UNITED STATES AIR FORCE • OCTOBER 1969

Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT

WINTER TIPS

BRRR...IT'S COLD

LIFE SUPPORT

THOSE MISCHIEVOUS MISSES

FOR F-4's

AURAL ALPHA

Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT

October 1969 AFRP 62-1 Volume 25 Number 10

SPECIAL FEATURES

REGULAR FEATURES

Lt Gen. S. W. Wells • Inspector General, USAF
Maj Gen Edward M. Nichols, Jr • Deputy Inspector General for Inspection and Safety, USAF
Brig Gen B. H. King • Director of Aerospace Safety
Col William J. Murphy, Jr. • Chief, Flight Safety Division
Col Willis H. Wood • Chief, Ground Safety Division
Col Ray W. Whipple • Chief, Missile and Space Safety Division
Col Samuel O. Smelsey • Chief, Life Sciences Group
Mr. Richard F. Gerwig • Chief, Reporting and Documents Group
Col Howard S. Davis • Chief, Systems Safety Engineering Group

Chief, Safety Education Group • Col James A. Talbot
Editor • Maj John D. Shacklock
Managing Editor • Robert W. Harrison
Art Editor • David Baer
Staff Illustrator • A1C James W. Douty
Staff Photographer • SSgt Dale F. Robinson

SUBSCRIPTION—AEROSPACE SAFETY is available on subscription for $3.50 per year domestic; $4.50 foreign; 30c per copy, through the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Changes in subscription mailings should be sent to the above address. No back copies of the magazine can be furnished. Use of funds for printing this publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. Facts, testimony and conclusions of aircraft accidents printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in accident stories are fictitious. No payment can be made for manuscripts submitted for publication in the Aerospace Safety Magazine. Contributions are welcome as are comments and criticism. Address all correspondence to the Editor, Aerospace Safety Magazine, Deputy Inspector General for Inspection and Safety, USAF, Norton Air Force Base, California 92409. The Editor reserves the right to make any editorial change in manuscripts which he believes will improve the material without altering the intended meaning. Air Force organizations may reprint articles from AEROSPACE SAFETY without further authorization. Prior to reprinting by non-Air Force organizations, it is requested that the Editor be queried, advising the intended use of material. Such action will insure complete accuracy of material, amended in light of most recent developments. The contents of this magazine are informative and should not be construed as regulations, technical orders or directives unless so stated.

By now winter preparation should be complete: contingency plans in order, snow removal equipment in first class mechanical shape, alternate routes established, markers installed, etc. Aircrews, too, must be ready for winter, even those stationed in warm climates. To help get you in the mood, a few reminders for aircrews are presented in "Br-r-r, It's Cold Outside," beginning on page 1. It's followed by some info on how aircraft ice protection systems are tested, page 4, "Reckoning With Ice."

In case you didn't know, winter does not automatically mean an increase in aircraft accidents. Apparently our aircrews, maintenance and civil engineering people do a good job despite the discomforts and problems cold weather, ice and snow bring. We checked out the major aircraft accident rates for five years and couldn't find any evidence that the rate goes up during winter.

To get on to another subject, how about taking a few minutes to get acquainted with some "Mischievous Misses?" In fact, that's the name of the article beginning on page 10. These misses are the trouble-making kind and you ought to know them. The article deals with mis-conceptions, mis-understandings, etc., about life support equipment, i.e., ejection systems and associated equipment.

For a real thriller see "Wild Ride in a Big Bird," page 18. This crew can truly say they've "seen the elephant," and can do without another such encounter. ★

Brrrr... IT'S COLD OUTSIDE

Most Air Force pilots have been exposed to the effects of cold weather and winter conditions on aircraft operations. If you spent last winter in the cold climes you're probably up to speed on the nuances of winter flying. But if you're new to the game, or have had long tenure in the sunny south, or spent the past year sweating it out in SEA, a few pointers and reminders may prove valuable.

First, obviously, you've got to get into the mood. If the mercury is at the bottom of the scale and a blizzard is blowing across the base, this is no problem. But a lot of crews take off in the land of palm trees with a frigid destination. This makes getting in the mood a bit more difficult. Those thermal boots and bulky clothes may be a nuisance, but you know their value. Heaters have been known to fail, it's no fun doing a walkaround on an icy ramp in Palm Beach apparel, and there's always the possibility of an inflight emergency requiring egress. Unfortunately, there are many who had to learn these things the hard way.

Once you're in the mood you are ready for the next step—flight planning. This is a little more crucial during bad winter weather. Alternates assume greater importance, as does your route—ice, winds, etc. Listen closely to what the weatherman has to say about your destination forecast and don't forget the NOTAMs. You don't want any nasty surprises like bare minimums, an RCR that you can count on your fingers and a barrier out of service. This is when the domino principle seems to operate. Throw in a bird just sick enough to require landing and the dominoes seem to be clicking away like a berserk fuel counter.

So now you're in the mood, you fully grasp and appreciate the special hazards of winter weather, and your flight planning has been thorough and complete. Now, out to the cold-soaked airplane. Being human, your body operates best within a rather narrow temperature range. And, friend, it's cold outside. Don't let this cause you to skimp on the walkaround. A loose panel, a leak you missed, a bad tire — the list could get pretty long — and this could turn into a nasty adventure. Check the pitot head, fuel vents, static ports and actuators for ice, and make sure the wings and control surfaces are free of ice, snow and frost.

A tip to the inexperienced: wear gloves. The frigid skin of that bird can peel the skin off nice soft, warm fingers. Now you strap in and make sure all life support equipment is in

place, hooked up, turned on, adjusted, etc. This will assure that if anything does go wrong you'll have an optimum chance of getting out safely and surviving once you're on the ground.

Taxiing may be one of your most tedious chores. Ice is the big problem but it has some help. At night you may not be able to see icy patches, or they may be covered with loose snow. If the sun is shining brightly, the glare may almost blind you. The password is *slow*.

Allow plenty of clearance for your wings, especially at night. A snow pile can tear up a wing tip. Approach turns slowly and go easy on the power—just enough to get you through the turn. Remember, on ice nosewheel steering may not be too effective. If other aircraft are parked nearby or following you, keep them in mind. A blast of power can throw chunks of ice and snow, loose mud and gravel on your friends. Also jet blast may melt snow and deposit it on another aircraft where it can freeze solidly. Keep your distance behind aircraft ahead—so that you can stop in time, in case it's necessary.

Takeoff, assuming the runway is in fairly decent condition, shouldn't be much of a problem. In fact, you'll have a plus going for you: more thrust—shorter roll. However, if the surface is slushy or there are ice patches, things can be a bit sticky. Nosewheel steering may be slow and slush may retard acceleration. Unless the surface is clean and dry, leave the gear down longer than usual to blow off snow or slush, and, on some aircraft, you might cycle the gear and flaps a couple of times.

What we've covered so far applies generally to both jets and recips. Once airborne, however, your situation will depend somewhat on the equipment you're flying. Through clouds best climb speed applies to both jets and recips. But a jet may soon be on top of the weather, whereas a recip may have to plow through the clouds. Be prepared to go on instruments as soon as you are airborne. Now your flight planning, based on the weather, pays off. You will avoid icing conditions, especially in strong frontal systems. Winds and the freezing level can change rapidly, so keep in touch with METRO — those WX types are your friends.

Chances are you're flying a jet, in which case you probably are cruising in crystal clear skies above the weather. But not necessarily, so talk to METRO to find out what's ahead and give PIREPs to help the other guy. Wind shear and turbulence may be your biggest problems, although ice is a possibility, especially during descent. Until recently we had quite a problem with inlet icing, especially when aircraft were descending. Ice formed and broke up either from heat application or warming during descent and flew back into the engine with drastic results. The time for inlet heating is *before* the ice forms, not after you have a good load. So turn on the anti-ice, defroster and pitot heat before penetrating the weather on descent.

Prior to starting your approach you will need to know several things: The DH and MDA for the runway, current weather and what to expect during your approach, and, of course, the RCR. The same goes for your alternate. If you planned properly you will have fuel for a missed approach and going to your alternate. Your approach normally will be about the same as at any other time, unless you're carrying some ice, in which case you'll want a little extra speed. But extra speed must be dissipated on the runway, which is another problem if the RCR is low, so don't increase speed unless it's necessary. In some locations wind is a winter problem which may affect your landing. A crosswind and a slippery runway is a dangerous combination. One of the problems that is aggravated by a crosswind but applies to any landing on an icy runway is that the runway may be only partially cleared. You could encounter a situation where the RCR down the middle is excellent but on the sides the runway is like a skating rink. Get over there and that's exactly what you'll do —skate.

If there has been a lot of recent snow, the overrun may be covered. Add to this a flat, snow-covered area, possibly glare off a wet or icy runway and finding the ground at the right time and place may be difficult.

History records a lot of aircraft that have landed short, long, or on the side because the pilots' percep-

Warm clothing, headgear and good gloves put you more in the mood for thorough walk-around and preflight... mighty important to you when it's cold and blowing.

tion was affected by snow and glare.

Taxiing may be a real headache. Say the center of the runway is pretty clear with an RCR of 18. Off to the sides it may be 05 or 06. As you roll down the center—no sweat. Then you try to turn off and you get onto the slick stuff. Your nosewheel is turned left but the airplane continues straight ahead. You put on the brakes and the bird just seems to go faster. Throw in a pile of snow from runway and taxiway clearing and you can imagine the rest.

A pilot's natural inclination is to clear the runway as expeditiously and as safely as possible. The fastest way may be to bring the aircraft to a complete stop before trying to turn off. When you get on the taxiway you may find it so slick that the only sensible thing to do is shut down and have the bird towed to the ramp. If this is the case, don't try to be the good guy. Better to roust out the guys with a tractor than wind up off the runway, in which case the tow crew will have to come out anyway to get your bent airplane.

Obviously this material has not been all inclusive and what has been said may be redundant to the old heads. Winter brings its own particular problems, but probably is no more dangerous than the other seasons. Just keep in mind the few things that are peculiar to cold weather operations, know your bird and the info on cold weather in the Dash One. And don't forget your booties. ★

Snow on the runway—obscures visibility, defeats braking, compounds steering, covers markings, hides the turnoffs. Beware!

RECKONING WITH ICE...

Paul W. J. Schumacher, ASD, Wright-Patterson AFB, OH

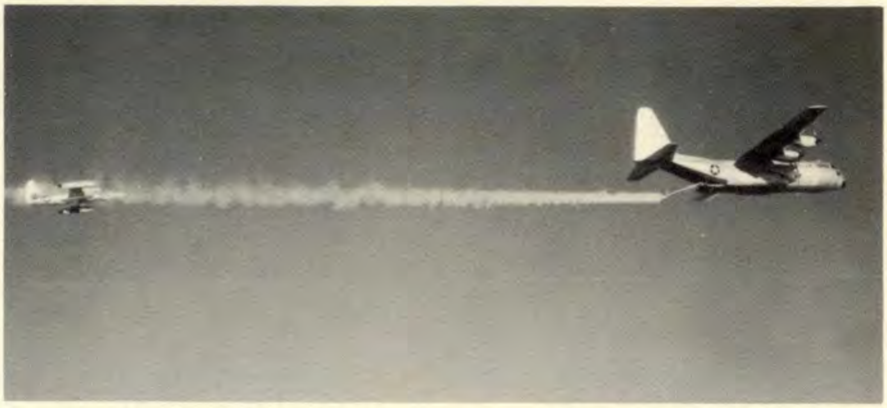
All modern Air Force aircraft have ice protection systems. Some are rather simple, others more elaborate. Perhaps you've wondered how the systems on your aircraft were tested and evaluated and by whom. The following is presented to answer these questions.

Air Weather Service Manual 105-39 sums up the dangers of aircraft icing by stating that "Aircraft icing is one of the major weather hazards to aviation. Ice on the aircraft decreases lift, increases drag and stall speed, spoils visibility for the flight crew and may produce false flight instrument indications. In addition, an accumulation on exterior movable surfaces may affect the control of the aircraft. In the past, airframe icing was a hazard mainly because it tended to cause difficulty in maintaining altitude. Today, although most aircraft have sufficient power to fly with a heavy load of ice, airframe icing is still a serious problem because it results in greatly increased fuel consumption and decreased range. Further, the possibility always exists that engine-system icing may result in loss of power."

The inflight icing situations that are of primary operational importance to aviators are:

- Icing on the engine inlet lip and engine duct surface, the ingestion of which seriously affects engine performance.
- Icing on the airframe and air data sensors causing problems with aircraft control and response, and producing false flight data.
- Severe fogging, frosting and icing of the windscreen critically affecting visibility.

Civil and military organizations in the business of flight testing ice protection systems and devices use icing envelopes in Federal Air Regulation Part 25, and various design and MIL Specifications in which meteorological conditions conducive to icing are spelled out. Consequently the flight test engineer who designs the test and evaluation program uses some relationship of cloud water content, temperature, distribution of water droplet size, rate-of-buildup of ice and time to satisfy a predetermined requirement or a specification.



Special water - tanker C-130 creates artificial icing cloud during low - speed tests evaluating aircraft and engine anti - ice systems.

TEST TECHNIQUE

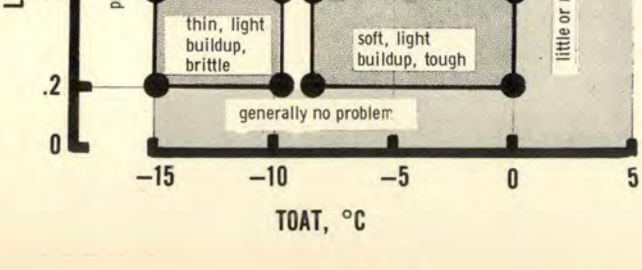
Both natural icing clouds (stratiform and cumuliform clouds with supercooled water droplets) and artificially produced icing clouds (usually water spray tankers and wind-tunnels) are used extensively to evaluate aircraft and engine ice protection systems.

The Aeronautical Systems Division of AFSC at Wright-Patterson AFB, Ohio, has two spray tanker facilities. The one most widely used for high-speed (150 to 300 KIAS) work is a KC-135 water-carrying tanker. The other is a palletized rig which can be on-loaded and off-loaded in a few hours into any standard C-130 aircraft for low-speed (90 to 180 KIAS) work. Engine-bleed air is used to atomize the water into small droplets as it leaves the little spray nozzles. The hot air also prevents that water in the spray rig from freezing solid when exceedingly low water flow rates are required or anytime the water is shut off. With the present pneumatic atomizing spray rig, adequate control is maintained over the flow,

Palletized rig, easily loaded in any C-130, uses engine bleed air to atomize water as it leaves nozzles, controls flow and volume.

both in rate and volume, of air and water to produce a consistent icing cloud having an average water content of any chosen value between 0 and about 1.75 grams of liquid water per cubic meter of saturated air.

For your aircraft, operating characteristics and limitations are determined by subjecting a product (windshield, air data sensors, engine inlet, wing leading edge) to both short and long periods of exposure in conditions described in the chart below. Practical methods for using tanker aircraft to simulate all types of ice conditions are continuously being investigated and improved.

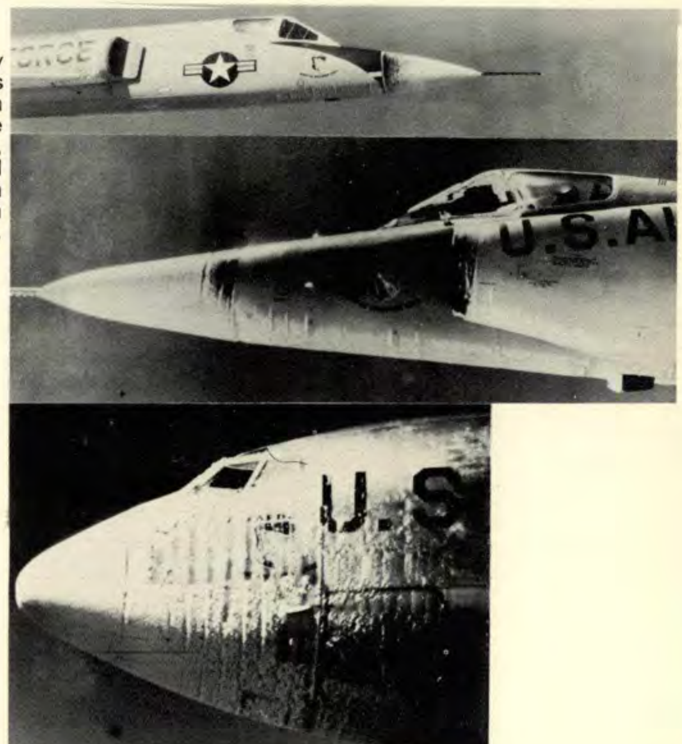


NATURAL ICING OR TANKER ICING

Tests conducted in natural clouds are better than those conducted in tanker-produced clouds, but natural icing tests are expensive and natural ice is hard to find when one needs it. Primarily, the frequency of encountering icing in the presence of clouds is quite low, generally ranging somewhere between 10 and 30 per cent. For example, about 10 hours of flying in natural clouds are expended for each hour of icing data. On the other hand, the three outstanding, positive factors in favor of tanker icing are: (1) the test aircraft can be moved a few feet laterally or downward and be in perfectly safe VFR conditions, either above the home airport or a designated test/restricted area, (2) each hour of flying yields about 45 minutes of test data, (3) testing can be terminated after only a few seconds of exposure, or in the other extreme, extended well over an hour. Photos here show extremely heavy icing that was used to test the limits of protection on some windscreens, engine inlets and air data sensors. No physical damage was done to the aircraft or engines during these tests.

Icing is rooted in some of those clouds around you and some day you will encounter a batch of it. Special instructions for reckoning with icing have been issued in the flight manuals for all aircraft and helicopters on which USAF Category II All Weather Tests and ordinary icing tests have been conducted. If you haven't read that part of your Dash One recently, with winter coming now would be a good time. ★

Extremely heavy icing tested limits of protection on some windscreens, engine inlets and air data sensors in complete safety.



Tests covered varying degrees of exposure, temperatures, and water content to determine operating limitations.

Keeping Fit Overseas

Lt Col Robert H. Bonner, USAF, MC
Directorate of Aerospace Safety

The Air Force mission sometimes requires aircrews and support personnel to be physically uprooted from one geographic area to another, perhaps halfway around the globe. When this happens there are certain adjustments that our bodies have to make. For example, our sleep cycle, which the scientists call circadian rhythm, is disturbed. All this really means is that there is a diurnal variation in the physiological processes of our bodies. When we sleep our respiration, pulse, and metabolic rates reduce their activities. When we are transported to a place where the work day comes at a time when we are used to sleeping, the physiological processes don't get the word and they slow down even though we are not asleep. Therefore, even though we are awake and may have had a good night's sleep (when we normally would have been awake), the decreased physiological functions make us less alert, less tolerant to prolonged work, and decrease our capability for making decisions.

Our G. I. tract, that is, our stomach and intestines, also goes through an adjustment. Being exposed to different food and different water can upset it and the result can be nausea, diarrhea, and stomach cramps.

Another adjustment has to be made to the various infectious bugs that are found in a new area. Man, when he goes from one area to another, can be called an "immunologic virgin." This means that, having never been exposed to certain diseases, he has no defense mechanism against them. Consequently, an epidemic of colds and flu-like illnesses not found in the local civilian population can occur in a squadron or wing when they have recently moved.

Depending on the destination of a deployment, additional local problems can exist; for example, sanitation. In most areas now considered trouble spots, particularly in the Far East, food and water sanitation at best are non-existent in the average civilian community. Eating food or drinking water from non-approved sources can cause all sorts of serious illnesses in the displaced aircrew member, where no problem exists in the local community. Local diseases which are peculiar to the area, such as intestinal worm infestation can be a problem, if the aircrew member is not aware of how he can catch the disease.

Animal life in a local area can create problems for the off-duty aircrew member. Knowledge of poisonous snakes and their habits can certainly reduce injuries and even deaths.

There are some general rules which, if followed, can provide reasonable protection to any individual anywhere in the world and make his transition to a foreign environment much more comfortable. Here are some suggestions.

• Avoid tap water unless it is from a USAF approved source. Most hotels and restaurants provide drinking water in bottles since they realize that tap water is contaminated. Don't brush your teeth with tap water. If the water is contaminated, then the same contamination will enter your mouth while brushing your teeth, and swallowing some of these contaminants is unavoidable. It is always a little disconcerting to treat an aircrew member for typhoid fever or dysentery and see the look of amazement on his face when you tell him he shouldn't have brushed his teeth in that water, even though he hadn't drunk it.

• Avoid uncooked food unless it can be peeled. Many areas of the world use "night soil" (human excrement) for fertilizing. This provides an excellent opportunity for the spread of diseases. Adequate cooking or peeling will eliminate this problem.

• Avoid fatty foods for the first week or two. Since your stomach and intestines are already being challenged by strange water and strange food, fatty food merely increases the strain placed on your G. I. tract. Fatty foods are hard to digest and alone can cause stomach cramps, flatulence, and diarrhea.

• Do not swim in unapproved areas. In Africa, the Middle East, Near East, and Far East many diseases are contracted through swimming, even though no water is swallowed.

• Patronize only approved bars. These bars use safe drinking water, both for mixes and for their ice cubes. The mere fact that a Martini contains alcohol doesn't guarantee that the bugs frozen in the ice cubes will be killed, and many unhappy souls have learned that they can become quite uncomfortable as a result of contaminated ice. Also, for the first week or two, drink sparingly. Alcohol is also an irritant to the intestines and can cause diarrhea.

• Allow one week for your sleep cycle to adjust to the new area. During this week, reduce your activities. Rest more than you are used to; go to bed perhaps a little earlier; don't party as hard during your free time.

• Take proper clothing, both military and civilian, for the area that you are entering. It was amazing to see the number of individuals who brought no winter civilian clothes when deployed to Korea during the winter.

• Before a deployment, ask your squadron flight surgeon to give your aircrew members a complete briefing on the specifics of the local conditions that you will find.

If the above simple precautions are taken, transition to a foreign environment can be easy, comfortable, and profitable since you will be able to more efficiently perform your aircrew duties and can better enjoy your off-duty time. ★

the I.P.I.S. approach

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

The teardrop penetration turn has been the subject of several recent questions. These questions are usually generated by inadequately designed and depicted teardrop penetrations similar to the examples shown in Figures 1 and 2 which were extracted from FLIP terminal instrument approach charts.

FIG. 1. SOUTHEAST AFB. VOR/ILS 2 RWY (PROFILE VIEW)

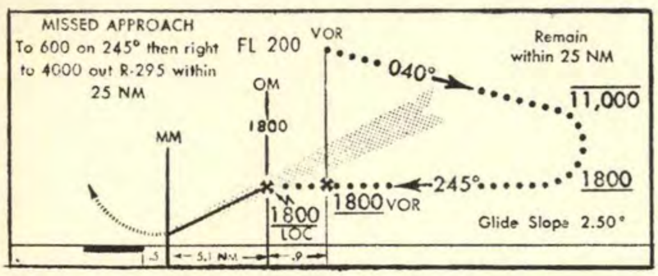
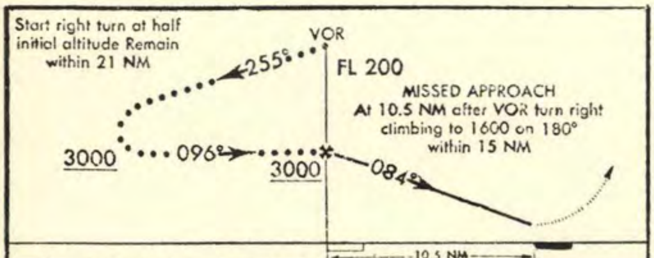


FIG. 2. SOUTHEAST NAS. VOR RWY 9 (PROFILE VIEW)



In a teardrop penetration, the designed flight track depends upon the altitude to be lost in the penetration and the point at which the descent is started. Half the total altitude or 5000 feet, whichever is greater, should be lost prior to commencing the turn. Figure 3 is a Penetration Turn Distance/Divergence table extracted from JAFM 55-9, *Terminal Instrument Approach Procedures (TERPs)*. The Course Divergence column in the table is the specified angular difference between the outbound and inbound penetration course. The Total Flight Track Distance column indicates the maximum distance the designed flight track, during the penetration turn, is from the IAF.

In Figure 1 the penetration turn should be started *at* 11,000 feet; in Figure 2 *at* 11,500 feet. The turn, as depicted in Figure 1, could be delayed until the aircraft is at 1800 feet which would cause the aircraft to exceed the obstacle clear penetration area. In Figure 2, the pilot must read the note in the top left corner and then compute the penetration turn altitude. The notes "remain within 25 and 21 miles" are completely worthless and unnecessary. It is impossible for a pilot to determine groundspeed accurately during a penetration, and there is no other means for the pilot to determine range from a VOR or ADF station. The penetration is *supposed* to be designed and depicted

FIG. 3. PENETRATION TURN DISTANCE/DIVERGENCE

Altitude to be Lost Prior to Commencing Turn	Distance Turn Commences (NM)	Course Divergence (Degrees)	Total Flight Track Distance (NM)
12,000	24	18	28
11,000	23	19	27
10,000	22	20	26
9,000*	21	21	25
8,000	20	22	24
7,000	19	23	23
6,000	18	24	22
5,000	17	25	21
5,000	16	26	20

*Standard. Assumes a 20,000 ft MSL initial penetration altitude. Should be used whenever circumstances permit.

in such a manner that the altitude lost prior to starting the turn controls the flight track distance. If this is done, an aircraft will not exceed the obstacle clear flight track distance provided by the penetration area. In addition to the Total Flight Track Distance specified in column 4, the penetration area extends an additional six miles beyond the designed flight track. The Total Flight Track Distance is usually the range used in the "remain within" note, however, Figure 2 uses the "Distance Turn Commences" value.

The Course Divergence value specified in the table will allow any aircraft, using 30 degrees of bank during the penetration turn, to roll out very nearly on the inbound course. For some reason, the divergence used in the penetration shown in Figure 1 is 25 degrees instead of 21 degrees as specified in the table.

The penetrations in Figures 1 and 2, in the interest of simplicity, readability, and flight safety, should be depicted as shown in Figures 4 and 5. If your base has some oddball-designed procedure, why not take action to have it corrected and save an accident investigation team the trouble.

PROPERLY DEPICTED PENETRATIONS

FIG. 4

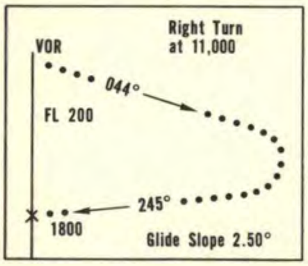
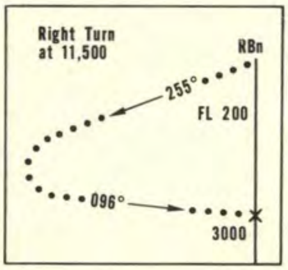


FIG. 5



PROCEDURE OR PENETRATION TURN

The need to emphasize the difference between *procedure turns* and *penetration turns* has been identified from correspondence received concerning the first question in the February 1969 "IPIS Approach" article. The answer stated that on terminal instrument approach procedures converted to TERPs, a note in the profile view would read "Remain within (distance) miles." This note is used in conjunction with *procedure turns* as stated in the article, and not with *penetration turns* as was interpreted by some readers. The note used in the profile view of high altitude terminal charts in conjunction with teardrop type penetration turns should state the direction of turn. ★

Airmiss

The three fighters, under radar control, were flying loose formation at FL 260 about 500 yards apart. Weather was clear, visibility unlimited. The radar controller spotted conflicting traffic crossing right to left at 40 miles, above the fighters and descending. At 13 miles he instructed the fighters to turn right 30 degrees to avoid the traffic, but gremlins had taken over the formation. Lead was troubled with heavy static in his earphones—so bad that he couldn't hear any transmissions. Two's radio became intermittent and he couldn't understand the instructions being passed. Three (as often happens when gremlins start meddling) knew only too well what was going on, and was frantically trying to do something about it. He tried to relay the turn instructions, but was foiled by Two's intermittent radio and interrupted by Lead who occasionally transmitted in the blind, trying to regain contact with the world. He started to move in, signal his intention, and take over lead of the formation.

Meanwhile, the airliner was getting closer and closer on a collision course. Three was becoming desperate. How do you quickly attract the attention of the others when you're all about 500 yards apart?

At three miles Three spotted the 707—it was on a collision course!

At 3000 feet, Two spotted it and, as the blips merged, the controller heard the call "Break up!" His heart must have stopped.

Two and Three pulled up and right to avoid the 707. Lead didn't see it until it passed barely 100 feet below him. The 707 captain reported seeing the two aircraft pass close to his port side but did not see Lead pass close overhead.

Close call, hairy story, yes. But what can you do about it?

Keep the eyes peeled and head out of the cockpit in VFR conditions, particularly when you're distracted by radio trouble. And don't delay in passing the lead to someone with a good radio. It's easier on wingmen and controllers.

(Adapted from UK Flight Safety Focus) ★

MISCHIEVOUS MISSES

IN LIFE SUPPORT

Robert H. Shannon
Life Support Systems Specialist
Directorate of Aerospace Safety

Step up, gentlemen, and meet the not-so-lovely "Mischievous Misses." Perhaps you have already had the misfortune; most people have. If you haven't been formally introduced, chances are you have been influenced by them at one time or another. They respect no sanctuary; they are usually present at "fly safe" meetings and bull sessions at the bar; they even invite themselves to your outdoor cookouts when you're entertaining friends; and worst of all, they sometimes accompany you while flying.

Who are these mischievous misses? Let's meet them one at a time: First is "Miss Understanding." She is a typical miss—unattentive, talks when she should be listening, doesn't have all the facts. As a result, she is responsible for many false impressions that can lead intelligent men astray.

Next is "Miss Conception." There is no end to her ability to miscalculate. She just doesn't bother to get the facts straight before she goes off on a tangent.

Another little beauty is "Miss Representation." She exaggerates, distorts, and falsifies. Why? Because she will not take the time to correlate a single happening with the big picture. She is off and running at the first indication of an undesirable incident and before you know it that single occurrence is soon blown completely out of proportion.

"Miss Interpretation" is just about as bad. She fails to comprehend, but this doesn't bother her. Her only concern is to be able to spread the word, regardless of how it may be misconstrued.

And finally, the most devious miss of all, "Miss Information." This poor misguided, misdirected bundle of deceit can pervert a truth without batting an eye. She and her followers truly personify the blind leading the blind. She just will not take the time to become informed.

These mischievous misses have no place in an operational environment, or any other, yet they are ever present, doing their bit to confuse the issue. They are particularly active when new life support equipment or procedures are introduced to the field. The resulting effect on the flying population is a matter of great concern. Their devious actions have severely compromised aircrew confidence in new and improved life support equipment/systems, especially when it appears that there is initial lack of success.

Let's look at some classic examples: During the early 1960s, many aircraft ejection seats were equipped with rocket catapults. This was considered to be a great step forward in overcoming the critical problem of escape at low altitude, low airspeed, and high sink rate. The added boost of rocket motors seemed the only hope for gaining more time for completion of the ejection sequence.

It was extremely disconcerting, therefore, to find that the initial success of rocket-equipped seats was less than that of ballistic-powered seats. This was in spite of the fact that rocket seats had all of the improvements that had been incorporated in ballistic seats over the years and should have had an even better success rate. Analysis showed that the seemingly bad record of the rocket seat was a statistical illusion. It is hardly likely that a system will work better under any given set of conditions and still have a worse performance record. In the case of rocket versus ballistic systems, both have very good success with over 500 feet of terrain clearance and both have relatively poor success with less than 500 feet. The rocket system works better than the ballistic system both below and above 500 feet, but is used far more frequently below 500 feet than is the ballistic system. When rocket seats were first installed, overconfidence in the new system caused some pilots to delay ejection to the point where successful escape was beyond the system's capability. Thus, even today, the same number of ejections with each system may result in more fatalities with the rocket system because of its greater usage at low level. For example, during a recent period studied, 25.5 per cent of all rocket ejections were initiated at 500 feet and below as compared to 14.4 per cent for ballistic ejections. However, 59 per cent of the low level rocket ejections were successful, whereas ballistic

These Mischievous Misses have no place in an operational environment.

ejections below 500 feet were only 20 per cent successful.

Another example in which the mischievous misses work overtime concerns the zero delay lanyard. It seems that every time seat/man/chute interference occurs during ejection there is an immediate campaign to discontinue use of the zero lanyard. It is a fact that seat/man/chute interference is a critical problem and is receiving high priority attention at this time. It is also a fact that replacement of the zero lanyard, which was introduced as an interim measure some ten years ago, with a more desirable means of rapid and positive chute deployment is long overdue. All formal studies conducted on total USAF operational ejection experience have consistently demonstrated that the life saving potential of the zero delay lanyard more than offsets the role it may play in the incidence of seat/man/chute interference.

The zero lanyard is but one of many variables that contribute to seat/man/chute interference. In some systems it is more of a factor than in others. A study of F-100 ejection experience showed that the interference rate with the zero lanyard attached was identical to that with the lanyard not attached. There were three fatalities attributed to seat/man/chute interference; the lanyard was attached in one and not attached in two. The three fatalities represent 1.9 per cent of the total F-100 ejections studied. Conversely, the deficient low level capability of most aircraft systems is and always has been the largest single cause of death in USAF ejections. This is the major threat and anything that enhances the success of ejection in this area is not only desirable but a definite requirement. The zero lanyard provides an added margin for successful recovery.

In still another example, the effect of the mischievous misses was perhaps more damaging to crew confidence than it has been at any other time. This involved the recent update of the F-105 egress system, which included a rocket catapult, a force-deployed personnel parachute, and a seat drogue chute to prevent the seat from striking the man and/or chute. Unfortunately, there was some initial unfavorable experience: A large number of femoral fractures that occurred in SEA were allegedly attributed to the rocket catapult; a failure of the automatic function of the force-deployed chute occurred in which the pilot was fatally injured; there is some question concerning the attachment points of the seat retardation chute which may cause the seat to tip forward on separation, striking the pilot; and finally, the overall success rate with the rocket system is not as good as it was with the ballistic system.

With all of this, you can imagine the fertile ground in which the mischievous misses had to operate. An extensive analysis was made of all F-105 ejection experience to determine if there was a correlation between injuries sustained and the modifications to the escape system. The analysis was based on official combat and noncombat reports. It did not include rumors and hearsay generated by the mischievous misses. In general there was no indication that egress system modifications are contributing to injuries. Actually, when fatalities not attributed to the escape system, such as out of the low level envelope, drowned after water landing, etc., are excluded, the F-105 success rate is 92 per cent.

Specific areas of this study disclosed the following:

Femoral Fractures. There is absolutely no evidence to indicate that femoral fractures are occurring as a result of the seat impacting on the thighs at the moment of ejection. Analyses have consistently shown that while contusions to the thighs are probably due to this cause, the most probable causes of femoral fractures are (1) flailing due to ejection at higher speed in SEA, (2) seat/man/chute interference, and (3) parachute landing.

Force-Deployed Personnel Parachute. The force-deployed parachute has not contributed to injury on ejection. Conversely, it has been a probable factor in successful outcome of at least three ejections. The concern over the force - deployed

Miss Understanding

Miss Conception

Miss Representation

Miss Interpretation, and

Miss Information

chute apparently stems from a failure that occurred early in the program, which was fixed immediately. It was probably not a factor in the fatality since conditions of ejection were extremely marginal (pilot estimated to be in trajectory no more than four seconds) and, due to lap belt failure, he did not separate from the seat.

Positive, rapid, and predictable parachute deployment and inflation, as incorporated in the F-105, is a definite requirement to improved escape capability at the low end of the spectrum. The force-deployed chute *will* enhance this capability.

Seat Retardation Chute. Prior to its installation, two fatalities and four major injuries were attributed to seat/man/chute interference. Since installation of the seat retardation drogue, three F-105 combat ejection fatalities have been reported. Causes of death cannot be definitely determined. In one case, it appears that a free fall of 150 feet following a tree landing is a possible cause. In the other two, head and extremity injuries were present. It is possible that the head injuries could have resulted from a blow from the seat or other objects during ejection. This cannot be corroborated from available data sources. There is one documented case on record in which the ejection seat with retardation chute installed struck the occupant after separation. In this case the pilot held onto the seat until the retardation chute deployed and his arms were fully extended behind him. This undoubtedly was a contributing factor. The pilot was not seriously injured.

Success Rates. The question is often asked, "Why was the F-105 ejection seat modified in the first place?" The overall success rate prior to the modification program was quite impressive. It averaged about 90 per cent. The plain fact is —the system was updated to PROVIDE THE OPTIMUM capability in the area of the major threat, which is low altitude, adverse attitude, and high sink rate. This is and always has been the major cause of ejection fatalities.

The M-3 ballistic catapult formerly installed in the F-105 was no better than similar systems installed in other century series aircraft. Experience showed that proportionately few F-105 ballistic ejections were accomplished at the low end of the escape envelope. When they were attempted under these conditions, the results were usually the same as with any similar system—FATAL.

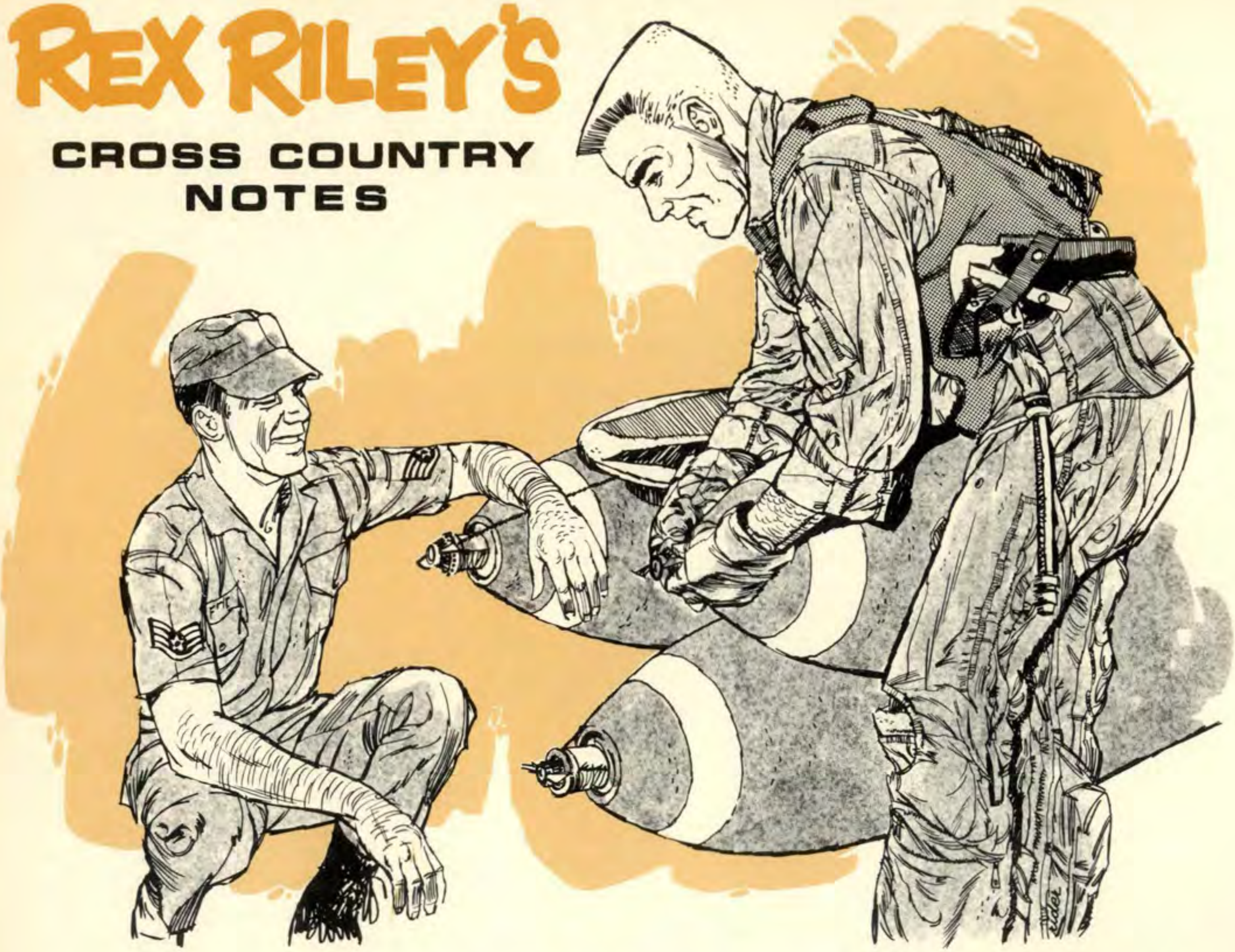
The present F-105 escape system is a good one—it definitely provides a vast improvement in the low level, adverse attitude, high sink capability. It *will* save lives in this area. Also, one of the major threats to within-the-envelope ejection, seat/man/chute interference, has been alleviated. Additional capability does not come without additional complexity. Consequently, unforeseen problems do arise. The treatment lies in the correction of the problem and not in the elimination of the system.

This then is the case against the mischievous misses. Do not forget them! Again, they are *Miss Understanding, Miss Conception, Miss Representation, Miss Interpretation,* and *Miss Information.* Don't allow yourself to become a pawn of these misses and thus a contributor to the general confusion and lack of crew confidence among our flying population. Get all of the facts. Just about all of the tales that are spread as the gospel can, if documented, be either refuted or corroborated.

Life support systems and procedures are not arbitrarily changed for the sake of change or at the whim of an individual or agency. Such changes come about only after a requirement has been determined by thorough documentation and analysis by the best heads in the business. Also, it is done with only one purpose — to provide USAF crewmembers with the best possible life support equipment available today. Most of the time these improvements come all too painfully slow and usually after a long, uphill struggle. ★

REX RILEY'S

CROSS COUNTRY NOTES



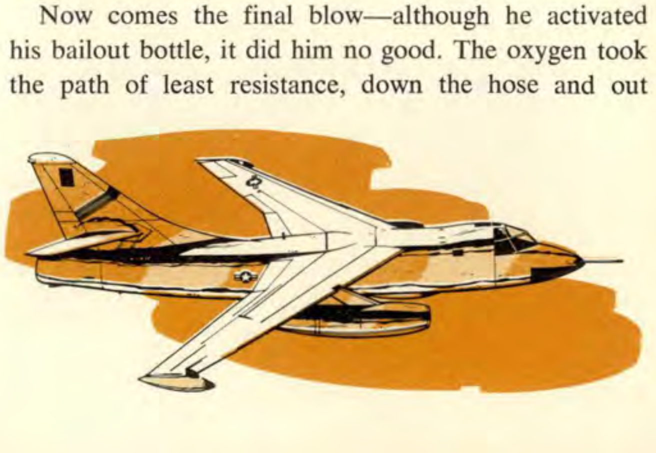
BAILOUT BOTTLE. The good old, faithful bailout bottle is something many of us have carried around for years, seldom if ever used, and pretty much taken for granted. Now comes a piece of information about it that made this pilot sit up and take notice, because I hadn't thought about it before. You may not have either—read on.

EB-66 pilot found his vision blurring about 20,000 feet in the climbout after takeoff, shortly after he switched to 100 per cent oxygen. He'd made oxygen checks during the climb and his pressure and blinker were okay. But now when he looked at the regulator panel, he found the blinker was not working. His immediate reaction was to pull the "green apple" on his bailout bottle. That should have corrected his vision and increasing hypoxia problem, but it didn't. As a matter of fact, he couldn't feel any pressure in his mask from the bailout bottle.

Still thinking clearly enough, he called his Nav to come forward with a walk-around bottle. After he descended to something below 16,000 feet his vision returned to normal.

Investigation after landing revealed that a pressurization duct had blown, causing loss of cabin pressure. Also, the pilot's oxygen hose had become disconnected at the quick disconnect on the floor beside his seat when he moved his seat back during the climb. (A short hose was responsible for this.)

Now comes the final blow—although he activated his bailout bottle, it did him no good. The oxygen took the path of least resistance, down the hose and out



through the quick disconnect. If he received any of it, he got precious little.

By now the lesson is obvious: when your blinker quits, consider that the hose may be open somewhere below your CRU-60P connector.

The fix? Easy! Disconnect the oxygen supply hose from your CRU-60P before you pull the green apple. That will allow the resistance valve in the connector to close, and your bailout bottle supply will go to you, instead of draining rapidly out on the cockpit floor.

SLICK SURFACES. With winter coming on it's safe to predict that a few birds will slide off runways and taxiways and some of these will wind up as major accidents. Slippery surfaces are a problem of long standing that no one has been able to solve to 100 per cent satisfaction, whether the surface is a highway or a runway.

What really got me started on this, though, were some figures from FAA tests involving slush on the runway. Here are the numbers: one-fourth inch of slush or three inches of snow equal a six per cent increase in takeoff distance; one-half inch slush or four inches snow—15 per cent increase; one inch slush or six inches snow—50 per cent increase; two inches slush or 10 inches snow—forget it.

So much for takeoff. How about landing on a slush covered runway? You've undoubtedly had some experience with hydroplaning on wet runways, and slush presents the same problem. Listen closely to the man when he gives you the runway condition and proceed accordingly. Remember that snow, ice, slush or water will lower the RCR and increase your landing roll, perhaps as much as 100 per cent or more.

A TRUE TALE. When I filed out of Far West AFB the other day, I selected the SID I'm familiar with, heading south toward home plate. Frequently, when I've listed a SID out of Far West, I've been given a radar vector clearance. But I don't mind—whichever makes the traffic flow smoothly. This time Clearance Delivery came through with the SID as I filed it. But when I called Ground for taxi instructions, they sent me back to Clearance Delivery for an amendment.

"Disregard departure instructions in previous clearance," they told me. "Turn right after takeoff to 210 degrees for radar vector."

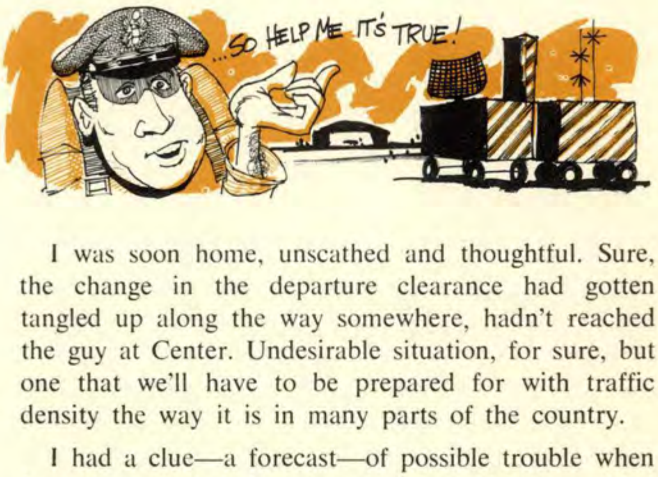
Well, that was okay with me. I read back the change and pressed on.

Established on the vector, I had the office pretty well squared away when Departure turned me over to West Coast Center. The Center controller acknowledged when I checked in, confirmed the altitude I was climbing to, and we each went routinely about our business.

Since I know the area pretty well, and what to expect on radar vector departures, I became a little concerned when the controller left me on the original vector a good bit longer than I thought he should. Of course, I was hesitant to question his judgment too early. He knew where the other traffic was—I didn't.

But after a few more minutes, I decided I'd better check. When I asked him how long he wanted me to hold 210, he acted quite surprised. A little indignant, you might say.

"Continue as cleared on Gronk One Departure," was all he said. Well, I saw what had happened right away, and after a little discussion we both started talking the same language.



I was soon home, unscathed and thoughtful. Sure, the change in the departure clearance had gotten tangled up along the way somewhere, hadn't reached the guy at Center. Undesirable situation, for sure, but one that we'll have to be prepared for with traffic density the way it is in many parts of the country.

I had a clue—a forecast—of possible trouble when I got the amended clearance. And I could have avoided a possibly painful situation with just a few words when I checked with Center. Like, "Center, this is Rex, on a radar vector of 210 out of Far West AFB, climbing to FL 350."

As a matter of fact, it would have been smart to use similar words on Departure Control, too. To this day I don't know whether *they* thought I was on the SID or an RV. ★

Warm Fog Dispersal . . . a different story

Capt Frank G. Coons, Aerospace Modification Div, AWS, Scott AFB, IL

We now have the capability to disperse cold fog. But progress in warm fog dispersal is a different story. As a follow-up to our July cold-fog article ("Fog Dispersal"), this article discusses progress in clearing warm fog from airport areas.

Practical techniques to dispel warm fog have eluded research efforts. Unfortunately about 90 per cent of fog-caused problems in flight operations occur at temperatures above 32°F (warm fog). The financial impact on military operations is known to be high. The Air Transport Association (ATA) has said that fog costs the nation's air carriers upwards of $80 million annually.

Category II and Category III landing systems are being developed in an effort to reduce the effect of fog on air operations. The multimillion dollar expense involved in equipping aircraft and airfields with these systems will limit their use to selected aircraft and high density air terminals. A substantial look into techniques of dispersing warm fog is warranted to see if this might not offer an additional option for solving the low visibility problem.

NO EASY WAY

Research aimed at useful techniques to attack warm fog has been underway for some time. While much has been learned about the physical composition of warm fogs, no efficient way has been found to create useful clearings. It does not appear that we will find anything to produce the dramatic clearings possible in cold fog. Warm fogs are just much more difficult to disperse.

Limited success has been achieved with "brute force" techniques. Several schemes have been tried, but not all are technically sound. Some show more promise than others. These include:

- Fans to force large quantities of fog through fine-meshed screens. Fog droplets are removed as they impact on the screens.
- Water drops sprayed into the fog. They collect fog droplets and improve visibility.
- Paddle wheels with fibers that "strain" the air of fog droplets.
- Carbon black released into fog to enhance solar heating, speeding up the natural dissipation process.
- Devices to electrically charge fog droplets, increasing collision efficiency, causing particles to grow to fallout size.
- Audio vibration causing drops to coalesce, fall out.
- Dry air from above mechanically mixed to lower relative humidity and induce evaporation.
- Heat which increases temperature a few degrees is sufficient to cause significant droplet evaporation.
- Hygroscopic agents, absorbing moisture, used to dry fog, either from aircraft or the ground. As they pass through the fog they absorb enough moisture to promote evaporation.

BUT IT CAN BE DONE

There are three techniques that show promise of operational use.

Mechanical Mixing. Some success has been demonstrated using this technique on shallow fogs overlayed by dry air. Dispersal is effected by flying a large helicopter slowly over the target area at fog-top level. It may take a number of passes in a small area to maintain a usable clearing.

Hygroscopic Seeding. One technique, used at Los Angeles International and Sacramento Metropolitan

Visibility prior to jet-engine test at Travis AFB.

Visibility five minutes after C-141 jets were advanced to military rated thrust.

airports last winter, dispenses dry hygroscopic particles from an aircraft several hundred feet above and upwind of the runways. This concept, which had good success in the laboratory has produced mixed results in the field. Best results have come from seeding with large amounts of dry, sized chemicals to compensate for fog movement. Similar attempts with ground-based apparatus and hygroscopic materials have not been fully successful. Much more testing is required before we may make a reasonable estimate of this method.

One objection to hygroscopic materials is that most are somewhat corrosive, particularly the most effective ones. An extensive search is underway to find hygroscopic agents for fog dispersal that are also non-corrosive.

Jet - engine Exhaust. The most proven method tested so far involves the use of heat. The British FIDO system during World War II resulted in a number of successful aircraft recoveries, but burning liquid fuels beside the runway has had very limited success since then.

The use of heat is scientifically sound and follows nature's own way. Jet engines provide a logical substitute for open flame burners. Using jet engines for fog dispersal was first suggested in the late 1950s by Air Force Cambridge Research Laboratories. Fairly extensive testing of the concept has continued in France since the early 1960s.

Three short tests by Air Weather Service in January 1968 further verified this concept. In these tests, four C-141s, parked 750 feet apart, were lined up on runway centerline at Travis AFB. Their engines were run at near maximum power for three separate periods of five minutes. Visibility increased from less than one-fourth mile in fog to above one-half mile during each of the test runs.

A French firm has designed an operational system based on this approach featuring eight jet engines set in underground casements. Engine exhaust exits through louvered openings that achieve maximum heat distribution and create minimum turbulence. Three engines are set in the approach zone and five are set along the runway, starting at the touchdown point. The Paris Airport Authority plans to contract for installation of one of these systems, costing over one million dollars, at an airport under construction just north of Paris.

EXPENSE VS UTILITY

Any technique or system employed to disperse warm fog is going to be expensive. One should, however, weigh the cost of developing fog-dispersal techniques against the expense involved in the development of sophisticated landing aids and the cost of diverting the giant cargo and passenger aircraft of tomorrow.

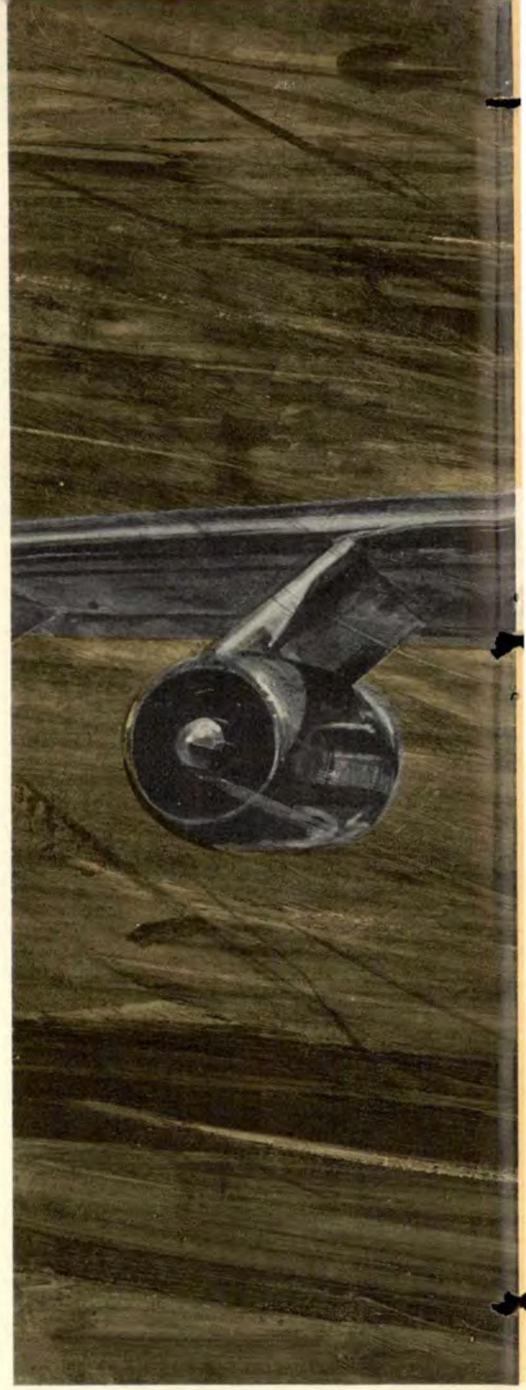
WHAT LIES AHEAD

It is unlikely that any major breakthroughs will take place in warm fog modification in the immediate future. Enough is known about its physical properties to rule out any spectacular surprises of this kind. Dramatic and powerful methods of clearing sufficient air space for tactical or close air support engagements are not immediately in the cards. But we can expect a steady increase in what is now a weak and doubtful ability to influence the natural occurrence of warm fog.

Initially, warm - fog modification may be available only at great cost in critical situations such as landing multimillion dollar aircraft safely and on schedule or for delivering troops and cargo in critical military operations. With time and experience, practical application of warm-fog dissipation should extend to more modest operations at less important sites. Savings in operating costs or the success of a critically important operation will in all probability be the determining factor. Increased safety and reliability will follow as a by-product. ★

Wild Ride in a Big Bird

Capt Charles L. Pocock, 62 Mil Alft Wg, McChord AFB, WA



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

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

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

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

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

pressed on, I knew that the typhoon moving north from the Philippines was going to cause problems until we were well north of Okinawa.

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

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

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

"Nothing."

Immediately the airplane was in a 60-degree bank. The attitude indicator showed 30 degrees nose up pitch. The vertical velocity indicator and altimeter were climbing and the airspeed was falling rapidly. I disconnected the autopilot, pushed forward on the yoke, and when the dot on the attitude indicator was approaching the horizon line, rolled the aircraft level. The throttles were at takeoff rated thrust and even though I had 10 degrees nose down pitch, the vertical velocity was still indicating an 8000 foot per minute rate of climb with 200 knots airspeed.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

AURAL ALPHA

Irv Burrows, Chief Experimental Test Pilot, McDonnell Douglas

The Royal Navy troops are shortly going to be flying their final approaches on audio! No, I'm not putting you on—the F-4K (XV586 and up and all others after UKAFC 23) will have a gadget installed which will provide aural angle-of-attack information. This is a feature which our British friends have used in other Navy aircraft. They're convinced of its value and after a few flights to check it, so are we.

The reason I'm bringing this up is that you AF gents will also hear something similar in your Phantoms soon. T.O. 1F-4-840 will install an aural tone generating system in your birds, primarily to aid in high angle of attack maneuvering.

I know, I know—you don't need another tone to decipher in the combat environment! I couldn't agree more. However, this can be a good usable tool in the *training* environment and it can be turned off if and when you don't want to listen.

ROYAL NAVY (F-4K) SYSTEM

Let me tell you briefly how the F-4K system will operate, and then we'll cover what you can expect in

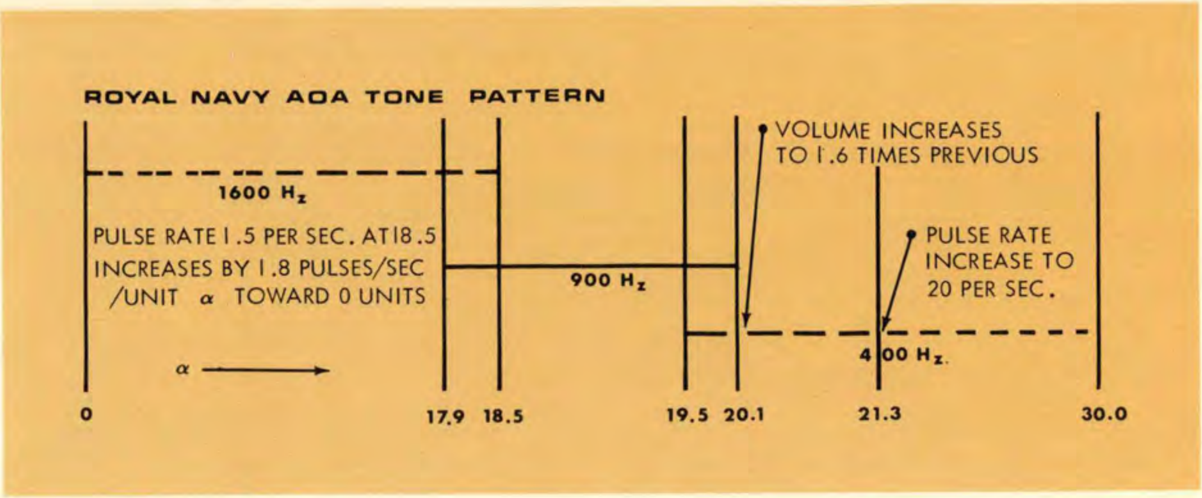


Figure 1.

Air Force aircraft. A picture here is worth a thousand words; check figure 1 above.

As you can see, the UK system consists of three different frequency tones, each of which presents specific patterns of interruption rate and volume. Now at first glance I'm sure you're saying to yourself that that's a ridiculous thing to have to memorize. True, it looks that way, but take it from a dumb pilot with a short memory—this becomes second nature very quickly and with very little effort. Let's hit the high points:

• On-speed is a solid 900 Hz tone.

• A tone of some sort is on whenever gear is down.

• Stall warning is indicated by a step change in interruption rate.

With that in mind a pilot can jump in the airplane, shoot a few approaches, and find that the whole scheme falls into place. The two primary points of interest, of course, are "on-speed" and stall warning. These come through loud (if you wish) and clear since the solid 900 Hz tone is readily recognizable and as soon as *α* strays outside the "on-speed" indexer limits, an overlapping tone is evident; and approach to stall (21.3 units, simultaneous with pedal shaker) produces a very noticeable change in pulse rate (of the signal not the pilot).

The philosophy here is clear—provide significant aural cues to show a trend of changing *α*, give a clear indication of "on-speed," increase volume as stall warning is approached so the guy who likes to keep the volume low will still hear it, and provide a stall warning that is obvious and grabs the driver's attention.

FROM LANDING TO MANEUVERING

By the time we had first seen this system, we were also getting "suggestions" that some sort of aid for high *α* maneuvering might be in order. This aural tone generator system (ATG), we reasoned, ought to be a quick and easy answer. We did feel that a few minor changes might further optimize the unit for USAF purposes, so we had a system modified and installed in one of our flight test "goats." A few flights convinced us that it did a good job and a couple AF representatives who looked at it here agreed. The net result is that effective with Block 39 and with retrofit to other aircraft, all Air Force F-4s will have this little gadget aboard.

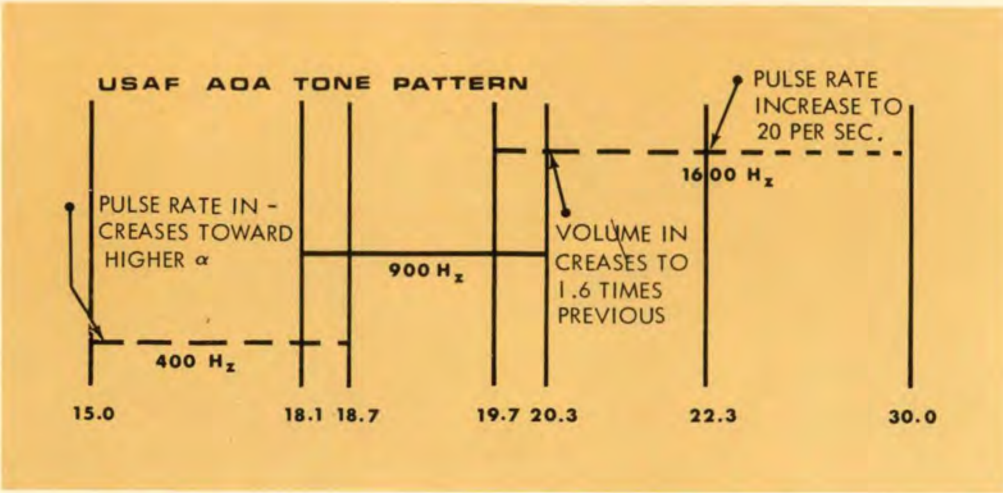


Figure 2.

Let's look at this edition, and once more I'll lay a picture on you; take a glance at figure 2 above.

We used many of the same numbers as in the F-4K system as to frequencies, pulse rates, etc., but flip-flopped them here and there. Our rationale was that:

1. A lower frequency (400 Hz) tends to denote a more passive environment, with increasing frequency (higher pitch) indicating higher and higher angle-of-attack.

2. Increasing interruption rates should be associated with increasing alphas.

Let's proceed through the cues:

• There is no tone until 15.0 units AOA. It seemed obvious that no one wanted to hear a tone unless he was in a reasonably high maneuvering condition or until he was getting serious about landing. Fifteen units looked like a good point to start and that's where you'll hear it *gear up or down.* The 400 Hz tone with low interruption rate simply tells you that you're at or past 15 units, which you will associate with light buffet in the clean maneuvering case. The increasing interruption rate tells you of increasing AOA, and when you hear a new tone on top of the 400 Hz you'll know you're approaching 18.7 units. I don't think you even need to try to remember the *α* switch points—the important thing is to understand the relationship between aural cues and aircraft handling, and that will come to you very quickly. O.K.—as you begin to hear the clear solid tone, you'll know you're in what's generally considered to be the optimum maneuvering or approach region. Obviously, you'll be well into buffet here if you're clean but quite frankly, I think you'll find the tone much easier to "read" than buffet.

• At 19.7 units, a 1600 Hz tone overlaps the clear 900 Hz with the standard one pulse per second interruption rate. As you ease up into higher angles of attack, the pulse rate increases. Also, the volume jumps to a higher level at the same time the 900 Hz tone quits—20.3 units. The final significant cue is at 22.3 (coincident with pedal shaker)—the interruption rate increases to a flat 20 per second.

That's all there is to it. The tone will be apparent in both cockpits but there will be volume controls for each. If the system is properly set up, it should be possible to turn the tone all the way off with volume control except for the high volume (or approach to stall) region. The gear squat switch will cut out all tone on the ground.

Those who are really familiar with the angle of attack indexer switch points will immediately recognize that the ATG switch points are identical—i.e.

/\ = 400 Hz
/\o = 400 Hz + 900 Hz
o = 900 Hz
o\/ = 900 Hz + 1600 Hz
\/ = 1600 Hz

If you've been using various combinations of indexer signals as cues, you'll be able to transfer to audio that much easier.

I'll lay odds that after you've tried this on for size a few times, you'll enjoy using it. Angle-of-attack knowledge is certainly important when you're mixing it up; and here's a way to know just about where you are on the *α* scale without looking at anything but the target.

The fallout benefit is the approach case—this is pretty handy, too. You'll find yourself reacting correctly to the onset of the high or low tones very quickly.

(Courtesy McDonnell Douglas Product Support Digest) ★


WEATHE
AOA
RUNWAY 12
RUNWAY CONSTRUCTION
traffic
Wind 120

WHAT DID HE SAY???

Lt Col James A. Whitener, Directorate of Aerospace Safety

"...Tower, Echo 50, landing instructions, please."

"Echo 50, runway 5 right, altimeter two-niner-niner-zero, wind 140 at 10 gusting to 18, first two thousand feet closed due to construction."

Minutes later you're on short final and you try to recall the tower controller's words. Did he say 05 left or right? What was the wind? There was something about construction.

Occasionally pilots get complacent or distracted and listen to just part of the information provided. This is especially true when landing at familiar airfields. After you have been apprised of the airfield conditions and existing weather, analyze the situation and plan an approach that best fits the existing conditions. When your decision has been made, be prepared for unexpected situations. This mental attitude should be maintained until the aircraft is parked, the engines shut down and chocks are in place. Two recent major aircraft accidents provide the basis for this advice.

In the first, the pilot was approaching his home station for a final landing prior to returning to the U. S. from the combat zone. Two runways were available: 18 and 12. During the descent check, the pilot briefed flap configuration for both runways, and the copilot computed final approach and landing speeds for both configurations. Approaching the field, the copilot requested landing information and clearance to land on runway 18. The tower transmitted the requested information and, after some hesitation, approved runway 18 although runway 12 was the active because of winds from 120 degrees at 20 knots, gusting to 25.

Although the crosswind component exceeded the maximum allowable established for the aircraft, the pilot made no comment about the copilot requesting runway 18 and continued the approach. According to the copilot and tower operator, he made an excellent crosswind landing. Since several thousand feet of runway remained after touchdown, the brakes were not checked and the props weren't reversed.

As the aircraft slowed to approximately 40 knots, the pilot transitioned to nosewheel steering and almost simultaneously engaged the flight control gust locks. He then centered the ailerons and elevators but did not recall centering the rudder pedals. Shortly thereafter the aircraft began to veer to the left.

Use of nosewheel steering did not correct the veer and, as the aircraft was leaving the runway, the pilot applied brakes but felt little or no deceleration. He then put the throttles into reverse thrust but again felt no deceleration. Before he could take further action the aircraft collided with a concrete GCA building located 315 feet from the runway. The pilots, engineer and one passenger received major injuries; the aircraft was destroyed.

In the second case an approach was being made to runway 03 at an overseas airfield. Both the pilot and copilot understood the foreign tower operator to report the winds as 350 degrees at 25 knots.

After touchdown, the aircraft rolled approximately 3800 feet down the runway with only rudder and aileron deflections being used for directional control. As the aircraft slowed, directional control became increasingly difficult. Nosewheel steering, differential braking and thrust were attempted. The differential braking effect was partially nullified by an inadvertent application of the left brake while the pilot was holding full right rudder. Nosewheel steering was briefly attempted but abandoned because the pilot misinterpreted the unusual "feel" caused by the aircraft skidding as a nosewheel system malfunction. The aircraft left the runway and traveled approximately 600 feet prior to hitting a concrete access road which was approximately three feet higher than the surrounding terrain. After striking the roadbank, the aircraft traveled another 125 feet before coming to rest 150 feet left of the runway. The aircraft received major damage.

Analysis of the airfield anemograph showed that the wind direction was 300 degrees at 25 knots with gusts to 33. Tower recording tapes substantiated that the winds were reported twice at 300 degrees and 25 knots.

These accidents clearly illustrate what can happen if information received is misunderstood or not used to make sound decisions during critical phases of flight. In each case the pilot suddenly found himself behind the aircraft and in a situation from which he could not recover. Stay alert and be prepared for the unexpected. ★

AEROBITS

GOOD SHOW. As the KC-135 crew took the runway they knew takeoff would be critical. Temperature was up in the nineties and pressure altitude was high. They had already reduced their load by 100,000 pounds to bring gross weight into line with takeoff predictions and runway available. On the roll, everything went smoothly until just before the 120-knot time check, when the Nr 4 engine fire warning light came on.

This sounds like the prelude to a disaster—and well it could be! If the aborted takeoff didn't go exactly by the book, that is. But this one went like clockwork. Pilot retarded throttles and initiated braking, crew followed Dash One procedures to a T, and the very-heavyweight abort was successful. The aircraft stopped on the runway and turned off on a taxiway.

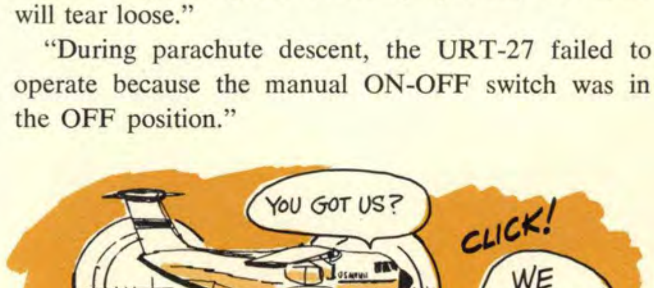
Each wheel brake had converted approximately 20 million foot pounds of kinetic energy into heat. Understandably they were overheated. The fire department responded promptly with a pre-positioned brake cooling rig and brought that situation under control before thermal screws released or tires blew.

Here is real, live accident prevention. And it didn't come about without a good deal of preplanning and preparation. The aircrew was well drilled, ready for the emergency abort. They performed the correct procedures promptly. That took study beforehand and teamwork. The fire department had pre-positioned their brake cooling rig at the end of the runway, knowing that any delay in cooling the wheels and brakes could mean explosion and fire. The Crash/Fire crew knew exactly what to do with no wasted motions or false starts.

In short, everyone involved did his job smoothly, efficiently. And that's accident prevention!

QUOTES FROM SURVIVORS. "Everyone carried radios in the rear pocket of their G-suits. You might as well forget about that radio if you get a high G, low altitude, high airspeed, tumbling ejection; the radio will tear loose."

"During parachute descent, the URT-27 failed to operate because the manual ON-OFF switch was in the OFF position."



RADAR CONTACT. Controllers are to positively notify pilots when radar contact has been established. For a short period, this term was used only when initial radar contact was gained; pilots assumed radar contact continued during subsequent hand-offs unless otherwise notified. Now, after each hand-off, you will again hear "Radar Contact" when the new controller has you on his scope. A change to FAA Handbook 7110.8-629 and 7110.9-494 is forthcoming. ★

NOMEX. Contracts for 88,000 fire resistant sage green Nomex flight suits have been let with delivery slated to begin in October. By next April they should be in sustained supply. Gloves made of Nomex and leather are already available but the intermediate weight Nomex garment probably will be held up until the large quantity of CWU-1/P coveralls in stock is depleted.

Maj Arthur Till
Directorate of Aerospace Safety

NEAR MIDAIR COLLISION HAZARD. FAA recently released the findings and recommendations by a special task force in its final report on a study of Near Midair Collisions (NMAC) of 1968. The report was based on analysis of 2230 reports voluntarily submitted to FAA by pilots during 1968. Of the total 555 were made by military, 938 general aviation and 732 airline pilots. About half the reports were classed as "hazardous."

FAA estimated that there were about 52.3 million flight operations in the U. S. during the reporting period. This works out to one near midair report filed for every 25,000 operations or one hazardous incident per 50,000 operations. The report estimated there were four hazardous NMACs for each one reported. During 1968 there were 35 midair collisions between powered aircraft in the U. S. with 68 fatalities.

The reports received during the study period indicated that near midairs occurred most frequently in terminal areas and were clustered around large metropolitan areas and along published airways.

Ten major problem areas were identified based on the near midair reports. Briefly these were:

- See and be seen in VFR weather—pilots' difficulty in sighting other traffic.
- IFR/VFR traffic mix. This accounted for 20 per cent of the incidents and involved aircraft during climb, descent and level flight.
- Navigation—aircraft converging or diverging on a navaid.
- Traffic pattern, 12 per cent which consisted primarily of one aircraft cutting another out of the pattern.
- Pilot deviation. Enroute: primarily wrong altitude or failure to accurately maintain altitude. Terminal: operations without radio communications or ATC clearances.
- Training—preoccupation of pilots with training duties, acrobatics and simulated IFR flying under the hood.

Also listed were high speed versus low speed aircraft, operations in marginal VFR conditions, proximity of airports to one another and air traffic control systems errors.

The task force recommended a program containing 20 remedial actions, some of which FAA has already moved to implement.

LOCK-IN. The rear seat pilot of an F-4C attempted to open his canopy after landing, but it would not unlock. Upon return to the parking ramp he summoned egress personnel. Their attempts at opening the canopy both pneumatically and manually from the outside met with failure. To safety the ejection seat, a hole was cut in the rear of the canopy and the banana link pin inserted. Using the canopy emergency escape knife, the pilot cut his way through the canopy and climbed out of the aircraft.

Examination of the aircraft disclosed a ⅝-inch nut, commonly used throughout the aircraft, behind the right front lock roller. The position of this foreign object prevented unlocking the canopy.

An interesting sidelight is the fact that the pilot would have been unable to eject under any condition.

Foreign objects in the cockpit are becoming commonplace. Earlier reports on foreign objects mentioned cameras, film packs and parts of the radar set which jettisoned canopies. But this is the first report we've seen where the canopy was prevented from going. The word is, clean up thoroughly after maintenance and secure loose objects in the cockpit. Pilots should check for loose objects before opening the canopy. Be sure to account for all paraphernalia taken into the cockpit.

(*Airscoop,* July 1969) ★

DON'T KILL THE CROW

Not long ago a proposal came up through the tortuous and complicated channels that all proposals must go through, to suggest that we do away with the term Minimum Fuel. The proposal stated (really, its author stated) that when a pilot uses the term, he is implying but not actually admitting an emergency situation; he desires special priority in the traffic pattern. Of course, the proposal went on, we all know that Minimum Fuel does not mean an emergency to the controller. He takes it as just an advisory that undue delay cannot be accepted. This, of course, would be a serious hazard because we have two people talking to each other in different languages. Therefore, the conclusion that we should eliminate the term.

This sounds too much like killing our pet crow because we can't decide what to name it. Some of us used to call the crow one thing, but we never really registered it under that name. It caused a lot of confusion and occasional consternation because there were some who preferred to call the bird by another name. As a matter of fact, Minimum Fuel could almost work magic around some traffic patterns. When the flight had run longer than expected and you were almost late for lunch, or Happy Hour was about to close, a quick call of Minimum Fuel was like instant landing instructions and license to enter the pattern from a split-S onto initial.

That approach to business might have been okay if we had all agreed on the bird's name. But there were some people who actually did find themselves critically short of fuel. These poor folks with their fuel needles bouncing off the bottom of the gage had to compete for priority in the pattern with the late-for-lunch-bunch. Traffic controllers, unable to tell the good guys from the bad, were frequently tempted to throw their headsets in the air and ignore the crow entirely. That would have been bad indeed, for the good guys with impending flameouts. In addition, there appeared on the scene a breed of Ops Officers and the like who disapproved of using a low fuel call as a lever on traffic controllers when you wanted (but didn't really need) special consideration.

So the time had come to name the old crow and eliminate the confusion. And a very strange thing happened. When a name (or definition) was agreed upon, it gave no one any priority at all! Minimum Fuel has been defined ever since as a term identifying a flight condition in which the remaining usable fuel may be needed to insure a safe landing *in normal sequence with other traffic.*

If you want to split-S onto initial, get home on time for lunch, or are genuinely worried that you don't have enough fuel to land successfully from normal traffic, you declare an emergency. And the Ops Officer will probably go along with you . . . if you can satisfactorily explain where your fuel went.

So why keep the crow if it doesn't do anything for us anymore—no priority, no special handling? Well, it does do something for you. Although it doesn't get you on the ground sooner, it won't delay your landing, either. By declaring Minimum Fuel, you tell the controller you can't afford an extra long GCA downwind to let that traffic in from the west. And you can't make two 360s on initial to let that VIP take off. You're telling the controller he will have an emergency on his hands if you don't get on the ground, but you're okay as long as your approach to the runway remains normal and predictable.

So let's not kill the crow. Minimum Fuel is a useful term. Used correctly, it will smooth the flow of traffic and preclude emergency situations. ★

☆ U. S. GOVERNMENT PRINTING OFFICE 1969 341-222/14

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.

Lieutenant Colonel
William A. Jones, III

602d Special Operations Sqdn., APO San Francisco 96310

On 1 September 1968, Lt Col Jones led a flight of A-1s on a search for a downed F-4 pilot in North Vietnam. While he was narrowing his search to a specific location, Lt Col Jones' aircraft was struck by intense ground fire. The cockpit immediately filled with smoke. Col Jones quickly determined that the aircraft was responding to controls and resumed the search. He spotted the pilot and the gun position which had inflicted damage to his own aircraft. On his next pass, he identified the pilot's position and began a turn for a rocket run on the gun position. During the turn Col Jones' aircraft received antiaircraft hits in the cockpit/canopy area. His cockpit immediately filled with fire of extreme intensity. It was obvious that he could not continue the mission and he himself might be forced to evacuate the aircraft. Col Jones immediately started a left, climbing turn both for altitude and to get as far away as possible from the known hostile forces. He activated his extraction seat system but it failed to function due to battle damage to the system. During the climb the fire in the cockpit subsided and eventually went out entirely. The fire had been caused when a hit ignited his seat extraction rocket and ruptured hydraulic lines which in turn fed the intense fire which burned and melted the extraction cords and parts of the parachute harness.

Col Jones had suffered severe burns to his hands, face, neck and back in the fire. In spite of his injuries, he examined the performance of his aircraft, which proved to be satisfactory. The canopy of the aircraft was missing, the right panel of the windshield had burned away and the left panel was scorched black. The windshield had collapsed and was resting on the burned and charred gunsight. Col Jones found that by flying in a slight skid he could avoid the direct wind blast by using the left panel as a shield. Col Jones was in severe pain and suffering from swelling. His eyes were his major source of concern; he feared they would swell shut. After a 40 minute flight Col Jones arrived in the home base area. Weather was 600-foot overcast with light rain. In a final effort, Col Jones executed a flawless, no-gyro, GCA and a perfect landing.

Col Jones' tenacity in the face of awesome odds, superb airmanship and great personal courage reflect great credit upon himself and the United States Air Force. WELL DONE! ★

MISS LIFE SUPPORT SEZ

When You're Out Of WATER... You're Out Of LUCK!

In SEA, water is the one survival item nearly every survivor used.

Our thanks to pretty Miss Elizabeth Nielsen for being our Miss Life Support this month.