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Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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SPECIAL FEATURES

REGULAR FEATURES

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HELP WANTED

1. Executive Officer
2. Demonstration Pilot
3. Narrator

by the

USAF THUNDERBIRDS

Applications for executive officer will be accepted until 1 April 1970; for demonstration pilot and narrator until 31 July 1970.

Selection of executive officer will be made by May 1970 with a reporting date in June. The executive officer must be a Major or Lieutenant Colonel with at least 2500 hours total flying time and 2000 hours jet fighter time and have completed a combat tour in Southeast Asia.

The demonstration pilot must have an active federal commission service date no earlier than December 31, 1960. A completed combat tour in Southeast Asia and 1000 hours of rated jet fighter or jet trainer experience are mandatory.

The narrator qualifications are same as for the demonstration pilot position. The newly assigned narrator will spend three years with the team — one year as a narrator and two years as a demonstration pilot.

Forward applications through channels with an information copy directly to the Commander, USAF Air Demonstration Squadron "Thunderbirds", Nellis AFB, Nevada 89110. Include the following documents:

- Personal statement expressing desire and reason for applying.
- Resume of civilian educational background.
- Marital status.
- Breakdown of flying experience.
- Copy of AF Form 11.
- A recent 8" x 10" photograph.
- Copies of last five (5) OERs.
- An indorsement by the applicant's immediate commander.

With the exception of the application time period which has been revised because of heavy show commitments, selections will be made in accordance with AFM 36-11, Chapter 45.

MINIMUM FUEL *then what?*

At least 22 times during 22 months of 1968 and 1969, Air Force pilots ran themselves out of gas. In 13 other reported cases, aircraft engines quit prematurely from fuel starvation caused by maintenance or materiel factors.

The disturbing regularity with which pilot-induced fuel starvation incidents have been happening raised some questions about the circumstances surrounding them. Is one type of aircraft involved more often than others? Do these situations occur on only certain types of flying missions? Who are the pilots involved? Are they new pilots; old pilots?

When you study these fuel starvation mishaps, the answers soon become apparent. And some of them are as disturbing as the frequency and regularity of the problem itself.

Do most of the fuel emergencies occur in single-engine; short endurance airplanes?

No. Twelve of the 22 occurred in airplanes with two or more engines.

Is fuel starvation more prevalent in the fluid, constantly changing environment of a tactical combat mission?

Half of the pilot-involved fuel problems occurred in PACAF. But four of the pilots were not in tactical situations when the trouble occurred. Put another way, two-thirds of the pilot problems occurred during scheduled, controlled training, cross-country and instrument flying or routine, noncombat missions. One was a medevac!

Are the people, the pilots involved, mostly inexperienced?

No. Instructor Pilots were in the airplane on six occasions when poor procedures caused or contributed to fuel starvation. In another, the pilot was a tactical flight leader. In fact, one-third of the incidents involved IPs or flight leaders—people who were well-experienced, above average pilots in their aircraft and mission. Many of the others were far from being neophytes. Not one incident was reported of a solo UPT student running out of fuel.

Do the complex systems of newer aircraft make fuel mismanagement more probable?

Not necessarily. The O-1, O-2, T-33 and C-47 accounted for nine (almost half) of the reported mishaps. When problems occurred in more sophisticated airplanes, they were usually problems identified long ago and briefed repeatedly to all hands:

An F-4 pilot forgot to turn off the external tank switch, trapped 4000 pounds of fuel in the wing tanks, flamed out and ejected six miles from home base.

A B-52 copilot mismanaged the fuel panel, causing an 8000-pound imbalance and leaving only two boost pumps operating for the four engines on one side. The aircraft commander and IP were busy switching seats, missed the descent checklist and didn't notice the error. On leveloff at low altitude, with flaps extended, the high power required to maintain flight overtaxed the capability of the limited fuel system. All four engines on one side flamed out, followed by bailout and loss of the aircraft.

An experienced KC-135 crew landed after four hours of a 50-8 proficiency flight to pick up an IP who was to administer flight checks to the pilot and copilot. Planning to fly to a base 125 miles away for an instrument approach and return to home base, the IP mentally calculated the fuel required and decided they had enough on board. His guesstimate did not allow for the reserve required by AFM 60-16. The IP didn't recognize that they were in a minimum fuel condition when they left the instrument practice base to start home. Their fuel lasted to within two and one-half miles of home base; the flight terminated 640 feet short of the runway overrun.

Several pilots became engrossed in aircraft system malfunctions and ignored rapidly depleting fuel quantity.

F-102 Unsafe gear indication, flamed out waiting for the runway to be foamed. Supervisor of Flying and squadron operations personnel stood by and watched.

A-26 Unsafe gear down indication. Right engine ran out of fuel, aircraft crashed making low passes over the runway at night, while the SOF tried vainly to see if the gear was locked down.

F-106 Pilot noticed a fuel imbalance problem, then a low level light on one side, didn't abort the mission and head for a recovery field until he had flamed out once and got it restarted. When the engine flamed out again he was unable to start it and ejected.

Others, recognizing a fuel problem (either self, materiel or maintenance induced) lost a good opportunity to get to a runway and land by not using sound, well thought out procedures.

An **O-2A** pilot and an **RF-4** crew, both returning from combat missions with full knowledge that they were running short of fuel, accepted traffic delays without saying a word to the control agency about their fuel state. Both aircraft ran out of gas and crashed without reaching a runway.

F-105 Pilot on three mile final after a night mission was told to go around, the runway was closed. The SOF diverted him to a base 80 miles away. The pilot did not declare a fuel emergency at that time or jettison external stores although he was already very low on fuel. Approaching the divert base he didn't ask for a GCA, used incorrect procedures in trying to intercept the TACAN radial to the field. Passing the runway without sighting it, he started a climbing turn, flamed out and ejected.

F-4 Returning to base with less fuel than they should have, the crew was told the runway was closed due to an emergency. They decided they had enough fuel to jettison unexpended ordance, divert to another base and land. But GCI told them there was a tanker in the area, so they abandoned their perfectly workable divert idea, missed the intercept with the tanker, flamed out, ejected.

We could go on and on. Almost every one of the briefs leaves you shaking your head—the medevac pilot who didn't want to offload litter patients at an enroute stop to refuel; the T-37 instructor who took off from a civilian field with only 400 pounds of fuel because he didn't know he could buy fuel there.

There are some among us who just don't pay enough attention to fuel status. For them, and maybe for the rest of us too, a few points need emphasis:

• Bingo fuel means start home—now! If the FAC wants one more pass, tell him you can't.

• On a multi-stop flight, don't press your luck. Take enough time along the way to fill up before you need every last drop in the tanks.

• Be absolutely sure you have fuel switches and selectors in the correct positions. Double check!

• Don't trust the fuel gages down to the last gallon. The calibration tolerance doesn't guarantee you that kind of accuracy. *Compute* your fuel consumption for the planned flight. Recompute along the way and when your flight plan changes.

• Once you've run yourself a little shorter than you planned, tell somebody! Holler "minimum fuel" and don't be bashful about it. Better to explain *that* than a bailout.

• After you've progressed to that stage of the problem, don't ever accept a "Hold east of the field for departing traffic"—or any other kind of traffic delay that jeopardizes a safe landing.

• Finally, treat low fuel state like any other emergency—be very deliberate and careful in your actions and planning. Don't let anyone talk you into chasing after an uncertain plan when you have a sure one in your hip pocket. ★

Maintenance and Materiel got into the fuel starvation act, too—

T-28	Stuck valve.
C-47	Fuel quantity indicators adjusted incorrectly.
T-33	Boost pump inoperative.
C-7A	Faulty fuel quantity indicator.
B-52	Fuel feed valve failure.
F-84F	2000 pounds fuel trapped due to unknown malfunction.
VT-29	Fuel quantity gages improperly calibrated.
B-52	Boost pump inoperative.
A-26	Gear down lock switch malfunctioned.
F-100	Nr 1 and Nr 3 boost pumps failed.
F-104	Unknown component of aircraft or engine failed.
F-106	Right main shutoff valve closed.
F-105	Possibly pumping afterburner fuel through engine without light-off.

And Aero Club!

Overseas:

Replacement of lower half of engine cowl, bottom skin from cargo door to tail cone, one fuselage former, wing attach bolts, engine mount bolts, and nose strut clamps. $750 for parts and $300 for repair.

Pilot attempted to circumnavigate weather and overextended fuel capacity.

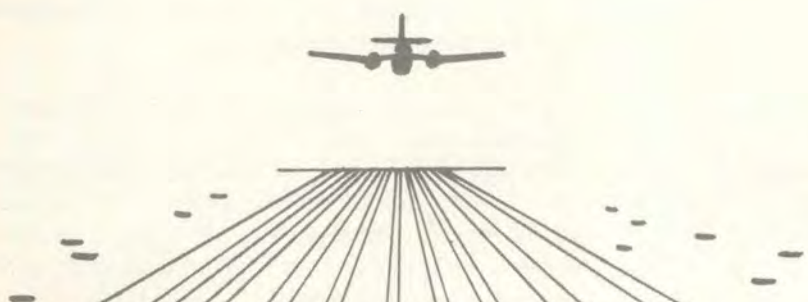
ZI:

Left main gear separated at impact, nose gear collapsed. Prop bent, firewall bent, engine cowl bent and torn, firewall broken. Left door spring, floor panels and stringers buckled from firewall to baggage compartment. All control cables sheared or broken. A $13,700 aircraft damaged beyond economical repair.

Pilot made large errors in flight planning, mixed statute and nautical miles in computations. Mileage, timing and fuel consumption figures were higher than planned. Changed destination in flight too late to complete the flight safely, ran out of fuel.

Pilot had not been properly instructed by the club in cross-country flight planning or procedures. Clearing authority failed to discover that the flight could not be completed as planned.

Landing at marginal strips, airlift pilots frequently encounter a problem common to all aircraft types



PerSPECTiVE

Col J. A. Talbot, Directorate of Aerospace Safety

In the routine accomplishment of their mission, our brethren in the salt water Navy perform the carrier landing. That they do so successfully never fails to amaze me. I am impressed by both their airmanship and the ruggedness of Navy landing gears.

I am equally impressed by the skill of Air Force pilots who fly in and out of marginal airfields in SEA. The threshold environment offered by some of these fields is remarkably like that presented to the Navy pilot on an approach to a carrier; except that the USAF pilot approaching a Type 1 strip has no "meatball" and no Landing Signal Officer to assist him, as does the Navy pilot. In fact, he may have no landing aid at all—no ILS, no GCA, no VASI, no nothing. Consequently, accidents occur as the result of short, long and hard landings.

Here are some classic examples. A highly qualified pilot in a C-7 made an approach to a short air strip in I Corps. His left gear hit 18 inches below the lip of the threshold and sheared. The aircraft sustained major damage.

Circumstances. This airfield is classified as Type 1 for the C-7. (Tactical Aerodrome Directory definition: "Operations will be marginal. . . .) The runway is graded dirt, 1000 feet long, terminating at each end with a sheer 30 foot riverbank. The ends of what was considered the "usable" runway were marked by white painted panels of PSP. No weather information was available. The pilot had made 24 successful landings at this field including two that day. However, on this particular approach, NEITHER HE NOR HIS COPILOT realized they were too low.

Example number two.

A C-123 pilot made a relatively flat approach into a dirt strip in the Central Highlands and hit short of the overrun in a nose high attitude. The right gear sheared, followed by progressive structural failure and fire. This was the fourth such accident at this field.

Circumstances. The airfield, classified as Tpye 1 for the C-123, was located on a knoll 800 feet above the surrounding terrain with steep dropoffs on all sides. Its 2000-foot length was marked with PSP panels that were covered with an accumulation of dust which rendered them difficult to see at any great distance. Lack of vegetation and runway surfacing resulted in a blending of the dirt runway with the surrounding area, which made determination of the exact boundaries extremely difficult. The profile of this airfield and the sur-

Tire marks indicate where wrecked C-7 (upper left) touched down on lip of slope. Runway is 1100 feet long, white rectangle on right side is 200 foot marker.

rounding terrain produce downdrafts and windshears intermittently. No weather information was available.

Example number three. (This one is back here in the real world just to prove it doesn't all happen in SEA.)

A very highly qualified (although relatively inexperienced) C-124 pilot made a VFR approach into a 5000-foot runway located in a large metropolitan area. During roundout, his right main gear struck a concrete retaining wall three and one-half feet below the lip and some 80 feet short of the threshold. The right gear stayed there, but the aircraft continued some 2500 feet down the runway and stopped 25 feet off to one side.

Circumstances. Although there are no tactical classifications for stateside aerodromes, 5000 feet in a C-124 is, from experience, not something you would want to tackle after six months of CAT III layoff. There was only an 80-foot overrun. The approach was made over a heavily populated area 150 feet lower than the runway, and the far end of the field offered similar abrupt conditions; in other words, you were in trouble in either direction if you didn't stay on the runway! Voice communication was adequate but there were no landing approach aids (no IFR approach procedure). As in example number one, both pilots felt no qualms about a successful landing up to the point when the gear made contact with the concrete wall.

Some similarities are apparent in these three PILOT FACTOR accidents: All three runways were located *above* the surrounding terrain with virtually no threshold area to provide cues during the roundout or flare. In all three cases the pilots realized that landing long would be drastic, if not catastrophic! And there were no approach aids such as ILS, GCA or VASI. We know that, in at least two cases, the pilots did not recognize they were in serious trouble!!

It would seem then, that we have physiological, psychological and environmental considerations which, in various combinations, *produced* "pilot factor" accidents. (Note, I didn't say "resulted in".) And, it is very probable that if we don't provide pilots more education and better facilities, we will produce exactly the same type accidents in the future. So, in the interests of education, here are some comments you might remember when tackling a short field situation.

The technique for determining height and distance on an approach to an elevated runway is not the same as that used over flat terrain. Normally, after receiving the local altimeter setting, the pilot enters the pattern (or crosses some prescribed fix) at a pre-determined altitude and from that point on,

Perspective

CONTINUED

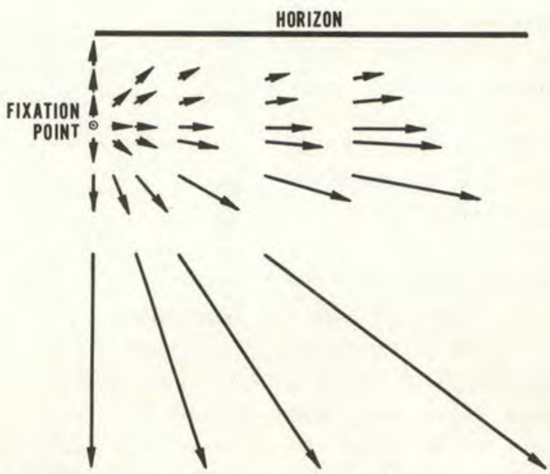
throughout base and final, he makes numerous evaluations of his height, airspeed, track and the runway perspective, to arrive at a flight profile which will get his rollers on the landing end of the runway.

The method and direction of these eyeball evaluations change throughout the approach. Direct eye references predominate between the ground and the instruments in the pattern and at the beginning of final approach. Then peripheral references are added as the aircraft approaches the runway. Just prior to and during the flare, the precision demanded in arriving at the optimum alignment/attitude combination uses most of the pilot's direct references; rate of sink or height determinations are to a great extent, evaluations of peripheral perceptions. Once over the landing end of the runway, alignment and height/rate of sink determinations become the result of direct references, with negligible inputs expected from peripheral sources.

So, what's so different about making an approach to an elevated runway? First of all, there is a certain dependence on the altimeter. Knowing that field elevation and the surrounding terrain are the same inspires in the pilot a certain amount of confidence that he is a definite number of feet above the runway. When an approach is being made to an elevated runway, this relationship is lost, or is at best only an approximation.

As the aircraft continues down final, the pilot is cueing off the ground under his track, taking each cue as he moves forward, comparing it to the one(s) previous, and from these estimating relative height, direction and forward speed. Because of his past experience, he uses the runway perspective as a strong cue in the judgment of distance, etc. Perspective combines size, shape, and slant, compounded with other cues, and provides one of the most important depth-judgment factors. Additionally, motion parallax—the relative movement of objects in the visual field—can be used to estimate touchdown distance. As the pilot concentrates on the touchdown point, assuming the aircraft is on a constant glide slope, this touchdown point will appear stationary. All other objects in the visual field will be spreading out from this point at different velocities. While this pattern will be constant as the aircraft descends, the apparent velocity will increase inversely to his distance from his primary visual reference: the touchdown point. From this information alone, most pilots are able to pretty well estimate touch down distance during landing.

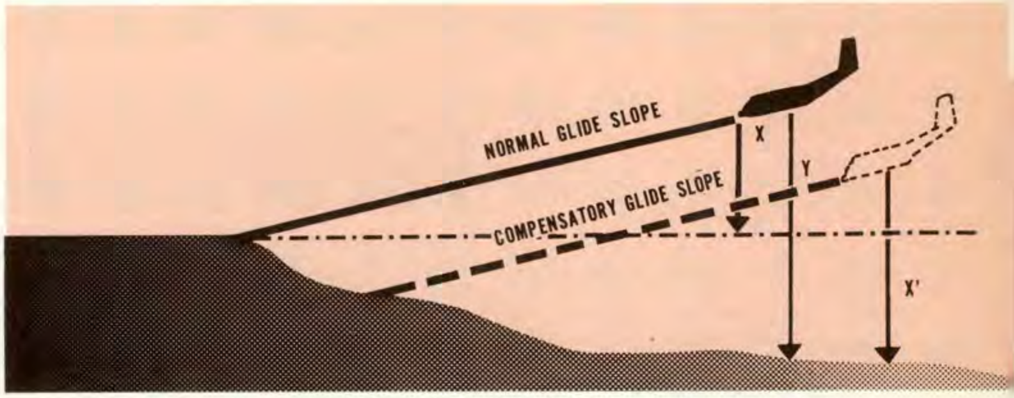
However, during an approach to an escarpment or bluff, the objects



The pattern of apparent displacement of objects in the field of view for a 20% glide slope toward the fixation point. The tails of the arrows represent the initial point of the retina. The direction and magnitude of the apparent motion are represented by the length and direction of the arrows.

on the ground do not spread out at the rate they do normally because the height/distance relationship is different. And, as the pilot nears the face of the hill it seems to expand tremendously, to the extent that his speed *seems* to be overly high. This tends to explain why pilots, approaching such an embankment, suddenly perceive a high relative forward speed and prematurely chop the power and hit short.

There is a technique that can be employed in situations like this. First of all, disregard the altimeter except for rather gross determinations. (This is a VFR approach after all, remember?) Secondly, disregard the terrain for cue estimations, except of course, to stay above it, or to calculate an approximate distance out on final.



The effect of terrain downslope in the runway approach on aircraft glide slope. With a terrain downslope, the pilot will believe the aircraft to be on low, flat approach, and there is a tendency to land short of the runway.

Now for the DO's. ESTABLISH A RUNWAY PERSPECTIVE! You know how the runway should look on final. Once you get to this point, cue on it, and it alone. From here on in, it is a matter of adjusting power and attitude to keep this relationship and perspective constant until you flare. Remember that motion parallax as an aid in determining height/distance isn't reliable until *after* elevated ground (the runway) is reached. It is only then that velocity cues become valid and adjustments can be made for touchdown. Prior to this time, your trust should be in the angle of attack indicator, (or airspeed if AOA not installed), not in what you think your eyes are telling you from cues outside the cockpit.

Another DO, is to establish a landing point sufficiently far down the active to take care of small miscalculations and at the same time leave room to bring the plane to a stop. While I'll admit this is easier to say than do, the fact remains that most short landings occur because the pilot attempted to use ALL the available runway and miscalculated.

Another educational goody I advocate is computation of landing roll; both without and with reverse, if this feature is available. This is simply a confidence maneuver. It is this information that proves the landing strip is within the aircraft's capabilities; that you don't HAVE to use every inch of the runway; that there should be no great concern about running off the far end of the strip; and, you will know when you must make your decision to go around if you fail to touch down where you had planned.

From a pilot's standpoint, the most important aspect of the educational process is in the *doing* part. It is all well and good to "do as I say," but when it comes to the "do as I do" its an altogether different thing. Practice is the only way that one can become familiar enough with his equipment to have absolute confidence that it will perform as advertised.

At a certain STOL airspeed how much margin do you have before the bird stalls? How much airspeed do you lose when the props go to high RPM? How comfortable do you feel with the angle-of-attack indicator right on the mark? How much power does it take to reestablish this angle once it drops low? And ultimately, how successful are you at touching the main gear on your aiming point on ALL landings?

If 100 per cent, you're OK. If not, practice some more—or stay away from the short fields! If you are having trouble, carefully review the Dash 1 and have one of the pros ride with you. He may offer a valuable tip you overlooked.

One of the greatest psychological barriers to successful short field landings is preoccupation with the apparent shortness of the runway. It is this factor that induces pilots to resort to extreme measures such as flat approaches, end of runway touchdowns, chopping the power while still airborne, etc., etc., etc. It is this type of preoccupation that inhibits concentration on the desired goal, namely flying the bird to a precise aiming point at the proper attitude and airspeed. The pilot who has practiced won't have this psychological barrier to contend with because he will know he can hit reasonably close to his aiming point, and once there, have every assurance that he can bring the aircraft to a stop in the runway remaining (assuming, of course,

PERSPECTIVE

CONTINUED

that complacency doesn't take over).

What else can be done to improve the pilot's lot? We can recognize that airfields constructed on higher terrain are tough to joust with and improve them at relatively little expense. For exampe, in two of the cases described in this article, there was a definite lack of color contrast between the runway and the surrounding area. If the pilot has trouble determining WHAT is the runway, he is certainly going to have trouble ascertaining his position in relation to it and also determining an aiming point. Would a couple of hundred feet of asphalt, penaprime or even crude oil help?

Finally, I'd like to return to a previous paragraph, where I suggested that a runway perspective must be established. This can be complicated. Length, width, surrounding terrain features and runway slope create illusions that defy the physiological and perceptual abilities of the guy we're trying to help: the pilot. (An illusory situation may affect both pilots, only one, or may not affect one individual the same way every time.)

Naturally, if there is an illusion, the pilot's runway perspective is going to be false. So is his approach angle and so also will be his aiming point.

The School of Aviation Medicine in their Technical Report 67-28 referred to this very problem when they stated; "Because of this extremely complicated stimulus (overall runway perspective), past experience-knowledge situation, a pilot would be expected to make poorer approaches and landings on unfamiliar airfields. This would be particularly true if the slant-shape-distance-size relationships were drastically *different* from fields with which he had had previous experience."

We can greatly assist the pilot by providing him with a visual glide slope. A means whereby he can establish himself on final the same way he does on an ILS, except that instead of reading his position off an instrument in the cockpit, he looks at the glide slope itself. This principle isn't new or revolutionary by any means because it has been used by the Navy for years aboard carriers in the form of the "meatball." The Air Force has installed the VASI system which uses a similar principle.

There are several portable VASI type landing aids designed for use in field environments and powered by batteries. And if these are too expensive (a kind of silly question when we consider the cost of four C-123s which were destroyed at a single field for lack of one) there is the genuine economy model known to the Navy as the POMOLA (poor man's optical landing aid) which can be constructed out of used packing crates and works just peachy. Even it can be deluxed a bit by covering it with reflective tape or paint. Shine a light on it — and it'll work at night too.

In winding up this article, I'd like to quote from a study conducted by Drs. Conrad L. Kraft and Charles L. Elworth of the Boeing Company entitled "Night Visual Approaches:"

"Our major emphasis is on the visual aspects of landing approaches and research results have convinced us that at least some of the 'pilot error' ascribed to approach accidents is based on *incorrect assumptions concerning normal human visual abilities.*" (Note: Author's *italics.*) In other words, for the pilot faced with an elevated and poorly marked runway of minimum length, the *visual task* may easily exceed his normal *visual ability*. Since the pilot's eye is the only means by which he can make this judgment or estimation of distance versus speed versus altitude versus power, it is apparent that someone, somewhere, sometime, is going to err; and all because the variables are more than he can cope with.

The answer lies in reducing the judgments necessary and providing him with a definite line to fly by means of some approach aid in conjunction with a charted airspeed or calibrated angle-of-attack indicator. Then, and only then, will he know exactly where he is on approach and be able to consistently touch down within a few feet of his aiming point ★

ACKNOWLEDGMENTS:

1. School of Aviation Medicine Technical Report 67-28.

2. Conrad Kraft and Charles Elworth, "Night Visual Approaches", Boeing Airliner, March-April 1969.

3. Carl Brown, "Fresh Approach," Air Facts, December 1969.

WHETHER YOU'RE PILOT OR GROUNDCREW DON'T GET CAUGHT IN . . .

those terrible taxi tangles

In nearly all taxi accidents there are circumstances over which the operator has little or no control. Such things as inadequate airfield lighting, poorly marked or confusing taxi lines, taxi lines that were intended for an F-105 being used by a C-130, or just plain poor housekeeping by Maintenance. In the latter instance, the maintenance men can set the stage for an accident by positioning AGE too close to where the aircraft is going to be parked, or by not properly clearing the area before giving the pilot the All Clear to Taxi signal.

Here are some prime examples of what we mean.

• A C-124 leaving a parking spot made a 180 degree, sharp right turn in a congested area and dragged the left wing over a B-2 stand. Damage to the wing and aileron necessitated sheet metal and fiber glass repair. Ground crew personnel directing the operation believed the wing would clear the B-2 stand. The copilot asked the pilot if it would clear and was given an affirmative. The scanner said nothing until impact. Obviously a case of misjudgment on the part of all concerned.

• An F-4 departing a parking spot, ran over a LOX cart which scraped and dented the wing. Again a case of misjudgment by both pilot and ground crew.

• A T-33, while being directed into a parking spot by the ground crew, wrinkled its wing tip on an MD-3. In this instance equipment had been prepositioned, setting the stage for a taxi accident. Same old story, both pilot and ground crew misjudged the distance between the wing tip and the MD-3.

• A C-130 pilot had to use reverse thrust to maneuver out of a revetment. Even though the loadmaster was monitoring the backing operation, they backed too far, struck another parked aircraft which damaged the C-130's right wing and aileron. This one happened without the aid of the ground crew.

• Another C-130 taxiing in the rain on a poorly lit taxiway strayed some 72 feet left of the centerline. The left wing struck the rotor housing of a parked UH-1B. The C-130's left wing and anti-icing ducts sustained considerable damage.

AFR 60-11 requires annual testing of ground crews who taxi or otherwise operate aircraft on the ground. At the time of the regular ground handling test, supervisors should insure that all their personnel are familiar with the different aircraft configurations they would encounter. An example of different configurations is the swept wing and how it seems to grow or get longer in a turn, or the flex wing that's high when empty and low when full of fuel.

Operator factor (pilot, crew chief, engine specialist) is commonly present in taxi accidents. His perspective from the cockpit may give him false information about wingtip or tail clearance. To prevent this type of accident:

• Stop the aircraft and don't move it again unless you are sure of clearance.

• If you can't see the centerline, stop until you get wing walkers.

• If necessary, send a crewmember to check clearance.

As for ground handlers, anytime a wing tip hits another object, AFR 60-11 has probably been violated. Added precautions should be taken when handling different types of aircraft. If the lines are painted for a fighter, don't try to park a C-141 there, until you are absolutely sure how much space the big bird requires. Also don't get ahead of yourself by prepositioning AGE, where the incoming bird might hit it. A little forethought and planning might save you time and embarrassment. If at any time there is the slightest doubt about the clearance, **stop the operation.**

Nobody wants to contribute material for a continuation of this story. If aircrews and ground crews will work together, those terrible taxi tangles can be eliminated. ★

experts talk about tho

In this fast-moving age of rockets and jets we are sometimes inclined to overlook the reciprocating engines, so here is some help for you round engine flyers and fixers.

BACKFIRING

The C-124 was past the abort point on the runway when trouble developed. Parts of the aircraft and engines were found scattered along the runway starting at the 9000 foot marker. Witnesses later said that one or more engines were either backfiring or afterfiring shortly after full power was applied.

Most pilots and maintenance crews have had experience with engine backfiring in one form or another. It is defined quite simply as a lean mixture seeking the missing element, fuel, which is available at some source in the induction system from the combustion chamber back to the carburetor screen. This definition is clearly the opposite of afterfiring which is defined as a rich mixture seeking the missing element, air, and then firing. The sound of each may be the same and both can produce vibration. However, a sudden drop in torque pressure, coupled with an increase in manifold pressure and carburetor air temperature, is a positive indication of backfiring.

Backfiring is a symptom of engine malfunction, not a cause, so if you fly or maintain round engines, it is important for you to be able to recognize backfiring. You should also know that usually the first backfire is enough to damage engine parts and either cause an immediate failure or a failure in a minimum of time. So any history of backfiring is a clear warning that the engine is being robbed of its power-producing capability.

Pre-ignition is very closely associated with, and generally causes, backfires. Anything which allows combustion at the wrong time in relation to intake valve position creates a backfiring condition. Such mechanical deficiencies as improperly adjusted valves, improper ignition and incorrectly adjusted idle mixture lead to backfiring. Materiel failure of valves, valve seats, rocker arms, push rods, and other induction system components contributes to backfiring.

Aside from immediate power loss, the effects of backfiring may reach back into the induction system, damaging parts, or even farther back into accessory gears, rods, bearings and propeller shafts. So just correcting the cause of back firing is not enough. The maintenance man must also thoroughly inspect for damage. Before the engine is released it must have the equivalent of a periodic inspection plus the appropriate steps of engine conditioning.

The seriousness of backfiring cannot be overstressed. It is up to the flight crew to report backfiring engines, and it is up to the maintenance crews to eliminate the causes and results of backfirings.

OVERBOOST/UNDERBOOST

Studies conducted at SAAMA show that hundreds of engine failures occur at flight altitude when the throttle is retarded to set up cruise. Generally, this is not the fault of the aircrew, but the result of a failure on the part of some previous pilot to report an overboost. There are conditions which lead to overboost and most pilots have been involved with them. Trouble comes when the engine appears to be OK, the pilot neglects to report the overboost and the next guy reaps the harvest.

Engines returned to the depot show the results of overboost in cracked cylinders, stretched studs, twisted rods and burned valves, but—and this is important—the paperwork with the engine does not mention anything about an overboost.

There are specific tests and inspections for engines subjected to overboost that are not used in normal overhaul procedures. So if the overboost is not reported, normal overhaul procedures are used and overstressed parts are mixed with others and end up in another engine. Now we have an engine starting life with a sick part. Nobody will condemn you for reporting an overboost—so why jeopardize someone else by not reporting it?

Underboosting can be as bad as overboosting. Engines were built and designed to operate within a certain environmental range. Good reliability depends on sound operating practices and techniques. Underboosting occurs when the combustion pressures do not equal or exceed the centrifugal and inertial forces generated by crankshaft speed. This condition results in reverse forces being applied to the piston pins and bosses, master rod bearings, and knuckle pins. In addition, piston ring flutter may be

se round engines

G. F. Heins, SAAMA
Kelly AFB, Texas

induced. These reverse forces can occur under most flight conditions but are more prevalent during descent, when the governor is holding constant RPM and the throttle is retarded to the point where gaseous pressure falls below centrifugal and inertial forces of the rod and piston mass.

After much analysis and compromise of the variables such as RPM, altitude, carburetor air temperature, fuel/air ratio, that affect BMEP, a simple solution has been arrived at to prevent underboost. Manifold pressure has been determined as the criterion and all a pilot has to do to prevent underboost is to maintain approximately one inch of manifold pressure for each 100 RPM.

So pilots, keep the pressure on to stop underboosts and watch the red lines to stop overboosts. ★

RIGHT: What goes on under that cowling is of vital importance to you.

FAR RIGHT: Engine starts are common source of backfiring. What happened to the engine?

ABOVE: A clean oil system is vital to engines, extra care is needed under these conditions.

Cylinder failures have plagued the R-2800 engine, so read what causes them.

Even on the old C-47, engine maintenance must be truly professional.

RIGHT: Aircrews must report all abnormal engine conditions to keep the next guy flying.

THE I.P.I.S. APPROACH

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

WEATHER BELOW MINIMA

Q When the weather at my destination is below minimums for the type of approach I request, will I be informed of this fact?

A Not directly. The controller will give you the weather anytime the ceiling is reported below 1000 feet or below the highest circling minimum, whichever is greater, or when the visibility is reported less than three miles. He is *not* required to inform you that the weather is below minimums for the approach requested. With the conversion to TERPs criteria, a controller can no longer be expected to provide this information. Consider the following: There are 115 different military aircraft listed by category in FLIP. Using Randolph as an example, there are six JAL procedures, five AL procedures, and minima for four ASR/PAR procedures published. There are 54 separate minima published to encompass these procedures. A controller would first have to find your aircraft category, then apply it to one of the 54 minima listed, recheck the weather as it probably would have changed, recheck the category to be sure, and on, and on . . . It's just not feasible and not his responsibility. It's the pilot's responsibility to determine if the weather is below minimums for the approach requested.

DD-175 TACAN IAF

Q On the DD-175, when filing to a TACAN IAF that has a name, can I just enter the name of the IAF as the last entry in my route of flight?

A FLIP Planning, Section II, paragraph 113c, states that TACAN IAFs will be clearly identified by TACAN identifier, radial, and DME, e.g., BAL 195/30.

REPORTED CEILING

Q If the ceiling at Podunk AFB is reported as 200 feet overcast, could it possibly be lower than 200 feet?

A You bet! Sky conditions and ceilings are reported in hundreds of feet; therefore, the ceiling in your question may be anywhere between 150 and 249 feet and still be reported as 200 feet. Another point to consider is that the ceiling may not have been measured in the approach zone, the area you are most concerned about. Still another consideration is that ceilings are rarely uniform, or exactly the same height over a given area. More often they are ragged and can vary considerably from one area to another.

RVR vs PV

Q If RVR (Runway Visual Range) for an approach is above minimums but PV (Prevailing Visibility) is below minimums, can I make an approach?

A RVR is the controlling visibility if reported. If PV is below minimums and RVR is above you may start an approach, but only a straight-in to the runway for which the RVR is reported.

HAA and HAT

As you have probably noticed in the IFR Supplement and in the high and low altitude terminal charts, Height Above Touchdown (HAT) is now defined as the height of the DH or MDA above the highest runway elevation in the touchdown zone and will be published in conjunction with *all* straight-in minima. Height Above Airport (HAA) is defined as the height of the MDA above the published airport elevation, and will be published in conjunction with all circling minima.

Previously HAT was used only in conjunction with precision minima and HAA with all non-precision minima. Now the pilot making a straight-in approach, either precision or non-precision, will know his height above the runway he is landing on at DH or MDA. This is more meaningful to the pilot as there can be a considerable difference between airport elevation and touchdown zone elevation. Remember, airport elevation is the highest elevation on any usable landing surface on the aerodrome while touchdown zone elevation is the highest elevation in the first 300 feet of the particular runway in question.

Some procedures have been converted, and all should be sometime in the future.

RADAR BEACON PROCEDURES

How well are you up on the new Radar Beacon Transponder Codes? Try these questions:

1. Is Mode 3 Code 0600 used for VFR or VFR conditions on top when you cancel your IFR flight plan and are below 10,000 feet?
2. With radio failure should you squawk Mode 3 Code 7700?

If you answered either of the above YES, you're living in the past and should check FLIP Section II, paragraph IIL, "Radar Beacon Procedures."

RADAR APPROACH PROCEDURES

Two recent changes in FAA air traffic controller radar procedures align civil procedures with USAF procedures. The first change is related to the lost communications time interval while on vector to final approach. Under previous controller procedures, the interval for execution of lost communication procedures during vector to final was determined locally with no maximum limit. The controller is now required to "Advise the pilot that if radio communications are lost for a specified time interval (not more than one minute) on vector to final approach, . . ." he will proceed with lost communication instructions.

The second change concerns precision radar approaches. The civil controller is now required to inform USAF and USN aircraft when the aircraft reaches Decision Height (or minimum altitude on those approaches not yet converted by TERPs). This requirement previously existed only for military controllers. ★

IS IT WORTH IT?

some people will bet on an inside straight

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

New Year's Eve. The aircraft was returning to home base after a night airlift mission. The weather at home was lousy; ceiling 300 feet variable, visibility one mile and variable with light rain and fog. After a 12-hour round robin, with several stops, the pilot was making a straight-in ILS approach because GCA was inoperative. (All three individuals aboard had events planned for later that evening at their home station. At their last stop, the pilot called his command post duty officer and advised him he was going to get home if at all possible, in spite of the weather.)

At three miles from the outer marker, the aircraft was cleared to tower frequency. The tower was contacted at the outer marker and the aircraft was cleared for landing after reporting wheels down. The crew called "inner marker" and seconds later the aircraft crashed into 50-foot high trees in a wings level attitude, three-fourths of a mile short and 2200 feet left of the runway. The aircraft was destroyed; all occupants were killed. The final evaluation of this accident determined the cause to be pilot's decision to descend below published ILS minimums and to continue the approach without visual contact with the ground.

What made an experienced aircrew violate minimums? An emergency at home? No. Pressing mission requirements? No. Experience in flying instruments? Perhaps. Wanting to get home in time for a party? Probably. Get-homeitis? Definitely!

On the return leg of a flight the aircrew received the existing weather at their home base as being 200 feet overcast with two miles visibility and fog. A 30-minute forecast predicted 400 feet overcast with five miles visibility and ground fog. The crew decided to attempt a precision radar approach to landing. A normal enroute descent was made and initial contact with the home base RAPCON revealed that the local weather was below GCA minimums and that the only available approach was ILS. (The ILS equipment aboard the aircraft was known to be defective and was noted as such in the aircraft Form 781.)

After some hesitation and crewmember discussion concerning the malfunctioning ILS equipment, the crew advised RAPCON that they would try an ILS approach and requested radar vectors to the ILS localizer. Radar vectoring placed the aircraft on ILS centerline at 1500 feet and nine miles out in a landing configuration. Following glide slope information presented by the malfunctioning equipment, the crew began a premature descent to landing. The aircraft crossed the radar five mile fix well below the 1400 feet listed in the letdown plate. The crew continued the descent and were surprised when the aircraft struck the water four and one-half miles short of the runway.

What caused this crew to attempt an instrument landing in marginal weather with malfunctioning equipment rather than land at their alternate? Only the aircrew really know. It certainly wasn't any pressing emergency at home. There was no inflight emergency. We can only suppose that for some reason, valid or not, this crew decided to throw common sense to the winds and then attempted a procedure recognized as unsafe. Another case of get-homeitis?

An aircraft had been on a cross-country day-night evaluation and training mission. The weather briefing before the flight forecast a severe weather area through their intended route. The flight to the west coast was uneventful. The crew refueled, ate and started home. Although the severe weather forecast was valid for this leg, the crew failed to get an updated weather briefing prior to their return flight. All went well until the aircraft was over Colorado, then the crew saw thunderstorms in front of the aircraft and requested a climb to flight level 410, which was granted by Denver center. After leveling at FL 410, the crew was advised that the severe weather area was too large for radar vectoring around it. The tops were reported varying from FL 400 to 450. The crew requested FL 430 which was granted.

Initially, they were on top of all clouds but the aircraft soon penetrated a cirrus layer. Denver Center reported that the area ahead did not look "real good." Airspeed was reduced to turbulent air penetration speed and all anti-ice devices were turned on. FL 430 could not be maintained, due to turbulence, and a slow descent was begun. Turbulence increased and control became more difficult. Suddenly, a severe jolt was felt in the aircraft and both engines flamed out simultaneously. Air Traffic Control was advised of the situation and that the aircraft was descending.

During descent, turbulence, lightning, hail and rain increased to the point where the aircraft was under only marginal control. Multiple airstarts were attempted from 31,000 to 15,000 feet without success. At 15,000 feet, fire was observed coming from the Nr 1 engine. It went out after the IP pulled the "fire pull" handle. At 10,000 feet, they momentarily broke out of the clouds and saw a small hole through which they could see ground lights. The aircraft was maneuvered through the hole and broke out in heavy rain at 5000 feet.

By this time, the batteries were dead and the flight instruments were lighted by a crewmember shining his flashlight on the instrument panel. Occasional flashes of lightning provided the only illumination from outside. The IP

established a glide which would enable crash landing on a highway, but because of a car on the road, the landing had to be made in a field and the aircraft was destroyed.

Why did this experienced crew elect to continue their mission in severe weather rather than turn around and find an area of more suitable weather? Overconfidence in radar vectoring around the worst cells? Perhaps. Pressing demands at the desk job the next day? Could be. Looking forward to a warm, comfortable bed at home? Possibly. Get-homeitis? Yes!

Man is a complex animal not only physically but psychologically. The above three cases, which occurred in 1969, certainly testify to that! In all three examples, the individuals were known to be intelligent, capable, well-trained, and professional in their approach to flying. Yet they elected to continue flight under conditions which their training, experience, and common sense should have told them were unnecessarily dangerous. What reasons could be so overwhelming to cause professionals to throw caution to the wind? At the risk of oversimplification, let's now consider some possible answers to this question.

All of us have had reasons for wanting to get to a destination. For example, many of us have a desk job which is waiting for us when we return from flying. The job could require attendance at meetings and probably deals with a lot of suspense correspondence. Could the fact that you were scheduled to brief a general officer the next morning motivate you to penetrate a thunderstorm? Could suspense correspondence which must leave your office tomorrow cause you to bust minimums? Could attendance at a conference be so important that you would press on in spite of what your common sense told you? I imagine that all of us could answer yes. Our sense of duty involving our "other" job could lead us to commit unsafe acts or more politely "take a calculated risk."

All of us, sometime in our flying career, have been disappointed by not getting home in time for a party or family gathering. Could the desire to attend a party that you had planned and looked forward to for so long cause you to take the calculated risk? This desire obviously played a role in one of the examples discussed. Have we ever done it? Yes, some of us have.

Can overconfidence in our ability as crewmembers let us take a chance? As we approach our destination, we are over water. We know what the minimums are and we know that the water is sea level with no obstructions; so, let's just duck under the clouds and continue our approach VFR. Perhaps we've done this before. This time, it's so dark we can't see the water until we hit it. Ouch! I think we can say that occasionally overconfidence in our ability may allow us to take chances, particularly when we have what we believe is a justifiable reason to press on.

What about our concern over members of our family? Suppose your wife called and said Johnny was admitted to the hospital after eating a bottle of aspirin. His condition is considered serious and your wife is frantic. You must get home! You reason, a father should be with his son when he is seriously ill. What father wouldn't take a little chance, the calculated risk, to be with his ill chid? And so, you press on.

We have shown a problem,

"get-homeitis," and examined the results, aircraft accidents, and now it is time to discuss a solution. What can we do about "get-homeitis?"

Perhaps, the most important thing is for us to admit that it can happen to any of us regardless of how professional we are. Whatever the reason, there will be times in the future when we will be tempted to take the calculated risk.

Suppose each of us were to take a piece of paper and jot down some reasons, other than operational, why we might take a chance. Now, look at these reasons and ask yourself, "Are they really worth it?" Is it worth the risk to penetrate a thunderstorm so you can be with your sick child or wife? Some of you undoubtedly will say yes. But is it, if, as a result your child would be permanently without a father? Can any reason other than inflight emergencies or operational requirements be just cause for taking unnecessary chances? Probably not, if put to the test of logic.

The final step is for us to resolve not to succumb to the temptation of "get-homeitis." Let us act like the professionals we are and admit there are very few times in flying when taking a chance is really justified. Each time we are tempted, we must ask ourselves the question and answer it truthfully, "Is it really worth it?" ★

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (AFIAS-E1), Dep IG for Insp & Safety, Norton AFB CA 92409.

Dear Toots

Please help settle a difference of opinion concerning the use of small Model JG-40FK tractors for towing T-39 aircraft. The 36M3-series TOs call it a warehouse tug for towing objects weighing up to 4000 pounds, but TO 1T-39A-2-1 shows a drawing of this small tug being used for towing a T-39. I contend that this tug is not heavy enough, nor does it have adequate braking to control the aircraft. Am I correct?

Opinionated

Dear Opie

Seems there's quite a difference between towing aircraft and pulling warehoused objects around. According to a friendly engineer at the AMA, towing tractors designed to tow weights up to 4000 pounds are okay for towing T-39s, full or empty, provided the operator uses good judgment—no quick starts or stops that could damage the gear, keeping the speed down, and having the required man on the brakes in the cockpit.

Toots

Dear Toots

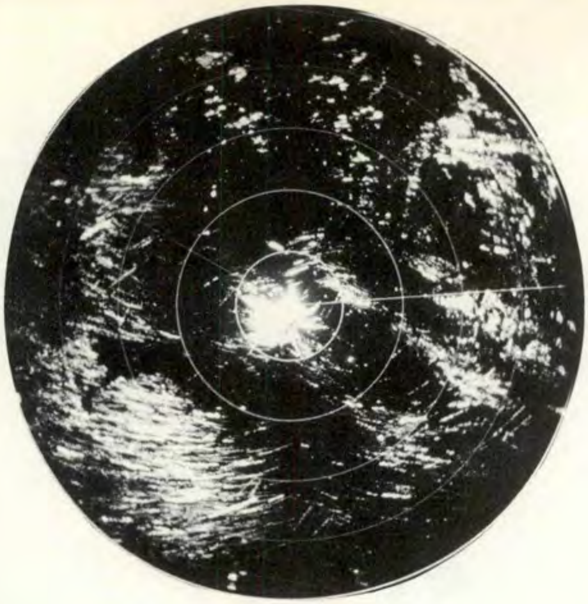
All USAF bases are supposed to have FOD control programs, but I keep reading about stray tools in engines, components, and controls. The British RAF has rigidly controlled minimum tool kits for each job and each specialist working on or around jet engines. Also, a tool kit supervisor accounts for all tools before they operate the engines. Does the USAF have such a tool control program?

Curio Smech

Dear Curio

Major commands publish supplements to the guide lines outlined in AFMs 127-101 and 66-3, as well as AFR 66-33. Tech Order 2J-1-28 also covers tool control, along with other objects, and an FOD inspection entry is required on the AF Form 781A. Past issues of *Aerospace Maintenance Safety* magazine have carried numerous articles covering tool control: use of tool counters, shadow boards, tool checklists, and mechanical tool inventory devices. I don't know how much of our annual multi-million-dollar FOD bill can be charged against stray tools, but it does make you wonder if there's a better way, doesn't it?

Toots



birdstrike

Elwood A. Seaman
Assistant for Natural
Resources, Hq, USAF

Dr. Seaman wrote this article shortly after attending the World Conference on Bird Hazards to Aircraft last September at Queen's University, Ontario, Canada. At that meeting biologists, engineers, flying safety specialists and administrators from 19 countries dug into the bird problem by reviewing their research findings and viewpoints.

Since it was impossible to get this article into Aerospace Safety *prior to the fall bird migration period, we held it for publication now—as we approach the spring migration and summer months.*

Too often we do more analyzing than solving problems. Look at the problem of four-pound, and over, birds in North America. That so many aircraft penetrate safely through large flocks of birds is almost unbelievable. There are over 60,000 swans breeding annually in Canada and Alaska and they migrate south for the winter to Chesapeake Bay and Curituck Sound. Over 4.2 million geese and 150,000 Sandhill Cranes migrate to and from various points in Canada and Alaska to many states. That there are not more strikes is amazing.

Birds fly higher than we have previously thought. A snow goose was hit at 25,000 feet! We have learned that many species fly up to 8000 feet; most strikes occur between this level and the ground.

Several species of birds that often weigh over four pounds move about in our air traffic lanes. There are about 760,000 vultures in this country. We had several strikes in 1969, one a fatility at Moody AFB in September when a T-37 windscreen was penetrated by a member of this species. Over 167,000 Great Blue Herons populate our wetlands areas and lakes, but this species generally flies too low to be hit. Pelicans—population 57,000—are sometimes struck. The water bird known as the cormorant totals about 100,000. Eagles, though getting quite rare, number about 8000. In 1968 a collision with a Golden Eagle cost a pilot his life. A T-37 hit a Sandhill Crane in 1967 with one pilot fatality.

While it is nearly impossible to compute the actual cost attributable to the bird problem, there are some figures available that will provide an idea. The USAF Office of Scientific Research several years ago estimated the annual cost to repair and replace aircraft parts damaged by bird strikes at 10 million dollars. This figure may seem large until we realize that we have lost an average of one aircraft and one pilot a year for the past six years. In addition, there have been several serious injuries. For a good idea of the magnitude of the problem see chart below.

To solve problems in the physical and biological world of science costs lots of dough. We can hardly qualify as big time spenders, having allotted only $80,000 to research on various aspects of the bird problem. But we have produced a short training film (FR 851), and we publish articles on the subject. We belong to several bird hazard committees which do some good. These are: FAA Interagency Bird Hazard Committee; the NATO Countries Bird Hazard Committee; and the two World Conferences on Bird Hazards, Nice, France, in 1963 and Canada, 1969.

WHAT TO DO

The most serious strikes with birds occur in the fall months in the U.S. This is because Mama and Daddy bird are traveling south (usually) with all the kids they raised the past spring and summer. Not all survive the winter, so fewer birds head north in the spring when our next greatest strike time occurs.

Report Bird Flocks Radar could assist more in birdstrike reporting, particularly in migration periods when masses of birds move. The large birds (over four pounds) such as swans, storks, cranes, geese, and some hawks and eagles, are the potential high hazard species. Radar controllers have their eyes busy on other aircraft, but it is possible to spot bird movements on their scopes at the same time, although most radar operators are not trained to observe these particular "bogies." If they were, they could provide a valuable service by reporting large migrating bird flocks in the fall and spring to tower operators for local traffic and directly to aircrews flying through the area. Pilots, when you sight large flocks from the air, report these to the tower.

Feathers A feather file has been developed at the U.S. National Museum specifically for identifying birds from feathers taken from bird-aircraft strikes. It is essential to know the species of bird struck and this service is a quick way to get the answer. *Send feathers* (and/or remains) to either AFOCE (Assistant for Natural Resources) or to Dr John Aldrich, Bureau of Sport Fisheries and Wildlife, Bird Division, U.S. National Museum, Washington, D.C.

Garbage-Trash Dumps If birds such as gulls, crows, pigeons, etc., frequent your airfield because of a nearby garbage or trash dump, there are a couple of things that can be done. If possible, relocate the dump away from the airfield area. If not possible, try to eliminate or cover food with landfill so that birds cannot get to it.

As a last resort, chase the birds from the airfield with a combination of bird dispersal methods such as shotgun shellcrackers, bird distress calls, use of chemical Avitrol (under pest-control or biological supervision), or vehicle-scouting the airfield to disturb birds. No single scare device will work regularly since birds become

	Strikes w/damage	Aborts	Engine ingestion	Engine overhaul/ replace-ments
1965	294	?	109	75
1966	320	20	73	73
1967	379	85	94	*
1968	363	40	88	*

*Although no figures avail, most of these required replacement or overhaul.

habituated to disturbances and come back. A multiple "chasing" effort is necessary and persistence is essential to keep the birds on the move. A warning here is timely: don't scare birds up into the path of a landing or takeoff aircraft!

Bird Control Patrol Airfields that have a rather constant bird visitation, either at migrating time or seasonal, should employ a crew to patrol the airfield. This patrol can apply all known bird scaring and dispersal means as outlined above.

Field Maintenance Grounds on and around an airfield can be altered to discourage bird gathering. A fishing pond is splendid for fishing, but if it happens to attract waterfowl, gulls, blackbirds, etc., which become hazards to aircraft, the pond should be put under bird control management, or drained. Management includes elimination of bird foods (aquatic plants or shoreline seed-bearing plants, etc.), scare devices to move the birds on their way, and removal of fish if fish-eating birds are the problem.

Trees and bushes which provide roosting or cover for birds should be removed if in the immediate area of the airfield.

Grass Cutting To control birds by grass cutting is a big question mark. We used to think that if you cut the grass at a certain height undesirable to the bird species you would discourage birds. It is not that simple. The basic thought was that you controlled insects in the grass by close-cropping and thereby eliminated the food of certain birds. We found out, however, that if you made the grass like a lawn, you *attracted* birds who like short grass! If you let the grass grow long (above six inches) you are apt to have seeds produced that are food for birds and attract mice as well. Then, the mice-eating birds, hawks and owls, come in for their favorite meal! Complex, indeed. The best advice is to have a biologist make the determination locally of what to do about grass height cutting.

Falcons Falcons are talked about more today because of spectacularly successful uses of them at three European airfields. However, I recommend we do not use falcons, except rarely, for one good reason. The falcon bird species of the world are in bad shape—they may soon be rare birds! In fact, the American Peregrine Falcon, *Falco peregrinus anatum,* is now considered extinct. Why? Most studies indicate rather definitively that DDT has eliminated this bird. Because of this steady decline of the falcon species it is very difficult to get permits from state, federal or provincial fish and wildlife agencies to trap falcons for sport or for uses such as on airfields. This and other reasons discourage the use of this bird-scaring technique.

Control of plants, roosts Control of seed-producing plants, roosts and the like are other jobs the maintenance staff has to accomplish to keep birds away from airfields. If crows, blackbirds, starlings and other such birds have handy roosting trees or bushes on or near the airfield, these birds can be reduced in numbers if you can cut down the roosts. Herbicides can be used for spraying seed-producing shrubs and weeds. (Only persons trained in the use of these chemicals should use them.)

Gravel Using Birds These birds are sometimes attracted to the edges of runways. Mourning doves are a good example of a species of bird which eats small gravel for its crop. To reduce this hazard the gravel strips should be covered

birdstrike

CONTINUED

LEFT: As shattered windshield shows, birds are not soft, feather-light creatures when struck by speeding aircraft.

ABOVE: Birds near flight of T-38s. This jet trainer is currently being retrofitted with bird resistant windshield.

RIGHT: Except for birdproof windshield, pilots' best protection is helmet with visor down.

with an asphaltic oil mix. This is often costly, but bird strikes with large flocks of mourning doves are, too.

Screening and Nest Destruction When birds build nests in flightline hangars three actions should be taken. Use hardware cloth screening where possible, knock out nests as they are constructed (swallows eventually can be discouraged), and when these don't work have your command entomologist apply poisonous feeds to kill birds. Do the latter only under strict control measures.

What Won't Work Occasionally you may hear that flashing lights chase birds. Such devices work only temporarily. Birds become adjusted to flashing lights and actually will perch on them! Stuffed owls in hangars will scare birds only temporarily . . . they soon catch on. Distress cries recorded and played back to scare one species of bird won't work on other species.

OPERATIONS

Here are some good suggestions for Ops and pilots to reduce the number of birdstrikes.

- Reduce airspeed for low level operations during migrating seasons to reduce strike damage.
- Reduce airspeeds and increase rates of climb or descent during terminal activity. Keep enroute aircraft above 10,000 MSL for as much of each leg as possible.
- Restrict night local flying activity during periods of increased bird activity. Proper scheduling could reduce the hazard.
- Fly with your visor down.
- Respond to radioed sightings of birds.
- Provide PIREPS on bird hazards.

UPCOMING ATTACK ON PROBLEM

Birds are here to stay, and no doubt, aircraft, too. Strikes will continue unless some technology is developed to prevent strikes. Research may find the answer.

I believe we need increased funding for research. We need to know more about bird habits—their movements and reasons for certain flying behavior. We need more research in the area of making a safer, bird-proof aircraft.

In the meantime, I feel we need to control birds and adjust ourselves and the aircraft to the situation, as we do to the weather.

The idea of a so-called "zap gun" to knock birds out of the path of aircraft, or whatever research may come up with, is a worthwhile venture. Recently, TWA claimed that keeping their aircraft weather radar turned on while in flight affected birds. This needs close checking.

We are gaining ground on windscreen improvement. Some canopies bounce birds in lieu of cracking or permitting penetration.

We should adopt the Worldwide Conference recommendations about reporting *all* birdstrikes. (As we did in 1968.) Use the addressee group for ALSAFECOM. Crossfeeding of birdstrike incidents and accidents might generate higher level interest in the problem. ★

The conference just had to be worthwhile. Attending were a Mr Bill Bird, *Dr Warren* Flock, *Hans* Blokpoel, *(name of a warbler), Mr Alastair* Allcock, *Lt Col* Brewer *(name of a blackbird), and to cap-off success we had a Mr. E.* Wright!

THE

REX RILEY *Transient Services Award*

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
CHANUTE AFB	Rantoul, Ill.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
WETHERSFIELD AB	England
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
WRIGHT-PATTERSON AFB	Dayton, Ohio
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.

REX RILEY'S CROSS COUNTRY NOTES

TRANSIENT TRAPS

Taxiing the other night after landing at a base in snow country, I asked for taxi directions since I wasn't familiar with the field. Ground Control told me to turn left at the "four-way intersection." I envisioned two taxiways crossing at 90 degrees, and promptly spotted at least two intersections ahead that appeared to satisfy the description. We went through a routine of: "Do I turn here?" – "No, don't turn there . . . now turn."

Next morning, in daylight, I found the four-way intersection was the junction of five taxiways. Confusing.

I'm adding four-way intersections to my list of descriptive terms that won't work for transients. (Some previous entries: Green spots, red barns, brown spots, high way overpasses, the train station and Rosie's Bar.)

Other people have had more serious trouble while taxiing. In the mail this month I read of a C-141 pilot, taxiing at night on an overseas field, when he saw vehicle headlights flashed at him from the side of the taxiway. Although the pilot immediately started braking, the big bird was still moving when it struck the propeller of a dolly-mounted C-130 engine being towed by a tug. Neither the dolly, the engine nor the tug were lighted in a manner that they could be seen by the taxiing pilot. The tug operator had turned off his headlights so they wouldn't shine in the pilot's eyes.

The fire that erupted in the wing of the C-141 was extinguished in 18 minutes. It will take 400 man-hours to repair the damage.

A T-39 pilot turned off the runway after landing at a stateside base, and taxied behind a C-130. The Hercules was performing a max power maintenance engine run. As could be expected, the T-39 pilot had a good deal of trouble maintaining directional control. Before it was all over, the T-39 had tipped over and scraped its left wingtip along the taxiway, and heavy braking had badly scuffed the right tire.

The report on this one stated that the C-130 runup location was the least undesirable location on the airdrome for engine runs. And the base involved is belatedly taking action to restrict traffic on that taxiway when engine runs are being performed. They also said something to their pilots about taxiing behind other aircraft and to their ground crews about the responsibilities of the outside observer during maintenance engine runs. ★

MAINTENANCE briefs

MOISTURE MISTAKE

AN A-37 PILOT, shortly after takeoff, noticed what appeared to be smoke coming from the right interphone panel. Then the right engine fire light came on. The engine was shut down and the aircraft returned to base without incident.

Investigation revealed the fabric cover on the bleed air duct was saturated with water. This caused what appeared to be smoke in the cockpit, but which in reality was vapor. The fire light was caused by moisture in a fire warning cannon plug. The investigation also revealed that the aircraft had been in a heavy rain storm with the canopy open not too long before its scheduled flight.

Heavy rains were listed as the cause for the malfunction. However, if Maintenance had not allowed the cockpit to be exposed to the elements the incident would not have occurred.

HYDRAULIC LEAK

THE SIGHT GAGE indicated the Nr 2 hydraulic system reservoir of the C-141 was empty, but neither the pilot's overhead panel or the engineer's panel indicated a loss of pressure. The Nr 2 hydraulic system was reserviced with 15 quarts of hydraulic fluid, and a normal check of the system was made to determine source of the leak, with negative results. The gear was extended normally and gear pins installed, emergency brakes were selected and a normal landing made. After landing, the scanner noted hydraulic fluid running down the Nr 2 engine pylon. The engine was immediately shut down and Nr 2 hydraulic system shut off. Investigation revealed the Nr 2 engine throttle cable had chafed a hole through the hydraulic pump suction tubing. The tubing had been improperly installed. Murphy again!

MAINTENANCE briefs

CASEY CHOCKJUMPER

A CHECKLIST does no good if the items thereon are simply given lip service. Ya gotta really check each item. Here's what can happen when you don't.

The ground crew, assisted by a jet engine mechanic, was running the engines on a KC-135 to ops check the oil pressure and EPR systems. The checklist was followed all the way. However, when Nr 1 engine was advanced to full dry power, the aircraft jumped the chocks and started a right turn. Throttles were retarded and full brakes applied. The aircraft stopped after traveling about 12 feet. No one was injured, and only minor damage was inflicted on the Nr 1 engine cowling, left nose wheel door and MD-3 power unit. No defects could be found in the brake system. They were just improperly set. The right brake was on but the left one was not. Now, back to checklists . . .

JAWBREAKER

THE SERGEANT, an experienced maintenance man, was about to be transferred. In fact, this was his last day on his present job before leaving for another base, so his mind wasn't really on his work. This cost him a broken jaw.

An F-4 was on the trim pad for a leak check and Nr 1 engine trim. The TSgt running the job was in the cockpit to operate the engines. During the leak check of the left engine, one of the crew found a small leak around the cap of the boundary layer control (BLC) collector bowl. After the engine was shut down he tried to remove the cap with pressure still on the system. The cap blew off and struck him in the face.

While this man was the primary contributor to his own injury, he had some help in that the TSgt supervisor did not understand exactly what the problem was — he thought it was merely a loose clamp — and he *assumed* that the other man knew exactly what he was doing. A good rule of thumb when working on airplanes is *don't assume anything.*

AS SPECIFIED IN T. O.

Lt Col Scotty O. Ferguson
Directorate of Aerospace Safety

ANOTHER DECADE has come to a close with some of you still involved with maintaining aircraft systems that you were sweating over when it started. After ten years of patching and repatching the same familiar machine, you have probably come to the conclusion that you pretty well have it hacked – you know your airplane like the back of your well-scarred hand. This is probably true. But even the old heads are subject to error. Many incident reports and occasional accident reports come through this directorate which prove this point time and time again. I'll give you a for-instance and it's close to home because it happened on a machine that was strapped to me.

I was flying an F-106 out of one of our ADC units when the secondary hydraulic system failed just after landing which, if you've got to have a failure, is a pretty good time. The cause was immediately apparent. The shuttle valve attaching bolt had been blown out of the right main gear actuator cylinder and was lodged in the wheel well. The investigators found that the threads within the actuator cylinder had been stripped. When full pressure was applied on the down side during gear extension, the shuttle valve attaching bolt was forced out, followed by great gobs of red fluid.

BACKWARDS NO BOOST

DURING PREPARATION for landing a C-130, the crew discovered that, with the autopilot disengaged, aileron control was normal to the left but restricted to approximately five degrees to the right. Various inflight procedures were attempted to no avail. Investigators found that during the last phase inspection the aileron boost package had been leaking. Corrective action was to reseal the actuator system and actuate it numerous times to purge air from the system. They also found that the cylinder sleeve, part number 110014, had been installed backwards. A test was run with a new aileron boost package, with the sleeve intentionally installed backwards. After 23 activations the movement became stiff, and on the 27th, the actuator froze. ★

EXPLOSIVES SAFETY

CORRECTION

Experienced munitions types will recognize the typing error in the caption beneath the WP smoke grenade picture on page 20, Jan 70 issue, *Aerospace Maintenance Safety*. *"Bursting,"* in "Bursting type smokes look like beer (or soda) cans with vent holes in top," should have been *"Burning."* But, for those who didn't recognize the error, please be advised that burning type smokes are the ones that look like beer or soda cans.

BURSTING TYPE WHITE PHOSPHORUS SMOKE HAND GRENADE (M15). ~~BURSTING~~ Burning TYPE SMOKES LOOK LIKE BEER (OR SODA) CANS WITH VENT HOLES IN TOP.

FILMS RECOMMENDED

Film Report FR 920, SECRET, "Parking Explosives Loaded Aircraft (U)."

This 28 minute film is based on realistic full scale tests, basically designed by the Directorate of Aerospace Safety, and provides authoritative information to commanders and their staffs concerning results to be expected and risks involved in explosions on the flight line. Data given will assist commanders in reaching decisions related to operational effectiveness through preservation of their force.

Recommend maximum use be made of this film throughout all echelons. It was designed for viewing by major commanders, field commanders, and appropriate technical personnel having a need to know in pertinent assignments (such as Safety, Munitions, Maintenance, Operations, Firefighting, Disaster Control, Civil Engineering, etc.) Copies have now been released to fill requests received through normal Air Force film channels.

Film Report FR 1207; "BIG PAPA — Explosives Storage Test Program."

This 18 minute unclassified film covers all four full scale test phases conducted under the direction of the Directorate of Aerospace Safety to test our modular concept of field storage. This storage concept was developed to permit storage of large quantities of munitions in limited land areas while providing reasonable protection of stocks from propagating explosions. Loaded storage sites containing 250,000 net pounds of explosives in bombs were detonated and results analyzed. The film was designed as a report to commanders and for the information of technical personnel (Safety, Munitions, Firefighting, Disaster Control, Civil Engineering, etc.)

DAMP RAMP

A couple of mishaps at the same base show how an overdose of rain can foul up the operation.

In the first instance a load team was dispatched to a B-52. While loading 750 lb bombs on a MER, the MJ-1 driver's foot slipped off the clutch pedal and the vehicle jerked forward. The bomb on the MJ-1 struck a bomb on the MER. The binder strap uncoupled and the bomb fell, striking the team chief on the leg and causing injury. The bomb rolled down the MJ-1 lift arm and stopped on the forward cowling with a damaged nose fuze.

Cause: Driver's foot slipped; steady rain which made everything wet and slippery.

About six weeks later at this base, a loading team was performing the same task—*in the rain*. The MJ-1 operator misaligned the bomb with the rack, lowered it and tried again. Apparently the bomb hit the rack, which caused the safety strap to pop loose. The operator saw the bomb coming and abandoned the MJ-1. The bomb fell nose down on the ramp and the MJ-1 struck the aircraft in several places as it moved along the fuselage. Another member of the team got it under control. The area was cleared and EOD personnel summoned to render the bomb safe.

Again—rain. The loading equipment was drenched and the team had worked for eight hours in the rain.

This isn't the first time something like this has happened and certainly won't be the last. We have to live with the elements, whether rain, snow, sleet, hail or hot sunshine, so remember the old standbys: Good supervision, good tech data, along with proper application of both, will help brighten a rainy day.

CHAOS IN THE CLASSROOM

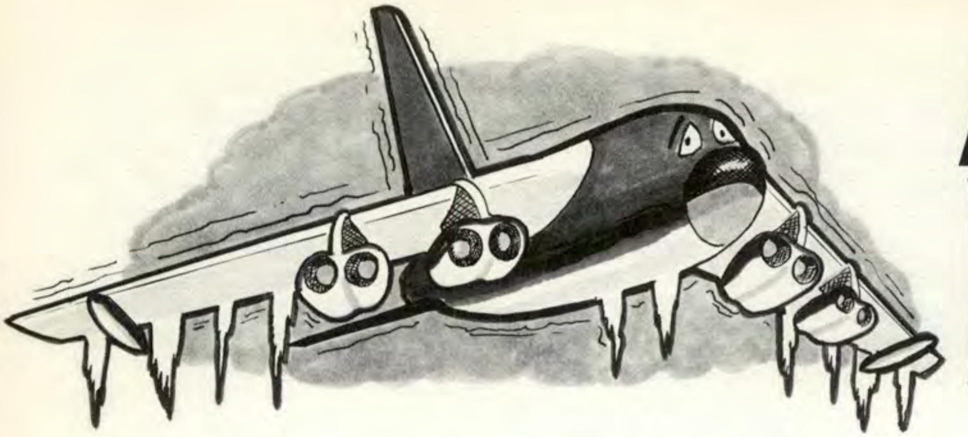
"Hey, Sarge, how does this M131 flare work?" asked the airman who was helping the sergeant rearrange the Life Support Training classroom.

"I'll show you," said the sergeant, "there's really not much to it. Watch. First, get a launcher tube, then insert the parachute and signal assembly and pull the ring. That's . . . " Blam! The flare took off like a good flare is supposed to take off. This one ricocheted off the wall just four feet from the airman's head. Particles from the burning signal caused minor burns to his neck and one eye. The sergeant got a bruised arm from the recoil.

The signal finally stopped and the sergeant scooped it up with a parachute back pad cushion and threw it outside onto a concrete walk.

How did a live flare get into a training classroom? Nobody seemed to know. Furthermore, the item was not marked inert, so it should have been properly checked. Being realistic, would you have checked this item under the circumstances that prevailed?

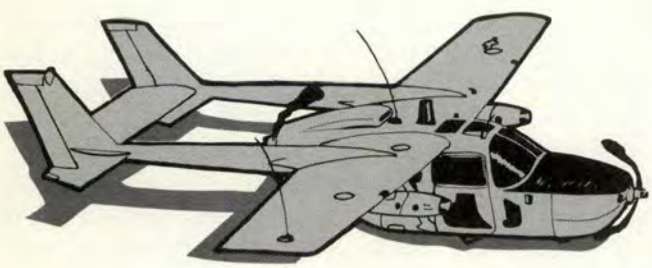
Now would be as good a time as any for all of you life support and teacher types to check the explosive items in your training equipment inventory to make sure you don't have any hot items. ★



AERO BITS

ICE. At Flight Level 420, the B-52 suddenly entered thick cirrus clouds and the crew felt light continuous turbulence. Visibility reduced to the point where they could just make out the outboard engine pods. Very shortly thereafter, the engines started compressor stalling and Nr 2, 3 and 8 flamed out.

Only number three would restart, even though the airplane descended to FL 350, within the airstart envelope. The crew had turned on engine anti-ice after they entered the weather. Apparently that was too late.



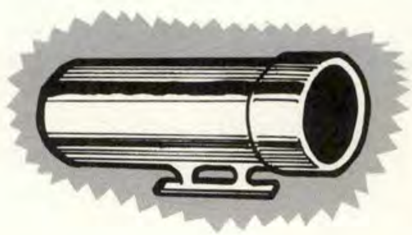
HERE WE GO AGAIN; It's an old story, and this one reads just about like all the other gear-up incidents you've seen in the past. But there's an unusual twist to this one that's worth keeping in the back of your mind.

An O-2 pilot, with enough time in the bird to be getting over-familiar with it, was returning to one of the busier SEA bases from a forward location. Number three for landing behind a C-130 and a C-46, he decided to make a 360 on downwind for spacing. He was reestablished on downwind as the C-46 approached touchdown. Calling in the base turn with gear, he pulled power back to about 12 inches, pushed the props forward and placed flaps full down. Halfway through the turn to final, he noticed that the C-46 had practically stopped 3000 feet down the runway. Because of the C-46, he set up a short field approach with about 14 inches of manifold pressure. The C-46 cleared the runway and the O-2 pilot, over touchdown, pulled off all power.

That's when he first heard the gear warning horn. It was too late to take the bird around. The gear-up O-2 slid to a stop, bending both props and doing minor damage to cowl flaps, antennas and fuselage.

Of course, the classic distraction and 360 on downwind, where this pilot usually lowers his rollers, set up this one. But investigators found the gear warning horn micro switches had vibrated loose. The horn would not sound until throttles were retarded to the full closed position.

Be a good idea to check the power setting where the horn starts to blow during flight, wouldn't it? And write it up when it's too low. Most gear warning horn complaints state that it blows at too high a throttle setting.



THERMOS BOTTLES. Something we didn't know, that was brought to our attention by the National Safety Council, is that those wide-mouth thermos bottles can be hazardous under certain conditions. Seems a metal spoon, or other object, could cause the glass liner to implode then explode. The result could be a face full of glass.

The NSC recommends:

- Never insert a metal object into thermos bottles. Pour the contents to get at them.
- Avoid temperature contrasts such as ice cubes in hot coffee, or a hot substance into something very cold.

Some of our aircraft have these containers aboard, but they are more likely to be found in your own home. So pass this message along to the wife and kiddies.

U. S. GOVERNMENT PRINTING OFFICE: 1970 39K-396/7

WRONG HAND-LE. In the F-100 we've seen pilots punch off stores when they want to drop the tailhook, sometimes they drop the hook when they wanted to punch stores. In the F-101B there have been cases of pilots grabbing the gear handle when they wanted the drag chute handle after landing. Now the '106 is getting in the act.

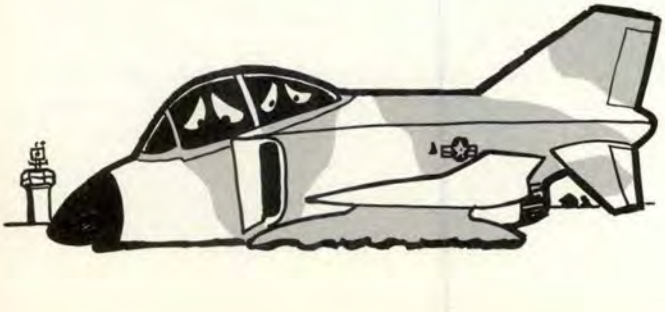
An F-106 pilot with over 400 hours in the airplane was practicing an SFO. Due to the strong crosswind, and to save altitude because his pattern looked kinda wide, he held his gear until low key. When he decided it was time for the gear, he was busy looking out the right side of the canopy, judging his distance from the runway. As soon as he did it, he realized his error and immediately jettisoned the drag chute, lowered his gear using the correct handle, and proceded to land the airplane.

We could say, "That's what a fighter pilot gets for flying a right hand pattern." But the problem really goes deeper than that.

WHAT'S FOR LUNCH. "The F-4 was cleared for a TACAN penetration and approach and turned over to Tower at approximately 17 miles. Radio contact with Tower was established at about eight miles on final. The crew was told to report five-mile final and did so, at which time Tower issued landing clearance. The aircraft touched down smoothly in the center of the runway, the drag chute was deployed and the bird continued straight ahead coming to a stop after approximately 5000 feet of slide. Parts of the centerline tank departed the aircraft after 1000 feet, but the external wing tanks, though ruptured, remained with the aircraft. Damage assessment is delayed because the aircraft is resting on the flatttened tanks.

"The crew states that although they completed a descent checklist and the initial landing check at 20 miles, no further checklist items were accomplished and they did not lower gear or flaps."

Ho-hum . . .



PEOPLE PROBLEM. Recently an HH-53 was climbing out after takeoff, enroute to rendezvous for refueling. While the pilots were busy maneuvering into position on their tanker, two crewmembers back aft decided to install the emergency escape hatch. They did not obtain clearance to do this from the aircraft commander and didn't know that the helicopter was operating above the airspeed recommended for hatch installation. The hatch caught in the rotor wash, tore from their hands, snapped the nylon retaining strap and fell away.

The crewmembers involved had been briefed on the proper procedures and had read an item in the FCIF on the subject.

GERONimo-o-o. Another case of an object falling from an aircraft in flight turned out to be a lot more serious than the helicopter hatch incident above. This time it was a navigator!

Returning to base after a combat mission, the navigator of a C-130 began storing equipment by an open door in the rear of the aircraft. Handling and moving equipment directly in front of him, the navigator frequently bumped the front of his chest pack parachute. Eventually the parachute pins worked loose. When the pilot chute popped out, it went right out the door, followed by the main chute—and then the navigator. He was rescued at first light the next morning with only minor injuries.

The unit has discontinued use of chest-type parachutes for people working around open hatches and doors. They're using either back packs or harnesses minus parachutes, plus restraining lines. ★

UNITED STATES AIR FORCE

WELL DONE AWARD

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

CAPTAIN
Richard B. Bugeda

CAPTAIN
Garlin D. Pill

355th Tactical Fighter Wing, APO San Francisco 96273

On 19 March 1969, Captain Bugeda and Captain Pill were flying an F-105 on a local training mission from Kwang-Ju ROKAFB, Korea. Departure weather was 1000 foot ceiling with four miles visibility in ground fog. The top of the clouds was at 19,000 feet. Upon arrival back at the TACAN holding fix for Kwang-Ju, the crew heard a loud explosion followed by severe engine vibration that made the instruments almost impossible to read. The crew immediately elected to attempt a safe recovery in spite of several limiting factors: The fuel remaining would necessitate a heavyweight landing. The instrument penetration through 18,000 feet of weather would be without the aid of ground radar control. Cockpit instrumentation interpretation would be very difficult due to the vibration. The terrain was mountainous with peaks up to 4800 feet. The crew would have to deviate from the long published penetration and approach due to the unknown engine condition.

With Captain Pill operating the aircraft radar to provide terrain avoidance and navigation assistance while continually aiding Captain Bugeda in reading the vital instruments, they managed to maneuver safely to a point seven miles from the runway at idle power setting. Then Captain Bugeda established landing configuration and started a glide 50 knots faster than normal instrument approach speed while Captain Pill provided azimuth and range information from the aircraft's radar. The aircraft broke out of the weather at 400 feet, one and one-half miles from the runway. Although the throttle was in the full military position the airspeed continued to decrease. Captain Bugeda continued the approach and successfully landed within the first 500 feet of the runway. The outstanding teamwork, calm and professional actions of this crew under extreme stress saved a valuable combat aircraft. WELL DONE! ★