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Aerospace SAFETY

COVER PHOTOGRAPH "A-1H SKYRAIDER" BY SSGT ROBERT WICKLEY, AEROSPACE AUDIO VISUAL SERVICE.

UNITED STATES AIR FORCE

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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NOVEMBER 1970 AFRP 127-2 VOLUME 26 NUMBER 11

LEt'S GeT involveD

The weather we live with 'cause there just isn't a whole lot we can do about it. Sure, there has been some success with cloud seeding, but by and large we just have to accept the weather as it comes. However, most of the other factors related to the flying business can be improved if we are willing to expend a bit of effort. It's a sad fact, however, that 20 minutes after landing, most pilots forget whatever it was that was so irritating while airborne.

How about the case where, after handoff to final approach, the radar controller comes at you with the wrong tail number? You feel fairly confident that you're the one he is talking to, but with lousy weather and a few hills scattered around, you can't rely on "fairly sure." By the time you get things sorted out, the approach gets scrubbed. No doubt the commander of this unit would like to hear about the incident; but, since this might require a phone call or an OHR, the matter is ignored.

Then there is Joe Jock who makes an entry in the 781 "Engine runs rough"—period. That piece of information along with the date and pilot's signature is almost worthless. Naturally, this type of write-up is going to cause many extra hours of work for the maintenance troops. There must be a better way. In most cases a briefing by the Maintenance Officer at a pilots' get-together can eliminate many of these fuzzy write-ups.

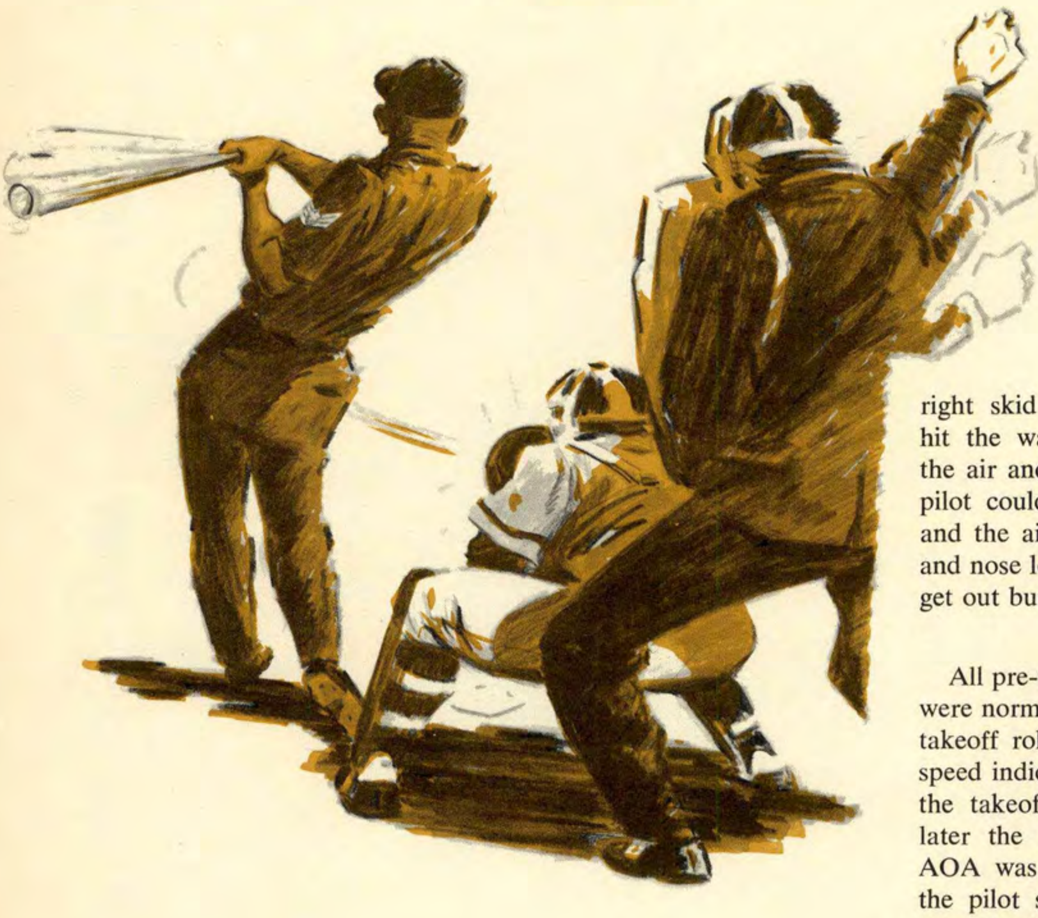
Too frequently, both knuckle busters as well as aircrew members, have the feeling that published Air Force procedures come straight from an infallible source. Granted, much time and analysis go into writing procedures, but the job is accomplished by guys like you and me. I don't know about you, but I know that some of the things I do leave room for improvement. If you see a procedure you feel is not right, question it. Perhaps there *is* a better way.

How about the Operational Hazard Report? How long has it been since *you* wrote one? A lot of Air Force troops have never written one and some don't even know what an OHR is.

There is no way of knowing how many mishaps or accidents have been averted by somebody who filed an OHR when he saw a hazard, but we know it's been a bunch. So don't be reluctant to fill out the OHR form for fear that maybe the hazard doesn't really exist. You may be the only one in a position to recognize the hazard. True, some of the hazards we hear about are not valid, but investigation by the safety officer frequently turns up another area that merits attention; and this bit of paper is one quick way to get the commander's attention.

To use the ol' cliche, "Safety is everybody's business." What we're asking *you* to do is get *involved.* If you see an unsafe practice or a situation that could lead to an accident do something! ! Don't assume that someone else is going to take action. Just because you're an A1C doesn't mean you don't have the rank to point out a weak area in our system. Even if you're wrong in your analysis, I'd be willing to bet your supervisor will more than appreciate your effort to improve a situation. Safety is simply common sense and it's *you,* the users, that are going to get things changed if they're not right. Don't live with an unsafe procedure —take the appropriate action to get it corrected. ★

1-2-3- YOU'R



An airman in the left seat of an O-2 was about to taxi to another parking spot with a sergeant in the right seat checking him out. The before-taxi checklist calls for gear handle DOWN, to close the gear doors. So the airman, probably a little tense, pushed the handle UP. The next thing they knew the nose gear was in the well and the front prop was chewing up the ramp. Result: one prop and one engine had to be replaced.

* * *

During takeoff at sea an HU-16 unexpectedly became airborne in a right skid and right wing low. It hit the water again, bounced into the air and right float sheared. The pilot could not bring the wing up and the aircraft went in right wing and nose low. The crew managed to get out but the aircraft sank.

* * *

All pre-takeoff checks for the F-4 were normal and the pilot began his takeoff roll. At 160 knots the airspeed indicator stuck. He continued the takeoff but about 30 seconds later the IAS went to zero. The AOA was functioning normally so the pilot stayed in the local area, burned off fuel with intention of landing. But during a landing configuration check at 10,000 feet, the AOA stuck at eight units and the off flag came up. With both the primary and secondary airspeed references inoperative, the pilot called his command post for an aircraft to pace him for a landing. This worked out okay and Maintenance got their

E OUT!

hands on the intact airplane. They found leaf particles and evidence of an insect nest in the pitot tube and intermittent power failure in the AOA instrument.

* * *

From the facts given, it may not be evident, but you know that there must be some relationship, a similarity, among these three events for us to have listed them here together. The connecting link, the thing in common, is that each of these mishaps resulted from more than one failure. Accidents frequently do, so if we can prevent *one* possible cause, we may be able to prevent an accident.

The airman who moved the gear handle the wrong way made a mistake. But it wouldn't have caused any damage if there hadn't been a contributing factor. The landing gear lever lockout solenoid stuck with the solenoid pin retracted. This permitted the gear lever to be placed in the up position while the aircraft was on the ground.

The HU-16 accident was set up by the float striking the water and breaking off. However, the primary cause was materiel failure of the number one engine mount or its support structure, probably because of a pre-existing defect (perhaps a crack). So we also have more than one cause factor at work in this accident. In addition, despite the age of the HU-16, there are still some inconsistencies in tech order phase inspection requirements which permitted certain components of the Nr 1 engine mount assembly to go uninspected for flaws such as a break or crack.

As for the F-4, how did the bug nest get into the pitot system? Well, the bird had been parked for two and a half weeks and someone did not install the pitot tube cover. There was no accident, but all the ingredients were there if circumstances had been different, such as instrument weather.

As it turned out only one of the events related resulted in a major accident. But it was real serious. Six men in the HU-16 could have lost their lives but fortunately, were quickly rescued. As it was the Air Force lost an airplane.

The point I'd like to make here is that we all have some margin going for us but we never know just how much. We may be able to get away with a minor mistake, a shortcut that produced a job that wasn't quite as good as it should be, an oversight such as leaving out a cotter pin—or failing to set the right numbers in the altimeter. Yes, we may get away with these things. Then again we might not.

Crewmembers bet their lives on their airplane being in safe flying condition. Consequently, only the foolhardy fail to carefully preflight. This won't find every possible flaw, but it is designed to reveal some of the more obvious and critical possibilities. Thus, the crew (whether one or more) is partially responsible for its own safety.

The maintenance people share this responsibility and, by their diligence, save lives and aircraft when they correct something that could cause an accident.

Since so many of these events we call accidents result from more than one mistake or malfunction, the last chance inspection conducted at many fighter bases takes on extra value. The loose fastener, cut tire, fluid leak, etc., discovered there does not fly off to disaster when coupled with another failure. The pilot might be able to cope with one failure such as loss of brakes. But what if he took off with a cut tire and then has to deal with a blowout *and* no brakes. Although it's rare, let's slip in a barrier failure. It does happen from time to time.

What all this adds up to is that one strike may not put you out, but 2-3 and that's all. Let's all work on eliminating those second and third strikes. ★

LIGHT

Four years ago *Aerospace Safety* reported on accidents involving Air Force personnel in light aircraft. The article said that non-aero club general aviation accidents had cost the Air Force 25 lives over a 21 month period.

That was four years ago. What is the situation today? There has been very little improvement. During the past 30 months the toll has been 28 lives and 14 injuries in 37 accidents.

PLANE *losses*

LIGHT PLANE *losses*

The numbers are for Air Force personnel and do not include others killed or injured in these accidents. (Aero club statistics are not included.) The records indicate the loss to the Air Force to be $1,293,-190. This is based on formulae provided in AFM 127-2. But this fails to take into account several factors that increase the cost to the Air Force many times over.

For example, one of the men killed in a light aircraft accident was a young lieutenant who had just graduated from pilot training. In another crash three captain navigators lost their lives. The potential lost to the USAF from these tragic fatalities can hardly be measured in terms of dollars, but surely would amount to much more than the $35,000 each as figured on the basis of AFM 127-2.

Perhaps it seems cold-hearted to measure a man's death in such terms. But such losses must be so reckoned along with the loss in mission capability each fatality represents.

It is difficult to get a handle on the exact cause of each of these accidents because they are not investigated by Air Force accident investigation boards, in the same manner as are USAF aircraft accidents. General aviation accidents are investigated by the National Transportation Safety Board and, as of this writing, many of the reports were not available. Therefore, the information provided here is based primarily on Air Force casualty reports which did not always contain all the factors. However, there was generally enough information to obtain a fairly good idea of what caused the accident.

Approximately half of these accidents were obviously the result of pilot factor. A few were due to engine failure and most of the rest were classified as undetermined either because the reason was unknown or the final report from the NTSB was not available. In some cases the pilot's qualifications were unknown.

At least eight of the pilots could be considered highly qualified in that they possessed either a commercial license, an air transport rating or were rated military pilots. Approximately the same number had private licenses and a few were student pilots. A few of the killed and injured were Air Force personnel riding as passengers.

Now, let's look at some of these accidents to see what happened. In one, in which six people lost their lives, a young recent graduate of USAF pilot training took five friends on a sight-seeing and photography ride. While flying in mountainous terrain they apparently got trapped in a canyon and crashed into the side of a mountain. The aircraft was not located for several months and when it was found no attempt was made to remove the wreck-

age because of its nearly inaccessible location.

This young pilot could be considered as well-qualified in some types of flying. He was not experienced in flying light aircraft at low altitudes in mountainous terrain, which very possibly was the major factor in this accident, along with poor judgment.

The three navigators lost their lives during takeoff in high winds when the aircraft struck power lines just off the end of the runway and crashed. While the primary cause was undetermined, the combination of wind and turbulence in the lee of a nearby mountain were listed as most probable.

Two highly experienced USAF pilots were killed attempting acrobatics in a light plane at very low altitude. The aircraft had been modified structurally and with a more powerful engine to make it aerobatic. However, it was still operating on an experimental ticket that restricted it from aerobatics and carrying passengers. The pilots not only violated several FAA rules but they exercised extremely poor judgment in attempting a loop close to the ground.

Inexperience combined with a hazardous operation probably cost a sergeant his life. He was flying an agricultural mission in a light plane which apparently crashed when the sergeant attempted a low speed turn on the deck.

A USAF pilot with 8000 hours military time and about 500 civilian flying hours died when the light plane he was demonstrating stalled and spun from between 1500 and 2000 feet. This may have been a case of overconfidence; surely this pilot would not have attempted to demonstrate a stall at that altitude in the big transport he flew for the Air Force.

Another Air Force pilot was flying at extremely low altitude when he attempted a turn and the left wing struck a tree. The wing separated and the aircraft immediately crashed, killing the pilot. There was evidence that the root causes of the accident were fatigue from lack of sleep, alcohol and carbon monoxide.

In addition to the lieutenant who flew up a deadend canyon and perished, an Air Force nurse, a pilot but riding as a passenger, was killed in the same kind of accident. Another lientenant and his wife flew into a similar situation in that on a sight-seeing flight, he realized he could not clear the terrain. He attempted a turn but the aircraft struck some trees and burst into flame. The pilot, his wife and a third passenger all suffered serious burns.

A captain was killed when his light plane collided with a civilian jet transport.

Determining the causes of some of these accidents may be difficult, but probably not as much so as coming up with some means of preventing them. Commanders and supervisors are limited for the most part to education as a preventive tool. And education doesn't always take. Almost without exception the people involved in these accidents had been counseled and received at least occasional briefings on the hazards of light aircraft operation.

A common thread that seems to run through a majority of these accidents is lack of good judgment. That plus inexperience is a highly dangerous combination.

Another thing that stood out in the accident reports was that very possibly some fatalities might have been avoided and injuries at least lessened if the aircraft had been equipped with shoulder harnesses. It is the author's opinion that every light aircraft should be equipped with shoulder harnesses and that the occupants should use them.

One preventive tool commanders have is support of Air Force aero clubs and encouragement of membership and flying in aero club aircraft. Today these clubs have very good equipment and they provide guidance and some control particularly over students and pilots with limited experience. Their safety record for the past few years has been outstanding. During the two and a half years covered by this article in which 28 Air Force personnel were killed in light plane accidents outside of aero club flying, the aero clubs had only 11 fatalities. And they flew more than 650,000 hours during that time. The accident rate last year was 10.2, about one-half the overall general aviation rate, and the fatality rate only .75 per 100,000 hours of flying—approximately one-third the general aviation rate.

Supervisors should identify those individuals who engage in hazardous outside activities and, as one of their responsibilities, keep in touch with their progress for counseling and guidance. This is primarily true for the younger, less experienced people. In the final analysis, however, the experienced pilot is pretty much on his own. He must exercise the good judgment that eliminates, on his part, violations of flying regulations, unauthorized and foolish escapades such as low level acrobatics and flying aircraft that he knows or suspects are unsafe, or flying when he knows he isn't physically fit. ★

THE I.P.I.S. APPROACH

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

FUEL REQUIREMENTS (AFM 60-16)

Change 3 to AFM 60-16 has added the *visibility only* criterion to determine field conditions. Since visibility, most often, determines whether the pilot can see the runway environment from DH or MDA, ceiling requirements have been eliminated from everything except for planning fuel required for a particular flight. This has prompted many questions on how to compute fuel requirements during preflight planning. The following is an explanation of present fuel requirements:

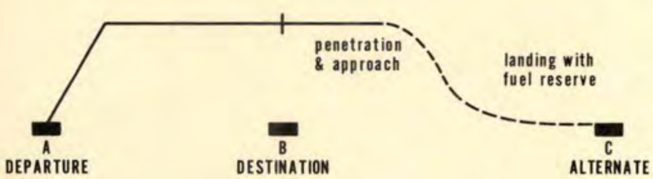
To begin, the basic fuel requirement for a flight remains unchanged—". . . must be sufficient to complete the flight to final landing . . . , plus fuel reserve. . . ." The confusion seems to be about how to determine the fuel required when an alternate is required. This can be explained best by considering two situations:

Situation 1: A flight from A to B with C as an alternate. Weather at destination B is 500 feet with ½ mile visibility. Landing minimums are 200-½. Using *ceiling* and *visibility* criteria, the general fuel required, during planning, must equal the time to fly from:

(1) A to B

(2) B to C

(3) Plus fuel for landing at C and fuel reserve.



Situation 2: A flight from A to B with C as an alternate. Weather at destination B is 100 feet with ½ mile visibility. Landing minimums are 200-½. You may file to this destination. Using the *visibility only* criteria, the general fuel required, during planning, must equal the time to fly from:

(1) A to B

(2) B to C

(3) Plus fuel for a landing at C and fuel reserve.

(4) Plus fuel for penetration/approach and missed approach at B (original destination).

The additional fuel requirement in Situation 2 is necessary because, using the visibility only criterion, you may execute a penetration/approach and missed approach at destination B.

RADIO FREQUENCY/RADAR BEACON CHANGE

Q Is there an altitude below which approach control should not assign a radio frequency or radar beacon change?

A Yes. Controllers will not assign departing IFR military turbojet (except transport and cargo type) aircraft a radio frequency or radar beacon change *before* the aircraft reaches 2500 feet. For approaches, controllers will avoid radio frequency and radar beacon changes for turbojet (excluding transport and cargo type) aircraft to the maximum extent that communication capabilities and traffic will permit. Also, they will keep frequency changes to a minimum below 2500'. (Ref FAA Manual 7110.8A.)

POINT TO PONDER
SINGLE FREQUENCY APPROACH (SFA)

For you jocks who fly a single-piloted jet aircraft, there are single frequency approaches available at many airfields. If an airfield has this service, the abbreviation "SFA" will be shown after the heading "Communications" in the IFR Supplement. If you desire an SFA and it is available, we recommend that you specifically request it from the controller.

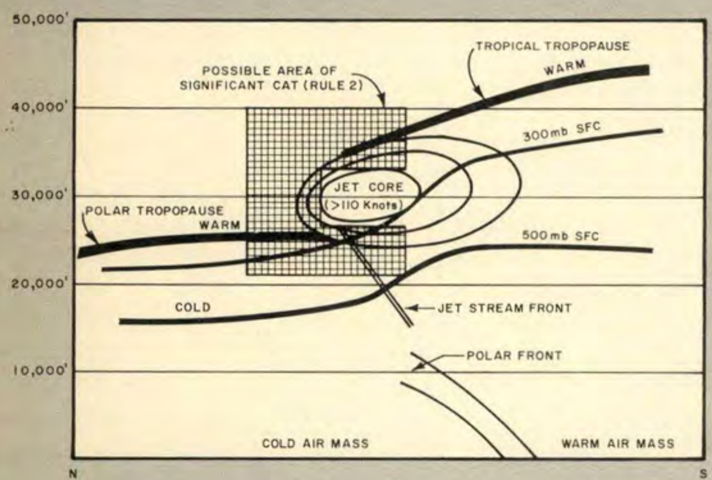
NOTE

ALTHOUGH CIVILIAN AND OTHER MILITARY PILOTS STILL USE SPECIAL VFR (SVFR), HELICOPTER PILOTS ARE THE ONLY *USAF* PILOTS WHO CAN LEGALLY REQUEST SVFR! ★

CAT-RULES OF THUMB

FAA Advisory Circular Nr AC 00-30, 5 March 1970, contained a number of "rules of thumb" to assist pilots in avoiding or minimizing encounters with clear air turbulence. Since not all Air Force pilots would have access to this circular, we asked Air Weather Service for assistance and they obliged with the drawings on these pages. Incidentally, the "rules" are for westerly jet streams.

NOTE: The rules should be considered strictly as rules of thumb and not as a substitute for official AWS turbulence forecasts. Although USAF aircrews receive CAT guidance in preflight briefings, it is felt that these drawings illustrating the textual matter would be of value.



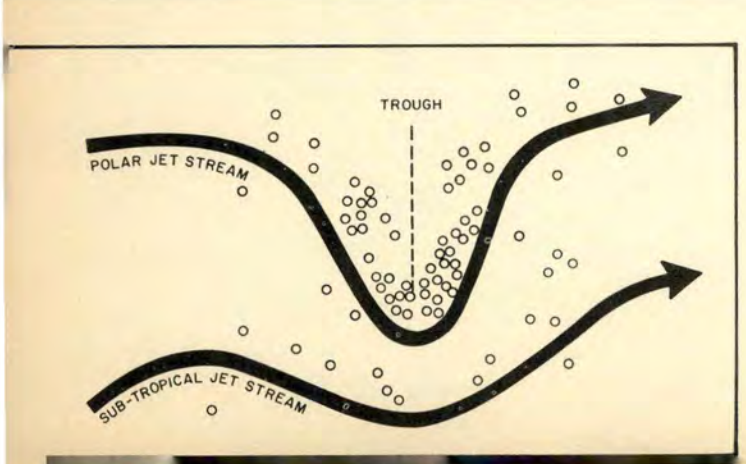
The grid area depicts where you can usually expect turbulence when the wind velocity exceeds 110 knots.

• Jet streams stronger than 110 knots (at the core) are apt to have areas of significant turbulence near them in the sloping tropopause above the core, in the jet stream front below the core, and on the low-pressure side of the core. In these areas there are frequently strong wind shears.

• If jet stream turbulence is encountered with direct tailwinds or headwinds, a change of flight level or course should be initiated since these turbulent areas are elongated with the wind, and are shallow and narrow.

• If jet stream turbulence is encountered in a cross-wind, it is not so important to change course or flight level since the rough areas are narrow across the wind. However, if it is desired to traverse the clear air turbulence area more quickly, either climb or descend after watching the temperature gage for a minute or two. If temperature is rising—climb; if temperature is falling—descend. Application of these rules will prevent following the sloping tropopause or frontal surface and staying in the turbulent area. If the temperature remains constant, the flight is probably close to the level of the core, in which case either climb or descend as convenient.

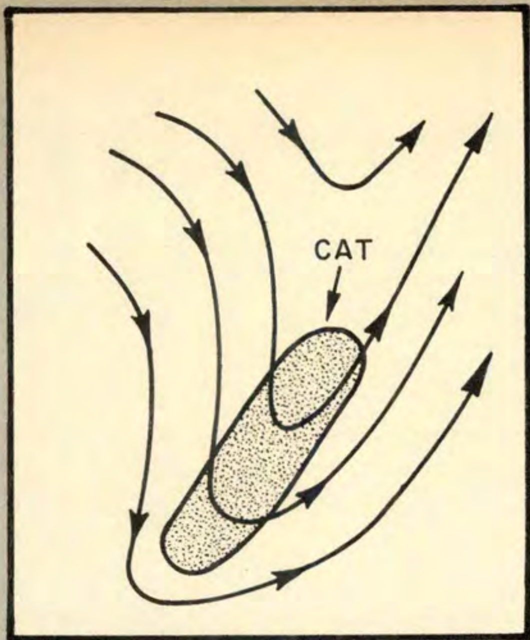
• If turbulence is expected because of penetration of a sloping tropopause, watch the temperature gage. The point of coldest temperature along the flight path will be the tropopause penetration. Turbulence will be most pronounced in the temperature-change zone on the stratospheric (upper) side of the sloping tropopause.



The 20 knot isotachs are one clue to turbulence. On a 300 MB chart if these isotachs are closer than 60 NM apart, expect a rough ride.

• On charts for standard isobaric surfaces, such as 300 millibars, if 20-knot isotachs are spaced closer together than 60 nautical miles, there is sufficient horizontal shear for CAT. This area is normally on the poleward (low-pressure) side of the jet stream axis, but in unusual cases may occur in the equatorial side.

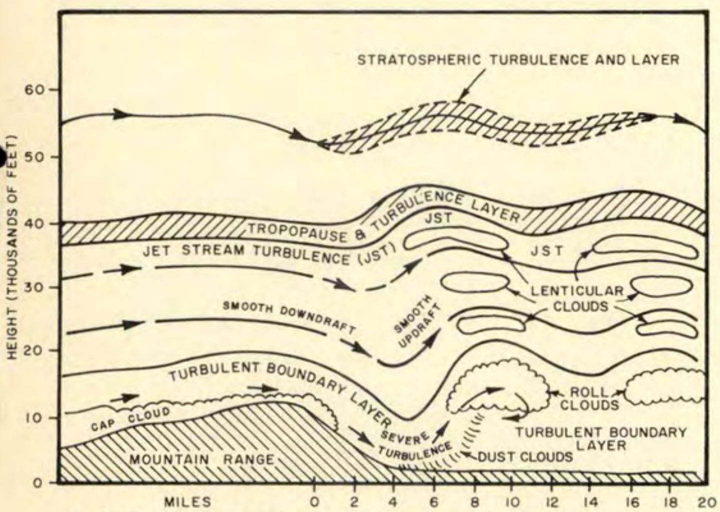
• Curving jet streams are more apt to have turbulent edges than straight ones, especially jet streams which curve around a deep pressure trough.



Your course through a trough such as this should be across rather than parallel to it.

• Wind-shift areas associated with pressure troughs are frequently turbulent. The sharpness of the wind-shift is the important factor. Also, pressure ridge lines sometimes have rough air.

• If turbulence is encountered in an abrupt wind-shift associated with a sharp pressure trough line, establish a course across the trough rather than parallel to it. A change in flight level is not so likely to alleviate the bumpiness as in jet stream turbulence.



Establish your best turbulence penetration airspeed when traveling jet streams flowing in the vicinity of mountains.

• Wind shear and its accompanying clear air turbulence in jet streams is more intense above and to the lee of mountain ranges. For this reason, clear air turbulence should be anticipated whenever the flight path traverses a strong jet stream in the vicinity of mountainous terrain.

• Both vertical and horizontal wind shear are, of course, greatly intensified in mountain wave conditions. Therefore, when the flight path traverses a mountain wave type of flow, it is desirable to fly at turbulence-penetration speed and avoid flight over areas where the terrain drops abruptly, even though there may be no lenticular clouds to identify the condition.

The following two "rules" do not readily lend themselves to illustration.

• Turbulence is also related to vertical shear. From the winds-aloft charts or reports, compute the vertical shear in knots-per-thousand feet. If it is greater than five knots-per-thousand feet, turbulence is likely. Since vertical shear is related to horizontal temperature gradient, the spacing of isotherms on an upper air chart is significant. If the 5°C isotherms are closer together than two degrees of latitude (120 nautical miles), there is usually sufficient vertical shear for turbulence.

• In an area where significant clear air turbulence has been reported or is forecast, it is suggested that the pilot adjust the speed to fly at the recommended rough airspeed on encountering the first ripple, since the intensity of such turbulence may build up rapidly. In areas where moderate or severe CAT is expected, it is desirable to adjust the airspeed prior to the turbulence encounter. ★

METAL FATIGUE

Richard J. Pennoni
Directorate of Aerospace Safety

The metals used in our aircraft reflect the state of the metallurgical art. But as strong as they are, those carrying loads can get "tired" from the stresses inherent in flight. We call this metal fatigue. One way to shorten the life of a piece of metal is to provide a point of stress concentration, as this article describes. Once the aircraft is in operation, it is the maintenance people who must look for, detect and correct any such defects. They have the added responsibility of **not creating** *any points of stress concentration.*

This is the first in a series on "things pilots and mechs should know" about aircraft. Next month's article will dwell on aircraft structures—how and to what criteria they are designed—and how pilots can help prolong the life and "structural safety" of an airplane.

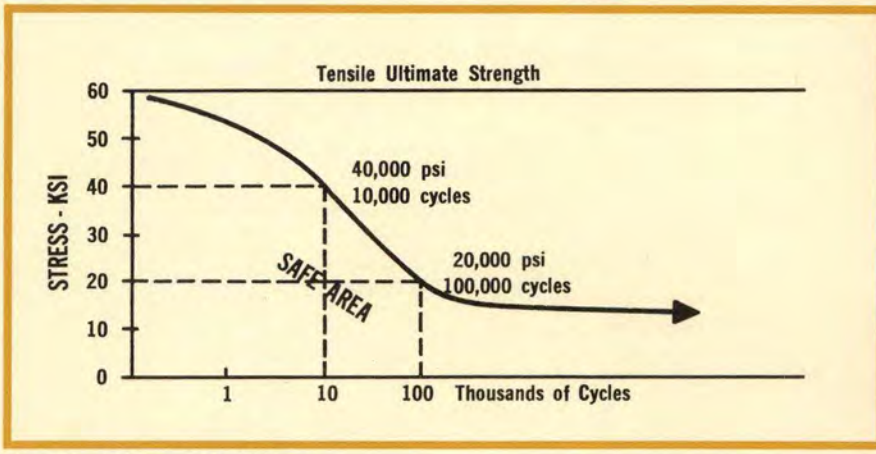


Figure 1 Endurance Limit Curve

Fatigue—for the human body, this word means weary, tired or worn out. In metals, this means a changed or weakened condition after repeated loads. We are interested in both, but this article deals only with metal fatigue.

More precisely, fatigue is the tendency of materials to fracture under many repetitions of stress at levels considerably less than the ultimate static strength. Examples are cracks in wing skins, ribs, stringers and even spars. Or in fuselage skins, stringers, longerons, bulkhead frames and webs.

Fatigue is not limited to the wing and fuselage structure but occurs also in heavy hollow members such as landing gear struts, engine shafts and torque tubes; solid members such as fittings, bell cranks, tie rods, turbine wheels, links, handles and bolts. Fatigue occurs when the endurance limit of the material is exceeded. Endurance limit (for our purpose) is extent of life, or number of cycles of flight loads or stress levels which a part can endure before fracture occurs. As shown in Fig. 1, it is possible for the endurance limit or life to be ten times greater if the stress level is reduced to one half.

Although the life of a part is increased by reducing the tensile stress imposed, this does not eliminate premature and catastrophic failures if high *localized* stresses are present. High localized stresses result from irregularities of form, such as holes, surface notches or nicks, sharp shoulders and abrupt changes in cross section. These are called *stress raisers;* the phenomenon is called *stress concentration.* Although the designer and manufacturer strive to avoid these, some aircraft mishaps attest to the occurrence of "slip ups."

For example, several years ago we lost a bomber and two of the four-man crew when one wing panel separated in flight. Investigators found that the main spar lower cap had a tapered change in section as shown in Fig 2, which contained a sharp vee notch. This apparently hand-filed notch created severe stress concentration. The vee notch was contrary to the design drawing

IN AIRCRAFT...

which specified a ⅜" radius at the base of the tapered cutout.

Here we had a fine example of irregularities in form, namely the notch or stress raiser, and the resulting fracture by metal fatigue. The endurance limit of this section had been drastically reduced. The determination that the filing had been done by unknown personnel after assembly of the aircraft was of no consolation in that this drastic loss could not be undone.

Recently we lost a modern fighter aircraft as the result of a fatigue crack emanating from a small semicircular groove as shown in Fig 3. This airplane had flown less than one-half of its 4000-hour service life established by fatigue tests. It was obvious that even the small area of crack progression discovered was sufficient to induce sudden cleavage of the wing lower plate at flight loads below the ultimate allowable.

What does the Air Force do about these "notch problems?" We issue immediate one-time inspection requirements to detect and rework other defective airframes after one is detected or found during an accident investigation. As stated earlier, this does not undo the initial loss, but it does prevent recurrence and it does alert operational and maintenance personnel to this type of defect. The maintenance man, especially, can render outstanding service. For example, in the two cases cited above, an inquisitive inspector type of individual who kept looking at all of his wing primary structure and who knew what to look for might have detected the notches in time to prevent these catastrophic failures. Also it must be remembered that the wing lower surface components (spar caps, stringers and skin or thick plate covering) are critical in tension throughout the life of the airplane. ★

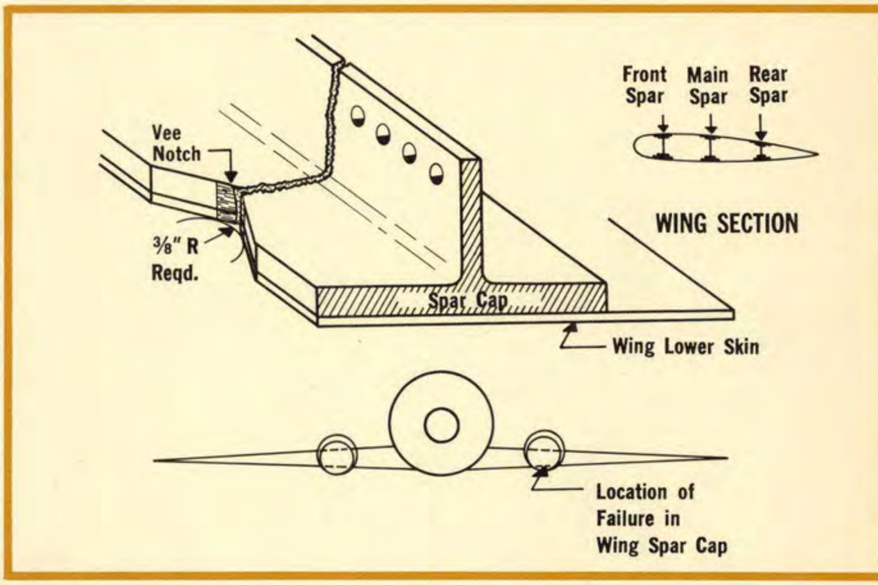


Figure 2

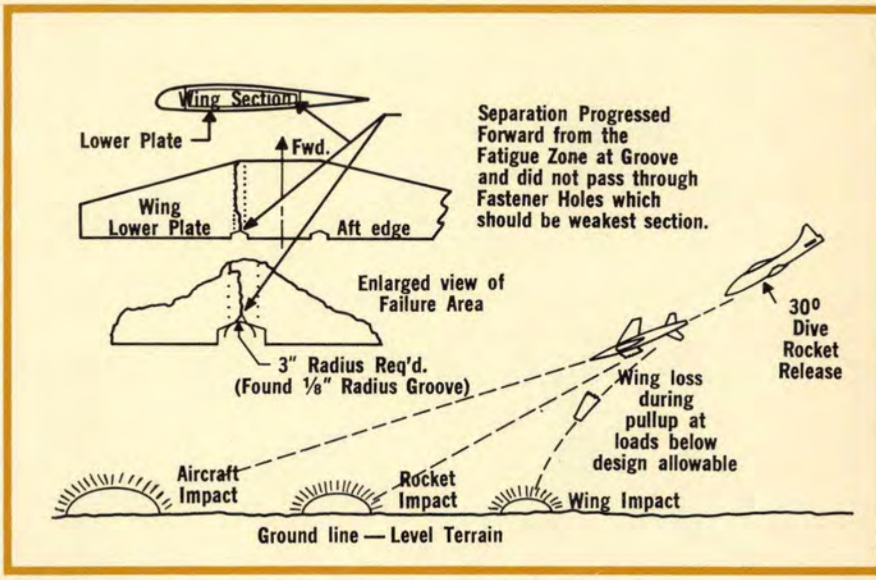
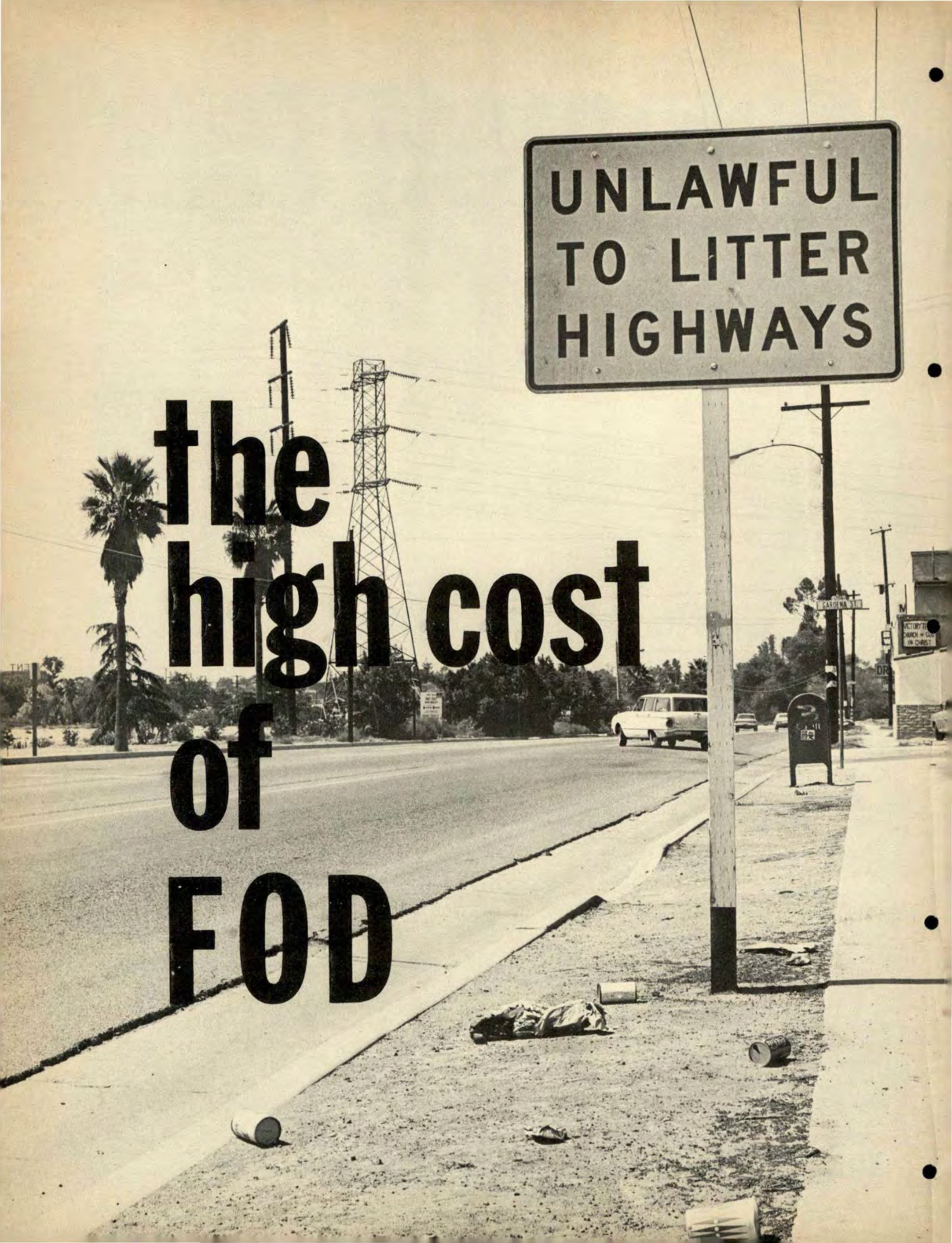


Figure 3

the high cost of FOD



In California one can be fined as much as $500 for littering. What about the litter that results in FOD?

Ever notice the difference in the amount of trash on an Air Force base versus the community at large? The kind of trash that people thoughtlessly discard along streets and highways, a bit at a time. Maybe you're a little careless yourself occasionally, like the paper cup that misses the trash container at a drive-in. Do you always pick it up?

Perhaps you do, but not everybody does. And if you are as neat and appreciative of cleanliness as most Air Force people, you are appalled at some of the messes you see. But we have some of our own, although they aren't always as obvious. When the wrong item gets into our equipment we call it a foreign object. The damage it does we designate as FOD.

We're all familiar with the term. Most of us are reasonably careful about discarding unwanted items on or off the flight line. Then how come FOD costs us many millions of dollars in damaged and destroyed equipment?

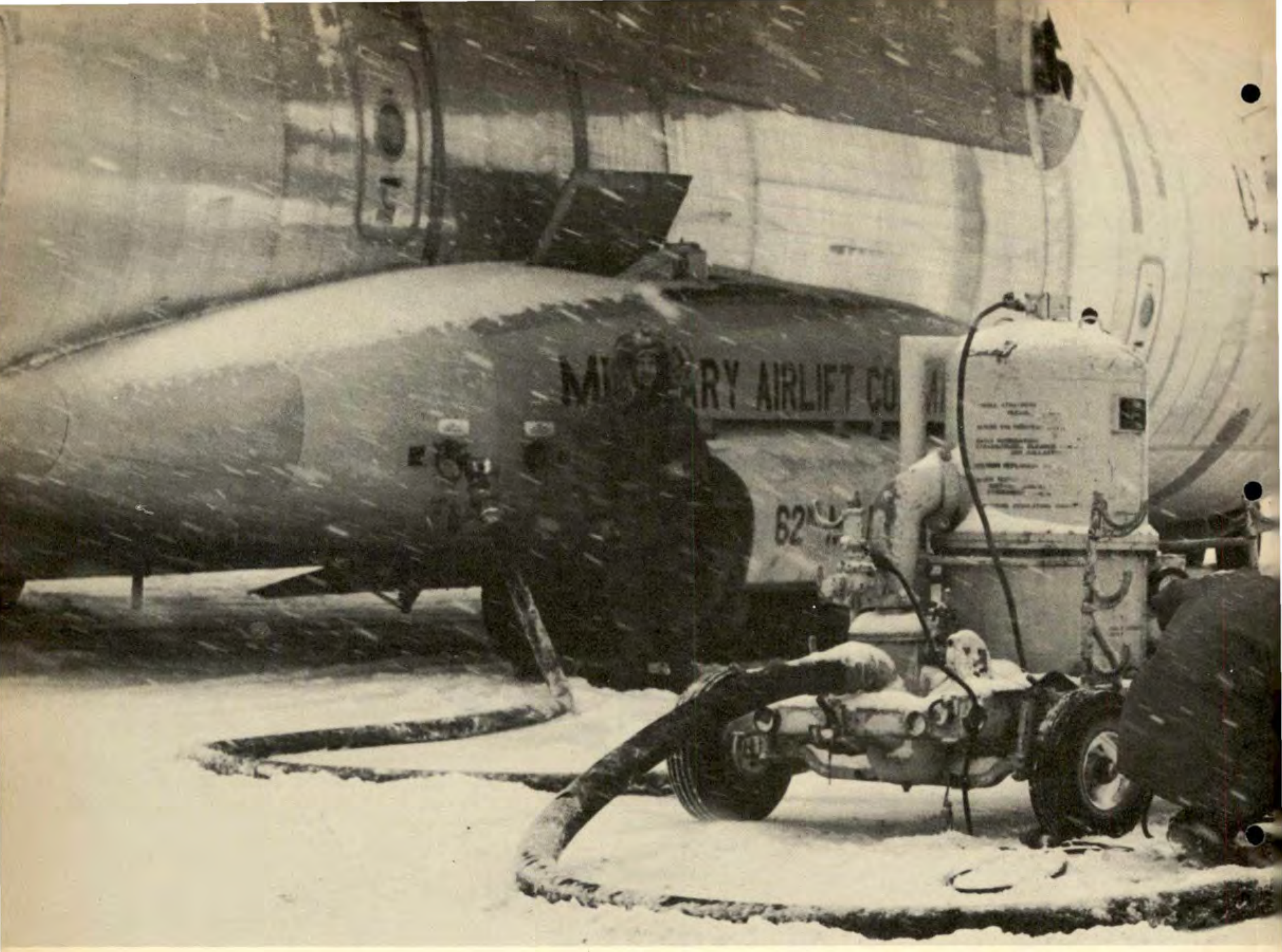
Perhaps the answer lies in size. A foreign object need not be large to cause a malfunction. A short time ago a ¾" piece of safety wire fouled up a fuel shut off valve when it got positioned across two electrical terminals. The engine flamed out and could not be restarted in flight. Fortunately, the aircraft had one good engine remaining and the crew got it down okay.

Loss of an engine at a critical point on takeoff can be, and frequently has been, catastrophic. Why do engines fail at such crucial times? Well, one did because there was a piece of cheesecloth in the left engine fuel strainer on a C-47. That 2 x 14 inch rag could have cost several crewmen their lives. Think about that next time you're tempted to leave such items lying around when you're working on an aircraft.

As we said, size doesn't mean much. Like David taking Goliath, a ⅝" washer went through the jet engine on an F-4, damaging it so badly that it had to be overhauled.

A nut, a small piece of cloth, and a bit of wire. They wouldn't even be noticed among the beer cans and other debris alongside any highway. But they were pretty big stuff when it came to grounding three airplanes.

Think about that! ★



WINTER AIRCRAFT OPERATION

MAJ OSCAR UNSER, 343 FIGHTER GROUP
DULUTH INTERNATIONAL AIRPORT, MN

Back in July when it was 120+ on the Mojave desert and sweat poured in salty streams down our sunglasses, we were trying to think *cool*. Like in this business we have to always be thinking two to three months ahead. So we magazine types are thinking November in August.

To get ourselves in the right frame of mind and to provide some timely stuff for these pages, we queried an acquaintance who spends his winters where the snow is up to his—well, pretty deep. So, these gems that you should find useful are from Major Oscar Unser, Chief of Safety for the 343 Fighter Group, ADC, Duluth International Airport.

He wisely warns that these tips do not represent policy, but are meant to acquaint each aircrew member with problems associated with winter operation. They are in addition to, not in lieu of, info contained in your Dash One.

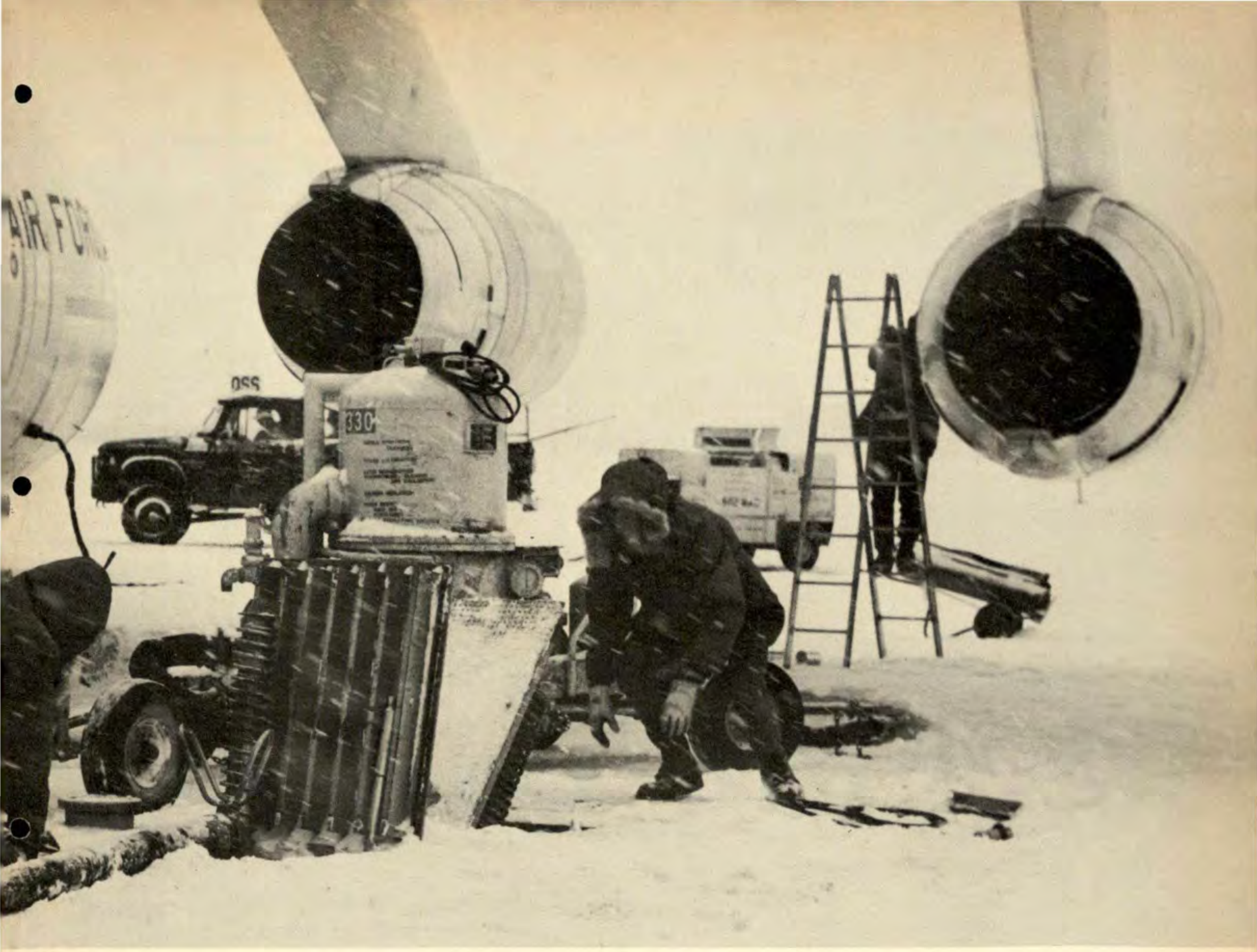
We hope they will aid you in cold weather. If you find a method here that works for you, use it. If you know some other tip that has helped you, don't be the only person who knows about it. Send it to us and we'll pass it on.

GENERAL

DON'T TOUCH COLD METAL WITH BARE HANDS. (Ever touch your tongue to a frozen ice tray?)

KEEP YOUR MASK INSIDE WHERE IT IS WARM. *Never* leave it outside in the cold where the valves will freeze.)

Carry your helmet out to the airplane in a helmet bag and leave it in the bag until you are ready to put



it on. This will help prevent mask problems (i.e., stuck valves) and cracked hardshells.

When you put on your helmet, put the oxygen mask on and start breathing. This will keep moisture from condensing on the valve and freezing.

When your hands are full and you're wearing a parachute, you are set up for a nasty spill. Your weight is not distributed evenly; you are "back heavy." ADD SNOW OR ICE FOR THE CLINCHER. Take it much slower than usual.

FROSTBITE HURTS . . . AVOID IT! ! ! Cover vulnerable areas of your body. No matter how warm you feel inside, your fingers, nose or ears can get frostbitten. Remember, temperatures below 32 degrees F are conducive to frostbite.

If you wear the felt winter boots, BE CAREFUL. No heels on ice is asking for a tumble. A BUSTED LIMB IS NO WAY TO SPEND THE WINTER.

Winter operations require more time than summer operations. GET AN EARLY START TO THE AIRCRAFT, so you can walk slowly; give the aircraft plenty of time to warm up; take your time taxiing.

When it is cold outside, there is a tendency to hurry the preflight. DO NOT HURRY the preflight. You might overlook some important item. The key to a quick thorough preflight is to know what to look for on the required preflight items.

Make sure all snow, ice and frost are removed from the aircraft.

Once in the aircraft with the lid down, remember the crew chief—IT IS COLD OUTSIDE. Perform all required checks in a safe and efficient manner. NEVER sacrifice safety for speed; however, it is important to avoid delays in making checks so the ground personnel can get inside where it is warm.

TAXIING ON ICE IS DANGEROUS. If you cannot taxi safely, SHUT IT DOWN AND TOW IT IN! ! ! Use idle thrust and taxi at a speed that is so slow you could beat the aircraft if you were crawling on your hands and knees . . . EVEN THIS SPEED MAY BE TOO FAST!

Turns are dangerous when runways/taxiways are wet or covered with ice and/or snow. Stop the aircraft before making the turn, then proceed, S-L-O-W-L-Y.

Another dangerous area for taxiing is a downhill slope. USE EX-

TREME CAUTION. If the brakes won't stop you maybe some solid object will.

Make sure there is enough space to taxi without dragging wing tanks/ tip tanks in snow drifts. WHEN IN DOUBT, SHUT IT DOWN AND TOW IT.

DEPTH PERCEPTION IN SNOW-COVERED APPROACH ZONES IS POOR. There are no *rules of thumb* or easy *trick methods*. Each pilot must find his own best method. Be aware of the problem and be prepared! ! ! Use available visual or electronic glide slopes!

While snow is falling even taxiing is difficult due to loss of depth perception. SLOW DOWN.

TACAN and ILS antennas are susceptible to heavy snow. A heavy snow squall can knock out these navaids within a half hour.

Compute landing distance BEFORE touchdown. DON'T GET CAUGHT SHORT! !

DRESSING FOR COLD WEATHER

Consult the Chill Temperature Chart on this page. Here is a rule of thumb: for each mph of wind, subtract two degrees of temperature. (i.e., if the temp is −20 F and the wind is blowing at 20 mph, the equivalent wind chill factor would be about −60 F actually −67).

When selecting clothing:

• Dead air space makes insulation. More layers of clothing, more insulation. Several layers of clothing are better than one bulky thick layer.

• Neck should be covered with a loose fitting scarf or turtle neck sweater.

• Heat escapes from the openings at wrist, neck, ankles and waist. Make sure these areas are protected.

• Loose fitting winter gloves provide more warmth than skin tight gloves.

• Your feet stay warmer if you wear a pair of light cotton socks under a pair of wool socks.

• Elastic around your ankles cuts off blood circulation.

FOR GOOD HEALTH

Wear a head protection device AT ALL TIMES.

Regulation of body temperature is most important. When coming inside from the cold, loosen or remove garments to control body temperature. Avoid sweating, this dissipates body heat.

Inspect clothing daily for rips, tears, worn spots and dirt.

COLD can be deceptive—it may look warm outside, or even feel warm but always dress accordingly — FOR THE WORST CONDITIONS YOU EXPECT TO ENCOUNTER.

C-O-L-D WEATHER KEY

Clean clothes give best insulation.

Overheating is like overeating— AVOID IT. Adjust clothing or remove excess clothing to avoid sweating.

Loose clothing in layers gives maximum still-airspace and more insulation.

Dry clothes are warmer.

OUR WINTER CLOTHING REQUIREMENTS

Heavy woolen cap with ear flaps. (Knitted wool face guard and head covering are in the survival kits.)

MA-1 flying jacket or equivalent.

Winter flying suit.

Leather gloves with wool inserts.

Thermal/quilted underwear (maybe both).

Heavy socks.

Flying boots (winter, thermal, bunny, felt, etc.). ★

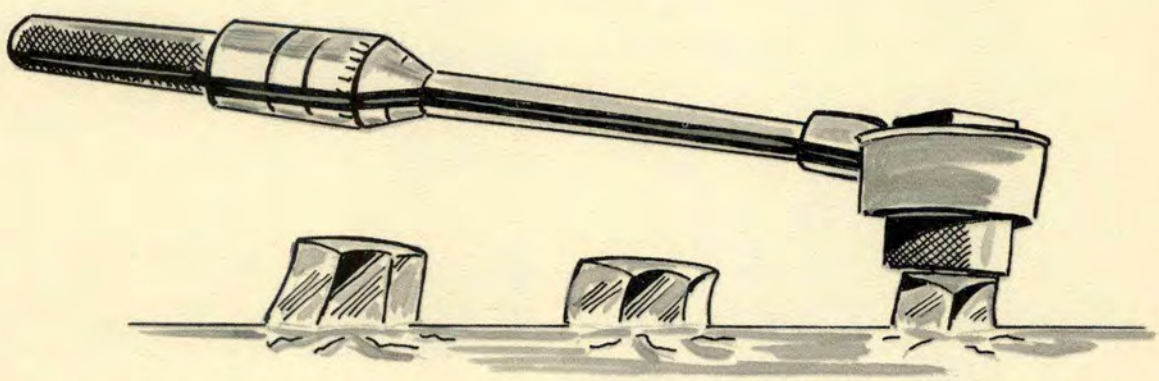
WIND CHILL CHART

Est. wind speed in mph	Actual Thermometer Reading (F.)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT TEMPERATURE (F.)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-21	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-36	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-124
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER (for properly clothed person)				INCREASING DANGER			GREAT DANGER				
	Danger of freezing exposed flesh											

INSTRUCTIONS: Measure temperature and wind speed, if possible; if not possible, estimate. Find the applicable wind speed in the left-hand column and the temperature in the top row. Where the two intersect, you'll find the equivalent chill temperature—that is, the temperature that would cause the same rate of cooling under calm conditions.

POOR TORQUING

ARE YOU ONE OF THE 10%?



The old adage, "As tight as you can get it plus one turn" won't do the job any more. Of course, it never did, but in looking over some accident reports, one wonders if that isn't the method some mechanics are using to torque fasteners. In other cases, however, the indications are that no torque method was used at all. Fasteners were left loose or not even connected.

A review of maintenance-caused accidents over the past three years indicates that at least ten per cent were caused by under- or over-torquing of all types of fasteners including "B" nuts on fuel, oil, hydraulic and air conditioning lines. Just about every fastener you can find on an airplane has been at one time either over- or under-torqued.

However, it seems that in most cases where a group of nuts are massed together, they do receive proper torque attention. Cases in point are where the turbine and combustion chambers meet on jet engines, or where a cylinder mates to the case on a reciprocating engine. Of more than one thousand accidents and incidents reviewed, there was only one case each of recip and jet engine case nuts improperly torqued. Even these are too many. But it seems that far more emphasis is being placed on torquing these items than is being placed on torquing "B" nuts and other miscellaneous type fasteners. This may be because of the emphasis placed during training on the necessity for torquing groups of nuts. It may be, too, that some individuals are just too lazy to go to the trouble of getting a torque wrench for just one fastener.

Who is the individual not properly torquing said fitting or nut? The answer is it happens right down the line, from depot to the flightline mechanic.

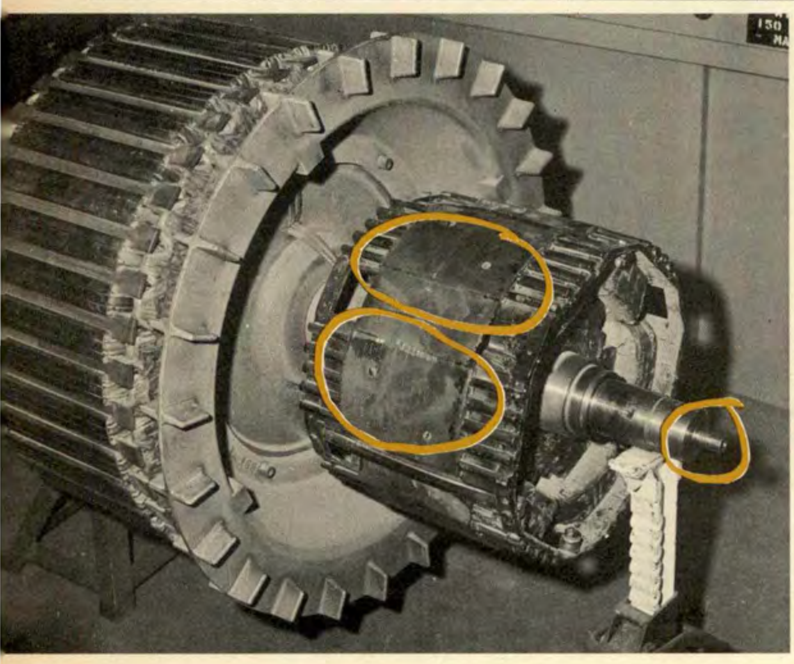
Supervisors at all levels must continuously monitor their shop practices to insure that proper emphasis is being placed on torque values. Also take a look at TO 32B14-3-1-101. What method of verifying the torque wrench calibration are you using? The question is in reference to TO 32B14-3-1-101, paragraph 1-3.

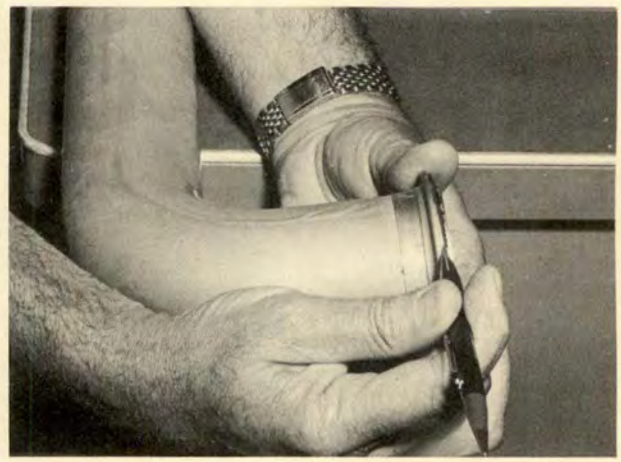
Every fastener that has a specified torque value must be torqued using an authorized torque wrench. (Not by forearm feel or inches of biceps bulge. Everyone's biceps may not bulge the same.)

SUPERVISORS, see to it that torque wrenches are available and used.

MECHANICS, check the wrench for proper calibration before use. And be sure you use it properly. ★

When you submit a QUMR you want action, so give the people who can help you all the ammunition they need, including photos, because they are saying . . .





Air Force photographers always make the scene of each major accident. Their job is to record evidence, such as skid marks and oil slicks, that cannot be packaged and shipped.

Gun cameras and photo reconnaissance aircraft verify the pilot's report of combat results. Photographs also show a wealth of information the pilot would have missed.

When the challenge is to "show me," the cheapest and most effective answer is often a photograph.

When a quality control man, investigating a Quality Unsatisfactory Materiel Report, tells a contractor that some item wasn't up to requirements, the immediate challenge is, "That was O.K. when we shipped it! Show me!"

TO 00-35D-54 encourages you to submit photographs with Quality

. . . SHOW ME!

James H. Smith, SAAMA, Kelly AFB, Texas

Unsatisfactory Materiel Reports (QUMRs, DD Forms 1686). But almost nobody bothers. We checked a couple of hundred recent QUMRs and found only half a dozen backed up with photographs. Some defects won't show on a photograph; but do 95 per cent of them fall into this category?

On a full third of the QUMRs we receive, there's a mistake in the address block at the top of the form. Even if the rest of the report is perfect, the exhibit may be turned in before a misaddressed report can be forwarded and processed. Without an exhibit, with erroneous, sometimes contradictory information on the report, photographs can be your ace in the hole to get effective action to correct the problem.

Unless you give the quality control people enough information to explain the defect, *plus enough evidence to prove it,* you are probably wasting your time and theirs by submitting your report!

The contractor or Specialized Repair Activity (SRA) will respond to your QUMR in about the same way you would respond to an unfavorable comment about the quality of your work.

Any condition worth the time and effort you spend on a QUMR deserves action, and is worth a few photographs to support that action. Consider the following response:

"(Contractor's company letterhead)

July 9, 1970

Gentlemen:

Subject report was received on 7 July 1970. Review of shop files and the data provided by the report indicate that a repair of the shaft stem was accomplished along with other work. While this repair was considered adequate, the report clearly substantiates that the shaft stem repair was inadequate.

Request the exhibit be returned for repair at no cost to the Government . . . etc."

The QUMR that received this two-day response was supported by a couple of photographs. Could a few pictures improve the replies to your QUMRs this much? Why not find out with your next QUMR?

If the base photo lab is swamped when you need pictures, don't let that stop you. There is at least one amateur photographer in your unit. If it shows the defect, any snapshot will do.

When your QUMR, with pictures, is ready to mail remember: the mail symbol for the Quality and Reliability Assurance Branch at each Air Materiel Area has been changed from "NMQ" to "MMQ," The symbols are now SAAMA (MMMQ), OCAMA (MMMQ), WRAMA (MMMQ), OOAMA (MMMQ), and SMAMA (MMMQ). ★

CHECKLIST FOR PHOTOGRAPHS

1. Is the photograph clearly identified, so it can be matched with the report after they become separated?

2. Is there something in the photograph, such as a ruler or a man's hand, to show size?

3. Is the defect pointed out? Paper arrows taped to the exhibit, or a pencil pointing to the defect, are two methods.

4. Is the serviceable tag, the inspector's stamp, and the contractor or SRA decal shown? Are they legible? If they won't show in your photograph, how about making copies on your office copying machine?

5. Did you send two copies (one for our file, one for action)?

6. Would the defect show better in color? Some problems, such as corrosion, show much better in color. HINT: Try using brown paper with large type for tags and arrows taped to the exhibit. White paper is much brighter than most exhibits, and the exhibit may be under-exposed while white tags are over-exposed.

Nondestructive Inspection (NDI) has become an extremely important maintenance tool. While NDI is not limited to any one command, this article describes some of its applications in Air Training Command.

NDI-MURPHY'S NEMESIS

Capt Elee W. Tyler, ATC (ATMME-AX), Randolph AFB, Texas

Anyone who has spent time around a flight line is familiar with "Murphy's Law"—"If there is any possible way to goof, someone will." This so-called law is not one of the laws of science, but seems an almost invariable rule of human nature.

This Murphy character is all too well known to every technical writer and every maintenance supervisor. He is like "Kilroy" of World War II —here, there and everywhere. But instead of writing on walls, Murphy does such things as installing bolts upside down, clamps backwards, and crossing connections.

Constant vigilance and dedicated workers have greatly reduced and kept Murphy's goofs to an all-time low; nevertheless, the continuing increase in diversity and complexity of our aircraft have created more and more chances for mistakes.

These opportunities for errors become more evident when we recall that most maintenance inspections follow a disassemble-inspect-reassemble process. It simply means that the more something is taken apart, the greater the risk someone will put it together wrong.

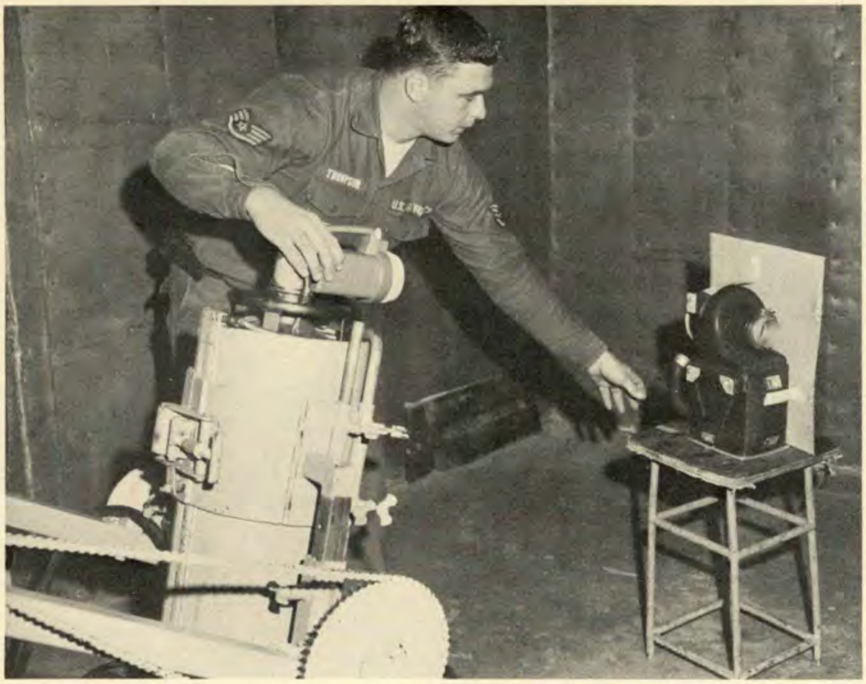
How can we beat the law? Obviously, if we quit taking things apart we will eliminate many errors, but you and I know it is better to check equipment periodically than to wait for a catastrophe.

So how can the periodic inspections be accomplished without the disassemble-inspect-reassemble sequence which takes time, extra parts, man-hours and extra toll in the life of the system?

Air Training Command (ATC) is now using a loophole in Murphy's Law to great advantage. It is called Nondestructive Inspection (NDI) which is proving more effective all the way around in comparison with the old method. Instead of a tool box and eyeballs, the command now employs x-ray and ultrasonics and several other types of equipment. Industrial x-ray units, which can shoot through several inches of steel, are being used to examine aircraft structures.

Ultrasonic units, which put sound into an object and then monitor the echo, help find flaws in a casting or corrosion under a screw. Some familiar types of equipment have been made smaller and handier by using transistors. This is especially true for magnetic particle equipment, some of the latest and most powerful units can now be held in one's hands.

NDI is essentially a new and bet-



The hoist is being lowered to the proper angle to X-ray the wing section and horizontal stabilizer of a T-37 aircraft.

Proper alignment is made of a Sperry 275 X-ray tube prior to photographing a T-37 heat exchanger for faulty parts.

The non-destructive inspection technician measures the distance between a Sperry 275 X-ray tube and a T-37 heat exchanger, prior to radiation exposure to determine the defect.

ter way to do the same old job. It is simpler, faster, and allows for work to be scheduled as needed. A prime example of the value of the new method was the experience with the forward canopy of the T-38 Talon jet trainers used by ATC.

The command had several incidents where the forward canopy blew off in flight. It was discovered that the canopy was ripping because the fiberglass nodes were cracking and retaining pin bushings were slipping. With the possibility of canopies "unzipping" from the frame, it became very important to know which aircraft were pending failures.

The only inspection method known at the time was a disassembly and visual inspection of the canopy. The job required 33 man hours, plus 48 hours of sealant cure time after completion.

From an operational point of view, it required four days before the aircraft could be flown again.

A team of technicians was given the go sign to test and verify an x-ray procedure technique. The results were so favorable that the procedures were incorporated into a time compliance technical order.

The inspection they developed could be accomplished by two men in one and one-half hours per aircraft. It required no canopy removal and no disassembly. In fact, a fleet wide inspection revealed that one canopy, which had previously been visually inspected, had been damaged during reassembly. Murphy had struck again!

Another example of NDI effectiveness is revealed by the current inspection program for the T-37 aircraft. The periodic maintenance interval is now 800 hours, compared to the original 400 hours.

This was accomplished by ATC conducting an engineering study of the aircraft and its own NDI research project. By the end of the project, so many NDI applications had been developed that complete changes in work sequence and job responsibility were required. The end result was a more thorough inspection and 100-man-hours less time per inspection. Most important, however, the results of the NDIs of critical areas were used as the basis for approving the 800 hour PE cycle, which, in terms of man-hours, will save the command nearly one half million dollars annually.

What about Murphy, is he beginning to age and become less active? During the project the command found the unscheduled maintenance workload dropped some 20 per cent. Maybe Murphy was not the cause of that 20 per cent extra work, but because of NDI he had less chance to foul up the aircraft.

Anyway, ATC believes it has found a loophole in Murphy's law and intends to use it to the fullest extent possible. ★

TOOTS

is interested in your problems.
She spends her time
researching questions about Tech Orders
and directives.
Write her c/o Editor (IGDSEA),
Dep IG for Insp & Safety,
Norton AFB CA 92409

Dear Toots

It has been Air Force policy for years to instill in the maintenance man to "follow tech orders." However, during the daily grind of launch, recovery, return to OR status and launch again, we may tend to deviate from technical data. I doubt seriously if even a handful of maintenance people could certify that they follow technical data to the letter in every applicable operation they perform. If one does, he is one in a thousand because if he makes even an error in aircraft form maintenance, he has violated a technical order.

In order to whittle down the lip service I would like to submit the Introduction Step of our lesson plan that is used in the Aircraft Maintenance Officer Course at Chanute when technical orders are presented. Quite long, but here goes!

Have you ever taken your car to a garage for maintenance and wondered why the mechanic did not use a technical manual to perform maintenance "by the book?" It is possible for you to enter a garage and watch several types of cars pass through various stages of maintenance and not one mechanic will consult a technical manual for information. Why? Either he has read all of the manuals before and "remembers" all of the material or he "hits and misses." Well, this type maintenance doesn't do your car any good and only adds to your expense when faulty maintenance contributes to a subsequent failure. Did you ever order a part for your car and, after waiting a week for it, discover it doesn't fit? These incidents often occur. Some feel it is lack of management. Some feel it is lack of training, and some feel the employees couldn't care less.

In the Air Force, we have been provided with the most adequate, accurate and elaborate technical manuals that could possibly be published. They have been distributed for use, and violation in not using them could result in strong disciplinary measures. After all, they are *military* orders. Many people do not realize this, and some have paid out of their pocket for failing to follow a maintenance procedure by wearing fewer stripes today or having their careers terminated earlier than expected. Being able to follow procedures properly or to order the right part for the right aircraft is a serious thing! We would be in sad shape if we tolerated people who damaged or destroyed costly equipment because they failed to follow procedures. We must train, manage and supervise our subordinates to assure compliance with technical publications.

Approximately 75,000 publications exist in the Air Force technical order system! It would stagger the imagination if we tried to figure the cost of research, printing, storing, distributing, and up-dating the publications. Further, if we took one copy of each publication and placed the mass on scales, what would be the total weight? Considering the cost and volume investment of the technical order inventory, it is imperative that managers and supervisors assure adequate use of the publications and not let them gather dust in a cabinet. We must perform only high quality maintenance. We must not be negligent since costly equipment and lives of air/ground crews are involved. We are in a serious business, so we must be serious! !

James D. Vanhook (SMSgt, Ret)
Chanute AFB IL

Everyone associated with aircraft maintenance can benefit from this message. Our thanks to SMSgt Vanhook!

Toots

REX RILEY'S CROSS COUNTRY NOTES

I recently heard about a situation that fortunately terminated with an incident instead of an accident. Two fighters on a routine cross-country were cleared by Approach Control from FL 250 to 3000' in preparation for landing. Weather was day VFR. At 10 miles and 3000', Approach Control called and advised the flight that the base was closed, would remain closed for approximately one hour and that the flight was to hold. The pilot refused and asked for an immediate clearance to a nearby base since the fuel remaining was about 2300 pounds. The clearance came through as requested and both aircraft landed safely at their new destination with 900 pounds of fuel.

Let's take a close look at this incident. First of all, the cause of the whole Alphonse and Gaston act was the balloon on the Fulton Recovery System. The local rescue folks had one inflated on the north end of the field in preparation for recovery. In reality this did not really constitute a hazard unless an aircraft had to execute a missed approach. In which case, forewarned and preplanned, the flight, approaching from the south, could have avoided the balloon.

Who, if anyone, told the approach facility to "close the runway?" Shutting down a patch of concrete is a big operation and certainly not to be done without much planning. The Air Force has a neat little system called NOTAMs designed to get the word out quickly. In this instance, a NOTAM had not been transmitted since it appears the closing of the runway was on the spur of the moment. As an ex-ops type, when I hear "Runway Closed" my first questions are "Why? For how long? Whom do we have up" and, if anybody, "what's his fuel state? Is the strip open for emergency landing or do we have a bird broke halfway down the runway?"

Runway closure is an eyebrow raiser in anybody's language and should be accompanied by answers to the above questions. Such was not true in this case. In every instance *all* agencies involved should get as much information as possible to avoid what happened to these two fighters. Had the weather been marginal, then the end of this story might not have been so uneventful as a hacked-off pilot or two.

This is the second such case of no-notice runway closure in the past three months (that Rex is aware of). The first one was with yours truly on five mile final. Fortunately the weather was good but it still points to a lack of professionalism on the part of all involved when those responsible for such action were aware of the closure days in advance but failed to publish a NOTAM to warn the pilots. Nor do I think "Runway Closed" is a good term to apply *unless* there is something that would absolutely preclude a landing (such as a wrecked airplane on the *only* runway). PPR seems to be a much better term.

I've never seen an air show yet that couldn't be broken off or delayed to get a crippled or minimum fuel aircraft on the deck. Let's try to be a bit more discrete in our treatment of the terms we use and ask the question, "Is the strip *really* closed," or do we mean we'd "Rather you go somewhere else during this period, but if you *need* the runway you're welcome." ★

THE

REX RILEY
Transient Services Awar

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.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
WETHERSFIELD AFB	England
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Col
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
WRIGHT-PATTERSON AFB	Dayton, Ohio
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.
CHANUTE AFB	Rantoul, Ill.
KIRTLAND AFB	Albuquerque, N.M.

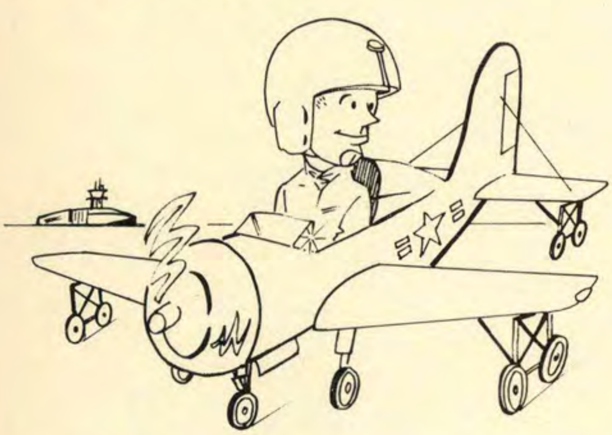
Ops topics

AN OLD ADAGE

Despite most pilots' familiarity with their cockpit controls, recent experience reiterates the need to heed that oft-repeated advice, "Look before you leap."

• UH-1F instructor reached across the center console to turn off the hydraulic console switch for the purpose of giving his student a hydraulic boost-off landing. Instead he turned off the main fuel switch, the engine flamed out and the IP demonstrated a power-off landing. Undoubtedly *both* the IP and the student learned from this one.

• As the F-100 rolled out on downwind the pilot lowered the gear without looking at the handle. The gear went down—and so did both external tanks and all the pylons. Apparently he got the emergency jettison system along with the gear handle.



READY FOR SOLO?

In two recent incidents solo students got themselves in trouble on landing and wound up with bent and battered airplanes. Both had been cleared for solo, but—

The first, a Primary student, encountered a light left crosswind (less than three knots at 90 degrees) and started to drift to the right over the end of the runway. He applied power for a go-around but released back pressure and touched down on the nose gear. The airplane immediately veered left, and the student pilot put in right aileron and rudder to correct the situation. The bird smartly responded with a roll to the right and the right wingtip contacted the runway. Then it nosed over, the prop bit into the runway and pilot, prop, airplane and wingtip careened off into the grass.

The second case was a student in an advanced fighter aircraft on a night solo mission. His touchdown was firm enough to cause the airplane to bounce a good way back into the air. He attempted to reestablish a landing flare but the airplane rolled off to the right. When he finally applied power to go around his aft section and right tip contacted the runway. As he lit afterburner to expedite his go-around, the bird rolled back to the left and the left tip dragged the pavement. He eventually managed to right the airplane and get it back in the air. His next landing attempt, from a straight-in approach, was successful.

Both of these incidents were classed as student pilot error. And both pilots were to be given additional dual landing practice with an instructor before being recleared solo.

Now comes the question: Were either of them ready for solo when their IPs cleared them? The solo decision is the toughest one an IP must make. He often finds himself pushing the maximum allocated dual time before he is confident of his student's readiness.

One of the many factors influencing the IP's decision—and an important one—should be: "Has this student been exposed to a sufficient number of unusual situations? And has he demonstrated a real ability to cope with them and come away unscathed?"

UNHAPPINESS IS

1. Arriving at your destination without the appropriate letdown book.
2. Experiencing electrical failure at night without a flashlight.
3. Flying with a sinus block and Approach Control tells you to expedite your descent.
4. Walking into Base Ops with the seat pin streamer hanging out of your flight suit pocket.
5. Forgetting to lock the canopy and it departs the aircraft as you depart the pattern.
6. Making a barrier engagement with the throttles in Mil Power.
7. When the formation lead breaks into the echelon.
8. Having a taxi accident while filling out the 781.
9. Having a bird come through the windscreen and not having your visor (or visors) down.

Capt Larabee, ATC

COMPLACENT?

It all began with a ground abort. The pilot then hustled through the preflight of the spare aircraft and caught up with the rest of the flight waiting at the end of the runway. He noticed nothing unusual during ground operation and takeoff, but during the climb he observed with annoyance that the cockpit wasn't cooling off the way it normally did. He dismissed it for the moment, rationalizing that it was just a normal result of his rush and hurry in preparing the spare aircraft. But when the condition persisted, he took off his glove to check airflow at the cockpit air conditioning outlet. He felt no airflow.

Shortly after leveling at FL 240 he experienced hot and cold flashes. Then he found he was having difficulty in responding to radio transmissions. When the physiological symptoms returned, he finally looked at the cabin altimeter—it read 27,000 feet! He informed his wingman, terminated the mission, descended and landed without further incident.

Investigation on the ground revealed a loose clamp on the hose to the inlet side of the water separator. The air conditioning hose to the cockpit had disconnected.

Primary responsibility for this one rests with the maintenance people who left the clamp improperly secured. But the pilot allowed himself to come unnecessarily close to disaster by failing to check cabin altitude during the climb and disregarding the ample evidence available to him that he had a serious problem.

QUOTES TO REMEMBER

. . . "The gear retracted and the IP elected to abort on the belly. The bird flew or slid the full length of 21 right and then inadvertently caught the BAK-9. He pulled out 200 feet of cable, stopped and caught fire. Both crewmembers made a ground-level egress and they were uninjured. A big point here for that "unnecessary" ground training we go through: We don't like egress training, but here are two guys who made it pay off."

(Minutes of 58 TFTW FSO Meeting)

HOW HIGH?

The photo above tells the story but here are a few details. In a formation climb out from Wethersfield the RF-4 aircraft commander misread his pressure altimeter by 10,000′. Below the viewfinder is a screw-on cap with a safety chain attached. This chain was hanging down in front of the ten thousand digit obscuring it. He thought he was at 3400′ when, in fact, he was at 13,400′. The photograph was taken from the pilot's normal position.

RF-4C units should inspect the length of these chains and shorten those that could mask any numbers.

Tech topics

briefs for maintenance techs

colored smoke grenades

A STUDY of colored smoke grenades has indicated that the smoke produced is of low toxic level and should present no noticeable problems unless inhaled in heavy concentrations. Accordingly, these grenades have been reclassified from Hazard Classification Group A (Chemical Munition Group D) to Group N—Pyrotechnics. This change which effects the M18, M22, M22A2, M23 and XM48E1 grenades, will be reflected in the next revision of AFM 127-100 and applicable stock catalogs (FSG 1300).

These grenades are satisfactory for outdoor demonstrations, tests, and marking and signalling. However, they will serve as an ignition source if they are used near combustible material. They should not be used inside buildings because of the inherent fire hazard and the fact they consume oxygen.

White Smoke Grenades HC, AN-M8 and Smoke Pots HC, M1, M5 remain in Hazard Classification Group A (Chemical Group B) due to the presence of zinc compounds in their smoke. The inhalation of zinc fumes in HC smoke has produced metal fume fever or pneumoconiosis. Therefore, use of HC smoke should be limited to outdoors, and anyone entering the smoke should wear a protective mask. The HC smoke grenades and smoke pots may also serve as an ignition source for combustible material.

Robert L. Alg,
Directorate of Aerospace Safety

save a nickel, lose??

AS THE PILOT advanced power on the Nr 1 engine of a T-37 to approximately 80 per cent, he noted severe vibration. He shut it down and made a successful single engine landing. Tear down inspection of the engine revealed a self-locking nut had backed off a stud on the radial diffuser and had passed through the engine, causing extensive damage. It was also determined that the nut had been reused during engine buildup. Review the instructions in TO 1-1A-8 regarding the reuse of self-locking nuts.

aim-9e

THE F-4 dearm crew discovered the area around and on the AIM-9E missile wings blackened. It was determined that during system checkout prior to air intercept, the gas grain generator was activated.

The generator activated because the load crew had neglected to install the umbilical adapter plug (bypass plug), P/N 1554965, between the AIM-9E umbilical and the missile quick disconnect on the aero 3B launcher, as required by TO 1F-4C-33-1-2CL-55. Damage to the missile was such that depot level repair was necessary at a cost of over $2900.00.

The load crew was decertified and an AFTO 22 was submitted to bring the checklist in line with the TO.

cadmium care

CADMIUM-PLATED tools can be a critical safety problem. The mechanic who uses a cadmium-plated wrench or hammer on a titanium part may leave small particles of the cadmium on the titanium. When the part, such as one for an engine, becomes hot, a chemical reaction occurs between the two metals; the titanium becomes brittle and a premature part failure could result. To prevent this possibility, mechanics should use only nickel-plated tools on titanium parts. Nickel-plated tools are embossed "21C" for identification.

J. H. Cates, SMAMA (SMNET)
McClellan AFB, California

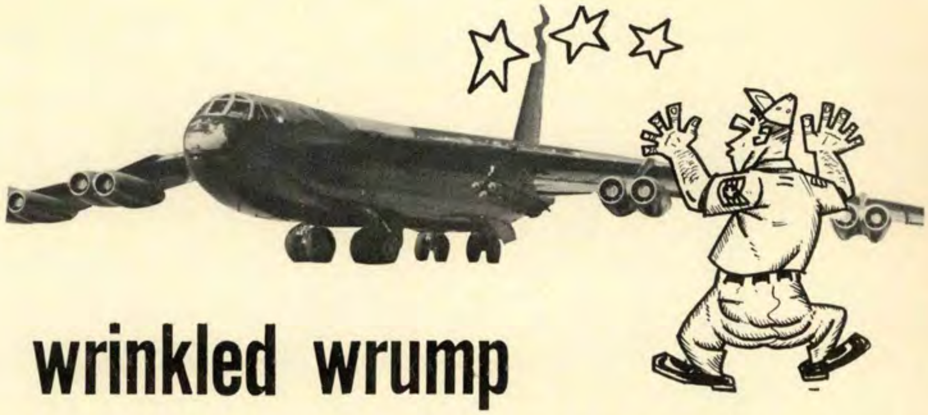
ov-10

DURING a functional check flight, an OV-10 pilot shut down Nr 2 engine per the checklist. But he could not get it restarted. A positive check of the condition lever position was made, and it was confirmed to be in the fuel shutoff position and not in the prop feather position, yet the prop had gone to feather. A single engine landing was completed without further difficulty.

Investigation revealed that the condition lever input rod was out of adjustment and that it had not been adjusted properly at the time of engine installation and subsequent runup. The maladjustment was such that when the condition lever was moved to fuel shutoff, it also moved the feather valve to feather position.

Tech topics

CONTINUED



wrinkled wrump

A TOWING TEAM was dispatched to remove a B-52 from the maintenance hangar. The hangar doors were partially opened to permit entry of the Euclid. The crew then began preparing the aircraft for towing. At this time, the tail walker and shift supervisor departed the briefing area toward the tail of the aircraft to move the crew Metro and obtain clearance to move the aircraft. The towing supervisor, thinking the tail walker had moved into position, gave the Euclid driver the signal to move out. As the aircraft started to move, the tail struck the tail fin door causing over $2000.00 worth of damage. The towing supervisor was charged with the primary cause factor.

Don't take your duties as towing supervisor lightly. Follow your checklist and *be sure* the aircraft is ready to move before you give the signal.

don't forget the pin

THE F-4 PILOT cruising along at FL 270 noted his Nr 1 rpm decreasing through 65 per cent and the fuel pressure at zero. After two unsuccessful airstart attempts, he landed at the nearest diversion base. Maintenance determined the incident was caused by a bolt coming out of the connection between the torque booster and the fuel control crossover shaft. When the bolt fell out it allowed the fuel control to go to the closed position. The bolt and nut were found in the cowling. It was determined that the cotter pin had not been installed. The individuals involved were either relieved of duty or received a written reprimand.

sloppy work, no qc

A T-33 PILOT was mildly surprised when he turned on his rotating beacon and the tip tanks fell off. He diverted to the nearest base and landed.

The aircraft had just undergone a TCTO for installation of a rotating beacon system. A three level electrician had installed the rotating beacon on/off switch and a ten amp circuit breaker. The beacon light wire was soldered in a cannon plug between a warning light circuit and the tip tank jettison circuit. The beacon wire was not completely in its pin hole; it was soldered at an angle and it had excess solder on it which made contact with the nearby jettison circuit. A five level assigned to the job didn't check the three level's work. The shift supervisor signed off the red X. The beacon light was operationally checked; however, the tanks did not jettison because ground safety pins were installed.

This incident points out the fact that you should never sign off a red X without personally inspecting all phases of the work the red X condition covers.

rig it right

HOW MANY TIMES have you taken your auto to a mechanic, with a specific problem, then paid for repairs that didn't solve the problem? I'm sure you find such incidents upsetting and you vow never to take your auto back to the same mechanic.

The reaction would be considered normal for auto drivers, but what about airplane drivers? Do pilots have a choice of mechanics? Obviously the answer is no. So we maintenance people must strive to give them a good product every time.

A problem that has repeatedly shown its ugly head in the past six months (not repeatedly to the same aircraft, but repeatedly to different aircraft in different parts of the world) is engines flaming out due to improper throttle rigging. There have been more than 20 such incidents with three different types of aircraft—T-38, T-37 and F-4 in the past six months.

The T-38 throttle rigging problems were mostly caused by low cable tension, and in most cases only one engine was affected at a time. However, there was at least one incident where both engines flamed out. The T-37 story reads the same as the T-38—engines flaming out due to improper throttle rig.

The F-4 problem is a little more complicated.

- Teleflex cable and control box worn.
- Cable twisted.
- Teleflex cable unraveled.
- Linkage became disconnected.
- Throttles out of rig.

In all of the above cases the aircraft did make safe landings. However, it would seem that now is the hour for supervisors to take a look at their engine trim program, especially the throttle rigging area. Don't give the bird drivers cause to wish they had a choice of mechanics.

aced deuce

WHERE do you store the 781? The Deuce pilot was ready for takeoff and as he ran up the engine there was a massive compressor stall, the engine overtemped and a long sheet of flame belched out of the tail pipe. Fortunately this was before the beginning of takeoff roll and not after liftoff. A recap of the events immediately preceding the pilot's getting into the cockpit disclosed that during preflight the 781 binder was left in the engine intake.

dangerous chemical reactions

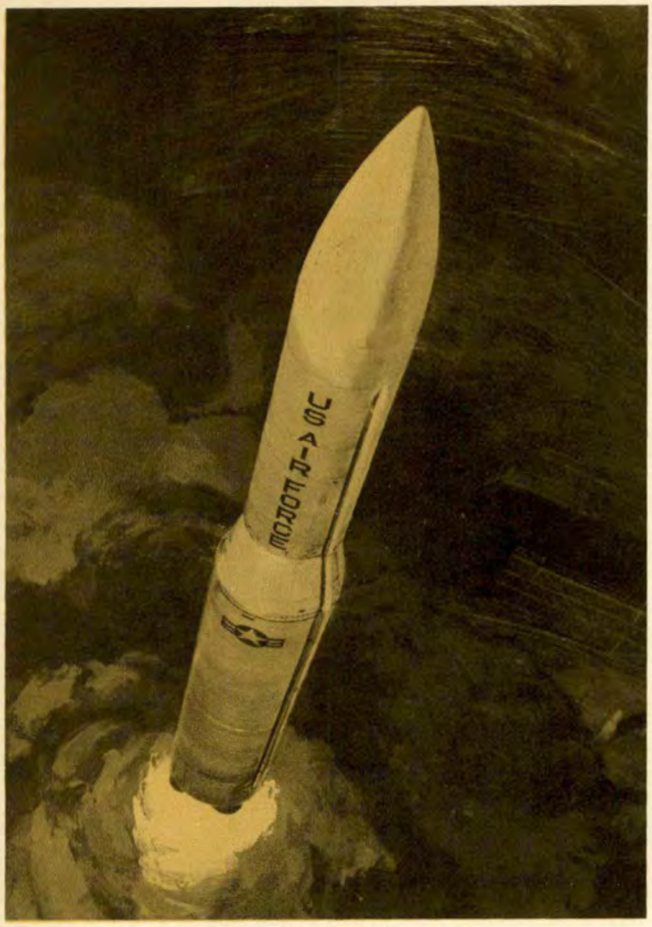
FLASHLIGHT batteries are usually made of graphite and zinc. Electricity is generated by chemical reaction between the zinc and the graphite. The same "battery" can be created on your aircraft if you write on aluminum with your graphite pencil. In one case, an inspector drew a pencil line around a crack in an aluminum wing skin. Two months later the crack wasn't a problem because the entire disc fell out. The pencil mark acted as a perfect can opener. Instead of graphite pencils, carry a grease pencil and use it properly.

J. H. Cates, SMAMA
McClellan AFB, CA

sin of omission

DURING a critical phase of flight an HH-3's Nr 2 engine flamed out. After analyzing the situation the pilot determined the engine could be safely restarted and the mission was completed without further incident.

Back at the base Maintenance found the Nr 2 fuel control filter preformed packing, P/N MS 9021-0019, missing. It is believed this allowed contaminated fuel to bypass the filter and enter the fuel control which caused the fuel control to malfunction and the engine to flame out. Of such stuff accidents are made. ★



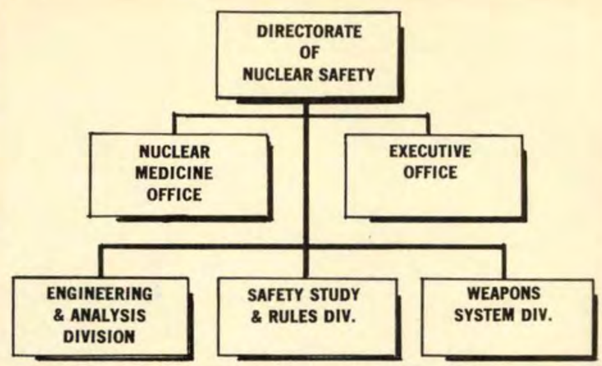


FIG. 1. MAJOR RELATIONSHIPS OF IGDN, NWSSG & AFWL

AIR FORCE NUCLEAR WEAPON SYSTEM SAFETY

Maj Mitchell B. Riley, Directorate of Nuclear Safety

Nuclear weapon systems play a vital role in this nation's continuing security against outside aggression. Because of their immense destructive capability, it is of paramount importance that these systems be designed inherently safe and be operated in a safe manner. To insure this result, the United States Air Force places great emphasis on two fundamental objectives:

- To prevent an *accidental* detonation of a nuclear weapon.
- To prevent an *unauthorized* detonation of a nuclear weapon.

During 25 years of operations with nuclear weapons, these objectives have been satisfied. To maintain this record, there is a continuing need for dedicated persons to reduce to an absolute minimum the number and consequences of nuclear weapon system accidents, incidents and deficiencies. This end is achieved through the proper application of those design concepts and operational procedures which emphasize nuclear safety.

The responsibility for nuclear safety in the Air Force is broad and ranges from individuals like you to The Inspector General who has overall responsibility for the Air Force Nuclear Safety Program. Right in the midst of this spectrum of responsibility are three organizational entities which are vitally involved in the USAF Nuclear Safety Program. These are the:

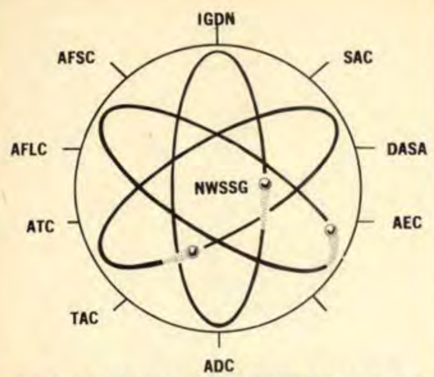


FIG. 2. DIRECTORATE OF NUCLEAR SAFETY

- Air Force Directorate of Nuclear Safety
- Air Force Nuclear Weapon System Safety Group
- Air Force Weapons Laboratory.

These organizations are headquartered at Kirtland AFB, New Mexico, and each plays a specific role in planning for and maintaining nuclear safety in the Air Force nuclear weapon systems. The purpose of this article is to define the responsibilities of these organizations and to explain their relationship to nuclear weapon system safety.

The Inspector General's responsibilities are fulfilled by the Deputy Inspector General for Inspection and Safety, (IGD). Acting for IGD, the Directorate of Nuclear Safety (IGDN) exercises Air Staff supervision over the nuclear safety program. IGDN responsibilities are to:

- Develop and insure prompt and effective implementation of Air Force nuclear safety policies, programs and standards.
- Monitor nuclear weapon systems to determine the adequacy of nuclear safety features.
- Conduct nuclear safety surveys, nuclear weapon system safety studies, inspections and operational reviews and develop safety rules.
- Monitor or conduct nuclear accident/incident/deficiency investigations.
- Provide technical assistance to an on-scene commander regarding the safety aspects of a nuclear weapon system involved in an accident.
- Provide the chairmanship and supervise the activities of the Nuclear Weapon System Safety Group (NWSSG).
- Provide the secretariat for the NWSSG.
- Formulate the Air Staff position on proposed safety rules and provide official interpretation of safety rules.
- Develop and act as the OPR for Air Force nuclear safety regulations.

The Directorate of Nuclear Safety, under the leadership of Colonel Britt S. May, reviews, inspects, and takes necessary action on issues affecting Air Force nuclear safety on a world-wide basis. IGDN is organized into three divisions: the Engineering and Analysis Division, the Safety Study and Rules Division, and the Weapons Systems Division. The Nuclear Medicine Office and the Executive Office complete the organization. (Figure 1)

The NWSSG, whose activities are supervised by IGDN, is responsible for the review or study of safety aspects of each nuclear weapon system and the procedures for its employment. The criteria against which the NWSSG evaluates a nuclear weapon system are the safety standards prescribed in DOD Directive 5030.15. These standards are designed to provide maximum safety consistent with operational requirements. As a minimum, the standards to be applied are as follows:

- There will be positive measures to prevent weapons involved in accidents or incidents or jettisoned weapons from producing a nuclear yield.
- There will be positive measures to prevent *deliberate* arming, launching, firing, or releasing except upon execution of emergency war orders or when directed by competent authority.
- There will be positive measures to prevent *inadvertent* arming, launching, firing or releasing.
- There will be positive measures to insure adequate security.

The membership of the NWSSG is as follows (Figure 2):

- One member from the Directorate of Nuclear Safety (the chairman).
- One member from the Directorate of Aerospace Safety when a weapon system involving a missile is to be studied.
- One member from each of the following major commands: AFSC, AFLC, ADC, ATC, SAC and TAC.
- One member from each of the following overseas major commands: AAC, PACAF and USAFE, when a nuclear weapon system for which it has a responsibility is scheduled for study.
- One member from the Defense Atomic Support Agency (DASA).
- One member from the Atomic Energy Commission.

An important product of the weapon system safety studies is to formulate proposed safety rules for the system under study. During the normal development of a nuclear weapon system, an Initial and a Preoperational Safety Study is conducted by the NWSSG. The purpose of the Initial Safety Study is to identify deficiencies of the weapon system with respect to safety and/or to provide guidance for further development required to enable the weapon system to meet the DOD safety standards. This study begins after the preliminary design reviews (PDR) and before the critical design reviews (CDR) of those subsystems directly affecting nuclear safety. It is not expected that complete design information be available for the Initial Safety Study. Preliminary design information and a preliminary operational concept provide sufficient information for evaluation by the NWSSG to permit that group to provide nuclear safety guidance early in the system life cycle.

At least 150 days before weapon

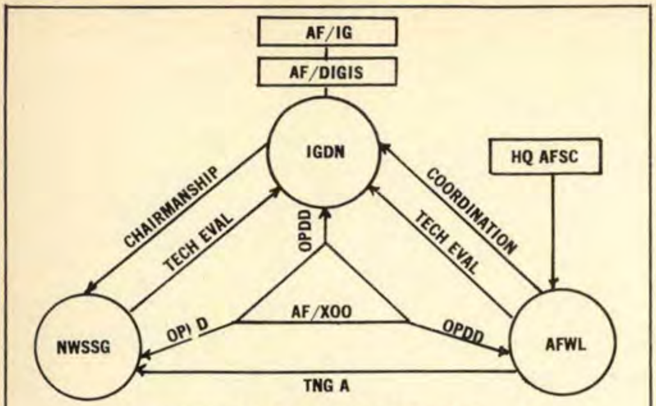


FIG. 3. MEMBERSHIP OF NWSSG

system safety rules are required, a Preoperational Safety Study is conducted by the NWSSG. Its purpose is to determine the adequacy of safety features in nuclear weapon system design and procedures and to provide a basis for developing safety rules. Such rules do not in themselves authorize the particular actions described therein but they do regulate the operation of the nuclear weapon system to insure conformance with the prescribed safety standards. The HQ USAF approved operational plan data document (OPDD) is the using command's plan of system operation and is used to develop the technical nuclear safety analysis of the system under study. The study includes all available technical and procedural information affecting nuclear safety throughout the stockpile-to-target sequence.

Once approved by the NWSSG, the proposed safety rules are submitted through the Deputy Inspector General for Inspection and Safety and:

- Approved by other Air Staff agencies.
- Coordinated with the Directorate Defense Atomic Support Agency (DASA).
- Approved by the Joint Chiefs of Staff (JCS).
- Approved by the Secretary of Defense on an interim basis.
- Coordinated with the Atomic Energy Commission (AEC).
- Approved by the Secretary of Defense on a final basis. (In certain cases, by the President of the United States.)

After the system becomes operational, there may be a requirement to change operational procedures and/or to modify the weapon system. If it is anticipated that a rules change may be required or if nuclear safety is significantly affected, a special study or an addendum to an existing study may be conducted by the NWSSG.

AFR 122-1 requires the Commander, AFSC, to provide the USAF focal point for technical aspects of nuclear weapon system safety. The Air Force Weapons Laboratory (AFWL) is the principal AFSC organization charged with planning and executing the USAF exploratory and advanced development programs in nuclear weapons components, advanced weapons technology, radiation hazards, nuclear warfare analyses, civil engineering and nuclear safety. Closely tied to the operations of the Directorate of Nuclear Safety and the NWSSG is the Nuclear Safety Division of AFWL. In addition to acting as the technical focal point for nuclear weapon system safety, the AFWL:

- Develops nuclear safety design and evaluation criteria.
- Reviews contract data requirements list (CDRL) which relate to nuclear safety before the System Program Office (SPO) contracts for a nuclear weapon system.
- Provides a member of the Safety Safety Group (AFR 127-1) for nuclear weapon systems.
- Provides nuclear safety certification to AFSC for equipment and procedures used with nuclear weapons.
- Evaluates all proposed nuclear weapon system changes or modifications referred to AFWL by AFSC or AFLC which may have an impact on nuclear safety.
- Evaluates nuclear weapon system problems, determines design implications and takes appropriate action.
- Insures that publications for which AFSC is the management agency, are in consonance with applicable nuclear safety rules, standards and procedures.
- Prepares a technical nuclear safety analysis (TNSA) for Initial Safety studies.
- Prepares a TNSA for Preoperational, Special and Addendum safety studies consistent with the Air Force-approved OPDD.

For fulfilling these responsibilities in an outstanding manner, AFWL was awarded a USAF nuclear safety plaque in 1969.

The above discussion defines the functions of IGDN, the NWSSG and the AFWL with respect to nuclear weapon system safety (Figure 3).

It is these three organizational entities which are vitally involved, along with many other organizations and individuals, with planning for and maintaining nuclear safety throughout the Air Force. This article is written to encourage confidence, cooperation and dedication across the nuclear safety spectrum. *ED. NOTE: The Nuclear Safety Program of each service was established by the DOD at the direction of the President. Nuclear Weapon System safety rules and rules changes require the approval of the Secretary of Defense, and in some instances the approval of the President of the United States.* ★

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UNITED STATES AIR FORCE

WELL DONE AWARD

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

Captain
Wyman M. Rish

319th Bombardment Wing
Grand Forks AFB, North Dakota

On 21 January 1970 while flying ten missile crewmembers to sites in the Grand Forks complex, Captain Rish experienced a catastrophic failure of major components of his UH-1F helicopter. A latch failed, allowing a large section of cowling on the forward section of the helicopter to separate from the aircraft. The cowling struck and damaged the main rotor blade, causing severe vibration, then blew into the air boom and tail rotor. The tail rotor and allied gear box were torn from the aircraft, causing loss of directional control and a severe balance problem. Captain Rish correctly analyzed the failure and initiated proper emergency procedures. He immediately told his passengers to assume crash position, called Grand Forks Tower advising them of his pending emergency landing, and selected an open field directly ahead of his aircraft. Although he had no directional control and could not apply engine power, he accomplished a perfect autorotational descent and landing.

Within 15 seconds of the original cowling latch failure, Captain Rish had landed his helicopter and shut down the engine. Damage to the helicopter was limited to that which occurred while airborne. Captain Rish's actions undoubtedly saved the lives of all ten of his passengers and prevented loss of his aircraft. WELL DONE! ★


MISS
FOD