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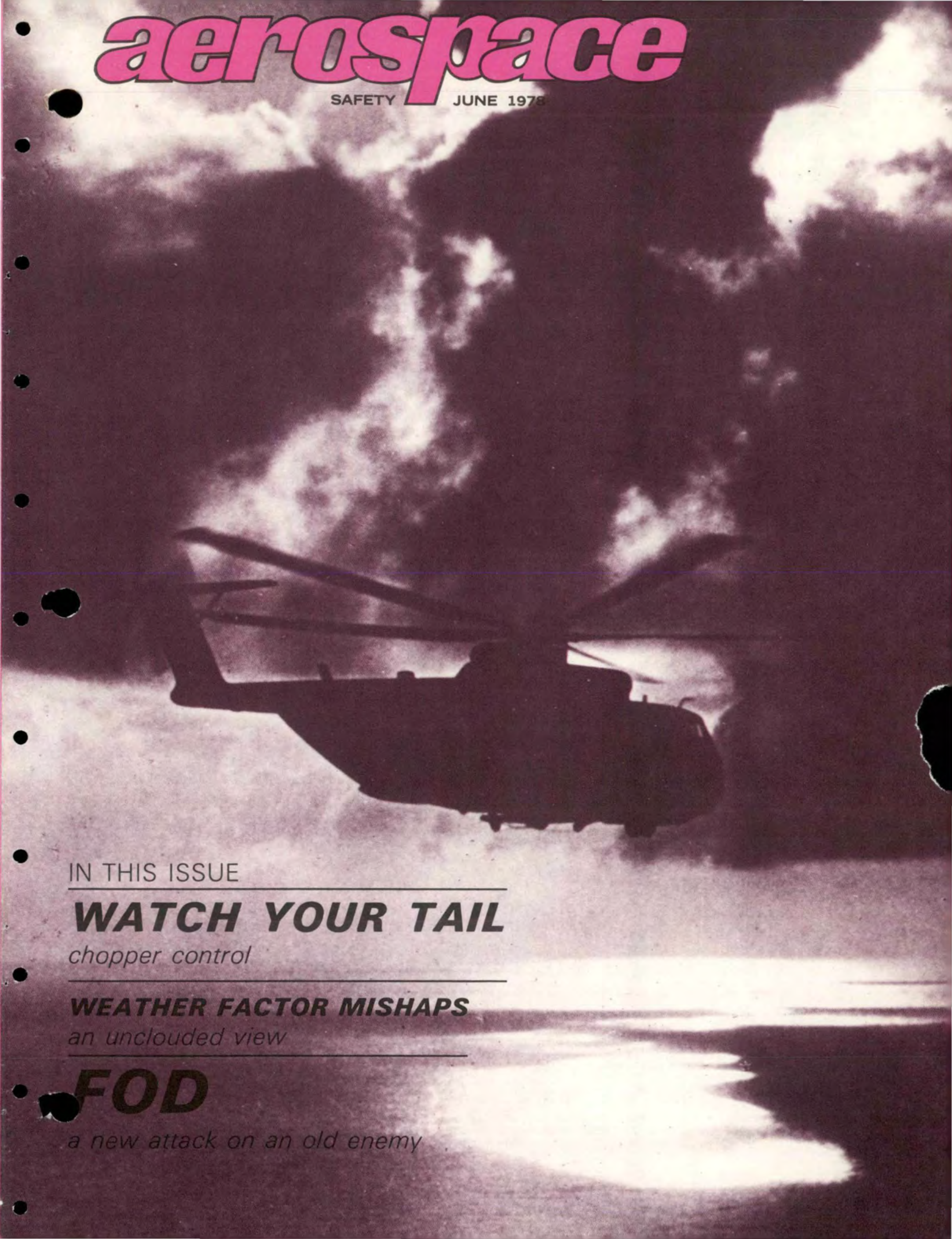
SAFETY JUNE 1978



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UNITED STATES AIR FORCE

aerospace SAFETY

THE MISSION - - - - - - SAFELY!

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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JUNE 1978 AFRP 127-2 VOLUME 35 NUMBER 6

FOD

In the never ending war on our old enemy FOD, the best defense is a good offense. For a closer look at what an active and aggressive FOD program can do, take a moment to read this article. You may find a few interesting ideas that can be adapted to your base.

COLONEL ROBERT S. BEALE • 4th Tactical Fighter Wing • Seymour Johnson AFB NC

There can be no doubt that the potential for FOD is greatest in the Periodic/Phase hangar. That is the single most important area simply because the aircraft is opened up. Having said that, concern, caution, good procedures and quality control can all be nullified by a "WEAK LINK" in the system. We can be 100 percent on the ramp and in the hangar, but if an aircrew puts a checklist on the instrument panel or "last chance" drops a pin, an interphone cord, a hat or even a restricted area badge, it was all for naught. This is first and second echelon FOD prevention, i.e., the individual who dropped the FOD (the FODDER) and the guy who didn't clean it up.

There's nothing new here, this is all old stuff.

We have adopted an interesting third echelon FOD program at Seymour Johnson AFB that you might consider for your own Air Patch. It's called Airfield FOD Trend analysis.

Before discussing this last ditch effort, let's consider certain basics that should be obvious. Do you have an adequate airfield sweeping program? Does it include the runway (often)? Do you include the street sweeper in the plan to keep rocks and junk off the flight line access roads? Do you limit the number of access roads to the minimum necessary? Do you follow up on these procedures? Do you track the status of your airfield sweeping equipment? Do you use your electromagnet? One base installed permanent magnets on the front bumper of the line trucks with excellent results.

The BIG Wayne-Vac Sweeper is an excellent piece of equipment if used properly. The vacuum hood must continually be adjusted, however, or it will not pick up a small bolt off the runway.

WHERE DO YOU LOOK FOR FOD?

We use our big electromagnet on the runway every weekend. The operator must be carefully briefed. Ours will not pick up a large bolt at more than 5 mph. CAUTION: When the magnet engine runs out of gas, all the FOD drops on the ramp. Can the driver hear the engine quit? If he is driving a dump truck, he probably can't. Give him a mower

Seymour Johnson's electro-magnet has prevented many FOD incidents.

Seymour Johnson AFB Airfield Management Chief, Major Thomas A. Dwelle, discusses FOD Trend Analysis with FOD committee members Captain Lyle Samuels (center) and Technical Sergeant Glen Whitwell, and Captain David A. Parisot, Ninth Air Force/LG FOD inspection team chief. In a monthly FOD pick-up, the debris shown in the foreground was found adjacent to the runway, and that in the rear was found elsewhere on the airfield.

FOD continued

tractor, if weather permits. We used to find large metal objects within 20 feet of the arresting cable. Investigation revealed that our Wayne-Vac Sweeper will not pick up a 3-inch bolt, but will scrape it along the runway. This was obvious from the scrape marks on the bolt. When the driver lifted the vacuum hood to get across the arresting cable, the metal was deposited next to the cable. Look carefully at what you find on the runway. Every piece will tell you a story.

WHO COMES TO THE FOD MEETING?

Who comes to your FOD meetings? Do you know? How many are primary members? (The ones who really should be there.) How many are alternates? How many are guests? Try a show of hands at the next meeting. *The word gets around quickly!*

APPLIED TREND ANALYSIS

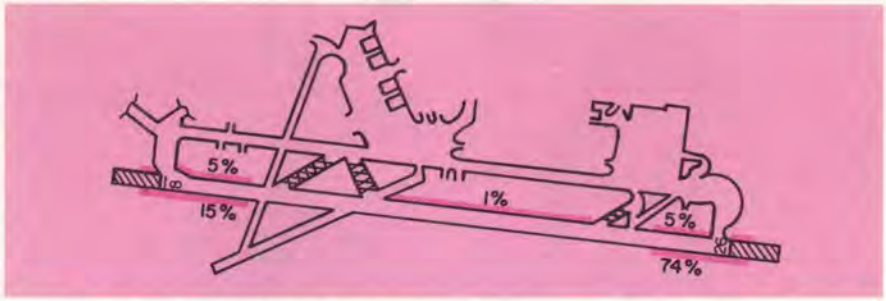
Having reviewed the basics, how can Trend Analysis help you locate that weak link? We generate great interest at our FOD meetings in an attempt to identify the pieces and chart some sort of trend. All items found on the airfield during the month between FOD meetings are laid out carefully and labeled as to where and when they were found. This started one week when the airfield manager discovered four bomb rack parts in five days on the taxiway and runway. The positions/dates were plotted and the chief of maintenance solved that problem in a hurry. Failure to follow tech data was the culprit. Six months have elapsed and we have not found any more bomb rack parts. This is typical of our "TREND ANALYSIS." We discovered two F-4 pilot chutes, from the drag chute, on the runway within a three-day period. While we were investigating, a third one appeared. The solution was simple. The parachute shop replaced a 6" nylon strap on all old drag chutes, and the problem went away. Incidentally, a B-52 went directly across one of these at high power setting, 1,500 feet into the takeoff run, and did not ingest it into the engine intake . . . very interesting. Another example is bomb rack safety pins

Monthly display boards of FOD deposits categorized by type helped identify major recurring sources. In some cases, this has been used to trace down maintenance errors and eliminate them, and alter operational practices which were causing added FOD.

that were found on the taxiway between the de-arm area and the ramp. We discovered that a man on the de-arm crew was putting the pin in the wrong hole. The opportunities for Trend Analysis are endless. The key is to have one agency responsible for checking everything.

In an attempt to analyze everything that falls on the runway, we built a 4' x 10' box covered with ¼" wire mesh. We dump the vacuum sweepings into this box and separate the metal for analysis. All metal parts are mounted on 20" x 30" boards, shown in the picture, for display at the FOD meeting and in the maintenance squadrons. Each board shows the metal recovered from the runway since the last FOD meeting. The 11 March—6 April display is cluttered with panels, etc., from the SAC wing aircraft and some F-105 drag chute parts, but there is a drastic reduction of metal parts in each category. We proved that metal is falling off aircraft during take off. It would seem that fighter aircraft are most vulnerable to FOD during a staggered formation departure. We avoid this by insisting on 1,000' spacing between elements. This problem becomes acute on a narrow runway.

The airfield manager is responsible for FOD on the runway(s), all taxiways and parking areas other than those that are restricted. All FOD found in this area by transient alert, barrier maintenance crew or whomever, is turned in immediately to the airfield manager. If he can't identify a piece, then he knows who to call. Once a trend starts, e.g., a particular type of fastener or safety pin found on successive days, then the chief of maintenance is advised and a memorandum for record (MFR) is written. An airfield map is attached to the MFR for future long term trend analysis. This procedure is applicable to everything from pitot boom screws to drag chute parts. We have stopped bad practices and pointed out problems in many areas.



Charting the locations of FOD picked up (shown in color) helps to set areas for future attention.

WHEN TO LOOK FOR FOD

We find that immediately after a rain is the best time to spot FOD on the runway. Our runway drains quickly because it is grooved; however, the small screws really stand out due to the sharp object/water contrast. A small screw can be spotted easily from as much as 20 yards. Walk or drive slowly . . . you'll be amazed. Finding FOD is an art that doesn't come easily. You must be attuned to constant vigilance. It must be like looking for other aircraft when you are flying. When you are out on the airfield and a dove flies by . . . chances are that you immediately start tracking it without thinking. We must have *this* sort of awareness in our FOD program.

I have harped on the runway, but there is a good reason. I believe that the potential for FOD is very high on the departure end of the runway. Most of the junk on the runway ends up on the departure end. It seems logical that when engines are run up and the heavy vibration starts, the loose objects fall off. To prove this, we put our big electromagnet on the edge of the runway, just barely onto the grass. We found six pounds of junk that came from the runway over the past 20 years: everything from gas caps (both aircraft and vehicle) to .50 calibre ammunition links.

That was surprising enough, but what startled everyone was where we found it. As you can see from the attached airfield diagram, we found 79 percent of the junk in the grass on the east end of the runway. The curious thing is that 74 percent of it was on the south side (of the east end). It turns out that Runway 26 is in use about 70 percent of the time. The junk that falls off gets blown to the side or out on the overrun. If it is *not* picked up immediately, the next time there is a runway change, the aircraft (especially the heavies with large wing span and podded engines), blow all this stuff into the grass as they turn off of the runway. Now we know where to look (departure end, opposite the turn off) and when to look (all the time, but especially when it's wet). And how to use Trend Analysis to trace FOD to its source. "CONCERN FOR FOD IS PICKING UP." ★

ABOUT THE AUTHOR

Colonel Beale got his wings in 1957 and has been flying fighters most of the time since. He has twice been assigned to the Air Force Flight Test Center at Edwards AFB, first as a student in the Aerospace Research Pilot School, and later as a test pilot and squadron commander. He flew more than 100 missions in the F-105 as a "Wild Weasel" during which he was awarded the Air Force Cross. He is currently Commander of the 4TFW, Seymour Johnson AFB, NC.

FLIERS--2; FIXERS--0!

CAPTAIN DAVID V. FROEHLICH • Directorate of Aerospace Safety

No, it isn't a game, and the last thing we want is someone keeping score! In the aircraft operations business, we tend to put fliers (aircrew members in general) and fixers (maintenance folks) on different sides of the fence. Perhaps there are some differences, but the goal is the same—a safely accomplished, successful mission! How do fliers and fixers communicate to accomplish that goal? Probably the main link in many cases is a thin booklet of forms called "the 781." When you consider that this is often the *only* crossfeed of data from the operator to the maintainer, it's really scary how little time or effort is expended on the aircraft forms. We are continually hounded with the need to log the time accurately and have our requirements properly documented. This is true, but only half the battle. POINT TO REMEMBER! The only way to ensure that the maintenance technician has an honest shot at fixing a problem is if someone:

1. Puts it in the forms.
2. Provides as much accurate detail as possible about the problem (in words maintainers understand. Don't assume they know how the system is used by the crew).

First, let's discuss whether to even put a write-up in the 781. I think your basic philosophy should be "if it doesn't seem right, write it up." This obviously includes the major items of inoperative equipment, warning lights, engine problems, etc. This is the stuff that aircrews always know to put in the forms. But! How about those flight controls that "just seem a little sluggish" or the flaps that "felt like they moved too slow" or the engine "that almost overtemped?" These are occurrences which are too often left out because the crew can't seem to put their finger on the cause. Let the experts find the cause; you just worry about giving them a complete and accurate description of the symptoms. If your "gremlin-type" write-up ends up as a CND (cannot duplicate) or an info write-up for the next crew, so what! We have still had it checked out *and* alerted the next crew to be on the lookout.

The other major problem is akin to when my wife drives the family wagon up to the mechanic and says "it goes whirr, click, thump!" If you write up the engine in your beautiful machine as not sounding right, be specific. Give the maintainer something to work with, i.e., altitude, airspeed, flight condition, G-loading, gross weight or whatever other factors might help isolate the problem. There's nothing that says you can't print your name, rank, and phone extension, either. That info will allow the engine fixer or electrician to call you and discuss the problem if they desire. Every little effort helps. Remember the goal—safely accomplished successful missions.

So much for the general advice! Now, down to the specifics of filling out the various parts of the 781! Bear in mind that the forms vary somewhat due to different commands and aircraft systems requirements. The only things I want to emphasize are some general areas about each part in the forms.

AFTO FORM 781 (Aircraft Flight Data Record)

Over and over again! Log everything accurately. There are lots of local handouts, samples, and guidance available on the correct filling out of this page. Heed the word. The data on these pages goes into a lot of folks' computers and generates many statistics. Spend some time ensuring the accuracy of this section.

AFTO FORM 781H (Aircraft Flight Status and Maintenance Record)

This is the page that is mostly used for the maintainers to talk to the aircrew! Here is the current status of the machine, the servicing records, time computations, armament status, etc. There is a wealth of info on "the H." Most of it, however, is in the form of codes or numbers which reflect discrepancies which are explained in detail elsewhere in the forms. Aircrews—spend some time cross-checking the symbols on the "H" with the explanation in the 781A or K. Know why the bird is on a red diagonal or dash. Check the time computations to ensure that you're not taking a machine that's overdue an inspection or some other time-compliance item. When you get a turn at a transient airpatch, check the servicing data and ensure the Thru-flight was accomplished (if required).

AFTO FORM 781A (Maintenance Discrepancy/Work Record)

Probably the most abused form, this is where the aircrew talks to the fixer. Be specific! The maintainer would much rather see too much data than not enough. Granted, there is probably no need to include three columns of details about everything, but if there is some condition that might shed light on a problem, include it!

AFTO FORM 781K AND J

These forms are the only glimpse that you can get into the history of your machine. Again, time well-spent! Read *and* understand the delayed discrepancies and TCTO's not complied with. It's embarrassing to write-up an item or piece of equipment only to get back and find that it was already in the forms. Even worse, I've seen a wasted sortie when the crew jumped in a bird and launched, only to find that a piece of equipment necessary for the mission was written up as inop in the forms. An extra minute of pre-flight reading would have saved the waste!

The above is necessarily a very broad-brush and non-specific coverage of the Forms 781. Why? Again, because of the variety of command and aircraft differences in the forms, I can't cover all instructions and problems. Tech order 00-20-5 contains the basic guidance, but that won't be enough unless the Ops and Maintenance folks get together with a strong, localized program to make the aircraft forms into a viable communications tool. The score of the game should be Fliers and Fixers—2, Mishaps —0. ★

THE EJECTION STORY

MR. RUDOLPH C. DELGADO • Directorate of Aerospace Safety

In line with The Inspector General's continuing concern over the needless loss of life in aircraft mishaps and particularly the USAF ejection survival rate, which has been below 80 percent for 2 years, we plan to provide monthly updates of recent experience in this section. Late ejection decision usually accounts for more than half of all ejection fatalities. During the month of April, it again claimed two lives. Try as we may to find a cure for this problem, it has been, and is likely to remain, a matter of how well the individual is mentally prepared to eject. When an instantaneous egress decision is required, the more forethought, the more likely one is to survive.

So far in 1978, USAF egress systems have saved 19 of the 20 individuals who initiated them in-the-envelope. The sole failure is still under investigation, but other material impacting the seat while it was in the aircraft appears to be implicated. The message is clear. Egress equipment will save your life, if you give it a fair chance. ★

	Ejections	Fatalities	% Survived
1978 — 1st Qtr	17	4	76
April 1978	9	3	67

WEATHER FACTOR MISHAPS

MAJOR FRANCIS L. GUIBERSON
Air Weather Service
Scott AFB IL

RC-135A During an enroute descent at 4,100 ft MSL in moderate rain showers, aircraft was struck by lightning. Aircraft radar and approach control were not painting any thunderstorms at time of occurrence. All systems functioned normally after the lightning strike, and the aircraft landed without incident. Postflight inspection revealed two small holes in the radome on the copilot's side of the aircraft. A weakened area 4-inches in diameter around one of the holes required the radome to be replaced.

T-39A Since several rainshower buildups had been seen along the route of flight, avoidance techniques were used. When the aircraft arrived over the destination base, a radar controlled letdown in visual conditions was accomplished to remain clear of clouds. At 6 miles on PAR final approach, the aircraft entered a rainshower, experiencing heavy rain and turbulence; however, no lightning was noted. The aircraft flew out of the rainshower in visual conditions at 5½ miles from the runway and visually acquired the field. One-half mile later, in visual conditions, there was a bright flash of light and a loud bang. The landing was uneventful. The upper fiberglass antenna/beacon mount assembly on the vertical stabilizer was destroyed with the aircraft skin noted to be separated from the vertical stab main spar and upper three ribs. Appropriate avoidance procedures were used.

RF-4C The aircraft was returning to home station at FL 240. Thunderstorm cells were noted at 30 miles to the East and 25 miles to the West. At the time of the incident, the aircraft was in cirrus clouds, with no precipitation and no turbulence. The crew saw a bright flash and felt a jolt as the lightning struck the nose of the aircraft. Damage was done only to the fiberglass nose radome, knocking lamination off.

C-130E During vectors by approach just prior to turning on final for 25L, aircraft experienced light-

FIGURE 1
MISHAP CAUSES (1972-77)

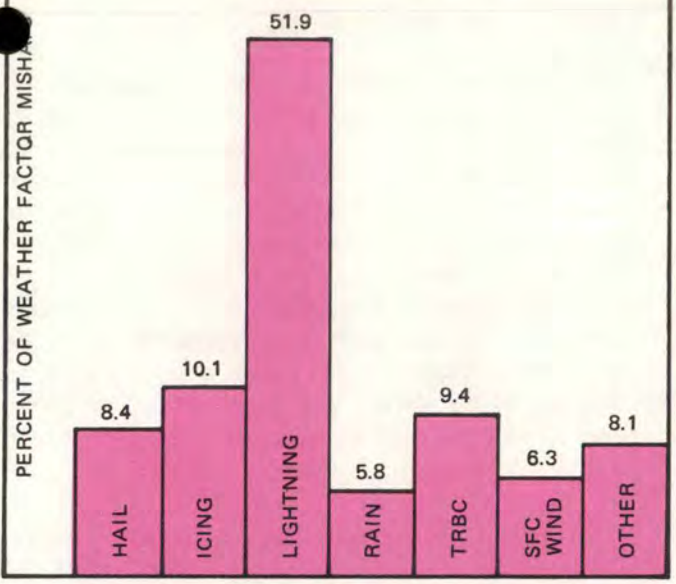


FIGURE 2
PERCENT OF MISHAPS BY AIRCRAFT TYPE
(1973-1977)

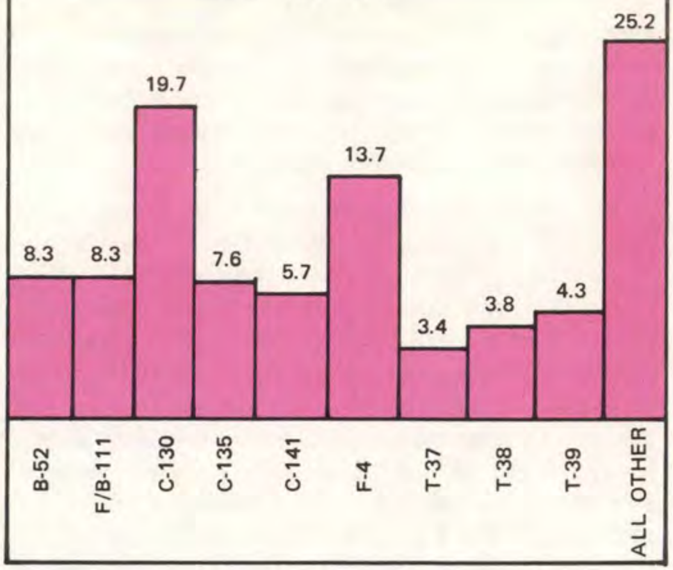


FIGURE 3
MISHAPS VERSUS SEVERE THUNDERSTORMS
BY SEASON

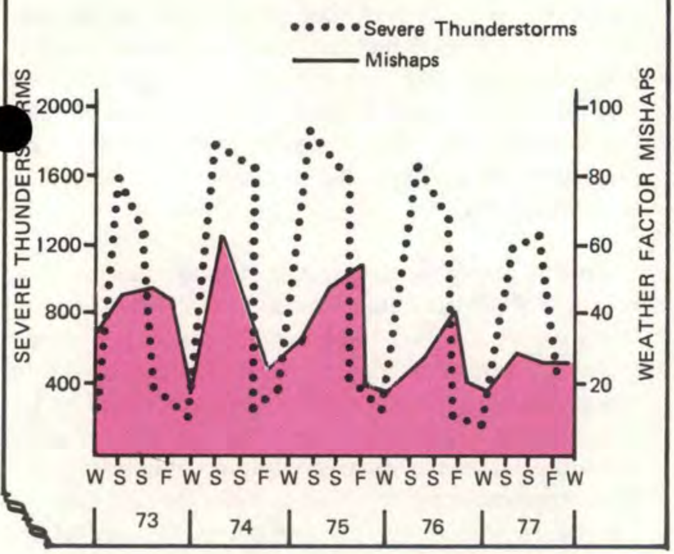
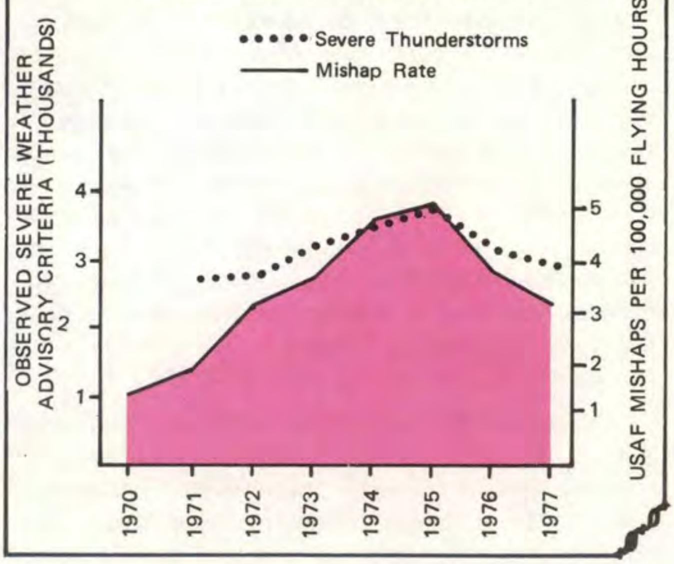


FIGURE 4
WEATHER FACTOR MISHAP RATE VERSUS
SEVERE THUNDERSTORM OCCURRENCE



ning strike. Aircraft was at 4,000 MSL with thunderstorm cells 6 miles shown on radar. Crew had not seen any previous lightning. The aircraft landed without further incident. Environmental factor, weather. Aircraft landed and a ⅝" hole was found in radome.

The above incidents are reports of weather factor mishaps. A weather factor mishap is an aircraft accident or incident which has weather conditions as a contributing cause. As long as United States Air Force aircraft operate in all weather environments, there will be accidents and incidents caused by weather. By analyzing trends and patterns in weather factor mishaps, we can strive to identify the major causes and learn to avoid them.

For example, you may have noticed that each of the above incidents involved lightning strikes. This was not by mere chance. Although weather factor mishaps are caused by a variety of weather phenomena, lightning strikes are the most frequent cause. Figure 1 shows that they exceed all other factors combined. As you probably expected, phenomena usually associated with convective activity—thunderstorms—account for a large percentage of aircraft mishaps.

The vulnerability of aircraft to weather hazards depends on several factors, such as cruise altitude. Aircraft which normally operate near the freezing level are most vulnerable to airborne weather hazards. This is one reason the C-130 experiences more weather caused mishaps than any other aircraft. The percentage of mishaps for most United States Air Force aircraft is shown in Figure 2.

The effect of convective weather on flying safety is evident in the seasonal distribution of weather factor mishaps. Figure 3 depicts the trend of weather factor mishaps and severe thunderstorms in the CONUS since 1973. (A thunderstorm is classified as severe when accompanied by gusts of 50 knots or greater or three-fourths inch hail or larger at the ground. Meteorologists classify thunderstorm severity by the strength of the associated surface wind or size of the surface hail. These elements are easily measured and are good indicators of destructive potential.) The figure indicates that peak occurrence of weather factor mishaps during the spring and summer months coincides with the seasonal maximum of thunderstorms at most CONUS locations.

The long-term trend of weather factor mishaps also suggests a correlation with the occurrence of convective weather. Figure 4 shows the rate of weather factor mishaps versus the annual occurrence of severe thunderstorms in the CONUS. The graph shows that the weather factor mishap rate decreased significantly in 1976 and 1977 after a steady increase since 1970. Although we would like to attribute this decrease to safer aircraft operating procedures or improved weather forecasts, weather data indicates that it was possibly due to a decreased occurrence of thunderstorms in the CONUS.

If the news of a decrease in severe thunderstorms during the past 2 years gives you a new sense of security—you've probably been fooled by Mother Nature. The decrease is most likely a short term anomaly, not the beginning of a long term climatic change. Consequently, you can expect to encounter normal amounts of convective weather in the future. In fact, it is reasonable to expect a tendency for weather factor mishaps to increase as severe thunderstorms return to normal frequency. The following review of thunderstorm hazards and how to cope with them will help you minimize this potential threat.

THUNDERSTORM HAZARDS

Any pilot who has encountered thunderstorms knows that they are accompanied by numerous hazards. Hail, lightning, icing, extreme or severe turbulence, precipitation, and strong winds can be expected with each thunderstorm. Because of these hazards, all thunderstorms have the potential to seriously damage aircraft which get too close, or worse yet, penetrate the storm.

Lightning and electrostatic discharge are difficult hazards for pilots to cope with since they frequently occur without warning. Lightning strikes may be from cloud-to-cloud, cloud-to-ground, or within clouds. The cloud-to-cloud variety occurs most frequently and is the most troublesome to aircraft. Aircraft have been struck by lightning of this type as far as 25NM from the nearest thunderstorm. Static discharge is caused when a charge builds up on the skin of the aircraft and can occur in clouds, dust, or haze. Lightning strikes and electrostatic discharge occur most frequently at altitudes in which the temperature is between $+5°C$ and $-5°C$.

Hail is another frequent cause of aircraft damage. Hail is associated with the updraft which produced the storm, so it is usually located near the center of a rapidly developing thunderstorm. But if the updraft is strong enough, hail may be lifted to the jet stream level and transported as far as 20 miles downwind in clear air. Hail usually occurs between 10,000 and 30,000 feet but has been encountered as high as 45,000 feet. The greater the height of storm and intensity of precipitation the more likely damaging hail will occur. The only exception is in the tropics and subtropics where thunderstorms are less likely to produce hail.

Turbulence associated with thunderstorms may result in 2-4G gust loads on aircraft. However, gust loads as high as 6G have been measured in severe storms. Turbulence may be located anywhere within the storm, including in the low level roll cloud on the leading edge. Light to moderate turbulence is often encountered in the clear air around thunderstorms. Severe turbulence at middle and high altitudes is usually restricted to the immediate vicinity of the storm but can sometimes occur in anvil tops 15 to 30 miles downwind. Severe turbulence at low levels is most often associated with well developed gust fronts, at altitudes below 5,000 feet above the ground. The gust front associated with thunderstorms is created by the downdraft hitting the ground and spreading out in all directions. It is usually most intense ahead of the storm. Even moderate downdraft may produce an outflow of 50-60 knots at the edge of the storm. Rapid and unusually large changes in surface wind may result as far as 15-20 miles from the storm. There is presently no operational real time system to measure the low level wind shear associated with the gust front, so pilots should note that

Because of the possibility of hail, lightning, icing, turbulence, precipitation, and strong winds, thunderstorms have a potential to damage aircraft that venture into or near the storm.

a thunderstorm may be a hazard for landing and takeoff operations even if the main cell is up to 20 miles away.

Thunderstorms contain considerable quantities of liquid water which is carried aloft by updraft. Liquid water may be encountered at altitudes much above the freezing level. This water presents a hazard to aircraft since precipitation can seriously damage an aircraft moving at high speeds, in addition to causing engine flameout.

Since flight time through thunderstorm areas is usually short, the potential for icing is usually not as serious as the other hazards involved. However, in areas of extensive thunderstorm coverage, icing will become a serious problem as exposure to icing conditions is prolonged. The heaviest icing will usually occur just above the freezing level, but severe icing from super cooled water may occur in temperatures as low as −25°C, and icing in temperatures as low as −40°C.

MINIMIZING THE RISK

Seasoned pilots know that the surest way to minimize the risk of thunderstorm damage is to avoid them altogether. AFR 60-16 requires pilots to clear thunderstorms by at least 20NM at FL 230 and above and at least 10NM below FL 230. The first and most important step in thunderstorm avoidance begins with the weather briefing. The percentage of thunderstorm coverage indicated on the DD175-1 pertains to the specific route of flight, so always check the forecasts for alternate routes or destinations. If thunderstorms are expected locally, make it a practice to check the radar before leaving the weather station. Also, if your departure is delayed by an hour or more, get an update from the forecaster; enroute updates can be obtained via the pilot-to-metro service. Finally, routinely transmit PIREPs for the benefit of the next crew along your route.

It is always a good policy to maintain a wide separation from thunderstorms, but if penetration is inevitable, the following steps will improve your chances of avoiding serious aircraft damage:

- First, call the nearest pilot-to-metro service with radar to check on the tops and intensity of the storm.
- Second, spend as little time as possible near the freezing level.
- Activate anti-icing systems before penetration.
- Reduce airspeed to diminish static buildup and stress loading on the airframe.
- If your aircraft is equipped with weather radar, select a path with the minimum gradient of echo intensity.
- If you're flying between two cells, you must be able to clear each cell by the minimum clearance distance, so cells at FL 230 and above must be at least 40NM apart.
- Overfly tops only if absolutely necessary. Allow a minimum vertical clearance of 5,000 feet. Increase the vertical separation by an additional 1,000 feet for every 10 knot increase in wind speed over 50 knots.

SUMMARY

The airborne hazards which accompany thunderstorms will probably continue to be a serious safety problem for the foreseeable future. However, aircraft damage can be minimized by identifying hazards and by fully exploiting available meteorological services. Pilot awareness and cooperative efforts of aircrews and forecasters are the keys to preventing an increase in the rate of weather factor mishaps in the future. ★

FORMATION FOLLIES

CAPTAIN JERRY E. WALKER • 86 FTS • Laughlin AFB TX

While on your trek through pilot training how often did your instructor beat you over the head for passing underneath lead during a formation crossunder? As an instructor, I am constantly screaming at some unfortunate student for not getting nose to tail clearance prior to crossing under. If the student questioned the necessity for clearance, I would simply fall back to the old expediency, "the book says so."

Of course, you also add the euphemism, "You could hit lead." While spouting this party line you know that Stanley Student is saying, "Of course you could hit lead. You could hit lead from any position in formation. Only an ignorant fool would hit lead." Stanley is absolutely right. Only an IGNORANT fool would hit lead.

A quick look at some elementary aerodynamics can eliminate the ignorance and leave the midairs to fools. According to NAVWEPS 00-80T-80, *Aerodynamics for Naval Aviators:* ". . . Another important form of direct interference is common when the two airplanes are in a trail position and stepped down. As shown in Figure 6.10 (right), the single airplane in flight develops upwash ahead of the wing and downwash behind and any restriction accorded the flow can alter the distribution and magnitude of the upwash and downwash. When the trailing airplane is in close proximity aft and below the leading airplane a mutual interference takes place between the two airplanes. The leading airplane above will experience an effect which would be somewhat similar to encountering ground effect, i.e., a reduction in induced drag, a reduction in downwash at the tail, and a change in pitching moment nose down. The trailing airplane below will experience an effect which is generally the opposite of the airplane above. In other words, the airplane below will experience an increase in induced drag, an increase in downwash at the tail, and a change in pitching moment nose up. Thus, when the airplanes are in close proximity, a definite collision possibility exists because of the trim change experienced by each airplane. The magnitude of the trim change is greatest when the airplanes are operating at high lift coefficients, e.g., low speed flight, and when the airplanes are in close proximity.

"In formation flying, this sort of interference must be appreciated and *anticipated.* In crossing under another airplane, care must be taken to anticipate the trim change and adequate clearance must be maintained, otherwise a collision may result. The pilot of the leading aircraft will know of the presence of the trailing airplane by the trim change experienced. Obviously, some anticipation is necessary and adequate separation is necessary to prevent a disturbing magnitude of the trim change. . . ."

I emphasize the statement, "In crossing under another airplane, care must be taken to anticipate the trim change and adequate clearance must be maintained, otherwise a collision may result."

As you can see, during a crossunder, lead will experience a tendency to pitch down. The wingman will experience a tendency to pitch up. Obviously, a collision potential does exist without any conscious or unconscious inputs by either pilot. In fact, the pilots involved must anticipate and correct the pitching tendencies of their aircraft to avoid a collision.

I have experienced this phenomenon while demonstrating the "picturebook" crossunder. As I cross under lead with what initially was sufficient clearance, the aircraft would rise and the vertical tail would pass through the jet wash and the wing tip would vortice.

I always figured that I made some mistake. The fact is that I was ignorant of the aerodynamic forces involved. Fly safe—take spacing. ★

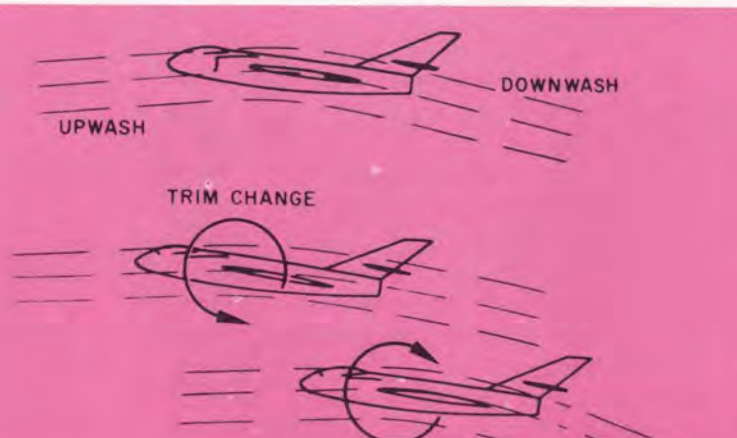


Fig. 1 Interference Between Airplanes In Flight

TRANSIENT SERVICES AWARDS REVISITED

The REX RILEY Transient Services Award program has been around for a number of years and at one time carried quite a bit of prestige. Transportation problems, personnel changes, and resource cutbacks had somewhat of a detrimental effect and recently the program has suffered. We're going to try and put a new shot of adrenalin into the award.

We, at the Air Force Inspection and Safety Center, feel that one of the mainstays of any installation's aircraft mishap prevention program is the transient services, maintenance, and facilities provided to visiting aircrews. The cross-country flight or transient aircraft presents a ripe opportunity for a mishap. Not only do visiting aircrews have unfamiliar surroundings, facilities, and landmarks to contend with, but often they are depending on the base food and billeting services to provide much needed crew rest before the next day's sortie. It is for these reasons that we are revitalizing the evaluation system of REX RILEY certifications. Hopefully, we will be able to visit or re-visit all bases in question within the next 2 years.

Our goal is an open-minded yet standardized look at the facilities of all bases with relatively high-volume transient traffic. We feel that this can't help but contribute and improve the bases' services. If the program saves a machine or aircrew, isn't that the name of the game? ★

THE

REX RILEY
Transient Services Awar

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
EGLIN AFB	Valparaiso, FL
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
ENGLAND AFB	Alexandria, LA
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AL
PETERSON AFB	Colorado Springs,
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
McCONNELL AFB	Wichita, KS
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RICHARDS-GEBAUR AFB	Grandview, MO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND

A Personal Review

When Squadron Leader Peter A. Barratt of the Royal Air Force left his job of publishing the RAF's *Transport Aircraft FS Summary,* he summed up some of his experience concerning flying safety. We think his words make a lot of sense, so we are reproducing portions of his editorial for our readers.—Ed.

Let me begin with a rhetorical question—what is Flight Safety? I believe that we should not have flight safety, per se, at all. None of us, except for the occasional psychopath (and I trust that we have none of those) sets out to kill, maim or injure himself or his professional colleagues. It therefore follows that we aim for safety in our daily round, whatever that daily round might entail. It further follows that, for those of us whose daily round is aviation, our primary unstated objective is flight safety.

It has become somewhat fashionable to make "airmanship" the preserve of those who actually get airborne. I disagree; I believe that it is in making this mistaken assumption that we have been forced into creating a generic name such as flight safety. For me, flight safety is simply good airmanship; conversely, airmanship is the practicing of good flight safety principles. The two are as inextricably linked as to be one and the same thing. As an island race we have always depended upon the sea, and our sea-faring traditions go back a long way. Perhaps that is why, with only three generations of airmen, airmanship is far from being on a par with seamanship. And yet I believe it should be. I would like to suggest that we take a leaf out of our nautical brothers' book and instill a spirit of airmanship in all those who have any dealings with aircraft—if you like an "air-in-the-bones" philosophy in lieu of "salt-in-the-bones." We could then dispel any idea that flight safety was a subject in its own right with its own mystique and we could put airmanship back where I believe it properly belongs—in the cockpit, on the flight line, in air traffic control, amongst the support personnel and so forth—in short, with all those whose job is associated with putting aircraft in the air.

A few months ago I wrote in these pages about the reasons for putting men, rather than machines, into cockpits and onto flight decks. Even as I did so, I realised that I was not stating the whole truth. I stated that the advantages that men had over machines was in their adaptability, their flexibility and their analytical approach to problems. And yet we are in danger of replacing those adaptable, flexible and analytical men with "mechanical" men who merely follow the book by rote. Already we have seen accidents caused by a blind adherence to FRCs (flight reference cards [checklist]) rather than a systematic approach to the problem. You may be lucky, your emergency may appear in FRCs, but on the other hand it might not. Certainly, the secondary effects of any malfunction and any action you may take can only be known by understanding the systems and logically thinking the problem through. Think up "new" emergencies for yourself and follow them through; try them in the simulator if you have one. Every one to which you have given prior thought is one less with which to be taken unawares. Once again this is all airmanship—I believe we must bring back the man who is capable of logical and intuitive thought; we cannot afford automatons in our cockpits. . . .

AIRCREW HAVE FINAL RESPONSIBILITY

Let me now turn to one of the specifics of the flight safety world—aircrew error. To err is human, as we have so often been told, and I cannot see anything that will radically alter man's fallibility. Aircrew error has become a very emotive issue. It is the aircrew who have the final responsibility and, more often than not, it is the aircrew who also have the unenviable task of trying to sort out the situation when it is all going to worms. But we have become too accustomed to shooting the pianist even when the piano is out of tune or when the score is wrong. Simply because the accident situation occurs at the final man-machine interface (i.e., pilot-aircraft) we should take more care before we rush in and blame the pilot. Conversely, when the pilot is skillful enough to rescue a situation that was not of his own making, we should be much more ready to heap acclaim upon him. Furthermore, I would like to extend this argument to those other members of the chain referred to earlier.

Virtually every accident has a human cause. The human error can occur when the specification is written, when the specification is turned into a design, when the design is turned into metal, when the product is tested, and finally when the aeroplane is put into service. Even here the human error can be made by any one of a thousand people involved in the aircraft's operation, its maintenance and all its other support services. Fortunately, each stage acts as a cross-check, seldom is any one man acting in isolation and, furthermore, we impose a system of controls and feed-back loops, all of which serves to eliminate the potential accident. However, we know from experience that, however small the mesh, sooner or later one will still slip through the net. Even then the accident may be avoided because its potential may be recognised in time and the appropriate remedial action taken. However, the human-being will continue to show its limitations—limitations in perception, limitations in understanding, and limitations in reaction and implementation. No, let us think twice before shooting the pianist, seldom will he not have been giving of his best even if his best still costs us an aeroplane. On the other hand, any breaches of discipline should be dealt with swiftly so the distinction can be made more easily by those on the sidelines.

WHAT IS FLIGHT SAFETY?

Perhaps we should return to the current definitions of flight safety at least as we see them in the Royal Air Force. The aim of Flight Safety is the reduction to a minimum of human and material losses due to aircraft accidents. The chief reason for an active pursuance of such a policy is simply because we can ill-afford either type of loss. Accidents erode our already overstretched finances, they eat into that intangible called morale, and furthermore we have an accountability to the general public who want their money used for their defence rather than for us to throw it on the scrap-heap.

AS PROFESSIONALS WE TAKE PRIDE

Having said that, I believe that few, if any, of us are actually conscious of these factors in our own flight safety philosophy. I said it earlier but it bears repetition —none of us actually wants an accident to occur. The real accident prevention motivators, I believe, are such things as the value we put upon our own and our colleagues lives and, furthermore, as professionals, we take a pride in doing the job to the best of our abilities. But it is in this same area where all too often we fall down. As members of the aviation community, flight safety is part of the community spirit. Only a few of us are assigned to fly the aeroplanes but all of us have a responsibility for their safety. It is a small air force these days and when an accident occurs the word travels fast. Often we will know the pilot or a member of the crew. Some of us will look at the cause and say —"I thought that would happen some day" or "That almost happened to me, but. . . ." How many people to whom it nearly happened or who thought it would happen actually told someone about their experiences or their fears? Where was their sense of community spirit? Are their consciences clear when the question is asked "Could this accident have been prevented?" Sometimes to voice our thoughts in this way will necessitate an integrity of the highest order. Sometimes to do so will be to appear foolish to our peers and our masters alike. But surely our sense of community spirit can overcome that, surely our commitment to aviation is bigger than that, and just as surely our peers and masters must respect our appearing foolish for the great degree of moral courage it really is. If ever a climate is engendered that tends to keep our mouths sealed we must do all we can to break those seals. A prerequisite of flight safety is communication and in an age of ever advancing communications, it is sad to see us performing so badly at the simple art of communicating. By failing to communicate, all we can be sure of is that we are, in effect, condemning a friend or colleague to death. And when the tragedy occurs, those of us who had the knowledge which could have prevented it, but kept it to ourselves, are as the perjured witness, the crooked judge and the biased jurors in a bogus trial leading to the execution of the innocent. . . .

FLIGHT SAFETY . . . WHERE IT BELONGS

Let us, therefore, abolish flight safety and recreate airmanship. Let us put flight safety back where it belongs in our personal approach to our jobs. Do pass on your good ideas all the time, not just when we visit, for not to do so is a form of complacency. Let us recognise that, for as long as men are part of the aviation interface, we will have human error accidents, but let us not shoot the pianist simply because he produces cacophony rather than harmony. Let us open up our own hearts and see if they contain any useful pointers towards the causal factors of accidents and then let us tell someone of responsibility to tell us of their mistakes so we may forewarn others. Finally, let us take the broader view so that we all contribute to a learning curve for our profession in toto rather than each having his own. . . . ★

WATCH YOUR TAIL

"RECOMMEND THE AIRCRAFT COMMANDER BE DOWNGRADED TO FIXED WING ONLY!" This message was sent after the aircraft commander had his third tail rotor strike during training operations in Southeast Asia. The aircraft commander mentioned was a very experienced pilot with many hours flying, but he had been wrenched from the security of the large fixed wing world and sent to fly helicopters in SEA. In all his hours of flying he had never had to worry about his tail, but the time had come.

In researching for this article, I not only reviewed the areas commonly known by helicopter pilots, but I also came across terms like: Tail Rotor Drift, Tail Rotor Roll, Tail Rotor Droop, and Tail Rotor Breakaway. This article will not only be an introduction for interested fixed wing pilots and a review for current helicopter pilots, but it also may have a new angle or two for the dedicated older rotor-heads.

TAIL ROTOR FUNCTIONS

As you may know, a helicopter is maintained in flight by the rotation of its main rotor blades. Newton's Third Law states "that for every action there is an equal and opposite reaction." On American single-rotor helicopters the main rotor system rotates counterclockwise, and because the main rotor uses fuselage-mounted power, torque is generated which tends to rotate the fuselage in the opposite direction. There are several ways of countering this torque reaction, but this article will address only the use of a tail rotor. The tail rotor's primary function is to compensate for torque reaction, but it is also required for heading control, maintaining trimmed flight and to stop the fuselage from rotating in autorotation.

CAPTAIN JOHN G. TAYLOR, III • USAF/RAF Exchange Program

1. Direction of main rotor rotation.
2. Torque reaction rotates fuselage in opposite direction to main rotor.
3. Tail rotor counteracts torque reaction and provides positive heading control.

Figure 1 Torque Compensation

Torque Compensation Compensation for torque is accomplished by a variable pitch, anti-torque rotor (tail rotor), located at the end of a tail boom extension at the rear of the fuselage. Driven by the transmission at a much higher rpm, the tail rotor produces thrust in a horizontal plane opposite to the torque reaction developed by the main rotor (fig. 1). Since torque effect varies when power changes are made, it is necessary to vary the thrust of the tail rotor. This is done with the tail rotor pedals which allow the pilot to alter the tail rotor thrust by changing the pitch on the tail rotor blades.

Heading Control In addition to counteracting torque, the tail rotor also permits control of the helicopter heading during taxiing, hovering, and sideslip requirements during takeoffs and approaches. Application of more control than is necessary to counteract torque will cause the nose of the helicopter to swing to the left. Conversely, less pedal than required to counteract torque will permit the helicopter to turn in the direction of torque, to the right. To maintain a constant heading at a hover or during takeoff or approaches, the pilot uses the tail rotor pedals to apply enough pitch to the tail rotor to neutralize torque and possible weathervaning effect in a crosswind.

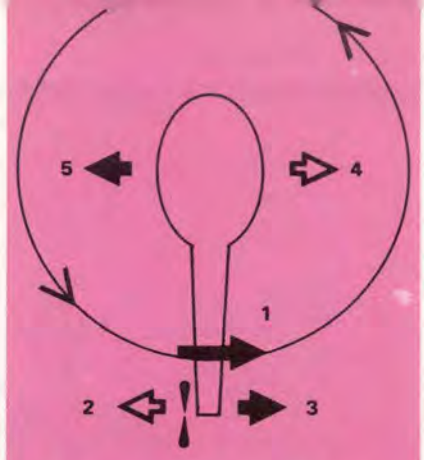
Trimmed Flight Heading control in forward trimmed flight is normally accomplished with cyclic control, using a coordinated bank and turn to the desired heading. Whenever power changes are made during flight, tail rotor pedals must be adjusted accordingly to maintain trimmed flight.

Autorotative Flight When the rotors are being turned purely by the reaction of the rising airflow as the aircraft descends and with no assistance from the engine, there will be no torque reaction. However, friction will cause the fuselage to rotate in the same direction as the main rotor. Directional control is maintained by changing the pitch on the tail rotor to such a degree that the tail rotor produces a thrust in a direction opposite to that required when the rotor is being driven by engine power. The tail rotor blades are symmetrical in shape and are capable of being turned (feathered) to produce plus or minus pitch values.

TAIL ROTOR PHENOMENA

Now that we are aware of the wonders a tail rotor can do for us, what are some of the phenomena associated with the tail rotor?

Tail Rotor Drift When hovering, the helicopter has a tendency to move laterally (to the right) due to the tail rotor thrust component (see fig 2). This tendency is called tail rotor drift and can be overcome by a pre-set tilt in the rotor hub or by the pilot tilting the main rotor slightly to the left. This lateral tilt results in a horizontal force to the left equal to and compensating for the tendency of the helicopter to drift to the right (see fig 2).

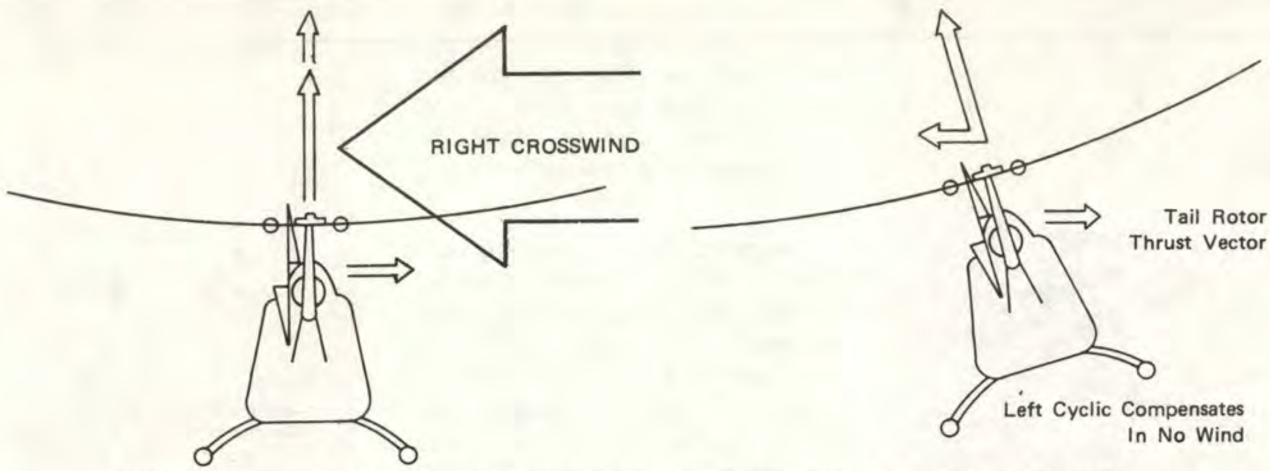


1. Direction of main rotor rotation.
2. Torque reaction rotates fuselage in opposite direction to main rotor.
3. Tail rotor counteracts torque reaction.
4. Tail rotor pushes entire helicopter into a right drift.
5. Pilot applies left cyclic to prevent right drift.

Figure 2 Tail Rotor Drift

Tail Rotor Roll Unless it is unbalanced, a fuselage suspended by a semi-rigid rotor system should hang level laterally (see fig 3A). However, the mast is often rigged to have a forward tilt to provide a level fuselage in forward flight which also results in a tail-low hover (see fig 3B). Some helicopters also have the tail rotor gearbox positioned below the main rotor hub. If the horizontal thrust of the tail rotor acts below the main rotor hub it will result in an unbalanced couple between the tail rotor hub and the main rotor hub (points of thrust application) tending to tilt the left side low during hover (see fig 3B). This tendency is called tail rotor roll. So, although the helicopter has been loaded within the lateral center of gravity limits, it will still hover with the left side low. This roll can be minimized by positioning the tail rotor high enough (on a py-

Figure 3 Tail Rotor Roll



NOTE: All figures in this article are hand drawn from figures in U.S. Army Field Manual FM 1-51, Rotary Wing Flight. Some portion of each Army figure has been changed to better prove my points.

lon) to reduce the couple, but this minimization point will only hold true for one position in the flight regime. Every time you change the nose up-down attitude of the aircraft the roll will either increase or decrease. The attitude is also dependent upon the gross weight and the density altitude at which the helicopter is operating, for as the weight or height increases so does the requirement for power for the main rotor and therefore the tail rotor. More tail rotor thrust creates more tail rotor drift which requires more left cyclic to arrest and therefore an increase in the left rolling tendency called tail rotor roll.

TAIL ROTOR PROBLEMS

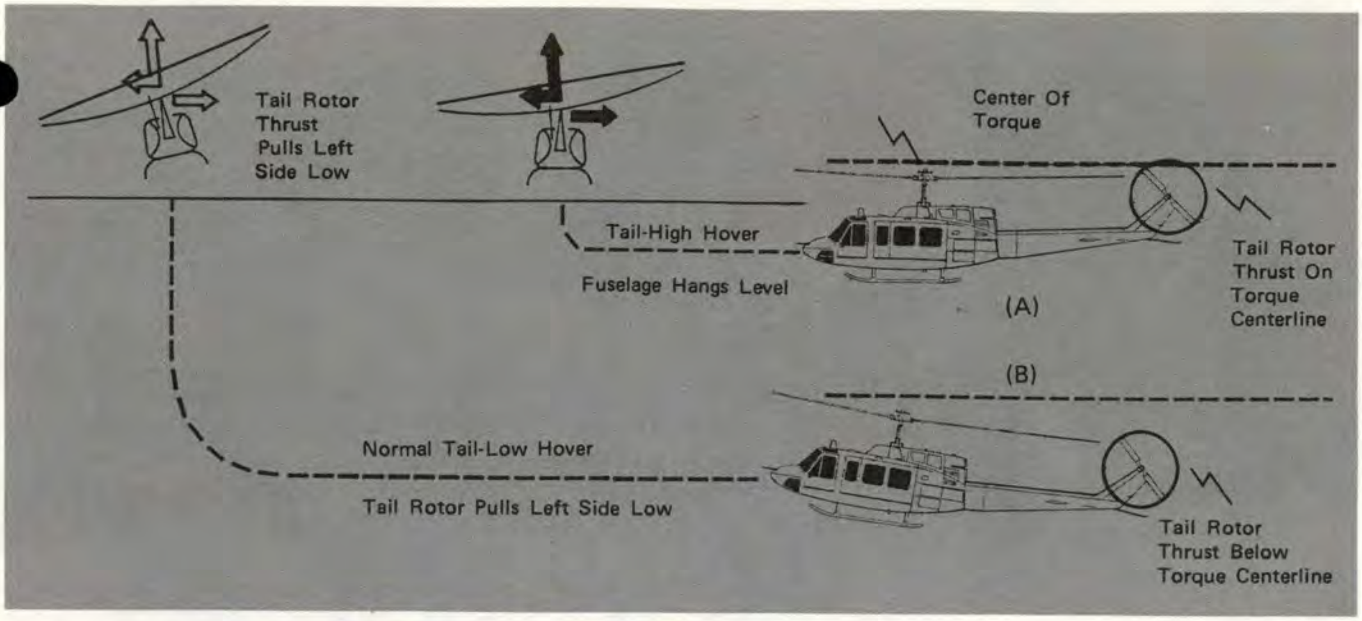
The tail rotor not only performs wonders, has phenomena, but it also causes problems. Most tail rotor problems are associated with its power demands which can lead to Tail Rotor Droop and Tail Rotor Stall.

Tail Rotor Power In order to produce tail rotor thrust, lift must be produced in a horizontal direction. The production of this lift causes drag which causes an increased power requirement. An increase in the power required by the main rotor must result in an increase in the power required by the tail rotor to maintain heading. In small helicopters approximately 5 per cent of the available power is coupled to the tail rotor, whereas large cargo helicopters have to have up to 20 percent of their power available to the tail rotor.

Tail Rotor Droop We are aware that the tail rotor is connected to the main rotor transmission at a constant ratio and, therefore, for each given rpm of the main rotor there is also a given rpm for the tail rotor. Since main rotor demands automatically regulate engine power output, the engine may be unable to provide enough power to meet the main rotor demands. If the main rotor demands more power than the engine has available the main rotor rpm will begin to decay and, therefore, the tail rotor rpm will also begin to decay. As the tail rotor rpm decays so will the tail rotor thrust decrease, unless more pitch is applied to the blades. This will require more power from an already overtasked power system, leading to more decay and ultimately insufficient thrust for the tail rotor to maintain heading, causing the nose of the aircraft to yaw abruptly to the right. At this point, attempted tail rotor pedal corrections of more left pedal have only made the situation worse, the pilot's only action should be to unload the main rotor power requirements, thereby allowing the main rotor rpm to increase and in turn allowing the tail rotor to increase its rpm and ultimately its thrust to stop the yaw. Hopefully the pilot will have enough altitude to accomplish the necessary main rotor unloading and get into the flight regime of translational lift. Most flight manuals have graphs which allow the pilot to predict at what main rotor rpm he will begin to lose his tail rotor effectiveness. This rpm will be dependent upon temperature, density altitude, and aircraft gross weight.

Tail Rotor Stall The same yawing movement caused by tail rotor droop can also cause the tail rotor to stall. When the nose of the aircraft swings abruptly to the right, the pilot's initial re-

Figure 4 Right Crosswind Effect



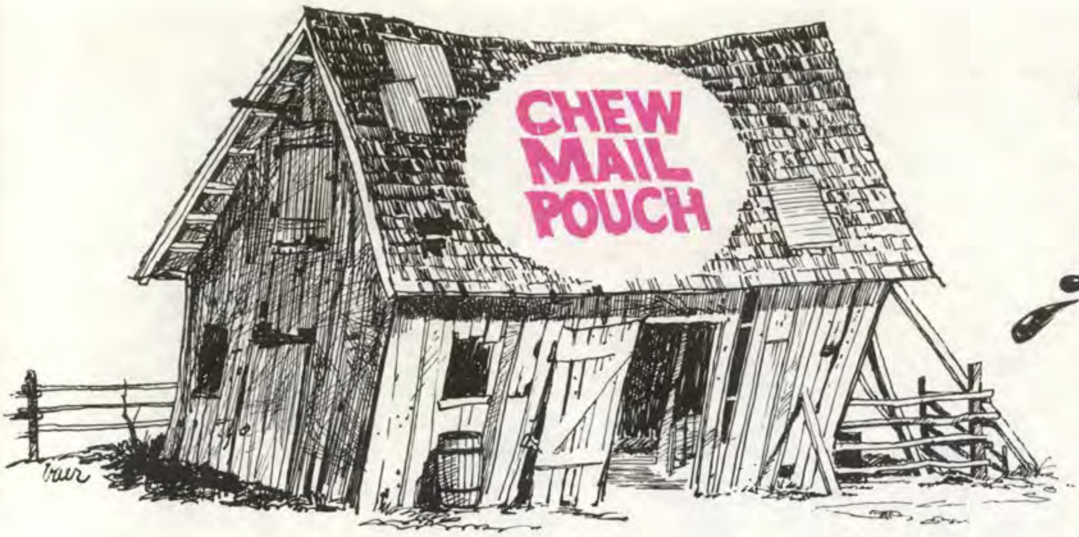
action to increase collective and apply more left pedal will aggravate the situation. Not only is the tail rotor losing rpm but also by the pilot applying more left pedal, he is increasing the angle of attack of the tail rotor blades and the rotor itself is passing through its own turbulence. Combinations of these factors may cause the tail rotor to stall.

Tail Rotor Droop/Stall Recovery Anticipation of conditions that could cause main rotor droop should begin during preflight planning and then early recognition of main rotor droop is essential to safely initiate corrective actions. If main rotor rpm begins to decay rapidly during high power applications, then lower the collective, increase airspeed, initiate a right turn to unload the tail rotor, and go around while there is sufficient altitude. Attempts to salvage an approach to a hover or landing will only increase your chances of an accident.

Crosswind Considerations Right Crosswind—because of the requirement to tilt the rotor to the left to stop tail rotor drift, a small crosswind from the right may alleviate the amount of left cyclic and therefore level the main rotor disc reducing the power required by canceling the horizontal component (see fig 4), but in most cases this benefit could be canceled by the requirement of additional left pedal to prevent weathervaning. This additional power requirement would increase as the crosswind increases until the wind approaches10-12 knots and then the power requirement would reduce as the main rotor system encounters translational lift.

Left Crosswind Airflows from the left can produce difficulties with directional control. With a 5-15 knot wind from the left, the tail rotor can be experiencing recirculation problems, where it is actually moving in the same direction as its induced air flow and into its own turbulence. The result is frequent changes in the pedal position, which is uncomfortable for the pilot trying to be accurate with his heading control. But a crosswind from the left rarely causes power problems because the tail rotor pitch setting is low. A phenomena called Tail Rotor Breakaway can be caused by a left crosswind due to blanking of airflow to the tail rotor by the tail rotor pylon (most American helicopters have the tail rotor mounted on the left side of the tail rotor pylon). The result of this airflow blanking can be a loss of directional control and excessive power demands.

We have discussed how useful a tail rotor can be to counteract torque, maintain trimmed flight, and to provide heading control throughout the helicopter's flight regime. Despite its good points there are also some bad ones: Tail Rotor Breakaway, Tail Rotor Droop and Tail Rotor Stall, all of which can be caused by excessive power demands. I must stress that flying within the authorized flight envelope of your aircraft will allow you to avoid all these tail rotor problems and that there is much that can be done to anticipate excessive power demands during preflight planning. Only anticipation and early recognition in flight will allow the pilot sufficient time, hence altitude, to recover the situation. But none of these precautions will be of any use to you if you allow your tail rotor to strike an object and damage or lose it. So BE AWARE and do not allow yourself to be "DOWNGRADED TO FIXED WING ONLY." ★



MAJ GEN PERRY B. GRIFFITH
USAF, Ret.

Nicotine and I first entered the ring when I was eleven, and vacationing on our ancestral Pennsylvania farm.

Having heard me brag about the Philadelphia A's, a bunch of village boys (some, shirttail cousins) invited me to play baseball in a pasture behind the mill. As I was such a hotshot, they said I could pitch.

All cheeks of these little rustics bulged with big lumps—like the ballplayers' cheeks in A. J. Reach's *Baseball Annual*. I asked one kid what he was chewing. Pulling a filthy packet from his overalls, he unfolded it and offered me some. It said what was painted on a nearby barn, CHEW MAIL POUCH.

I stuck a handful in my mouth, sauntered to the mound, warmed up, then threw three pitches.

Suddenly my head expanded to eight times normal size, Roman candles, sparklers, walls of enemy flak exploded inside it, and swarms of ballplayers grotesquely whirled around me the same way First Act Finales of all Broadway musicals end.

Descending onto a cow chip, next, some older kids were soaking my head in the pasture-bisecting mill run, I was in convulsions and the other pre-adolescent, village idiots were rolling on the ground, to see this city dog—me—visiting the country dogs and, now, slowly twisting in the wind.

The following round in this melancholy bout took place on Saturday, a week before my high school graduation.

A mechanical drawing teacher told me to finish some derelict work or else; so I borrowed my father's car to go to the school. His raincoat was on the seat and, as it was drizzling, I wore it into the building. I noted that his empty pipe had been left in a pocket.

While drawing, I remembered the pipe, idly stuck it in my mouth and hardly noticed the door open when the janitor—old walrus-moustache four eyes—looked in to find out why the lights were on.

Monday morning, I was summoned to the vice principal's office and accused of smoking in a classroom; particularly reprehensible because my dad was the city school board president (they later named a school for him), my grades were passable, and I was president of the Mathematics Club. Some example for the other kids, they said.

All rebuttal was dismissed out of hand. I was a criminal, suspension until graduation was my punishment, and I didn't even smoke.

So a week was spent, hiding from the firestorm and playing tennis with a local buddy, Frank Schwartz, who had beat me out on an Annapolis appointment, and was straightaway leaving to become a Navy plebe.

When some expert from out of town handed us our diplomas, a roll of laughter filled the auditorium when I got mine, my mother was too ashamed to attend chuch for a spell, and dad would glare, grab his golf clubs and leave for the links. I would sneak to a window and watch him to his car, shaking with ill-concealed laughter. The air, therefore, was clear. For he, too, once had been a boy.

While at West Point, my roommate smoked. I tried to learn in self defense. But my Wellesley girl didn't smoke, and as I was on the swimming team and the coach was psychotic about smoking, it never took.

Graduation summer, five classmates and I joined the Midshipman Cruise in Europe. My confederates all smoked. With five to one, I finally got wacked out by what passed for cigarettes in Europe—all little more than fertilizer, spelled with nine letters. But I had joined the club.

Shortly before WW II, the girl I finally married had our first child. Before a cure for the negative Rh factor was discovered, the baby hovered between life and death for five days.

Perhaps because the inflections of my prayers for mother and child might be more meaningful in so doing, on the fifth day I quit smoking. The baby rallied and never has been desperately ill since.

During the war, as responsibilities blossomed, my vintage shot up fast. Early on, I had a squadron, then group, overseas, in the tropics. Everyone smoked. But the cigarettes were damp and the Russian-made matches wouldn't strike. So you really had to be hooked to work at it.

For something to do in the ops center and during long hours in the cockpit, I started again. (This is about as predictable as a rerun of Gilligan's Island, isn't it?)

Then, in the late Forties I had two impacted wisdom teeth removed. Afterward I tried to smoke, but the taste was so foul that I threw the coffin nails away and didn't smoke again for three years—when I found myself spinning in the vortex of the Air Staff's Directorate of Plans and Operations.

I was to spend six years in Washington—too long for anyone who hopes to preserve his sanity, save a congressman, and in that racket you don't seem bound by the same code of ethics we in the military forever have set our course by.

I began anew. I'd fire up, take a puff, stub it out, whirl my chair around, cough, vaguely stare through my vapors at the good-looking secretary twenty feet away in the Pentagon's next ring, then return to work.

Between cigarettes and coffee all day and martinis at night, I survived. But I was getting like Rodney Dangerfield, who said one morning, "The first thing I've gotta do is find whose car I drove home last night. The second thing is, I've gotta find the guy who drove my car home."

Finally, more dead than alive, I was sprung and got command of an air division. By then I was smoking cigars (the in-thing for youngish, show-off, AF file-boners, because you-know-who smoked them).

After a good tour, I found myself back on the Air Staff as the USAF Deputy IG but, thank God, with my end headquartered out at Norton Air Force Base, California.

So along came time for my annual inspection of USAFE. On completion, we gave the final briefing to the CINC, General Ted Landon, once my boss in the Pentagon, a gifted leader, an easy keeper, as horsemen say, and one who never disrupts things unless smoke is rising.

The pressure was off, and we were outward bound. The flight steward had laid in some good German cheese, bread and wine, for those who didn't have to fly. We had our own bird. I took it off, climbed to altitude, then turned the yoke over to the next pilot and went aft.

My aid, Captain Charley Woods (now a major general selectee on

I need smokes like Dolly Parton needs falsies.

the Air Staff), our surgeon, Colonel Ken Pletcher (later to become the AF Surgeon General), and my exec, Colonel Paul Douglas (later to be a brigadier general), a WW II Ace who once shot down five Jerries in one fight, were grouped around a table where they graciously had left me a little food.

After gorging what was left, I asked Charley for a cigarette, lit up and settled back to watch the English coast come up.

Suddenly, Ken—who is the genius who thought up those signs seen in all AF hospitals, WE THANK YOU FOR NOT SMOKING HERE—reached over, yanked the butt from my fingers and stomped it out.

My impulse was to go over the table, seize his throat and ask him to make a funny noise. But I didn't.

That was fifteen years ago. I haven't smoked since. I have not missed it, and if I confined all my problems to a nose, eyes, throat and lungs, there's nobody who's in higher cotton, unless it's a relative of the president.

Long ago I learned that booze and I don't mix. I like the damn stuff's taste, but it does strange things to me, puts me to sleep in odd places, and at one USMA reunion, I rather innocently walked into a broken nose.

I've never flown to the moon with Timothy Leary on LSD-fashioned, gossamer wings, and I wouldn't know the smell of pot if I shlepped naked through all those turkeys at a Woodstock Festival.

But I know booze and I know nicotine, and I need both like Sadaharu Oh needs a glass eye, like Dolly Parton needs falsies and like Joe Namath needs computer dating to find a date.

Smokers and boozers think that to stop you need the insane, impulsive will power that motivates one to run for mayor of the mare's nest that's called New York City.

Not so. You don't have to shell out bread for pills, hypnotic courses and all that jazz.

You just quit. That's all!

Or you have some guy like Pletcher shove your back to the wall. In about two days you never miss smokes again, and after the hangover subsides, you simply shun booze and drink tonic water at parties. It ain't too simple, but it works.

"But," one says, "what have you got to live for?"

Well, everyone has a few private vices that get nobody else in trouble. I figure: Live it up otherwise. You've run the course and taken all the fences—in a clumsy sort of fashion—but you're still in the saddle and the cockpit.

Someday, though, in company with all other hell-raising military pilots and ex-cavalrymen, I'll have some accounting to do with the CINC who minds the muster and flight line up in Fiddler's Green's airdrome and stables. But I'll have plenty of company—most of them friends of long standing.

And it all began with a gaggle of country-jake, tobacco-chewing, little devils and a bloody, four-eyed janitor who couldn't see straight. ★

Major General P. B. Griffith writes for the aviation and international press. He is Associate Editor of Horse and Horseman *magazine, and was one of four US editors accredited to cover the equestrian events at the '76 Olympics. Recently he has been following the US Equestrian Team screening trials and Modern Pentathlon World Championships. In 1939, incidentally, before going to pilot training he won the US Cavalry Pentathlon Championship at Ft. Riley, Kansas.*

I need booze like Sadaharu Oh needs a glass eye.

OPS TOPICS

WATCH OUT

• An FB-111A was on an IFR low-level bomb run when the pilot noticed a single-engine light plane pass approximately 300 feet in front of his aircraft. The light plane driver apparently never saw the fast-mover.

• A T-37 was practicing VOR holding in VMC at 7,500 feet MSL. The IP observed a light aircraft on an apparent collision course and took evasive action.

In both of the above cases, the military aircraft was on a hard IFC clearance in radar contact with the controlling agency. REMINDER—Don't let IFR clearances, transponders, separation altitudes or other "traffic protection systems" lull you into security. By the same token, don't get so involved with your in-cockpit action (practice instruments, bomb runs, checklists or inflight malfunctions) you neglect the lookin' around outside.

ANIMAL FOD

Recently, an aircraft aborted takeoff when the pilot thought he had hit a small animal soon after beginning his takeoff roll. Later that same day, another aircraft had to brake hard to avoid cows on the active. An unusual example? Maybe, but on a smaller scale these incidents serve as a good reminder for:

• Flight crews—Just because there are no other aircraft on the runway, don't assume the active is clear of obstructions.

• Tower personnel—Get in the habit of scanning the entire runway environment for stray animals, people, or other hazards to aircraft.

• Airfield management personnel—When was the last time you had the entire airfield area checked for holes in the fence, animal nests, or other possible origins of animal FOD?

ALERTNESS COUNTS

A C-130 executing an ILS monitored approach was forced to execute a missed approach because of a vehicle on the runway. The senior tower controller cleared the aircraft to land when he was 6 miles on final. Two minutes later an airfield lighting truck requested clearance onto the runway. The senior controller cleared the truck onto the runway, having forgotten about the previously issued clearance to the C-130. The pilot acquired visual sighting of the runway when approximately 100' AGL and approaching the landing threshold. He then saw the truck on the runway edge and executed a go-around. Another ILS was flown to full stop. The tower was manned by a senior controller and a controller assigned to flight data. The flight data controller had just returned from the equipment room after completing a recorder check. He was unaware of the clearance for the aircraft to land. The senior controller had become distracted after the clearance to land by becoming involved in a coordination of alternate communications procedures on the primary crash net. This could have been a bad one! A good reminder for all to constantly clear the runway and airfield environment. ★

USAF IFC APPROACH

IN RETROSPECT

The USAF Instrument Flight Center (USAFIFC) is scheduled to close 30 June 1978 with its many functions being transferred to other USAF units. This closure ends a 34-year flying tradition. The Instrument Pilot Instructor School (IPIS) portion of the USAFIFC closed 31 December 1977 which was the first interruption of service since school operations began at Bryan Field Texas, 23 March 1943.

The creation of IPIS signified a dramatic change in aviation philosophy. A statement of the Commandant, Air Corps Primary Flying School, Brooks Field, Texas, 15 August 1928, clearly represented the old philosophy: "Flight by means of an artificial horizon has no place in primary or basic training." Visual flight reference was the order of the day and this position was generally supported until the early years of WWII when it was recognized that more aircraft were being lost to flight under instrument conditions than to combat-related causes; IPIS was developed as a corrective measure.

Since those early beginnings, IPIS evolved from an instrument proficiency course to a graduate level instrument instructor school. Not limited to "How to Fly the Gauges," the final course encompassed theory and practical applications of flight instruction, situational communication techniques, and an academic environment for in-depth study of instrument flight-related materials. Throughout those 34 years, over 19,000 select instrument instructors from all MAJCOMs, the AF Reserve, Air National Guard, and 50 foreign countries have attended IPIS. Depending upon the vintage, in-flight training was conducted with the AT-6, B-25, T-33, T-29, T-39, or T-38 aircraft. A helicopter course, using the UH-1, was added in 1973. Training was detailed but broad enough in scope to accommodate the diverse needs of instructors from a variety of aircraft types and missions.

With changing times and advancing technologies, the military flying community needed an organization to train an instrument instructor cadre, to research flight instruments and systems requirements, to develop and standardize instrument flying procedures, techniques and training methods, and to provide this information to the pilots in the field. These requirements led to the development of the USAF Instrument Flight Center on 1 May 1972. The USAF-IFC was created by expanding the IPIS to sustain a progressive instrument program for the entire Air

These are the aircraft used by IPIS for instrument training from 1943 to the closing of the school 31 December 1977. Clockwise on this page: AT-6, T-33, T-29, B-25. Opposite: T-38, T-39, UH-1.

By the USAF Instrument Flight Center
Randolph AFB, Texas 78148

Force. The Center was the focal point for all matters related to instrument flight. The Center had three major divisions: IPIS, Flight Standards, and Research and Development. The Flight Standards Division provided the USAF with a standardization process for the use and development of instrument approach and landing charts, flying directives, and instrument flying techniques. This division also wrote the "USAF-IFC Approach" article which has appeared monthly in the USAF **Aerospace Safety** magazine. These functions will be transferred to the following organizations and future questions should be directed to these agencies:

ATC/DOTO, Randolph AFB TX AV 487-5834
AFM 51-37, AFR 60-16, Instrument Refresher Course, and Annual Instrument Exam

Air Weather Service, Scott AFB IL AV 638-4731
AFM 51-12

MAC/DOCS, Scott AFB IL AV 638-3391
AFM 55-48

AFCS/FFO, Scott AFB IL AV 638-4451
AFM 55-9, AFR 60-27, ICAO TERPs, NATO TERPs

AFCS/FFO, Scott AFB IL AV 638-5479
FLIP Changes and FLIP Operational Requirements

The Research and Development Division, in cooperation with AFSC and other organizations, conducted pilot factors testing, evaluated instrument control, display and guidance systems. They also were deeply involved in the Microwave Landing System (MLS) Program. The MLS function is the only function being transferred. It will be at the 4950TW/DOCB, Wright-Patterson AFB, OH AV 787-4610. The personnel of the USAFIFC have supported the mission of instrument flight for over 35 years and have contributed to the current high level of all-weather flying expertise within the USAF. With the knowledge of a job well done, they can honestly look to the future with pride in the past.

The "USAFIFC Approach" feature has provided vital information for aircrews for 13 years. With the Instrument Flight Center closing, this is their last article. We are working on a substitution and hope to continue the series from another source. Our sincere thanks to the people who have written the "Approach" articles over the years. There have been many, and each has contributed to flying safety. —Ed. ★

Mail & Miscellaneous

Send your ideas, comments, and questions to:
Editor, Aerospace Magazine
Norton, AFB, CA 92409

THE FIGHTER PILOT'S BREAKFAST

Lieutenant Banta's article on this subject in your January issue was truly outstanding and worthwhile. All of us should take heed, regardless of our duty assignment.

I'm encouraged that we already appear to be making progress in the nutritional program. This progress is most evident in the upgraded Fighter Pilot's Breakfast footnoted in the article. It's a quantum leap forward from the old WWII "Brown Shoe" counterpart. Ours was more austere and consisted of a cup of black coffee, a cigarette, and to regurgitate—in polite usage. A midmorning snack of 100% oxygen usually followed to carry the body through till lunch. Somehow or another, some of our young bodies survived. How, I don't know. But the going accident rate appeared to be a direct function of our morning's nutritional input.

I look forward to the next great leap forward in the Fighter Pilot's Breakfast, Mark III. Perhaps it will herald the arrival of that perfect zero accident rate we have been after for all these years!

STANLEY F H NEWMAN, Brig Gen, OKANG
Commander
137th Tactical Airlift Wing
P.O. Sta. 18, Will Rogers World Airport
Oklahoma City, Oklahoma 73169

NOMEX FLIGHT CLOTHING

The article on Readiness in the January 1978 issue of **Aerospace Safety** shows a picture of a C-141 pilot with improper wear of his protective flight clothing. Rolled-up sleeves and turned down gloves may look cool in a photograph but they have no place in our flying. Unfortunately, the picture is typical of many aircrew members use of protective flight gear.

If every crew member were given a tour of Brooks Army Medical Center, Burn Ward, to see the results of neglect and misuse of flight gear, they would be aware of the serious consequences of fire to exposed skin. As shown in the picture on page 1, the rolled up gloves act only as a chimney to funnel heat into the hands. Heat from the typical turned-under sleeve can funnel up as far as the back. Although the "we don't need it" attitude is more common in heavies, there is seldom time to cover up before the accident occurs. Few people have the presence of mind to pull out their gloves and cover up as they depart the runway.

We in safety education need to keep reinforcing our aircrews in proper use of the excellent protective gear the Air Force provides us. If the aircrew involved was a select lead crew with two flight examiners and three instructors, proper wear of flight clothing was not part of their instruction of evaluation as should be the case. Aircrews in those positions should be the ones to set the example so crew members they come in contact with will "get the idea." Hopefully we can get every aircrew member to make safety gear a part of his Before Takeoff Checklist.

HAROLD N. CARTER, Captain, USAF
Chief, Physiological Support
USAF Clinic Kadena (PACAF)
APO San Francisco 96239

You are perfectly right about the proper wear of flight gear. We will work harder at selecting photos that show only proper wear.—Ed.

F-111 COPILOT

In your article "Communications" under the Ops Topics in the April 1978 issue of **Aerospace Safety,** you referred to the F-111 copilot. I would like to point out to you that the F-111 right seat crew member is known as the Weapon Systems Officer (WSO) and not copilot. The WSO can be either a navigator or pilot, but the majority are navigators.

Enclosed is the T.O. 1F-111A-1 Glossary.

DONALD M. MAY, Colonel, USAF
Assistant Deputy Commander for Operations
366th Tactical Fighter Wing
Mountain Home AFB, Idaho 83648

You caught us with our WSO down. It's sharp-eyed people—who will tell us—who keep us honest. Thanks!—ed.

Please share this magazine with your fellow crew members

ITS DESIGNED TO BE SHARED WITH TEN PEOPLE... AND YOU CAN NEVER BE SURE WHAT THOSE NINE OTHERS MIGHT DO

NEWS FOR CREWS

Information and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

CAPTAIN HERB JENNESKENS
Air Force Military Personnel Center

We at AFMPC realize that many of you do not have time to keep abreast of the myriad of changes, updates, and revisions that are happening in the personnel arena. We'd like to present a capsulized review of some items you might find interesting or significant.

Strategic and Tactical Sciences Program (AFIT). This recently initiated 18-month graduate program leads to a degree of Master of Science in Operations Research. More specifically, the program prepares Air Force officers for operational staff (not rated Supplement) assignments involving selection, planning, and optimum use of conventional and nuclear weapon systems. The curriculum includes individual and class exercises in planning and targeting problems for both strategic and tactical scenarios. Graduates will be qualified for responsible positions as Air Force strategists and tacticians. Admissions criteria include a baccalaureate degree in engineering, chemistry, physics, mathematics, or a degree from a service academy with appropriate major. Grade point average should be above 2.5. All students must have taken the GRE apptitude test. Interested? Write: AFIT/RR, Wright-Patterson AFB, OH, 45433, or call AUTOVON 785-2549. AFMPC point of contact for rated officers is Capt Herb Jenneskens, AUTOVON 487-5081, and for support officers Maj Paul Kintz, AUTOVON 487-3474.

NASA Astronaut Candidate Program. The recent selection and announcement of 35 new astronaut candidates include 10 Air Force officers. All will enter a two-year training and evaluation program prior to final selection as astronauts. For you future potential "selectees," the application requirements are expected to remain as minimums, but a review of those previously selected shows a definite trend toward advanced degrees in mechanical, electrical, or aeronautical engineering, or earth, space, or life science with good research or experimental backgrounds. NASA expects no additional recruiting within the next two and one-half to three years and will not accept applications until announcement of a new recruitment program. If interested, now may be the time to increase your competitive advantage.

Special Experience Identifiers (SEI). On 1 May 1978, an expanded special experience identifier (SEI) coding system went into effect at AFMPC. SEIs are used to flag the records of personnel with unique experience, education, or training not normally reflected in an AFSC or associated prefixes and suffixes.

What does this mean to you? We expect the new SEI system to assist us in better matching people and jobs, reduce the time needed for you to "come up to speed" in your next job, and in general, assure that your records provide a true picture of your qualifications and abilities. SEIs will not be entered in the system for everyone immediately. Rather, AFMPC resource managers will review your records and designate applicable SEIs in conjunction with normal personnel actions such as reassignments, AFSC changes, scheduled record reviews, etc. If you don't want to wait and feel you have special skills, background, or experience that should be flagged with an SEI, have your local CBPO forward a request to AFMPC. A complete explanation of the SEI system and a listing of new SEIs are included in AFR 36-1, Officer Classification.

ATC Instructor Duty. AFMPC resource managers are always looking for highly qualified pilots and navigators to serve a tour of duty as instructors in Air Training Command. Continued MAJCOM interest and anticipated increases in UPT/UNT production have renewed the emphasis on instructor duty. Some benefits of an ATC tour include a three or four-year stabilized assignment, limited TDY, and excellent opportunities to function in supervisory positions. Selected individuals can expect to be returned to their original weapon system field upon completion of the ATC tour. If interested, contact your appropriate resource manager at AFMPC. ★

ABOUT THE AUTHOR

Captain Jenneskens is a Resource Manager in the Rated Departmental/Joint Career Management Section, AFMPC. His previous assignments have included ATC instructor duty and F-4 assignments in PACAF and USAFE.

NUCLEAR SURVIVAL

SGT WILLIAM F. BRITTON
Operations and Requirements Branch
3636th Combat Crew Training Wing (ATC)
Fairchild AFB WA

You have exited your aircraft and find yourself safely on the ground. Suddenly you realize that you have become another statistic in the present war. There are no enemy personnel in sight, and it seems that all you have to do is utilize the basic techniques that you learned at Survival School. A little bit of E&E, proper signaling, finding food and water, and you will have it made. After all, that's the way it's been in every other war you have read about. Spend some time on the ground and then get rescued. The problem is that this war has an added ingredient which was not found in any other wars. You are a survivor in a nuclear holocaust!

Hopefully, you (as a member of the Armed Forces) will never have to experience a nuclear survival episode. But no one can predict the future. One fact we can predict is that nuclear fallout will compound the problem of obtaining shelter, food, and water and will make difficult the everyday hygienic principles. It is important to realize that the basic principles of survival that were used in past conflicts **will** be applicable. But they'll have to be modified due to the varying amounts of radiation present.

Just how dangerous will the radiation be to you during a nuclear episode? This will largely depend on the proximity of the bomb blast site. Naturally, the closer you are the more radiation your body will receive. Depending on the exposure time, radiation will affect your body in different ways. Because radiation is tasteless, odorless, and invisible, it will be very difficult to detect.

There are three different types of radiation (alpha, beta, and gamma), all of which could be present in your situation. Alpha radiation is considered the weaker of the three types. These particles can be stopped by a sheet of paper, clothing, or even your skin. They are only considered dangerous when allowed to enter your body. Alpha radiation will not only damage internal organs, but also the blood cells. Keep the radioactive dust off of yourself and use proper protective devices to keep from inhaling or ingesting these particles.

The second type of radiation, beta, **does have** an affect on the external parts of the body. If exposed long enough, the unprotected skin will burn, causing you to look as though you have a severe case of sunburn. The skin will become very sensitive to the touch, and, if exposed for a long period of time, blisters will appear. You can protect yourself from beta radiation by wearing materials of moderate thickness (i.e., flying suits, fatigues, boots, etc.) and by keeping any exposed parts of the body as clean as possible. Make sure you do not inhale or ingest these particles.

The third and most penetrating type of radiation comes from gamma rays. These rays not only pass through your body, but also through much denser material. You will be required to seek some type of shelter which will reduce the number of these penetrating rays. It is the gamma ray which causes the greatest concern in a nuclear survival situation. Extended exposure to these rays may result in death.

SHELTER CONSTRUCTION

The following table shows the thickness of various materials required to reduce gamma penetration from fallout by 50 percent, which could be incorporated into your shelter:

GAMMA RAY PROTECTION BY MATERIALS USED
(To Reduce Penetration By 50%)

Iron or Steel	*0.7 inches*
Concrete	*2.2 inches*
Brick	*2.0 inches*
Dirt	*3.3 inches*
Ice	*6.8 inches*
Wood (Soft)	*8.8 inches*
Snow	*20.3 inches*

Each time you double the thickness of the materials, you cut the penetration of radiation by another 50 percent. The thicker the walls, the better your protection.

When constructing a shelter, build it in an area where you can obtain food, water, and possibly construct a signal. Just remember to spend as little time as possible exposed to radiation. Any type of protection is better than nothing at all, and it is imperative that you seek shelter quickly. A unique fact about radiation shelters is that a roof is not mandatory; however, it will offer some protection during a long duration survival stay from alpha and beta radiation. Depending upon location and wind direction, you may need the shelter for as long as two months. If you have a radiac meter packed in your survival kit, use it to determine the amount of radiation present. If you do not have one, consider the area to be dangerous and take proper precautions.

EXPOSURE TIME

Once inside your shelter, you should properly store any survival rations you were able to save. Make sure that all contaminated objects are kept away from this area. If you were unable to save any survival rations, you will probably begin to wonder how long it will be before you can go outside of your shelter and search for food and water. The following timetable will provide you with the protection necessary to avoid a serious dosage of radiation:

a. If it isn't necessary to leave your shelter for the first week, don't. Maintain complete isolation until four to six days after the last explosion. If you must leave your shelter to procure food or water, you may do this on the third day, but for no more than 30 minutes.

b. On the seventh day, one exposure of not more than 30 minutes.

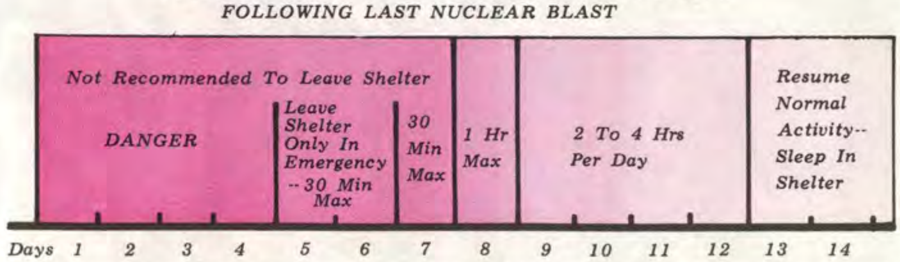
c. On the eighth day, one exposure of not more than one hour.

d. From the ninth day through the twelfth day, exposure of two or four hours per day.

e. From the thirteenth day on, normal operation, followed by rest in a protected shelter is the recommended procedure.

If you are unable to remember the above table, here is another approximate rule you can use. Radioactivity decreases tenfold for every sevenfold increase in time. Thus, after seven hours, the intensity of radiation will be one-tenth that of the first hour; after 49 hours, it will be one one-hundreth, and so on. At the end of two weeks (343 hours), it will have dropped to one one-thousandth of the first hour.

FIGURE 1. TIME TABLE FOR RADIATION SHELTER FOLLOWING LAST NUCLEAR BLAST



REMEMBER: Radioactivity decreases tenfold for every sevenfold increase in time.

WAITING IN THE SHELTER

As you can see, most of the first thirteen days of your survival episode will be spent inside your shelter. Many people become very upset and nervous if they have to stay cooped up inside an enclosed area for any length of time. You should try and get as much rest as possible and do small amounts of exercise to maintain muscle tone. The exercise periods will be determined by the amount of food you are able to consume. Hopefully, you will be in good physical condition before you start your mission. You should plan what you are going to do outside when the thirteen days of shelter time have ended.

WATER AND FOOD PROCUREMENT

Once you begin to leave your shelter, try and replenish your water and food supplies. Depending on your location, there are several water sources you can use. Try to use water from springs, wells, or other underground sources. If you have snow, use the snow located six inches or more below the surface. Water from rivers and streams will be comparatively free from fallout within several days. In the meantime, you might boil some water and condense the steam. The radioactive materials will remain in the bottom of the containers. Purify and filter all water using a simple filter made from sand, rocks, grass, or any other suitable materials.

For food, remember any item (sealed) in a metal container is the safest to eat. If not available, you can use animals as long as you skin them and throw away all internal organs. Do not cut the meat off closer than ⅛ inch to the bone and be sure to cook it if possible. Eggs are also a good food source, but all milk should be avoided.

If animals are not available, you should take advantage of plant foods. The best choice would be vegetables such as potatoes, turnips, and carrots, whose edible portions grow underground. Your second choice should be those plants with a smooth skin or shell which can be removed such as bananas, apples, and tomatoes. Be sure to wash these fruits or vegetables thoroughly. Plants with a rough outer surface such as lettuce, broccoli, or cabbage are difficult to decontaminate by washing and should be considered as your last choice.

HYGIENE

The same care that goes into filtering water and selecting non-contaminated food should be incorporated into personal hygiene practice. It is important that you keep as clean as possible during nuclear experience by keeping only decontaminated material in your shelter and burying any human waste or contaminated material. Wash yourself thoroughly whenever possible and use decontaminated water. As long as you can keep the body healthy, you stand a much better chance of coping with any situation that might arise during your survival episode.

As a potential survivor, it will help considerably to use plain old common sense when dealing with nuclear survival problems. You must deal with the problem at hand and solve it before you proceed. It will be much easier to prevent the problem than to treat it. Remember to locate your shelter as quickly as possible, watch your food and water closely to make sure they do not become contaminated, and keep yourself clean. Above all, be patient. Try and learn all you can about survival in a nuclear area. It could save your life.

Questions and comments concerning the information contained in this article should be referred to 3636 CCTW/DOTO, Fairchild AFB WA 99011, AUTOVON 352-5470. ★

☆U.S. GOVERNMENT PRINTING OFFICE 789/855/58

UNITED STATES AIR FORCE

Well Done Award

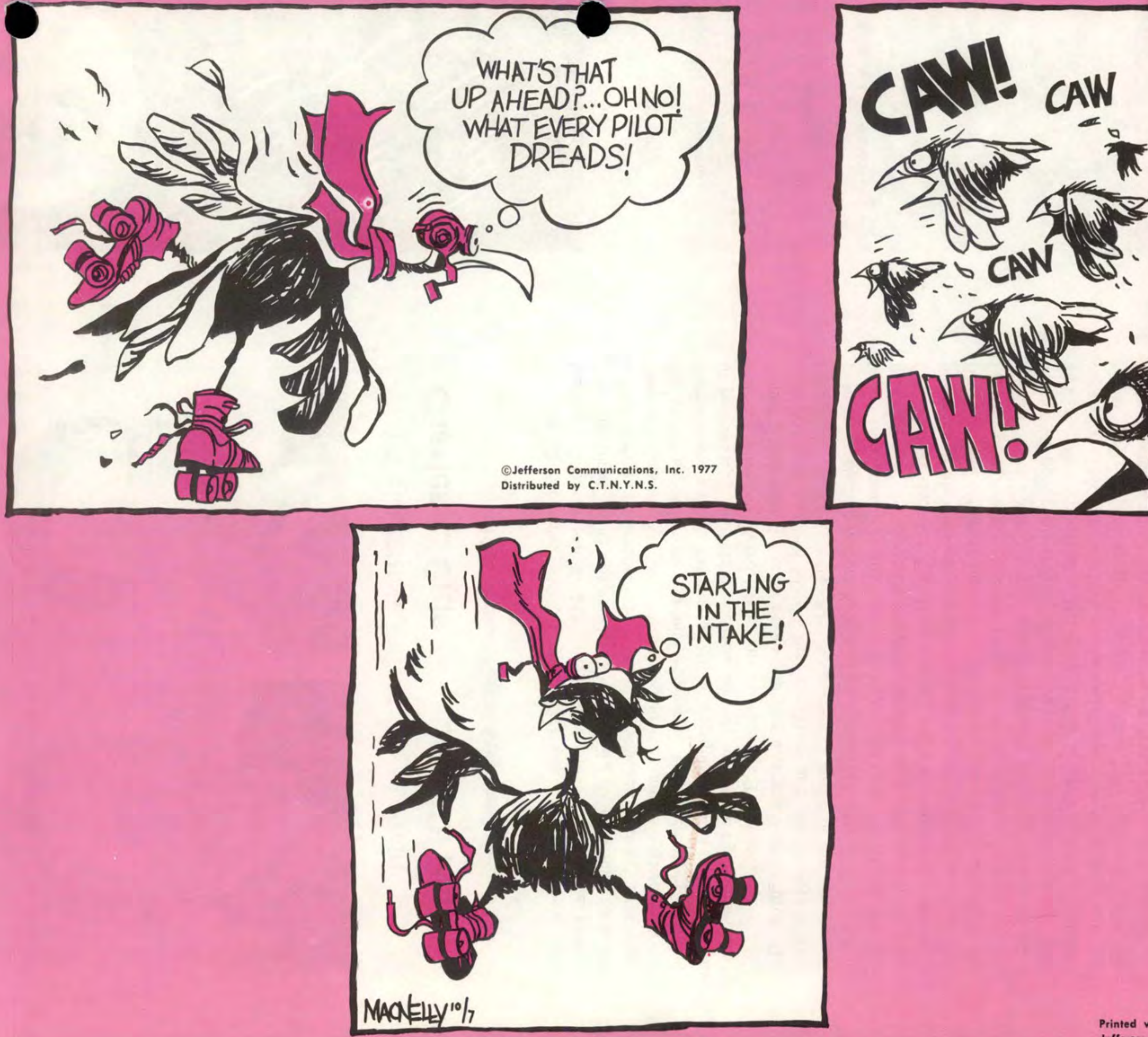
Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

FIRST LIEUTENANT
Charles L. Ogle

CAPTAIN
John D. Parr

492d Tactical Fighter Squadron

On 12 September 1977, Captain Parr and Lieutenant Ogle were leading a flight of two F-111F aircraft performing low altitude, terrain following flight. At approximately 500 feet AGL, the crew felt and heard a loud explosion accompanied by an abrupt yaw and pitch-up. Automatic Terrain Following was terminated and counter controls applied to arrest the uncommanded maneuver and recover to controlled flight. Captain Parr initiated a climb, turning toward an unpopulated area in anticipation of possible ejection. Within seconds, the left engine fire light illuminated directing attention to the left engine instruments. These indications confirmed a fire, and the crew began applying emergency procedures. The explosion had been so violent that checklists and debris were strewn throughout the cockpit. The left throttle was jammed in full afterburner position precluding normal bold face procedures. Captain Parr and Lieutenant Ogle decided to shut down the engine with the fire pushbutton and then activated the agent discharge in an attempt to extinguish the fire. Captain Parr declared Mayday on guard while simultaneously directing the rejoin of his wingman and turning to the nearest suitable airfield. The fire continued for approximately 2 minutes and was confirmed by Hid 14, his wingman. Additionally, Hid 14 reported a 5-by-8 foot hole on the left aft side of the aircraft with a large charred area streaming behind it. After accomplishing a controllability check, the crew prepared for landing. The lack of spoiler brakes due to the stuck throttle severely hampered stopping capability. This problem was compounded by a short runway and the higher single engine approach speed. Captain Parr executed a flawless single engine landing. The timely and decisive actions of Captain Parr and Lieutenant Ogle during an extremely critical inflight emergency prevented possible injury or loss of life and resulted in the safe recovery of a valuable aircraft. WELL DONE! ★


WHAT'S THAT UP AHEAD?...OH NO! WHAT EVERY PILOT DREADS!
CAW!
CAW
CAW
CAW!
STARLING IN THE INTAKE!
MACNELLY 10/7