written it here,
But things oft occur that are stranger.
More humane, we assert, than to succor the hurt
Is the plan of removing the danger.
The best possible course is to safeguard the source
By attending to things rationally.
Yes, build up the fence and let us dispense
With the ambulance down in the valley.

Author Unknown

PHYSICAL ORIGINAL PAGES

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OR
MISSING