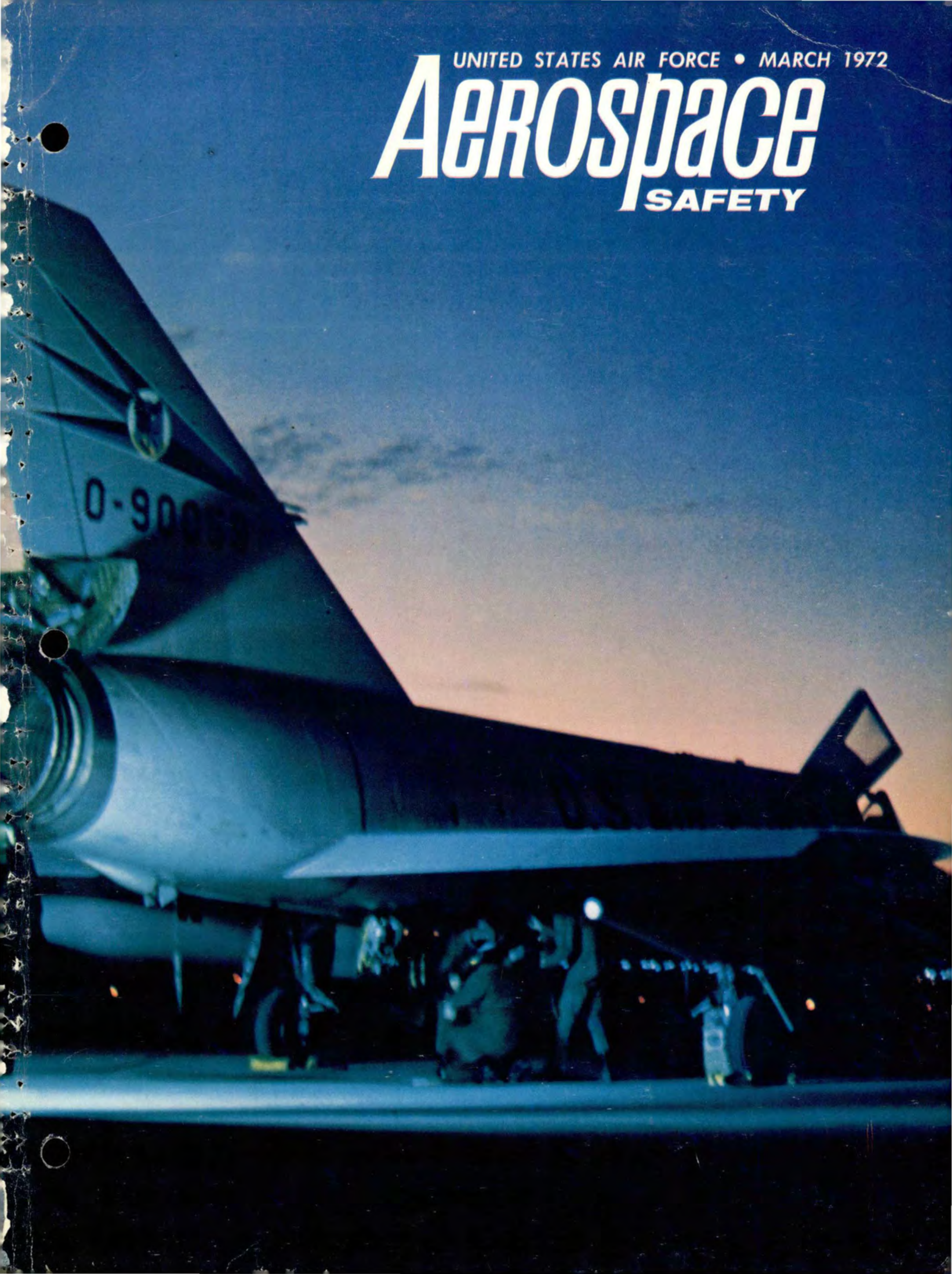
UNITED STATES AIR FORCE • MARCH 1972

Aerospace SAFETY



Cover photograph by Sgt James H. Klein, 1365 Photo Sqdn, Hq, AAVS, Norton AFB, Calif. F-106, Nellis AFB, Nevada.

UNITED STATES AIR FORCE MARCH 1972

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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MARCH 1972 AFRP 127-2 VOLUME 28 NUMBER 3

MAJ RICHARD E. HAMILTON, DIRECTORATE OF AEROSPACE SAFETY

THE COMMANDER'S GOT TO GET INVOLVED

Although the record shows that maintenance is the primary cause in only 6-7 per cent of all USAF aircraft accidents, poor maintenance practices definitely contributed to many of last year's accidents which were tagged with operator factor or materiel failure as primary cause! There were far, far too many cases where the "remove and replace" syndrome was substituted for trouble-shooting the system, work was signed off without actually being inspected, or discrepancies were cleared by "could not duplicate" or "checked IAW. . ."

In one recent major accident, the aircraft maintenance history revealed that repeat write-ups on three separate systems had occurred seven times in one month. Corrective actions consisted of "could not duplicate," "removed and replaced unit," and "checked within tolerances IAW . . ." Incidentally, one of the repeat write-up items failed in flight —and contributed to this accident.

Someone has to keep tabs on this kind of maintenance practice and bring it to a screeching halt! Quality Control isn't the only outfit responsible for insuring that quality maintenance is being performed. The only way we can expect "quality" maintenance is by bringing Operations, Safety and Maintenance all together and launching a joint effort.

Obviously, only the commander has both the responsibility and authority to bring this about. He—and his staff—must get involved in the maintenance function *at all levels.*

One good place to start is the pilot's maintenance debriefing. The bulk of the discrepancies in de-briefing fall into the following areas:

- No established/private debriefing area provided.
- De-briefing teams not adequately staffed with qualified technicians.
- Minor discrepancies not written up or otherwise documented.
- Pilot's write-ups incomplete and/or not understood by the man assigned to correct the discrepancy.

The lack of communication between the pilot and the maintenance troop may be greater than you think. Does your maintenance operation always have a supervisor available to check the write-up and to explain the work card to the man who's going to accomplish the job? Do you have a follow-up program to insure that repeat write-ups are identified and corrected?

Okay, so you've got a system established. Does it work? The best way to find out is to ask—talk to the man who is working on an aircraft and have him explain to you what the pilot's write-up means and how his action will correct it.

. . . Sound like we're changing your AFSC to Maintenance Officer? Take a look at AFM 127-1, Chapter 3, regarding maintenance and safety. And remember this: an effective safety program is the commander's responsibility, and it is kept effective under the commander's authority. The commander has GOT to get involved! ★

the two-million dollar CLIPBOARD

Finally, after sitting number one for five minutes, the RF-4C got takeoff clearance from tower. The pilot taxied onto the runway, accomplished engine run-up and completed the before takeoff checklist. All checks were normal. He pushed the throttles to 85 per cent, pulled the stick full aft, released brakes and eased the throttles into afterburner range as the heavyweight bird accelerated down the runway. In the aft cockpit, the navigator reached across to the clipboard on his left leg, extracted the pencil, noted the time and called "Off at zero-six" over the intercom.

Passing 160 knots, the nose wheel lifted off and the pilot eased the stick forward to maintain takeoff attitude of 10-12 degrees. He thought the stick felt stiff as he brought it forward, but he was well past the computed maximum abort speed of 125 knots, and everything else seemed all right. The aircraft was stabilized in pitch at this point. The Phantom became airborne, accelerated normally, and the pilot retracted the gear. As the airspeed increased, the nose began to rise, and the pilot tried to counter the increasing attitude with forward stick. He suddenly realized that the stick wouldn't go forward. He brought his other hand off the throttle to the stick in order to exert more force, and ran full forward trim, but nothing helped!

In the back seat, the navigator suddenly realized that his clipboard was no longer on his leg, but had lodged, upside down, between the stick and the vicinity of the rudder pedal adjust knob.

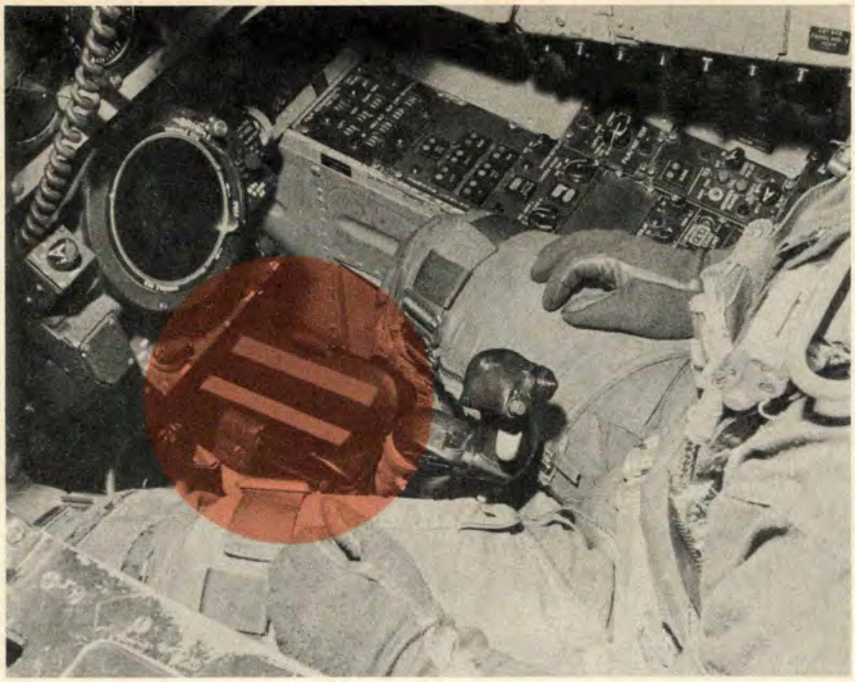
The bird continued to accelerate and the pitch attitude increased uncontrollably. The pilot continued to apply forward pressure with both hands and asked the nav tersely if he was on the controls. The nav's answer was strained and unintelligible, primarily because he was bent over in the rear cockpit, banging at the checklist with both hands, trying to force it loose!

The pilot noted the airspeed at 250 knots as the nose passed 40-50 degrees of pitch—still climbing—and he retarded the throttles to MIL power to slow the aircraft. The pitch attitude stabilized at about 40 degrees. He cycled his paddle switch several times and turned off the pitch augmentation switch, but felt no stabilator response. He considered jettisoning his external tanks, but decided against it because he was over a village.

At this time a rapid and excited conversation took place between the two crewmembers. The pilot understood the nav to say that his checklist was wedged forward of the aft control stick (the nav later admitted that in the excitement he might have said "checklist" instead of "clipboard"), and he told the nav that he would roll the airplane on a wing and release forward pressure. Airspeed at this time had diminished to 190 knots, and the flashing wheels light reminded the pilot that he had not yet retracted his flaps. He reselected afterburner, retracted flaps and rudder-rolled the aircraft to the right.

During the climb and roll to the right, the nav continued to hit the clipboard with the butt of his hand —first from the left, then from the right—with no success at dislodging it. At about 60 degrees of bank the pilot momentarily eased some of the forward stick pressure. The nav realized it for he saw the clipboard slip down slightly. Unfortunately, he was in the back swing phase at the time; before he could follow through, the pilot had resumed forward pressure.

The pilot first noticed the rudder pedal shaker during the roll to the right. He continued the roll until the nose of the aircraft came almost



to the horizon. At about 70 degrees of bank the rudder pedal was still shaking, and he noted the angle of attack indicator at about 24 units. Then, with no control input from the pilot, the aircraft made a very lazy roll back to 20 degrees of bank. The pilot saw the airspeed decreasing through 150 knots. Seconds later the nose sliced through the horizon to the right and the aircraft entered what felt like a nose-high spiral. The pilot told the nav to prepare for ejection, made a quick MAYDAY call and pulled the lower ejection handle.

Time from brake release to punchout: slightly more than two minutes.

* * *

Well, there's the narrative. Now what inferences can we draw? The team that investigated the accident was extremely thorough; they put pilots in airplanes, trying to get an inadvertent clipboard release; they jammed clipboards and removed them until they ran out of clipboards; they ran exhaustive tests verifying the testimony of the crewmembers; they surveyed every F-4 crewmember they could conveniently get at.

—And they found that the primary cause of the accident was a design deficiency of the clipboard.

That was hard to swallow, at first. A cursory reading of the accident report led us to jump to the conclusion that cockpit confusion was the *real* cause. But after arguing ourselves into a corner several times, we find we have to go along.

There *was* confusion between the cockpits—sure! But suppose, just for a moment, that the nav had had the presence of mind to say—in a very clipped, precise voice—"My *¢&#@ clipboard is wedged in front of my stick and you'll have to bring the stick back so I can remove it." What then? Could the pilot have brought the stick back at that point? We don't know—maybe they'd have made it, maybe not.

On the other hand, a survey of more than a hundred crewmembers turned up the interesting fact that 32 per cent had experienced at least one inadvertent release of the MXU-163/P clipboard—yet there had never been an input from the field on the deficiency of this piece of equipment.

Complicating the issue is the way the clipboard fits on the leg. By design, the right strap is the long one and it fastens on the left. If the board is worn on the right leg, the clasp is to the inside of the leg where it is not likely to be released inadvertently—and even if it did, it would be flipped to the right and wouldn't go anywhere. On the left leg, though, an inadvertent release is easy, because the clasp is on the outside of the leg and lines up with various holes and protrusions in the seat and around the cockpit—and if it springs loose, it flips right into the stick area.

So the moral of the story turns out to be just what the board said it was: If you're using a piece of equipment and it is not satisfactory, *write it up!* Use the USAF Hazard Report, the EUMR, or anything else to draw some attention to it. But don't ignore a "minor" piece of equipment.

Even a clipboard can cost a couple of million bucks. ★

the perfect MURPHY

He squirmed back into the shadow of the crate in the corner, a shadow himself, and watched the crowd around the helicopter that had just been towed into the hangar. He giggled, wrung his hands and scrunched deeper into the shadows. By golly, he had really done it this time. He counted off the people around the helicopter: the chief of maintenance himself—he'd bagged a big one—the maintenance officer, the shop NCOIC and assorted other types with stripes on their sleeves.

He could hear the chief of maintenance—who couldn't?—"@)&$*$¢ you'd better find out what in the (%@¢ is the matter with this—bird."

"Yessir," said the maintenance officer.

"Yessir," echoed the NCOIC.

Several others yessired and started removing panels and other parts.

This was the second time the helicopter had been in the shop in the past few days. In fact, it had just gone out this morning for an ops check after a transmission change. The preflight had gone okay, and engine start and rotor engagement were normal. After the initial checks had been completed, the pilot brought the bird to a 3-5 foot hover for an instrument check. In a few moments a soft whine began, then ceased. After a few seconds it began again followed by a grinding sound. The crew promptly landed and shut down the engines.

When he heard about the mishap, the Lt Col who was chief of maintenance called in all the layers of supervision who were in any way concerned with the helicopter. He soon found out that the chopper's troubles started just after completion of a TCTO 10 days previously. On that occasion the helicopter was being flown in a low hover for an engine power check when a high pitched whine began, followed by a sharp decrease in main rotor rpm, flight control problems and fire flashing from the base of the rotor mast.

When they dug into the bird, Maintenance found a gear failure in the main transmission. The helicopter had been in the shop since then and had just gone out that morning for an ops check. Now it was back in the hangar and the boss wanted to know why.

The figure hiding in the shadows chuckled gleefully as he watched the green clad figures swarming over the helicopter. This was real fun. He hoped they would make the same mistake they did last time. *Fix the symptom but not the cause.* He alone knew the real cause. And he wasn't telling. Let them find out themselves—if they can.

It didn't take long for the mechanics to find the apparent problem. The transmission gear again. But how come? The maintenance NCOIC stood back and watched, a thoughtful look on his face.

"All right, so you found it," he said. "Now let's see what really went wrong. Give me the 781."

The following morning the NCOIC and the maintenance officer were standing in front of the old man's desk.

"Sir, it was a perfect Murphy," the maintenance officer was saying. "When we pulled the TCTO, we found some plumbing that was chafing. We decided to reroute it and somehow-or-other the line was reinstalled in such a way that a check valve in the line was in backwards. Of course, the transmission gear couldn't get any oil, went dry and that was it."

Out in the hangar, behind the packing crate, Murphy shrugged his shoulders. So they found it, he thought to himself. It's a good thing these guys aren't as thorough every day as they are when the boss is riding their tails. They'd put me out of business.

Lessee now, I'll wait a couple of days to let them get back to normal. Then I'll let 'em have the old hoses-crossed-to-the-flight-controls trick, or . . . . ★

REX RILEY'S
CROSS COUNTRY NOTES

FEEDBACK: Response has been good from you troops in the field recently concerning your approval or disapproval of transient facilities. Even better, we've had a lot of outstanding reports. Keep up the good work!

CLASS A PHONES: Several months ago I made the suggestion that each base ops have available a calling card-size list of telephone numbers. Looks like many of our facilities have done this, but now another problem is cropping up. The complaint came from a transient pilot who wanted to call his command post from the "Q" but was hard-pressed to find a Class A phone. Looks as though we could provide the "Q" with a Controlled Class A, with autovon, to contact home plate when the need arises. However, if no Class A is available and you have a *valid* operational necessity, the base should insure that all Class C phones have access to an operator who is able to connect you with your autovon number.

ATTITUDE: One of our conscientious TA types called to discuss attitude with me the other day. He pointed out that it's hard for the TA troops to get excited about helping transients that appear to be out on a boondoggle. To keep the record straight, all aircraft movements are so carefully supervised these days that I'm sure no one is out just boring holes. Crews that take an aircraft on a cross-country mission must have reqrirements to fill or they don't go. During my evaluations, I have to assume that the treatment I receive is representative of that particular base. The mission assigned to TA is an important one and if everyone in the business realizes this, service and attitude have to improve.

PAX CODES: Ideally, if the system works as advertised, a code properly noted on the 175 will get preferential treatment. However, the system isn't foolproof so to be sure, call ops dispatch 20 minutes or so out and let the base know. Might save a lot of embarrassment. ★

THE

REX RILEY
Transient Services Award

RAF MILDENHALL, U.K.

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, Colo
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.

MAJ CHARLES LEHMAN

Directorate of Aerospace Safety

the other way out

Mention ground egress training in most squadrons and you're sure to be met with a chorus of groans—at best. If training to step out of airplanes is so unpopular, why is it almost universally required in the Air Force? Well, mainly it's because people keep getting hurt needlessly in ground escapes.

When you start reading accident narratives, the serious and fatal injuries resulting from delayed egress stand out like the proverbial sore thumb. For instance, from 1966 through 1969 33 of our primary fighter aircraft alone were involved in ground (or water) egress accidents. Twenty of these birds (61 per cent) caught fire. Of the 66 crewmembers, 47 had trouble getting out of the cockpit or away from the flames. That's almost three out of four. Seven people were seriously burned trying to get out.

The problem isn't confined to fighters, either. In nine bomber accidents during the same period, 20 of the 32 crewmembers had problems leaving their big birds. Six of them never made it! Three others were burned because of delays.

The picture is similar in training aircraft and transports.

Although a lot of things can cause delays in exiting a bashed bird, the one that really stands out in the reports is the one we airplane drivers have some control of—"inadequate training." It's so easy to get complacent about ground egress training because we all *know* how to dismount our steed. We do it every day. But can we do it with flames licking around our ears and blinding smoke stinging our eyes? Not always.

WHEN THE AIRCRAFT CAME TO REST THE PILOT "RELEASED" HIS PARACHUTE RISER FITTINGS AND TRIED TO STAND UP. HIS SURVIVAL KIT PULLED HIM BACK DOWN, SO HE RELEASED IT AND LEAPED OVER THE LEFT CANOPY RAIL. HOWEVER, HIS RISERS WEREN'T REALLY RELEASED, SO HE WAS HUNG UP WITH THE FLAMES LICKING AT HIS FEET. WHILE HE TUGGED AT THE RISERS THE AIR CRAFT CANOPY FELL CLOSED AND PINNED THEM TO THE CANOPY RAIL. HE WAS SLOWLY BEING SUCKED INTO THE INTAKE OF THE LEFT ENGINE WHEN THE BACKSEATER ARRIVED AND CUT HIM LOOSE.

Stories like this may be great at the bar, but too often they cost us a crewmember and make a lot of folks unhappy.

In a real emergency ground egress, there are some things which must be done quickly, correctly, and in the proper order. Yet the records and a basic knowledge of performance under stress tell us we're not apt to do everything right unless we've done it before.

Obviously we can't have people jumping out of burning airplanes just for practice, but we *can* practice the ground egress procedures in a real cockpit (with egress ballistic components safetied) or a simulator, and we *can* add some stress. Even having someone yelling, "Come on, move! Hurry up!" can add a little urgency which sometimes leads to a mistake in procedures. And that's the time to make mistakes—during a training exercise, when you can go back and do it again with only your pride ruffled.

It's not hard to come up with an effective, realistic egress training exercise. Just ask yourself a few questions about your aircraft and equipment.

For instance, can all crewmembers actuate the releases for all life support equipment to be left in the cockpit? It's not enough to *know how* to operate the releases. They've got to be able to do it—FAST. What about alternate releases, like unhooking survival kits in case the emergency release fails? Can everyone operate the canopy or hatch jettison controls?

DURING AN ABORTED TAKEOFF A BOMBER BURST INTO FLAMES. THE AIRCRAFT COMMANDER COULDN'T OPEN HIS HATCH. HE TRIED TO USE THE COPILOT'S HATCH, BUT FLAMES DROVE HIM AWAY, AND HE FINALLY USED A NOSE HATCH. HE WAS SERIOUSLY BURNED.

Maybe we can't operate emergency controls routinely, but all crewmembers should get the opportunity to actuate them at least once in a while.

How about restricted vision? Many post-crash fires cause severe vision problems because of smoke and fumes. This is especially bad in bomber and transport aircraft where the crewmembers must find the exit before they can use it.

IN A RECENT TRANSPORT ACCIDENT ONE CREWMEMBER, COMPLETELY BLINDED BY SMOKE, WAS BACKING AWAY FROM THE FIRE, AND FELL THROUGH A RUPTURE IN THE FUSELAGE. HE WAS THE ONLY ONE TO GET OUT OF THE AIRCRAFT, ALTHOUGH NONE OF THE CREW WAS SERIOUSLY INJURED ON IMPACT.

Some kind of practice in finding and opening the exits with no visual reference should be provided.

Are there alternate emergency exits which can be used when the primary escape route is blocked? People have died simply because they went over the left canopy rail from force of habit—and landed right in the flames, even though the other side of the aircraft was not burning. Practice using all exits.

The new generation of flying clothes, like Nomex suits and gloves, provides some protection in a post-crash fire. So do the helmet and, especially, the oxygen mask. But the very best protection against fire is getting away from it—FAST. To do that you've got to practice.

AS THE AIRCRAFT SLID DOWN THE RUNWAY, FLAMES FILLED THE COCKPIT. BOTH PILOTS RELEASED THEMSELVES AND CLIMBED OUT, HUNG ONTO THE SIDE OF THE AIRCRAFT UNTIL IT CAME TO REST, THEN DROPPED TO THE GROUND AND RAN TO SAFETY. THEIR TIMELY EGRESS AND FIRE-RETARDANT FLIGHT SUITS UNDOUBTEDLY SAVED THEIR LIVES.

Ask yourself a few questions about your aircraft and your flying gear, practice for the obvious possibilities, and you *can* get out of a burning aircraft successfully.

You may even be 100 yards away before the fire starts. ★

THE I.P.I.S. APPROACH

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

AFM 51-37

The 1 November 1971 issue of AFM 51-37 should be in every pilot's possession. It will be impossible to list every change and the rationale behind each change in this article. However, the major changes are listed below as a guide to study of the new manual.

The introductory comments on the title page contain this statement: "This manual provides adequate guidance for instrument flight under most circumstances, but it is not a substitute for sound judgment. Circumstances may require modification of prescribed procedures." This places the emphasis on sound pilot judgment when such judgment would conflict with a prescribed procedure.

Chapter One: No major changes.

Chapter Two: Title changed to "Illusions in Flight." This chapter has been updated to include the latest concepts in physiological training.

Chapter Three: The information in this chapter has been updated and expanded.

Chapters Four and Five: No major changes.

Chapter Six: The discussion of the display and use of angle-of-attack has been greatly expanded.

Chapter Seven: A complete discussion of the Control-Performance Concept of attitude instrument flying is included.

Chapter Eight: Changes include:

a. Altimeter tolerance of 75 feet applies to VFR and IFR flight.

b. Discussion of helicopter instrument takeoff added.

c. The technique for level off is applied in both intermediate and cruise situations.

Chapter Nine: No major changes.

Chapter Ten: Flight Director and Integrated Flight Instrument System information has been included in this chapter.

Chapter Eleven: The most obvious change to this chapter is the inclusion of procedural steps for course interceptions. The procedural steps list the minimum required actions in sequence necessary for solution of a course intercept problem. There should be *no* requirement for pilots to memorize each step verbatim. A working knowledge of the procedure is all that should be required.

The chapter has been arranged so that illustrations and corresponding procedures are on facing pages. Numbered aircraft positions in the illustrations correspond with numbered instrument displays and numbered procedural steps. Lettered aircraft positions refer to corresponding instrument displays for which there is no associated procedural step.

Subdued tone illustrations represent either procedural steps which may have been previously accomplished or alternate courses of action.

Chapter Twelve: A slightly different technique for proceeding direct to a TACAN fix is presented. An introduction to Area Navigation (RNAV) has been added.

Chapter Thirteen: Specific steps for tuning and accomplishing ADF/RDF course interceptions have been included.

Chapter Fourteen: No major changes.

Chapter Fifteen: This is a new chapter which consolidates information that applies to all types of non-precision approaches. Changes include:

a. Criteria for descent after passing an Initial Approach Fix.

b. Criteria for descent below a penetration turn completion altitude (within 5° is considered on course).

c. Requirement to establish final approach configuration and airspeed prior to the Final Approach Fix.

d. Revised procedures for the accomplishment of a Procedure Turn. These include depiction, timing, and descent below procedure turn altitude. Procedure turn procedures in AFM 51-37 apply only to approaches depicted with a barb symbol. All other approaches should be flown as they are depicted. (See IPIS Approach, December 1971).

Because of the numerous changes, detailed study of this chapter is recommended.

Chapter Sixteen: Minor changes to update the radar information and align the pilot procedures with FAA Handbook 7110.8B.

Chapter Seventeen: Numerous changes were made to clarify ILS information. These include:

a. Requirement to read back vector information.

b. Criteria for descent to the published glide slope intercept altitude when being vectored to the localizer.

c. Authority to descend only to localizer MDA and *not* circling MDA in the event of glide slope malfunction.

Chapter Eighteen: Information gained from the IPIS "Landing Weather Minimums Investigation" has been added in a section titled "Transitioning From Instrument to Contact Flight Conditions."

More definitive procedures for circling approaches have been included.

The USAF IPIS hopes that you will find the new AFM 51-37 a valuable tool in your instrument flying and training programs. The world of instrument flight is dynamic and constantly changing. We are in the process of collecting material for the first change to the manual, not only to correct typographical errors, but to improve procedural and background information as well. We solicit your aid in keeping this manual current and responsive to the needs of you, the pilot. Do not hesitate to use the AF Form 847 to recommend changes to this manual. ★

* * * * * * *

MAINTENANCE MANAGEMENT COURSE

Maintenance of equipment in military organizations is a keystone to the total ability of the organization to meet its mission requirements. Normally, the maintenance element is managed by an individual designated for the task, but it is becoming more and more important that the commander and senior non-maintenance staff personnel understand what problems the maintenance manager faces. Hence, a one-week Maintenance Management Orientation Course (242) specifically designed to provide an orientation to equipment maintenance for senior military and civilian personnel who are not maintenance managers. The five class days provide coverage of maintenance policies and concepts in the Department of Defense.

The DOD-sponsored course, conducted by the Air Force Institute of Technology, School of Systems and Logistics, is for military and civilian personnel of all agencies of the Department of Defense. Criteria for attendance are established at the 0-5/0-6 level for military and the GS-13/GS-14/GS-15 level for civilian personnel although requests for waivers, based upon job and need, will be entertained. The program is outlined in detail in DOD Catalog 5010.16C, Defense Management Education and Training, available in training offices. The school is located at Wright-Patterson Air Force Base, Dayton, Ohio. ★

F-
IMPLANT

Ever had a good idea? How do you know it was good? Did you make a formal suggestion? The Air Force realizes millions of dollars from suggestions by people who have found a better way of doing things. We have to admit that few single ideas or suggestions amount to millions of dollars, but we do know of one that will amount to a tangible savings to the military of 3.6 million a year with a projected ten year saving of *28 MILLION*.

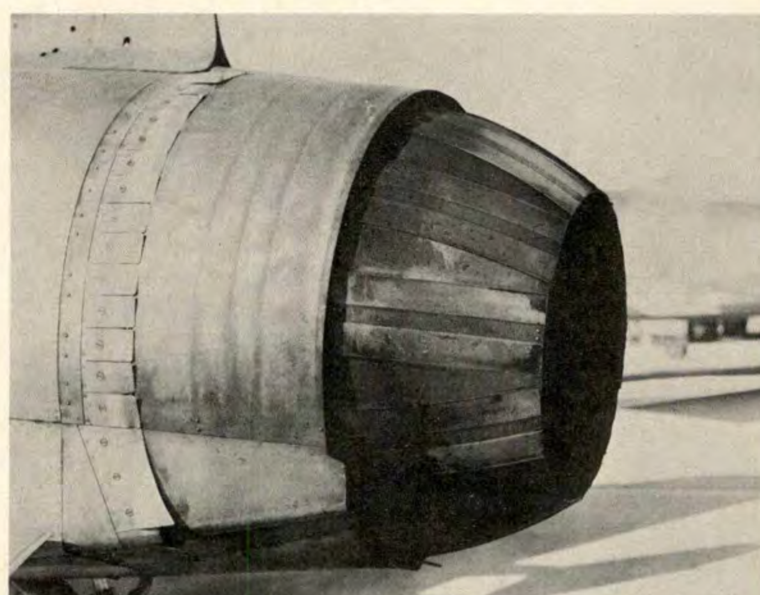
Originator of this whopper of an idea was SMSgt Mike Suzich, Jr., with the 162d Tactical Fighter Training Group, Arizona ANG. The idea is so simple it's probable that everyone else overlooked it. Here's how it all happened.

The 162d operated with F-100As for about six years (1959-1965). Throughout this period the propulsion section sweated and swore at the problems associated with afterburner operation in the Hun. Then in 1965 the unit switched aircraft to the F-102, with the same engine but a *different* AB. For the next four years or so problems with afterburners were almost nonexistent. The fellows responsible for that part of the engine began to smile and whistle again. Their smiles faded when in 1969 the unit converted back to the '100 and its -21 AB and the merry-go-round started again—compressor stalls, bent actuators on the iris lids of the AB and many other pressure related problems.

Now comes Mike Suzich who says, "Hey, if the AB on the Deuce is so good and the '100 is bad and they're basically the same engine why not swap" (or Suzich). It's hard to believe but the Deuce AB matched up beautifully with the '100 engine.

The result was a major improvement in the quality of afterburner lights, performance and reliability, plus a substantial reduction in maintenance manhours expended due to engine compressor stalls, overtemps and aft section removals.

In May 1970 action was taken to secure official approval of Sgt Suzich's suggestion. AF Form 1000 went on its way through channels. Informal reaction that month at a SMAMA F-100 Maintenance Manager's Review was positive, and a MIP number was assigned.

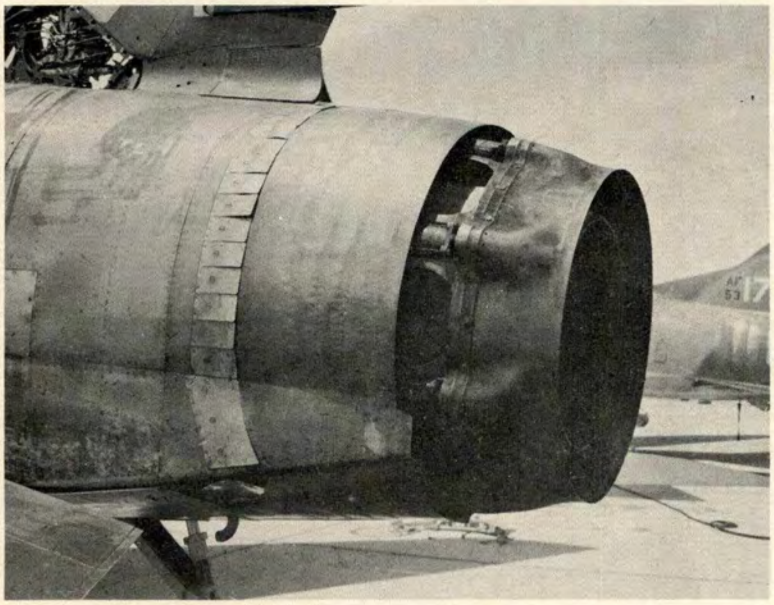


F-100 -21 afterburner "before" transplant.

100 SURGERY

A study and evaluation of the -23 AB on the F-100 engine was completed by OCAMA in August 1970. Engineering feasibility and improved reliability were acknowledged, but recommendation was temporarily withheld. In the meantime, Lt Col C. L. Coward, 162d Maintenance Commander, and Suzich were conducting extensive installation and ground tests. All results continued to be highly favorable.

The National Guard Bureau was kept up to date on the program and testing continued at the local level. USAF was asked for a Class V feasibility study.



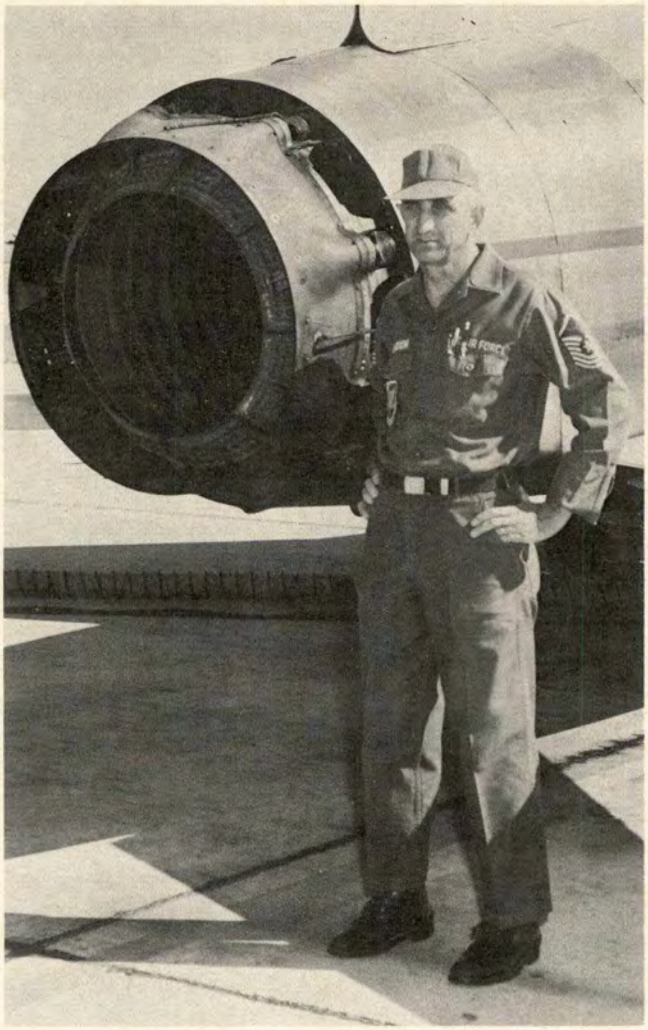
F-100 -23 afterburner "after" transplant.

During February-March 1971, a full flight test program was accomplished at Tucson International Airport by engineers from both SMAMA and OCAMA. Twelve test flights and two chase flights were flown by Test Flight Maintenance Pilot, Major John M. Hartnett, in an NF-100F aircraft fitted with a standard J57 engine and an F-102 -23 afterburner. The test aircraft was fitted with 24 temperature pickups in the aft section and on the afterburner. The front and rear cockpits were equipped with special flight instruments, plus a camera in the rear cockpit, controlled by the flight test engineer. Drag chute deployments were also filmed in order to check for possible damage of the -23 AB by the drag chute cable.

Results were continuous good lights at three-second intervals under all flight, altitude and G loading conditions for which the F-100 is operationally qualified. More than 200 lights were accomplished without a single hard light or compressor stall. With the -23 afterburner installed, a small thrust and fuel consumption increase was realized; however, this increase regained some of the performance loss the F-100 had experienced over the years. Also, temperatures in the aft section ran cooler than with the -21AB. Drag chute operations were normal with no cable hangups on the AB during crosswinds. At the end of the test, the engine was checked for trim, AB growth, heat damage, vibration and drag chute heating. All results were negative.

According to Colonel Coward, "This modification is unquestionably

IMPLANT *cont'd*



SMSgt Mike Suzich, Jr., stands beside a successfully transplanted -23 afterburner in one of his unit's F-100s.

one of the finest things to happen to the old bird." Sergeant Suzich also says that the -23 afterburner provides satisfactory service for up to 600 hours. The average time between major maintenance on the -21 AB is 150 hours. And the in-commission rate of the -23 is four times better than the -21.

A current estimate of comparative maintenance costs per 200 hour periodic cycles is as follows:

-21 Afterburner:	
Materials	$5,252.32
Labor	412.25
TOTAL	$5,664.57
-23 Afterburner:	
Materials	$700.47
Labor	116.50
TOTAL	$816.97

This difference of $4,847.60, multiplied by an average of eight current AB repair jobs per month, gives a gross possible savings per year to the 162d alone of $465,369.60.

On 27 September 1971 Major Hartnett performed the final "test" flight prior to USAF approval of Project Pacer Transplant. The aircraft performed as advertised.

In November 1971, the National Guard Bureau Incentive Awards Committee authorized an initial payment of $1,500.00 to Sergeant Suzich for the adopted suggestion. The National Guard Bureau estimates the first year's tangible savings to be $3,629,853.00 plus numerous intangible benefits that will be realized after the complete F-100 fleet is equipped with the -23 afterburner.

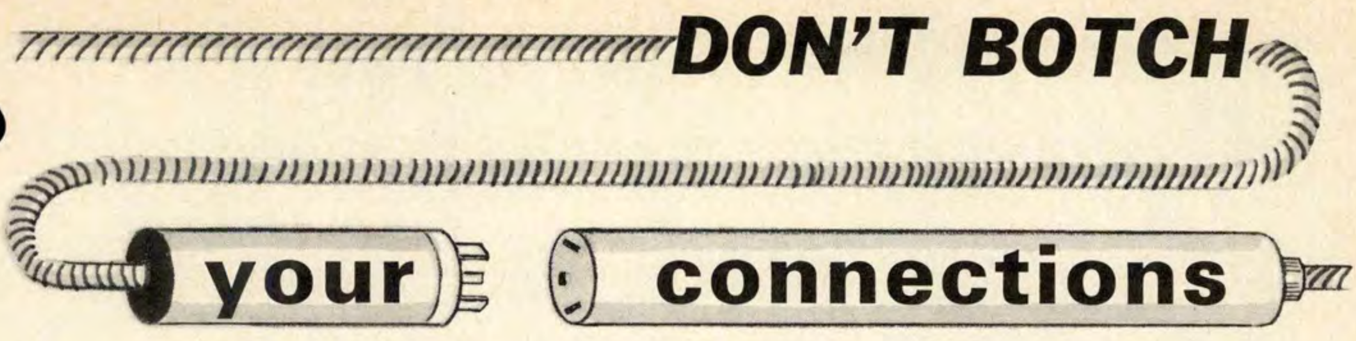
Major General I. G. Brown, Director, Air National Guard, Washington, DC, personally presented the check to Sergeant Suzich at a ceremony at the 162d Tactical Fighter Training Group facilities located on the Tucson International Airport, on 8 January 1972.

This is a Cinderella story of how one good idea "got off the ground." It was a long process, taking about 18 months, but those involved did not give up because they knew the idea was sound and would dramatically improve the effectiveness of their mission.

We know this is perhaps a rare case (notice we say, perhaps) but we have presented the facts in hopes that *you* who have a good idea won't forget it just because everyone doesn't line up and applaud when you offer your suggestion. Put it in writing and stick with it. If you believe in your idea enough someone else will, too.

Congratulations to SMSgt Suzich and to all those who had the strength of their convictions and breathed new life into an old bird. ★

DON'T BOTCH your connections



Capt John W. Seyfarth, 18th Tactical Fighter Wing, APO San Francisco 96239

Explosives and missile mishap reports continue to stress the importance of properly handling electrical connectors. Moisture in cannon plugs, foreign matter in connectors, bent pins, lack of protective covers, inverted connections are some of the discrepancies noted.

The result? Short circuits, fires, explosions, inadvertent firings, assorted malfunctions that have cost the Air Force lives and millions of dollars in property damage.

Since the guidance in tech data does not cover all possible hazards, the folowing general precautions for handling electrical connectors are offered.

If you observe these cautions when assembling and disassembling electrical connectors, you will be helping to reduce losses of valuable Air Force equipment, prevent possible injury to yourself and others, and increase the effectiveness of the Air Force mission.

- **Insure that both ends of the connection are free of foreign matter and moisture except as prescribed by technical data. If they are not, make sure that cleaning is done as required by the tech data. Connectors are, in some instances, required to have a silicon substance applied to prevent moisture.**

- **Insure that all the pins are straight. If not, be sure they are straigtened in accordance with technical data before using the connector.**

- **Take a good look to insure that the connector has not been damaged externally.**

- **Before making any connection, be sure the power is off, unless specifically directed otherwise by technical data.**

- **Insure that both ends of the connector are properly aligned before making the connection. Most Air Force system connections have safety devices to prevent misaligned connections, but a few have none.**

- **Make sure the cables are properly routed.**

- **Once connected, be sure the mate is firmly seated, and that all locking or latching devices are engaged as directed by technical data. Also insure that all cable restraining devices are properly used.**

- **Insure that all cables are free from potential obstructions such as gear doors, forward firing ordnance, and moving parts.**

- **When disconnecting connectors, make it a habit to immediately install protective covers and insure that loose cables are restrained.** ★

cigarette smoking and carbon monoxide

LT COL DAVID ROOT
School of Aerospace Medicine
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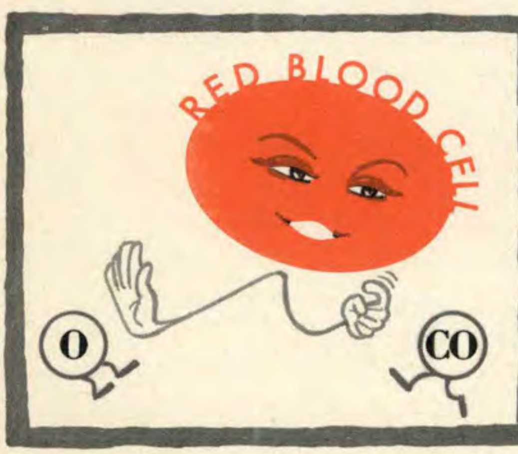
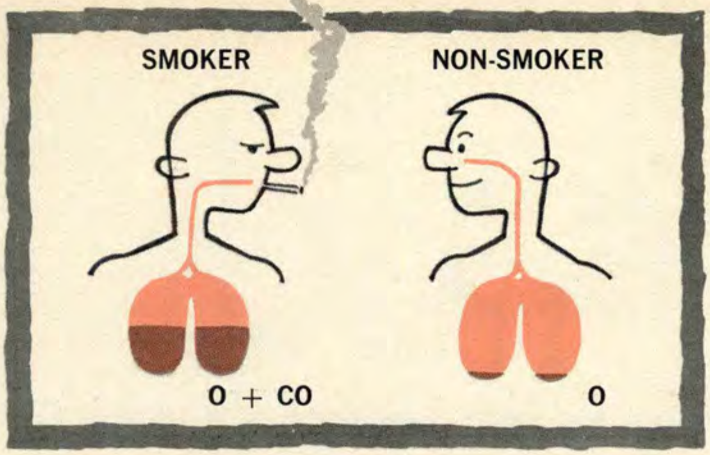
For many of us, cigarettes may be a prime source of exposure to carbon monoxide (CO), that potentially lethal, odorless, colorless gas produced by the incomplete combustion of organic material. To understand the effects of the CO produced by smoking, one must understand where in the body CO works to produce its ill effects.

Oxygen is carried inside the red blood cells in combination with hemoglobin. However, when the hemoglobin is exposed to carbon monoxide, as well as oxygen (as it is in a smoker's lung), it "prefers" to combine with the CO; that is, hemoglobin has an affinity for CO *200 times that for oxygen.* Thus, there is less hemoglobin left to carry oxygen to the tissues, creating a condition we call "hypoxia."



In a normal, pink, non-smoking, country living body, a certain amount of CO is normally produced, equivalent to 4 to 7 parts per million (ppm) or in terms of hemoglobin saturation with CO (carboxyhemoglobin-COHb), 0.2 to 1.0 percent. Under normal conditions, the hemoglobin is about 98 percent saturated with oxy hemoglobin (O_2Hb). Next consider the non-smoking big city dweller strolling down the street where the CO level is 100 ppm, a not uncommon level in the larger cities. (Up to 1000 ppm have been recorded!) His total COHb level will rise at the rate of 3 percent per hour up to approximately 15 percent COHb after five hours of strolling. To place this figure in perspective, a level of 60 percent COHb is considered to be fatal in most cases if not properly treated. So why don't most city dwellers get sick from all this carbon monoxide? Because the wind and other factors tend to keep the CO dispersed so that the levels do not remain high for long periods. Also, levels of 20 percent COHb and higher are required to produce subjectively noticeable symptoms.

Now you may wonder—what does cigarette smoking contribute to carbon monoxide levels? Consider these facts: The average concentration of CO in cigarette smoke is about 20,000 ppm, or about 400 ppm in the inhaled mixture of smoke and air. More than one half of this inhaled CO is absorbed into the body. One cigarette, deeply inhaled will produce COHb saturation of 2 percent, and three cigarettes will produce 4 percent COHb.



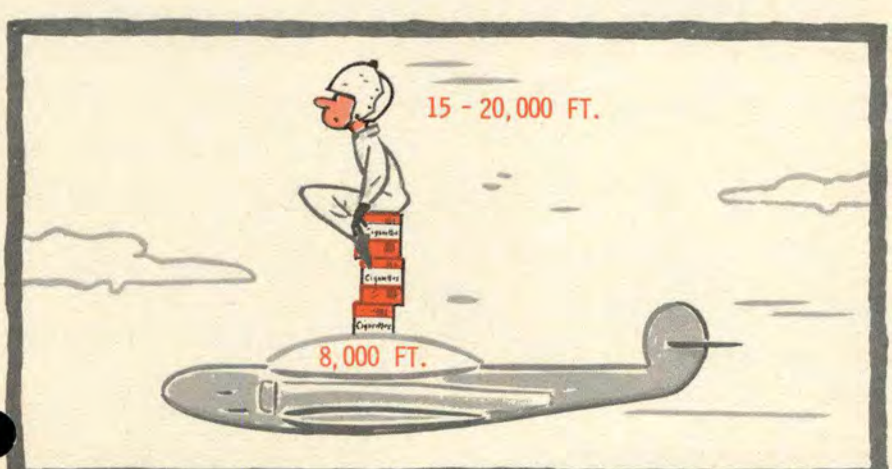
One study has shown that in terms of median carboxyhemoglobin levels, a non-smoker will have 1.2 percent COHb (due to body production and air pollution), a one-half pack per day smoker will have 3.8 percent COHb; a one-half to two pack per day smoker will have 5.9 percent COHb; and, a two pack plus smoker will have 6.8 percent to 15 percent COHb. Remember that these are average values for the whole day. It should also be stressed that all these sources of carbon monoxide are additive! "So what?" you may ask. "Aren't pilots and navigators continually exposed to a cabin altitude of around 8000 feet which corresponds to about 4-6 percent COHb?" Very true. But here again the effects of altitude hypoxia and hypoxia due to carbon monoxide exposure are additive: an aviator with a cabin altitude of 8000 feet and smoking two plus packs of cigarettes per day is at a *physiological* altitude of 15-20,000 feet.

Since the carbon monoxide levels we are discussing seldom reach lethal levels, just what effects on the body *do* they have? Probably the most hypoxia-sensitive tissue in the body is the retina. Carboxyhemoglobin levels of 3-5 percent, corresponding to altitudes of 4-8,000 feet have been shown to produce a decrease in light intensity threshold. At levels of 15 percent COHb, or 15,000 feet, the light intensity threshold was twice that at sea level, i.e., it took twice as much light to perceive an object at 15,000 feet as at sea level. In addition, the periphery of the retina is very sensitive to motion, compelling the eyes to move involuntarily when a moving or novel object, such as a bogey, is detected in the peripheral visual field, so that the object is focused on the two areas of central vision and can be seen in detail. A decrease in efficiency and accuracy of these systems could be of critical importance to the automobile driver as well as the pilot.

Tone length discrimination—the ability to tell whether a second tone is the same length, shorter, or longer than a first tone—is also known to be impaired with exposure to as little as 50 ppm CO for 90 minutes. There is also evidence indicating impairment of higher sensory centers so that limb coordination, cognitive, and psychomotor function are impaired at COHb levels of 5-10 percent.

To put it quite bluntly, the decreased O_2 carrying capacity of the blood due to the formation of COHb from cigarette smoking could mean the difference between life and death in one of those critical flight situations where your grey matter should be running at 100 percent.

A non-smoking pilot flying at a cabin altitude of 22,000 feet has approximately five minutes of useful consciousness to discover his O_2 regulator is malfunctioning; if he had three cigarettes just prior to taking off he has 45 seconds to make the same discovery. Think about it next time you fire up a coffin-nail—taste as good as it used to? ★



oh say can you see?

A difficult time for a pilot is when he takes his annual flight physical and realizes he can no longer read the 20/20 line of the eye chart. The flight surgeon and the optometrist subsequently prescribe corrective lenses for him and, if necessary, obtain a medical waiver. Crewmembers can continue to fly even if their near and/or distant

LT COL RUSSELL B. RAYMAN, USAF, MC, Directorate of Aerospace Safety

visual acuity deteriorates from 20/20 to 20/200 *IF* corrective lenses can restore normal visual acuity and *IF* they are worn during flight.

Glasses require some adjustment that certain individuals do not readily accept. Consequently, some pilots, especially those with small refractive errors, do not wear the glasses prescribed for them. They continue to fly with abnormal vision, not fully realizing that a threat to flying safety exists even with a small refractive error.

But first, a brief description of abnormal visual acuity. Most individuals with abnormal visual acuity will be either myopic (nearsighted) or hyperopic (farsighted). Myopic patients can see near objects clearly but have difficulty seeing distant objects. Thus, glasses are prescribed to correct distant vision. Hyperopic patients, on the other hand, cannot see near objects clearly but can see distant objects (there are some exceptions to this as some hyperopic individuals have difficulty focusing clearly on distant as well as near objects). Therefore, in the case of the hyperope, glasses are prescribed to correct for abnormal near vision.

In addition to hyperopia and myopia, there is another condition, which is really a type of hyperopia, called presbyopia. Presbyopia is a process which happens to almost everybody with aging. As one gets older, the lens of the eye becomes less able to focus upon near objects. Therefore, reading and writing slowly become more difficult. This person needs what we call reading glasses so he can focus clearly on near objects.

The conditions described, besides causing abnormal near or distant vision, if uncorrected, can further compromise one's ability to see by reducing depth perception. This may occur because the amount of myopia, hyperopia, or presbyopia may not be exactly equal in each eye.

Now let us enter the cockpit. Pilots must have good vision: good near vision for the instruments, controls, and map reading, good far vision for seeing other aircraft, for takeoffs and landings, and for formation flying. Depth perception is especially critical for landing and formation flying. It is for these reasons that glasses are prescribed and required to be worn at all times in flight.

Perhaps you are wondering whether there have been any aircraft accidents in which a pilot with abnormal vision, and not wearing his glasses, was a contributing factor to the accident? The answer to this question is YES. There have been nine such cases of hyperopia, six cases of myopia, and one of presbyopia. Rather than discuss each of these 16 examples, only a few need be illustrated to make our main point:

- An F-4 pilot with hyperopia (abnormal near vision) was flying without glasses. He had a flameout at low level, due to incorrect positioning of fuel toggle switches, resulting in loss of the aircraft. It was determined that this error was made due to blurred near vision.

- A T-33 pilot with hyperopia was flying without glasses and landed short of the runway. Poor depth perception was considered a definite factor.

- An F-4 pilot misjudged his altitude while flying at low level over water and subsequently crashed. He was myopic (blurred distant vision) but not wearing glasses. Poor depth perception and blurred, distant vision were considered factors in this accident.

- An F-102 pilot with hyperopia landed short on a GCA landing. He was not wearing his glasses and could not read the instruments clearly. Misreading the altimeter contributed to this accident.

These are only four of the 16 known cases in which the pilot was flying on a medical waiver for abnormal visual acuity, was not wearing his glasses and, in each case, was a factor in the accident.

Our message is simple. In order to ensure normal vision and safety in flight, pilots and navigators with abnormal vision must wear their prescribed glasses at all times during flight. ★

Ops topics

WHAT YOU SEE IS WHAT

Prevailing visibility below the 1100 foot ceiling was good, and the pilot established visual contact with the runway at about three miles. He lowered full flaps at that point and continued his approach, which appeared normal in all respects. Airspeed was correct and stable. At about two miles, the pilot noted that the approach end overrun was clear of snow, and that the aim point he had been using was the end of the overrun, rather than the end of the runway. He raised the nose slightly to adjust his aim point, and maintained proper final approach speed until crossing the end of the overrun. Power was reduced at that point, and the pilot began his flare.

In the rear seat, the copilot noted the aircraft was slowing and called "airspeed!" over the interphone to alert the pilot. Airspeed continued to dissipate. A partial stall occurred and the aircraft landed hard, in a left-wing-low attitude, 200 feet short of the runway. Landing forces resulted in structural damage to the left main landing gear, and rolled the aircraft back to the right with sufficient force to scrape the right tip tank on the overrun surface.

BENT SABRE

The mission was local IFR training in the T-39, and the flight was terminating with a minimum-roll landing. Shortly after touchdown, the upgrading pilot shut down the left engine (a normal procedure, which shortens the T-39 landing roll to a remarkable extent) and applied what appeared to the IP as normal braking pressure. The runway was patchy with snow, however, and the left main wheel brake was apparently locked. When the left main tire passed over a dry spot in the runway, BAM!—it blew! With the left tire blown, the left engine shut down, a ten-knot crosswind from the right and an RCR of ten, directional control was impossible and the bird impacted a snowbank 35 feet off the left side of the runway.

All these bad conditions—the crosswind, the RCR, the patchy runway, etc., were cited as contributing causes to the accident, and we have to agree—with the added comment that the conditions add up to a heck of a time to practice and leave us room to doubt the judgment of the IP.

The primary cause of the accident was supervisory factor, in that the IP allowed the upgrading pilot to practice minimum-roll braking technique during a training mission. This might be a good time to dust off AFM 51-33, the T-33/T-39 Aircrew Training Manual, and take a look at paragraph 2-6c(3). The manual authorizes minimum-roll landing to be practiced *through approach and touchdown only.*

HEADS

A cross-country F-102 was cruising westbound, into the sun, at an assigned flight level of 350, when Center gave him instructions to descend immediately to FL 310. Seconds later, a commercial DC-8 passed overhead, on line, eastbound, 200 to 300 feet above the Deuce! The airliner was also assigned FL 350. The Deuce pilot stated that, had he not started an imme-

...YOU GET (SOMETIMES)

The pilot was fully qualified in the aircraft, but he was pretty low on total time (less than 500 hours), and there have been many older, wiser heads drawn into a trap by the conditions he found during his approach. Consider:

• The runway at destination was 2300 feet longer and 250 narrower than the one he was used to.

• There was no VASI, no ILS glide slope and no PAR available for his approach.

• The terrain surrounding the runway was rolling hills, snow-covered, and afforded minimum depth perception aid.

• Light snow and rain on the windscreen impeded direct forward vision (as did the pilot's visor, which had been lowered at altitude and not raised for approach).

• The 19-knot headwind on landing was appreciably greater than any the pilot had previously encountered.

• The full-flap, high-power, flat approach is very conducive to rapid airspeed bleed-off when power is reduced and pitch attitude increased.

UP!

diate descent when instructed, a collision would have occurred.

Don't know yet who was wrong, but *somebody* was! And after a midair, it doesn't usually matter, to those most closely involved, where the fault was. Keep those eyeballs moving, folks!

FLIP CHANGES

Hijacking Attempt:

Procedures were implemented effective 1 January 1972 whereby U.S. Air Traffic Controllers upon observing the established Hijack Code on radar are required to ask the pilot if the squawk is intentional. See ATC RADAR BEACON SYSTEM in the PROCEDURES Section of the IFR Supplement for details.

OLD FASHIONED PROPWASH

The Gooney Bird was number one for takeoff on runway 32, holding short, when the control column and yoke suddenly began violent oscillations. The IP attempted to neutralize the controls, but was unable to hold them. He declared an emergency on tower frequency, stating that the aircraft was out of control. Simultaneously, the RSU officer observed the tail section of the C-47 bouncing up and down and advised tower on a landline that a C-130 was running up with its tail toward the C-47.

As the oscillations ceased, the IP of the C-47 said that he thought he had sustained control surface damage and was shutting down to inspect the aircraft.

Meanwhile, the C-130 pilot had finished his runup and turned his aircraft toward the runway. He advised the tower of the damage to the C-47, and tower advised him to return to the parking ramp.

This was a clear-cut case of pilot goof. The C-130 pilot was aware of the Gooney Bird in number one position, but stated that he believed his position for a 30-second runup would not direct prop blast on the aircraft behind him.

HOWEVER:

Wind at the time of the incident was 360 degrees at 16, gusting 22. The C-130 is required, when the wind exceeds 10 knots, to run up within 30 degrees of the wind. The taxiway leading to runway 32 is oriented north-south. Put them all together, they spell C-R-U-M-P!

The base in question has a 7000-foot runway oriented 18-36, and it seems to us, the winds being what they were, that runway 36 should have been in use.

Ops topics

CONTINUED

KNOW YOUR SYSTEMS?

The C-130 was on a night training mission. At the end of the mission, the aircraft was brought to a stop in the parking area, the parking brake was set, engines one, two and four were shut down, and a bleed air check was initiated with Nr 3 running.

Suddenly the IP noticed that they were rolling! He quickly selected Emergency Brakes and applied brakes while the student reversed Nr 3 engine. The aircraft rolled approximately 30 feet before it was stopped, and a Nr 2 engine prop blade struck a power cart, but there was no damage.

So this is an accident that didn't *quite* happen, and there are several lessons to be learned. Mitigating circumstances include darkness, a broken right forward brake hose fitting and no checklist available for this operation.

- The crew must constantly monitor outside if an engine is running, to detect inadvertent motion. Darkness merely dictates extra diligence.
- Murphy is *always* present. If something *can* go wrong, it *will!* In this case, the broken fuel hydraulic fitting cost the crew the residual pressure to the parking brakes.
- Using number three to check bleed air was an unwritten standard procedure in this unit—most pilots did it the same way. Someone should have considered the need for back-up safety precautions, however, since utility hydraulic pressure (for brakes) in this model comes from engines Nr 2 and 4. Selection of Nr 3 should have dictated selection of emergency brakes and aux pump ON prior to starting the check.
- And, since these checks always took place in the parking area, we can see no reason for not having chocks in place, as required for all maintenance ground runs.

How about your procedures? Have they been Murphy-proofed?

NIGHT WORK

Two recent incidents, although on different aircraft, have a relationship. The first occurred during a search for a missing fuel selector knob in the cockpit of a fighter. The knob was not found so it was decided to remove the seat and check further. A final check was made to insure all the pins were in before removing the seat. However, during removal the initiator, rotary actuator, lap belt, and associated ballistic plumbing were actuated and performed as advertised.

In the second, the seat was being transported in a truck. During removal from the truck the M-32 initiator was fired which again caused all the components to function. The interesting part about both of the incidents was that they happened at night. In the first case, only a flashlight was used to remove the seat in an unlighted area. In a recent issue of *Aerospace Safety* we stressed the importance of close supervision on the line after dark.

Supervisors, are you sure that there is someone there to mind the store after you leave?

TIE ME RADIO DOWN, SPORT

Ever lose a radio? Here's a pilot who lost a couple of them.

The O-2A was returning to home station. After clearing the mountain range to the east, he was descending briskly when the aircraft encountered severe clear air turbulence. The plane rolled violently to the left, and the pilot reduced power and recovered as quickly as possible. The G meter read 1.2 negative. The pilot made a controllability check, determined his plane to be controllable, and continued to a normal landing.

After landing, the crew discovered that two radios carried as cargo were missing, the top rear window was broken out and the rear prop had been damaged by debris.

It's easy to get sloppy—if you've got something to carry, just toss it in the back and let's go. But we've lost a lot of airplanes over the years from just that. Unsecured cargo has slid forward on landing, causing major injury; slid aft on takeoff, causing an extreme aft CG and the resulting crash; looped, bound, entangled and jammed flight controls on hundreds—perhaps thousands—of occasions; and has been the cause of more grief than anything so easy to correct has a right to be.

The solution is simplicity itself. Anything in an airplane that could cause damage if it moved around should be secure. Don't just toss it in the back and press on. Tie it down! ★

INSIDE JOB

LT COL RICHARD H. WOOD
Director of Aerospace Safety

Everybody knows about SOAP by now—we hope. Not the kind you wash your hands with—the kind that tells you when your engine is about washed up. We've come a long way with the Spectrometric Oil Analysis Program, but there is still a long way to go. As a routine operation, accident boards and safety officers recognize the need to examine SOAP records as a part of the investigation of an accident. Unfortunately, there are some grey areas that confront anyone attempting to derive meaningful data from these records. There are, however, some statistical methods available which can help in determining whether the engine is or will be the main participant in an accident.

The truth is that oil analysis is a comparatively new technique and, although we have guidelines, hard and fast rules on limits and trends are not completely developed. The success of the program depends largely on the ability of the SOAP technician to spot an abnormality, which might be a single high reading or a rate of increase which looks bad to him. He gets some of his ability through training, but a good deal of it comes from experience. He's looked at a lot of oil samples and he's developed (we hope) a mental picture of what's normal and what's abnormal for a particular engine.

Since we have trouble quantifying these abnormalities for the lab technician, it's not surprising that we have a little trouble looking at the analysis figures and second-guessing his decisions.

One problem is that the numbers on the SOAP records (see Figure 1) are not particularly meaningful by themselves. Take a single iron (FE) reading of 12 ppm (part per million). To make something out of that, you'd have to have some idea of what was normal for that engine and what was the guideline limit for that element, that engine, and that analyzer.

Suppose the FE readings went from 8 to 12 to 16 ppm over three successive samples. Is that significant?

Maybe. Maybe not. We expect some wear and we expect the results of this wear to accumulate in the oil and progressively increase the readings. What we really need to know is how much it increased per unit of time. Since we have the iron content readings and the engine operating hours for each sample, we can subtract and divide to come up with the *rate* of increase per operating hour. This we can compare with the *rate* calculated for an engine we know (from experience) is wearing normally.

We must be careful that our calculated rate did not occur over an oil change, since new oil would invalidate the trend. This is no problem as the SOAP records also show time since oil change.

Now we're in a position to evaluate our 8-12-16 trend and this is essentially what the experienced lab technician does. He mentally judges and compares rates; it may be a long time before we figure out how to replace his experience and judgment with a computer.

All this is leading up to a method an investigator can use to reduce SOAP data to some form that is easier to investigate and describe in a report.

Since we're interested in change per unit of time, we can get the

HOURS SINCE		SPECIAL INFORMATION	Fe
O/H	O/C		
500	22	INITIAL	14
512	34		13
527	45		15
534	7		6
544	18		10
552	26		11
561	34		11
574	48		12
585	2		4
596	12		7
608	25		10
619	35		14
629	3		6
639	13		8
659	33		11
667	41		12
667	51		12
687	7		5
696	16		10
712	32		13
725	46		(16)
725	46	SPECIAL	4
729	50		(18)
732	3	SPECIAL	7
737	7	SPECIAL	12
737	7	SPECIAL	(16)
737	.25	SPECIAL-RER ENG. MOUNTED GEAR BOX	6
737	.5	SPECIAL	7
738	2	SPECIAL	12

FIGURE 1. The data above was extracted from the AFTO Form 119A for a J57 engine. For the purpose of this article only the iron content readings are shown.

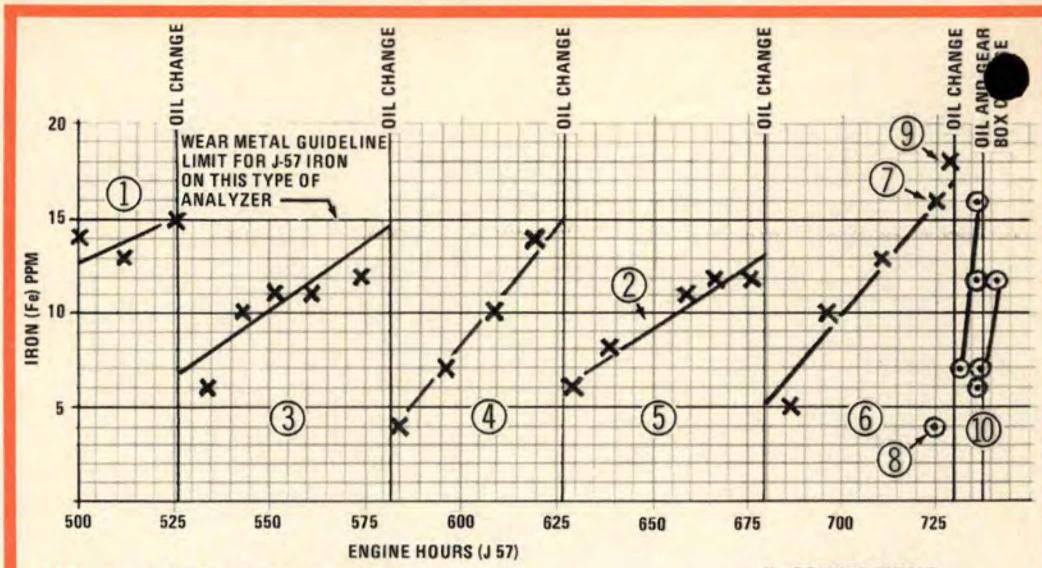


FIGURE 2 PLOT OF SOAP HISTORY

same results with graph paper that we can with a slide rule. The slope of the resulting curve will be the rate of change.

The SOAP Tech Orders suggest this method, but don't provide much information on exactly how to do it. We've selected one method that might be of some use in an investigation (Figure 2).

To do this, we've analyzed about 250 hours of the SOAP history of a J57 engine. This particular engine was transferred to a new unit and its oil analysis responsibility assumed by a new laboratory. For some reason, the old SOAP records did not go with the engine, so the new lab started from scratch, so to speak.

Eventually, the engine quit due to failure of the engine accessory drive (bull) gear and cost us an airplane. Naturally, we developed a big interest in whether this failure could have been predicted by SOAP.

Figure 1 shows some of the SOAP data available to the accident board. For clarity, we've included only the FE readings. This same data has been plotted on the graph in Figure 2.

To construct Figure 2, we plotted engine hours against FE readings in parts per million. The guideline limit for FE in this engine tested on this analyzer is 15 ppm. We've also plotted oil changes as vertical lines at the appropriate engine times. We've elected to treat each oil change as a separate graph and to examine the trend developing in that oil.

Instead of drawing a line connecting each sample reading, we've sketched a "best fit" curve that averages the readings between each oil change. This technique is statistically acceptable and provides a more accurate trend (slope) by averaging out minor variances in spectrometer calibration.

Now we're ready to analyze. The paragraphs numbered below correspond to the circled numbers on Figure 2.

1. This was the SOAP lab's first look at this engine. Although this isn't much of a trend, the readings are roughly twice those normally found in a J57. The reading just before oil change was right on the guideline limit, so the red warning flag was already up. From this and the other readings, it is obvious that this lab was not going to take any action unless the reading actually exceeded the guideline limit. Apparently, they were using the guidelines as firm go-no-go criteria in ignorance, perhaps, of the introductory instructions in both SOAP tech orders. They could have requested special samples or queried the former lab for more history, but they did neither.

2. The unit owning the aircraft is required to take routine samples every ten hours, or as close thereto as possible. This is the only "hole" in the sampling intervals, where a sample was either not taken, or taken but lost in transit to the lab. It is apparent that the unit was doing its part and supporting the oil analysis program.

3, 4, 5, 6. Each of these shows a trend considerably steeper than anything seen on a J57 that is wearing normally. SOAP trends are seldom this dramatic. In "4", the trend was obviously going to go beyond limits and the engine was "saved" only by a timely dose of new oil. Here, in fact, was an engine that was "hooked" on oil. By eliminating the symptoms, it hid the problem. It's not nice to fool the SOAP lab by sneaking in new oil, which is why the time-since-oil-change is reported with the sample. Unfortunately, the significance of these trends was not caught by the SOAP lab.

7. Finally, we got a reading that was out of the ballpark. Finally, the SOAP lab told the unit they might have a problem and requested a special sample.

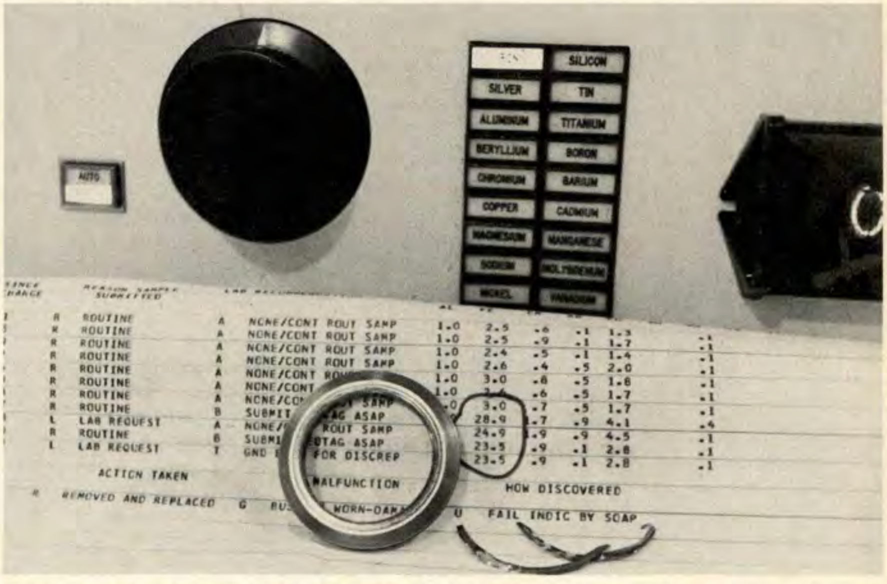
8. This was the special sample and something went wrong somewhere. None of the wearmetal readings on this sample correlated with any of the history of this engine. It looked like two samples had been switched, somehow, either in the sampling, transportation, analysis, or posting. A prudent lab technician might have suspected that something was amiss and thrown this sample out and requested another.

9. This was the next "routine" sample. No mistake here, they've sampled the right engine again. The engine was put back on special sampling procedure. Grounding was not recommended.

10. The remaining samples were all special samples. After the special sample of 16 ppm, grounding was recommended. The unit changed the engine mounted gearbox (as suggested by TO 42B2-1-10), changed the oil, and took samples after 15 and 30 minute ground runs. These tested at 6 and 7 ppm and were reported by the lab as normal for a J57. Perhaps, but not for a J57 that just had clean, fresh oil installed. A reading of 6-7 ppm is high for clean oil and a rise of 1 ppm in 15 minutes is a pretty sporty trend. The problem was not the engine mounted gearbox and the ground run samples indicated that something was still wrong. The unit was a little suspicious, so they flew the plane 1.7 hours and submitted another special sample, although none was requested by the lab. The unit attempted to obtain the results of this sample before flying the plane again, but the sample had not yet been received by the lab. The maintenance officer made a "judgment call" and elected to fly the plane. On the basis of what he knew about the engine at that point and what the SOAP lab had told him, he had no basis for grounding it. We wish he had, though, because the accessory drive gear failed on this flight and the plane crashed before the final sample was analyzed by the SOAP lab. Perhaps he would have decided differently if he had had a graphic picture of what his engine was trying to tell him. Unfortunately, SOAP records are maintained at the area SOAP lab and in most cases, the maintenance officer must rely on their analysis.

Now that we've graphed the problem and seen the deficiencies, the findings and recommendations tend to jump off the graph paper and into the accident report all by themselves. With the graph attached, they are fairly easy to explain and substantiate.

Incidentally, the accident board arrived at all the proper findings and recommendations without (as far as we know) resorting to graph paper. Their SOAP investigation was much more extensive than is described here and they did an ex-



Experts say any engine oil-wetted part will tell us when it's about to fail, if properly analyzed. This one did!

cellent job. Obviously, a thorough analysis can be made with just the raw data. We're presenting this as merely one method of putting a large amount of data into a form that is easy to understand and easy to explain to others.

As you would expect, the units most concerned about oil sampling are those equipped with single and twin-engine airplanes. We understand that one wing has established a procedure that *after each flight* the pilot has the oil sample with him when he arrives at debriefing—even though a sample is due only after each 10 hours of flying time. Another outfit includes a copy of the SOAP historical data sheet with each airplane that goes cross-country, thus insuring that the SOAP lab at the transient base can spot a trend.

Another unit stamps "oil sample due" in the discrepancy block of the 781 to insure samples are taken after each mission.

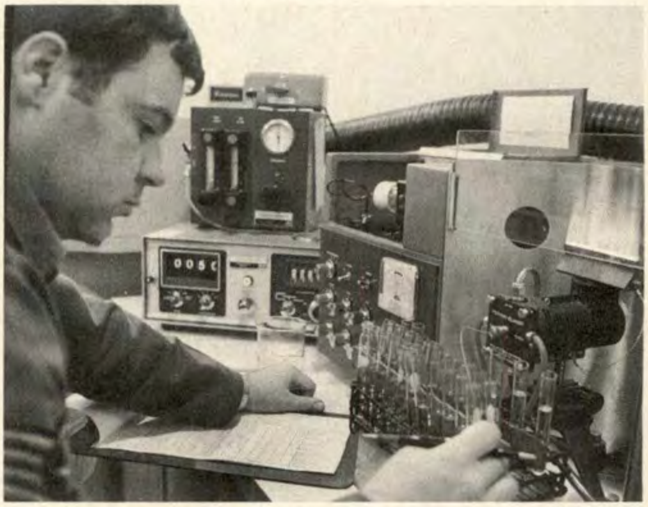
In spite of the combined efforts of those directly involved with accurate assessment of oil samples there are always ways of negating the system. A practice by one unit, changing oil every few hours as a routine, instead of the recommended 200-600 hours, can reduce the effectiveness of analysis. To be useful everybody has to abide by the rules!

If the SOAP program is going to be completely successful, it's going to take a bit of effort by everyone involved. Most of all

- The lab must be adequately staffed by trained personnel.
- It must be responsible to units within 24 hours.

In the final analysis we think that the success of any program such as this is in direct relationship to the emphasis placed upon it by the commanders and supervisors. ★

479 FMS SOAP laboratory supervisor, William C. Moffat, calibrates Perkins-Elmer 303 unit in preparation for the day's analysis.



J79 engine oil samples are tested for iron content by SSgt Raymond B. Borm.

Moffat discusses trend shown by oil samples with **Aerospace Safety** editor, Lt Col C. W. Minett.

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

Recently one of our aircraft encountered a birdstrike. The pilot estimated approximately 30 birds in the flock. Visual inspection revealed that birds had struck both drop tanks, both wing slats, right stabilator and at least one bird had been ingested into the engine. No aircraft structural damage was noted. Forward portion of the compressor section showed feathers, blood and guts; however, there was no visible damage to either compressor or rotor blades as far back as could be seen with a strong light. Compressor bleed port was removed and found to be clean. Turbine and afterburner section showed no evidence of damage.

AFM 66-3, chapter 2, paragraph 2-1, item d(2) classifies this as foreign objects organic matter. Paragraph 2-2, item d(3) states, "Organic matter does not commonly cause foreign object damage to gas turbine engines; however, large birds are an exception and a concentration of birds is a definite hazard."

Our problem, TOOTS, is this: We have no way of knowing what constitutes a large bird, or how many small birds are required to make one large bird, or for that matter, how many birds were actually ingested into the engine. TO 1F-100C(1)-6, TO 1-1-200, TO 2J-J57-26, and the 00-25 series TOs were consulted, and we could find no guidelines as to what type of inspection was required. How far should we go to determine if we have a problem or should we clean up the mess, run the engine and let the aircraft fly?

It is felt that the -6 TO for all aircraft subject to this type of problem should have definite inspection requirements spelled out.

SMSgt William H. Jensen
102 Camron, Mass ANG
Otis AFB, MA 02542

Dear Bill

I can't tell you how many small birds it takes to make a large bird, or even what constitutes a large bird. But I can give you a reference to follow when inspecting for FOD—TO 2J-J57-26, para 5-69, "Compressor Blade—Inspection and Repair Limits." This paragraph lists the inspection and repair criteria, regardless of the damage source.

I would suggest that, following a birdstrike, you inspect the aircraft in accordance with 2J-J57-26 to determine the extent of damage. If there is damage, repair as required. If no damage was incurred, or after repairs have been made, then clean the engine thoroughly; this should prevent future air-conditioning write-ups. Finally ops check the engine. If no problems have turned up by this time, the aircraft should be released for flight.

Toots

Dear TOOTS

Possible situation during a training flight in a multi-engine aircraft, recip type: We have a checklist of items to perform during engine failure shutdown. One of the items is "FUEL, OIL and HYD SHUT-OFF switch to off." One switch completes this action.

My question is this: "Do we simulate this switch off, or do we actuate this switch off? Why ask for a problem if either valve were to remain closed during engine restarting?" Please answer with reference to TO or other means.

MSgt John Jesse
143 Special Ops Sq
T.F. Green Airport
Warwick, Rhode Island

Dear John

Yours is a real good question. Your reference is AFM 60-16, para 5-11, which makes the major command (TAC, in your case) responsible for setting these policies.

I would also suggest that you visit your squadron stan eval section. They can bring you up-to-date on all established procedures, both major command and locally directed.

Toots

Tech TOPICS

MURPHY LIVES!

The crew of a four-engined transport encountered severe flight control difficulties just after takeoff on a routine airlift mission. The aircraft's right wing was extremely heavy; it took twelve degrees of trim and two-thirds of the available opposite aileron to keep the aircraft under control. The pilot immediately declared an emergency and, despite his problems, managed a successful landing.

After they were back on the ground, the reason for the flight control difficulties became painfully apparent. The right aileron was **disconnected!** It seems the aileron push-pull rod had been disconnected during some fuel tank maintenance and this Red X condition was never entered in the forms! The rod was forgotten and never reconnected when the maintenance was completed. The inoperative aileron was overlooked by the flight engineer during preflight, because he completed his checks without a ground scanner!

—MAC Flyer

TECH DATA???

When the nose gear of an F-104D failed to extend and the aircraft had to be landed on the mains, investigators found a broken bungee spring, excessive lubrication of the drag strut, and a locking block installed backwards. The broken bungee spring could not exert enough force to overcome the excessive lubrication of the drag strut and improperly installed locking block.

Proper lubrication for all moving parts is a must; however, excessive lubrication coupled with a build-up of dirt results in sluggish operation, binding and failure.

Sound supervision, proper use of tech data and a sharp inspector would have prevented this incident.

COMMANDERS: *Failure to use tech data is one of the most frequent deficiencies documented during UEIs.*

BITS & PIECES

Excessive amounts of metal shavings and other bits and pieces were found in the under-floor compartment which houses armament relays and connectors in the OV-10.

One of these metal shavings had shorted a relay causing Nr 1 pod to jettison in flight. The pilot was unaware that the pod was missing until the dearming crew discovered it.

Try reading the cause of this incident again and think about how better supervision could have prevented it. Sometime in the past a supervisor failed to note the debris in this compartment. Policing the area does not only mean the ramp. Any time maintenance is performed the affected area should be thoroughly inspected for foreign objects before the aircraft is released for flight.

COMMANDERS: *Cockpit FOD is cause for a red cross entry in the 781. Do all your people know why?*

"SHORT CUT" MAINTENANCE

During maintenance on a WC-135, an oil leak was discovered. Corrective action was to re-torque the B-nut. Later, during flight, Nr 4 oil pressure began fluctuating, finally exceeded limits, and the engine had to be shut down.

It wasn't difficult to find the problem—a leak at the same place as before. This time the O ring seal was properly inspected and found to be extensively damaged. Replacement of the seal and torquing of the B-nut per the TO solved the problem. But this example of "short cut" maintenance cost an engine change.

WHERE ARE THE 781'S?

This incident occurred at a transient base during an out-and-back mission in a T-38.

After a short visit to base ops, the IP and his student arrived back at the aircraft to find that refueling had just been completed. However, the 781 form had no fuel entries, so the IP asked the crew chief to make the required entries. The IP then climbed into the aircraft and proceeded with the interior checklist. The IP noticed the crew chief hand something to the student. Thinking it was the 781, he started the engines.

After takeoff and gear retraction, the red light in the gear handle stayed on. The gear was cycled and the light went out so the mission was continued. Upon arrival at the home base it was discovered that the nose gear door was slightly damaged and the 781 form was missing. You're right—the crew chief had stowed the 781 in the nose gear door which jammed and was damaged during retraction. The forms were most likely lost during the recycling.

SUCTION PUMP

While the engines of a T-38 were being operated at 70 percent for an ops check to complete an inspection, the ground observer approached the aircraft to check a malfunctioning ram-dump port. As he approached the intake he felt the suction and immediately dropped down to exit the danger area. In doing so his head bumped the lower portion of the intake and his headset was jarred loose and ingested down the intake. Both engines were immediately shut down, but the left engine was severely damaged.

Think for just a moment how close this man came to disaster. Granted the T-38 intake isn't very big, but just suppose that his head had been drawn into the intake. He could have been asphyxiated.

1T-38A-2-1, para 1-21 clearly explains the danger areas during engine operation. Supervisors, how long has it been since you briefed your troops on the hazards of operating aircraft engines?

INSPECTION FIRST–SIGN OFF SECOND

Forty minutes after the RC-135 took off Nr 3 throttle was noted to bind, followed shortly by an increase in RPM to 106 percent. By then the throttle had no control over the engine speed so the engine was shut down.

The cause—maintenance. The throttle control rod was disconnected from the fuel control. The nut and bolt from the linkage was found in the lower cowling; however, a searching inspection failed to turn up the cotter key.

Review of the aircraft records showed that this engine had been rerigged twice in the past 10 days. The cotter key had apparently not been installed during the last rerigging.

This incident underlines the reason for thorough inspection of maintenance that has been accomplished. The 00-20 series tech orders are very clear: "The inspection of maintenance accomplished will be completed prior to the inspector signing the 781-A."

COMMANDERS: *Do you review maintenance Quality Control Inspection reports? Do your inspectors identify non-use of tech data? Are your responsive actions aimed at correcting the cause?*

OLD PART SNEAKS IN

Just after takeoff, as the gear was retracted, a loud snap was heard from the nose wheel area of the F-101B. Gear warning light and horn remained on and the wingman reported that part of the nose drag link was hanging loose. The aircraft was returned to base and stopped on the runway where the down locks and a jack were installed under the nose before the engines were shut down.

Studies of the broken drag brace link assembly revealed that it was an obsolete part. The aircraft records indicated that this part had been replaced during TO compliance several years ago.

It could not be determined how or when the obsolete part was reinstalled on the aircraft, but somebody goofed.

COMMANDERS: *How many untagged aircraft parts did you find on your last trip through the shops?*

Tech Topics

BRAKE FIRE

KC-135—While taxiing after landing the crew heard a noise like brake chattering and saw sparks coming from under the right wing. They stopped and evacuated the aircraft. Firemen extinguished a grease fire in the Nr 7 wheel axle area.

The fire resulted from wheel wobble and subsequent damage caused by a wheel position collar being omitted during assembly of the wheel after a brake change.

This may seem like a minor mishap and some people probably think it's not worth the space it takes to tell about it. If this happens to be your opinion, consider the fact that this incident cost more than $8500. We can't afford very many of these.

COMMANDER: *Nor can you afford shoddy maintenance.*

B-NUT BLUES

The KC-135 was 30 minutes out on a refueling mission when Nr 2 engine oil pressure started fluctuating 15 to 45 psi accompanied by a flickering oil pressure warning light. The engine was shut down and a three-engine return to base accomplished without further incident.

The problem was that the oil line B nut from Nr 6 bearing oil scavenge pump had backed off at the engine fire seal connection allowing depletion of the oil supply. Maintenance had recently been performed in this area during engine build-up and the B nut had not been safety wired iaw current directives.

This unit has expanded its critical area inspection checklist to include complete supervisory inspection of this area. How about it, supervisors? Is your current critical area inspection checklist sufficient to cover all critical areas of maintenance?

TOOL ACCOUNTABILITY

During investigation of a T-33 accident a six-inch screwdriver was found in the wreckage. The screwdriver had become wedged in the nose gear uplock assembly, causing failure of the emergency extension system. At the same time, the normal hydraulic system failed due to materiel failure of a right main gear up hose.

The T-33 doesn't land very well on one gear, so the end result was a major accident.

Unfortunately, ownership of the screwdriver could not be determined. The Air Force paid a mighty expensive price for a lesson in tool accountability.

USE YOUR HEAD

After all these years, we still have those stupid accidents that are caused by simple human oversight or negligence. Chock jumping is one type that comes to mind because we've had several recently, including one in which a man was killed.

There may be some circumstances that can't be foreseen which could cause an airplane to jump its chocks. But we can't think of one. Invariably, chock jumping results from someone's failure to use his head. The most common cause is failure to set the parking brakes, which is really a case of not following the checklist. A funeral is a helluva price to pay for the few moments it would have taken to read and follow the tech data.

THE HIGH PRICE OF FAILURE

After the C-130E touched down during a night max effort landing, the tower controller saw sparks trailing behind the aircraft. He advised the pilot who stopped the bird on the runway. The crew deplaned and discovered that the right aft gear lower strut had dropped out of the upper strut and dragged on the runway.

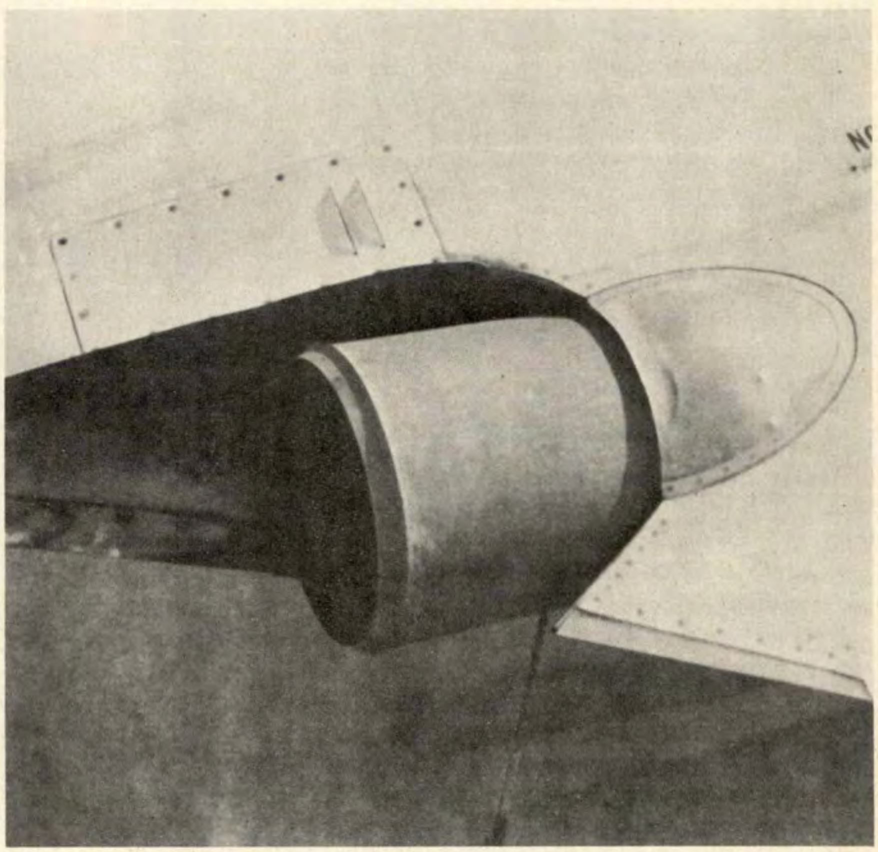
This incident, which cost the Air Force more than $7,000, resulted from maintenance malpractice. The locking tab washer was not bent into the locking position, which allowed the gland nut to back off with subsequent separation of the lower strut.

The records showed that the aircraft had undergone two phase inspections since IRAN. During one of those inspections, work cards required use of a go-no-go gage. How well the individual complied with the work card requirements is questionable. Who signed off the work on the 781? Are QC reports to the commander reflecting the true quality of maintenance performed?

NEAR ACCIDENT

During go-around from a low approach, the IP and student in a T-37 heard an explosion in the right engine. The IP retarded the throttle to idle as smoke entered the cockpit and the overheat light illuminated. The fuel shut off "T" handle was pulled, the overheat light went out in approximately 20 seconds, and the IP made a single engine landing.

Turned out the tailpipe had come loose and was forced back against the interior of the nacelle. Closer examination revealed that the tailpipe clamp had been installed with its edge caught on the tailpipe flange. The clamp worked loose in flight and the tailpipe was forced aft by the exhaust gases, as shown in the accompanying photo.



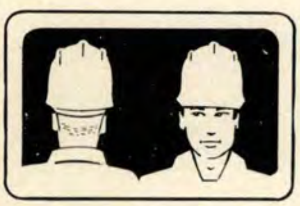
COMMANDERS: *How conscientious* [a]*re YOUR inspectors?*

10

NUCLEAR SAFETY AID STATION

THE HAZARDS OF WINTER DRIVING

In early December, at one of our northern Minuteman bases, a maintenance team was convoying a reentry vehicle (R/V) from the support base to a launch facility. While braking on an ice covered portion of the highway, the maintenance van, one of the support vehicles within the convoy, slid off the road onto the shoulder. The shoulder then collapsed and the vehicle tilted onto its side. This necessitated halting the convoy and establishing a national defense area for approximately two and a half hours until a replacement maintenance van and team could be dispatched. It seems as inevitable as the coming of winter itself that incidents of this nature will occur. The importance of driving carefully when driving conditions are hazardous cannot be overemphasized.



REPORT TWO-MAN POLICY DEVIATIONS

A two-man electrical-mechanical team with a security guard was performing routine maintenance at a Minuteman launch facility when the team chief fell from level one to level two of the launcher equipment room. He received serious head injuries and was removed from the silo and placed in the cab of the vehicle. The security guard remained with him while the assistant team chief reentered the launcher equipment room to secure the site. This was, of course, a valid deviation from the Two-Man Policy necessitated by the nature of the emergency. However, the Two-Man Policy **had** been violated and follow-on verification of the proper launch facility configuration should have been made. This was not accomplished until four days later, since neither the security guard nor the assistant crew chief reported the deviation at the time of the incident, and it only came to light during a subsequent investigation. Our people should be able to handle emergencies; however, we must not lose sight of the fact that we are dealing with nuclear weapons, and one of the keystones of the Nuclear Safety Program is based upon assurance that the Two-Man Policy will be strictly enforced.

HIGH POWERED AIRPLANE

What happens when you apply 380 volts/50 hertz power to a 115 volt/400 hertz aircraft system? In at least one system it causes computers, heaters, amplifiers, and lights to produce varying quantities of smoke from both A.C. and D.C. sources. Fortunately, all switches in the nuclear weapon monitor and control system were off and no serious problems resulted. What caused the problem? Basically it was human factors. The power receptacles are color coded but this one had just been replaced and was not painted. Normally there is a checklist attached to the power junction box but this time the checklist was missing. The 380 volt power source was no longer required at the junction box but no one had taken the time to have it removed. With all of these hazards the result can only be an occurrence in the Dull Sword or Bent Spear category. Have you looked for such hazards in your area? Reporting under AFR 127-6 could prevent problems reportable under AFR 127-4. ★

EXPLOSIVES SAFETY

for munitions, weapons, and egress techs

GUN CLEARING OPERATIONS CAN BE DANGEROUS

D. E. ENDSLEY, Directorate of Aerospace Safety

An airman was assigned to remove a jammed round of ammunition from a 20mm gun on an A-1E aircraft. The airman noted that the gun bolt was in the rear position and that the gun blocks were properly installed by the dearming crew. The pilot had turned all armament switches to the off and safe position. The airman then mounted the wing, opened the left outboard gun bay panel, and detorqued and removed the feeder. Upon checking the round of 20mm ammunition, he noted that the primer had not been dented. He then inserted a screwdriver in the extractor groove to determine if it could be removed. This procedure failed. He then tried it with a pair of channel lock pliers. Again no luck.

The NCOIC of the weapons loading crew suggested that a gun cleaning rod be used to extract the jammed round. The airman obtained an M-13 cleaning rod and had another airman insert it down the barrel of the gun while he observed the operation from the wing of the aircraft on the right side of the open gun panel. After several light taps with the cleaning rod the round popped out and struck the ejector which caused the round to explode. The airman observing the operation sustained a superficial chest wound.

This mishap caused the unit to revise its gun clearing checklist and provide padding to prevent 20mm round primers from striking the ejector. The approved knockout rod with appropriate limit marking will be used in future operations; during gun clearing of jammed rounds the gun bay door will be closed and personnel will be evacuated from the immediate area.

Have you checked your gun clearing procedures lately, and do you know your crewmembers respect the hazards related to 20mm ammunition?

INADVERTENTLY FIRED

DONALD S. LYON, OOAMA, Hill AFB, Utah

"The primary cause of this accident was that the weapons mechanic inadvertently actuated the aircraft rocket firing circuit with the aircraft in an armed configuration."

This finding is typical of those involving the personnel factor in explosive accidents. The word "inadvertently" is normally the phraseology that is used in explaining why some explosive item was damaged or destroyed.

In some cases it is hard to understand how this phraseology can be rationalized. It apparently is used to soften the findings, rather than say that the primary cause was a *flagrant violation of operating procedures.* A review of some accident reports bears this out:

• Qualified egress system mechanics were removing the left seat, and, due to poor lighting, were unable to insert the maintenance pin in the M3A1 initiator behind the seat. After several tries, they decided to remove the seat without a safety pin installed. While one of the mechanics was lifting the seat, he slipped, turned the seat into the initiator striking bar, and the propellant actuating items were *inadvertently* fired. Stated cause: Initiator linkage misaligned. The real cause: Blatant disregard of operating procedures.

• During synchronization check of guns on aircraft, an airman fired rockets which struck other aircraft. Primary cause: Mechanic inadvertently actuated the aircraft rocket firing circuit with the aircraft in an armed configuration. Real cause: The mechanic failed to follow directives while working on a hot aircraft. Too many accidents are caused by obvious violations of good, sound safety precautions contained in checklists and operating procedures. ★

THE CREW CHIEF

In your December 1971 issue you had an article on the Crew Chief. On behalf of thousands of crew chiefs around the world, I'd like to give you the Well Done Award. This article had to be the "Article of the Year", if only for the crew chief.

You're always reading of the mistakes the crew chief has made, but rarely do you read about the good he has done or the dedication he has. If only the next pilot who climbs into his aircraft and looks down at the greasy object below (the crew chief) would remember that that crew chief has been out in below zero weather, or swimming around the aircraft in a hurricane for some long, hard hours waiting for his pilot, and instead of saying to the crew chief, "You're a mess," a friendly "Good morning" would do.

I wish the article would be mandatory reading for all pilots. A person who has good morale will have an excellent product.

SSgt Rex G. Lawrence
APO New York 09020

MAIL CALL

WHAT IS IT?

Here are a few hints:

It was built in the late 40's.

Gross weight somewhere over 150,000 lbs.

Flew primarily out of Mobile, Alabama.

Belonged to MATS (MAC).

Bashed along for long distances at around 200 kts TAS.

One of the few aircraft that flew for any length of time in the USAF inventory where no fatalities were incurred.

Engines, wing and main gear used on a later model aircraft.

(Turn to back cover, lower right for answer)

☆ U.S. GOVERNMENT PRINTING OFFICE 1972 789-126/7

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.

Staff Sergeant
THOMAS N. SNOW

Airman 1st Class
WILLARD L. AVERY

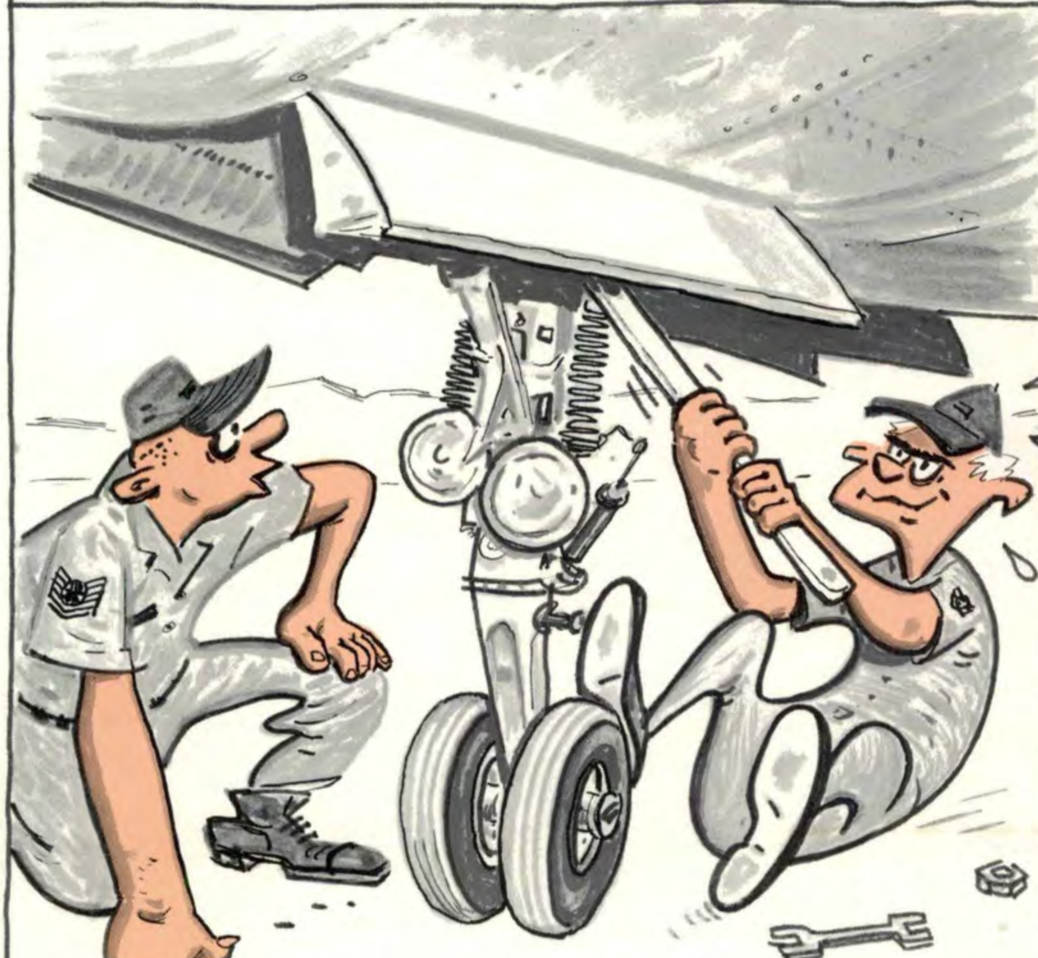
Airman 1st Class
DELANE E. FICKBOHM

349th Munitions Maintenance Squadron, Holloman AFB, N.M.

On 3 May 1971 Sergeant Snow, Airman Avery, and Airman Fickbohm were performing as dearm crew at Holloman AFB, New Mexico, when they were confronted with a serious fuel fire endangering an aircraft and its crew. Just as an F-4D taxied into position for dearming, a small explosion occurred in the centerline fuel tank area. A considerable amount of fuel spilled onto the ground and immediately started burning. Sergeant Snow, Airman Avery, and Airman Fickbohm rushed a fire extinguisher to the aircraft and started combating the rapidly spreading fire. While the other two continued to fight the fire, Sergeant Snow assisted the aircrew in evacuating the aircraft and getting to safety. He then returned to assist with the fire extinguisher. The three men worked feverishly to keep the fire suppressed until help could arrive. Just as the small extinguisher became empty, base fire fighting vehicles pulled into position and extinguished the fire.

The quick actions of Sergeant Snow, Airman Avery, and Airman Fickbohm, while facing the possibility of a larger fuel explosion, undoubtedly saved the aircraft from total destruction and the aircrew from physical injury. WELL DONE! ★

HAVE YOU EVER SAID THIS?



IF YOU GET IT AS TIGHT AS IT WILL GO
AND THEN BACK OFF A LITTLE
IT OUGHT TO BE ABOUT RIGHT.

take time and find out what torque values are required