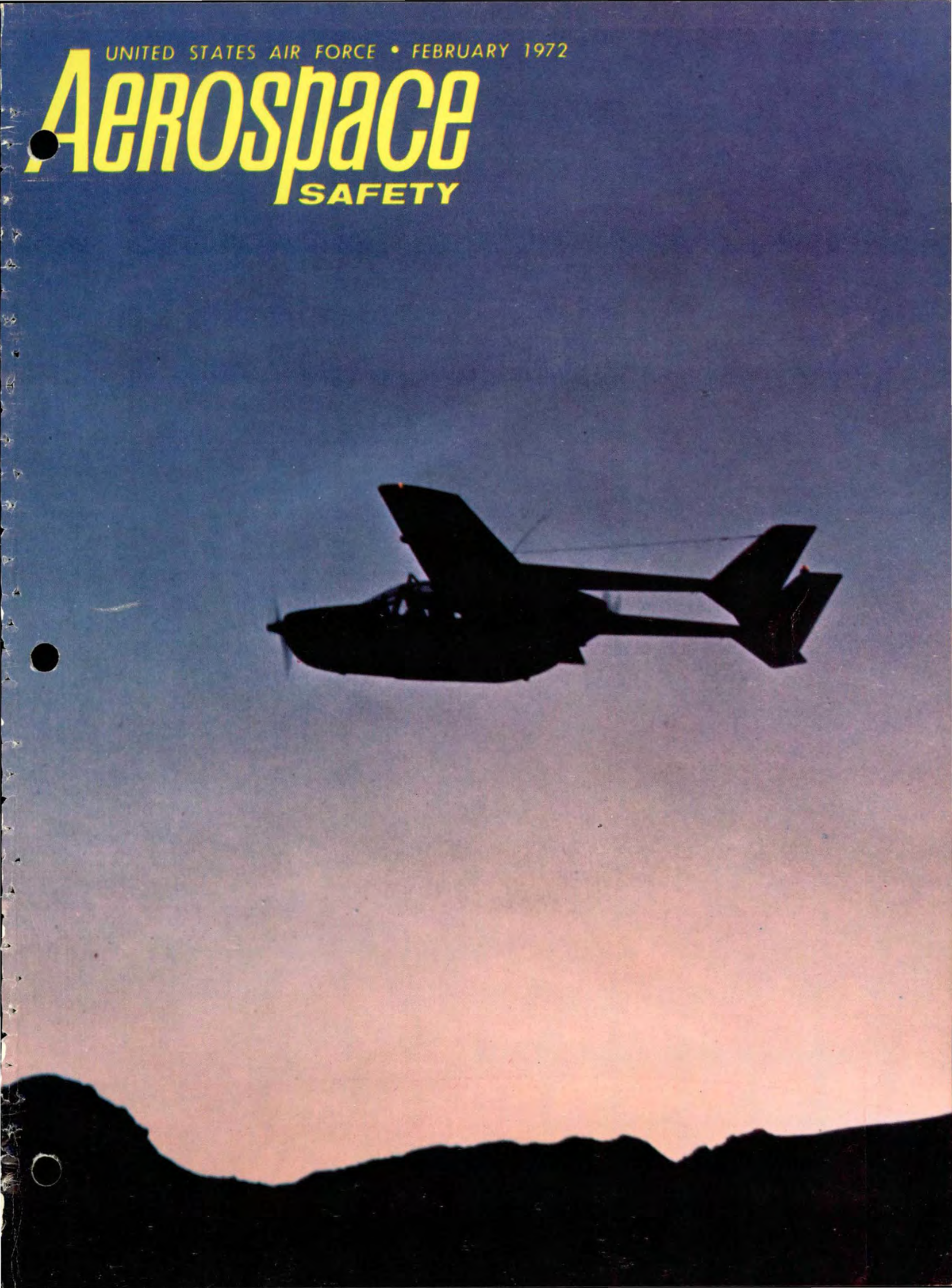
UNITED STATES AIR FORCE • FEBRUARY 1972

Aerospace SAFETY



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UNITED STATES AIR FORCE **FEBRUARY 1972**

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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whoa woes

One sure way to cause the hair to stand up on the back of your neck is to apply your brakes and have your machine pick up speed. Here are some guidelines that may help avoid this nasty situation.

LT COL DAVID L. ELLIOTT
Directorate of Aerospace Safety

After "surfing" 1300 feet, the aircraft slid off the side of the runway and into a major accident. Another victim of the phenomenon known as hydroplaning.

It was a rainy night, the water depth was estimated to be one-tenth of an inch. The tire tread was measured at nine hundredths of an inch on one main gear tire and none on the other; the total dynamic hydroplaning speed was computed at 114 knots. The aircraft touched down at 135 knots, 16 to 18 feet left of the runway centerline. The crosswind component was computed at approximately 13 knots. It was calculated that the aircraft departed the runway six seconds after touchdown. With this data it's easy to see—the 13 knots represents 22 feet/sec which, times six seconds, equals 132 feet, precisely his distance from the edge of the runway at touchdown.

It has been said by the people who know, that, under total dynamic hydroplaning conditions, an aircraft can be expected to depart the side of the runway at a rate equal to the existing crosswind component.

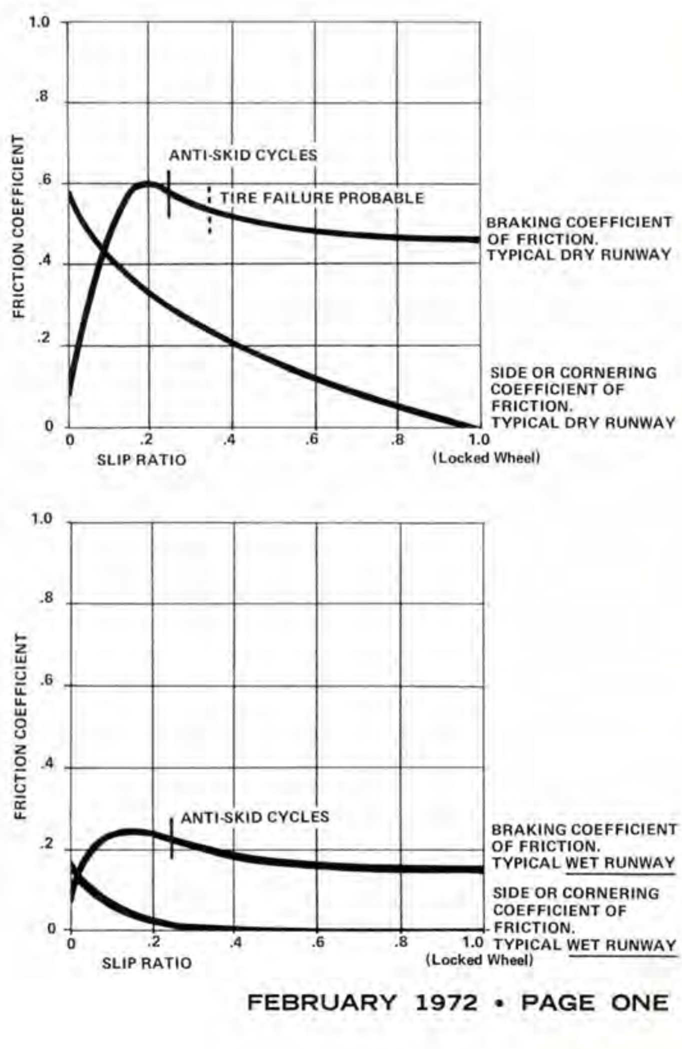
Most pilots agree that controlling and stopping aircraft on dry runways is not much of a problem, but when the runway is wet, or icy, or flooded, it's a different ball game.

On a dry surface an aircraft can develop friction values that exceed the structural limits of the tires. When an aircraft tire is totally skidded (slip ratio of 1) on a dry surface, tire failure is complete and immediate. Figure 1 shows that, as you increase the slip ratio, the side force capability of the tire drops, and as you reach a 1.0 slip ratio (total skid) the side force coefficient of friction drops to zero, whereas the braking coefficient of friction levels at somewhere around 0.4. You've probably experienced this phenomenon of loss of directional control during a panic wheels-locked stop in your automobile.

Anti-skid braking systems are designed to prevent total skidding and thus loss of directional control and tire failure. Some very slight skidding is required, however, to develop the most effective coefficient of friction. From Figure 1 you can see that the coefficient changes as the slip ratio changes. The most effective frictional values are developed with approximately 0.20 slip ratio or 20 percent of a total skid. Based on this, most anti-skid systems cycle at 0.15 to 0.25 slip ratios.

Most jet fighters are not capable of developing really high coefficients of friction on dry runways, even

FIGURE 1



though full skids are possible, particularly with boosted brake systems. The author believes that, on a dry runway, failure of the tire will generally occur prior to development of a 100 percent slip, particularly with high pressure tires.

To better understand the effects of a wet runway on stopping distances and aircraft control, let's look at how a pneumatic tire develops friction on a dry surface. Researchers in tire characteristics say there are two sources of friction between the tire and the runway surface. They are *adhesion* and *hysteresis*. Where the tire contacts the runway surface high pressures exist, and strong molecular forces can be generated to resist the relative displacement of the surfaces. These adhesion forces resist skidding.

Rubber has the ability to conform to the shape of the irregularities in the runway surface. The horizontal components of these potential forces constitute the friction due to *hysteresis*. If a runway is smooth, such as a smooth glass plate, friction due to hysteresis becomes negligible. If a runway is lubricated with water or oil the adhesion forces become negligible. One of these two sources of friction is necessary. On wet runways the hysteresis component is the only practical source of friction available. However, enough vertical pressure must be exerted to permit the tire to break through the lubrication film and conform to the irregularities of the runway surface.

It is important then that runway surfaces have texture and that the irregularities in the surface be capable of developing horizontal component forces. Grooved runways do this. Runways with the aggregate worn down to polished stones may not provide horizontal component forces, even though texture is present.

HYDROPLANING

Hydroplaning is an abstract term, widely misused, and more widely misunderstood. Let's define it specifically.

Total dynamic hydroplaning is a phenomenon that occurs when the water is deep enough, and the speed of the aircraft great enough, to create a hydrodynamic pressure that reaches the tire footprint pressure. The tires are lifted from the runway surface, the frictional values between the tire and runway are not enough to spin up the tire, so it can be said that the coefficient of friction is less than that of a free rolling wheel. Application of wheel brakes under these conditions is about as effective in stopping the aircraft as applying wheel brakes on the downwind leg to get spacing in the pattern. This condition can be calculated by the formula $9 \sqrt{\text{tire pressure}}$ = hydroplaning speed in knots. Now, if you are under the impression that $8.9 \sqrt{\text{tire pressure}}$ = non-hydroplaning speed in knots, best read on . . .

Wet runways vary extensively in relative slipperiness. Both Projects *Combat Traction* and *Concrete Traction* demonstrated that with uniform water depths the coefficients of friction of various runway surfaces differ significantly. One runway tested developed a coefficient of friction of only .24 when wet, while others developed up to .6. The significant point is that partial dynamic hydroplaning is dependent upon the runway surface below the water and the amount of hydrodynamic force available. If the runway surface is smooth and you slow to below total dynamic hydroplaning speed, you're still in trouble, partially because the runway is smooth and partially because you still have a slight case of dynamic hydroplaning. When you cease to *totally* hydroplane you *partially* hydroplane, depending on the hydrodynamic force on the tire. This force is a function of the square of the speed of the aircraft or wheel and tire.

Figure 2 explains the effect of partial hydroplaning on braking performance on a slippery wet runway. Across the bottom of the chart is the percentage of speed below total dynamic hydroplaning speed. Across the top are the corresponding speeds of the F-4 and the F-111. In the F-4 your total hydroplaning speed is 122. At 92 knots you would be 56 percent hydroplaning. Move to the right side of the chart to runway 1 with a total coefficient of friction capability, when wet, of 0.24 (or an RCR of 8). Under the partial dynamic hydroplaning condition above, the total coefficient of friction capability at that speed would be only 0.10, (an RCR of 3). As the aircraft slows down, the effective RCR or coefficient of friction would increase but never exceed the total capability of the runway, which in this case is 0.24 (RCR of 8).

Viscous skidding and reverted rubber. Viscous skidding is not, in the true sense, hydroplaning. It's a condition that exists when the surface is lubricated and the adhesion forces are significantly reduced. Skidding starts at lower brake pressures or coefficients of friction. If the runway is relatively smooth, the heat generated from the skidding tire can cause the rubber to revert to the uncured state. The heat necessary to do this is on the order of 600 to 700 F and rapidly produces steam from the water film which can generate pressures that reach the footprint pressure. This is referred to as friction-generated, reverted rubber hydroplaning.

This phenomenon does not occur under a total dynamic hydroplaning condition, but may under partial dynamic hydroplaning. It usually occurs when there is a thin film of water on a smooth runway surface. The

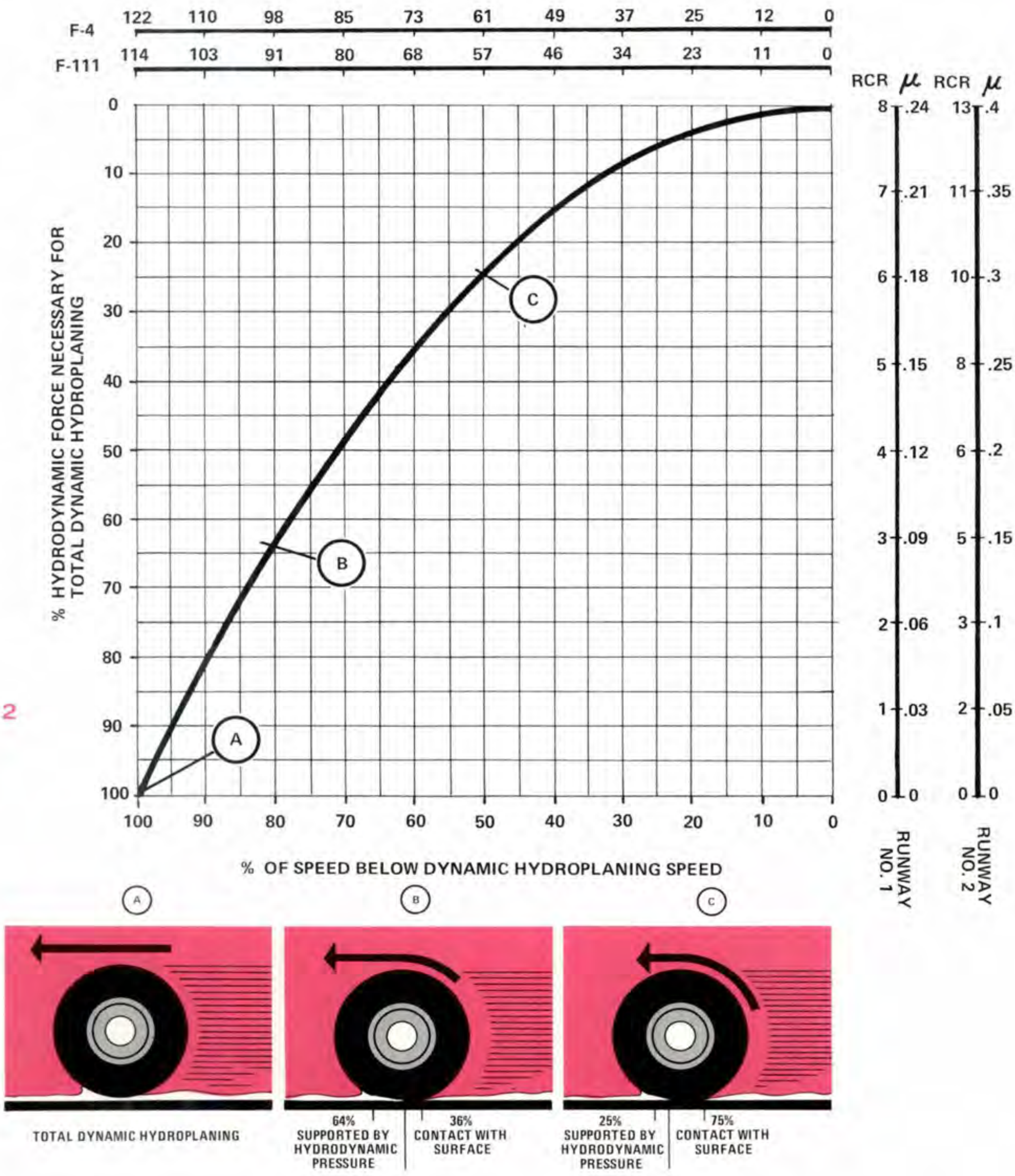


FIGURE 2

real significance of this type hydroplaning is that it is not a function of speed, and the condition can exist down to very low velocities. Other than the fact that a fairly smooth runway is necessary for this to occur, it is unpredictable. One interesting point about this phenomenon is that it can and has occurred on unbraked nose wheels during sideslips.

MEASURING SLIPPERINESS

There are several methods of measuring relative slipperiness of runways. The only system presently in use operationally for measuring the slipperiness of wet runways is the British designed Mu-meter used by the United Kingdom. USAF, in conjunction with FAA

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MANAGEMENT IN ACTION

show ME!

Frequently deficiencies go undetected for long periods simply because those who could, and should, correct the problem can't see it—a case of not seeing the forest for the trees.

This is not an uncommon condition. Maintenance people, for instance, are usually 100 percent occupied with their day-to-day workload and may, consequently, live with some unacceptable situations, such as unsafe AGE, poor PMEL support, a third-rate motor pool, supply problems, just to name a few.

When they can't hack the schedule, because some birds are out of commission, the Ops types blame the maintainers regardless of the reason.

The wing commander begins to get excuses rather than performance, and the whole house of cards starts to quiver.

When an outfit gets in this condition, an IG inspection can be devastating in its criticism of local management; but, at the same time, it could be the salvation of the unit.

A commander commands. He also manages, and the two words are not necessarily synonymous. Therefore, in his elation at getting a command, a new commander must reflect on the management aspects of his job. Perhaps the following samples of findings from Unit Effectiveness Inspections conducted during the past several months will serve to stimulate and motivate both new and experienced managers at all levels. Items cover several different areas and are from UEIs at a half-a-dozen different bases.

• No approved listing of authorized items to be packed in survival kits to be placed aboard aircraft . . . neither the radio tester nor battery tester had been calibrated since factory release in 1967 . . . survival radios and beacons were not being tested every 120 days . . . several items of test equipment were on order but not on hand . . . no one was on orders as authorized to inspect and repack parachutes, etc., etc., etc.

If a UEI team were to inspect your PE shop tomorrow, what would they find? Is it properly manned? If there are deficiencies in your shop do you know what they are and why? Have they been documented and reported upward so that the appropriate level of management is aware of the situation and taking action to correct it?

• An emergency ground egress exercise was graded unsatisfactory for several reasons: Rescue personnel had to return to the crash truck for a ladder when they were unable to release the installed ladder; simultaneous extraction of front and back seaters was not attempted; the tech order was not followed for releasing the front seat pilot from personal leads, shoulder harness, lap belt and leg restraints; survival kits were not released until three unsuccessful attempts had been made to extract the crewmembers.

What about your fire/rescue personnel? How will they perform in an emergency? A commander should know. And, do your aircrews practice their emergency egress procedures to the point where both you and they are confident of their ability?

FLIGHT MANAGEMENT

• Management of the stan/eval function was weak. Flight examiners were conducting both training and testing, something hardly conducive to objectivity. There were indications of a "no-fail" program. Only one pilot had failed a flight evaluation. He was later rated as qualified, although his Form 8B indicated substandard performance.

In many cases, there was no evidence of the commander's review of the 8B. Some of the remarks by evaluators indicated that a crewmember's performance was substandard; however, he was allowed to pass the flight check with no corrective action required. Where corrective action or retraining was requested, no follow-up to insure compliance was performed.

The function of a stan/eval section is to inform the commander where weak areas exist in the training program and correct these deficiencies before

they result in a loss of life or combat potential. Unless the commander uses the section to attain this objective, he denies himself a major tool by which he can improve his operation.

HR (USAF HAZARD REPORT) DISINTEREST

• Disinterest and poor administration degraded the HR program . . . only four HRs were submitted during the first four months of the year.

A successful HR program is one that identifies hazards to the people who can correct them and that also provides feedback to those who take the trouble to submit them. Lazy, disinterested or complacent people at any stage along the HR route, from originator back to originator, can kill this program. If you are a manager, do you know how good your HR program is? Do you know how your people feel about it? Have they had results, or at least a reasonable answer? Or has their paper gone off into limbo never to be heard from again? If you identify a hazard within your unit that may also exist elsewhere, do you pass it on—or let the others find out the hard way?

AIRCRAFT MAINTENANCE

• Quality control inspectors did not use tech data during aircraft inspections.

• Although quality control inspections were in depth and detailed, managers showed little interest in correcting basic causes that persisted, as indicated by many repeat write-ups.

A function of management is the detection and correction of deficiencies. In the second case management apparently had the information but failed to exercise a primary responsibility.

• No tire inspection cage available . . . only one of three required bearing cleaning steps performed . . . prescribed mats to protect wheels during teardown and buildup were not available.

How long since the chief of maintenance took a good look at his tire shop? Good management requires leg work. Unfortunately, paperwork and other deskbound duties tend to take precedence over getting out and taking a first-hand look. When this is combined with a failure to delegate tasks, then it is possible that management will collapse right down the line.

• Some static grounds were not constructed of the proper grounding cable and bayonet plugs . . . ground wires had broken off and were tied in a knot to the clips. During this inspection an aircraft was worked on for four hours by QC with the aircraft grounded to an uncertified grounding point.

One wonders about the *quality* and the *control* in this operation.

CALIBRATION LAB

• Airlocks and doors to calibration areas were defective and caused laboratory contamination and difficulty with environmental control . . . shoe cleaners improperly located or missing from entrances . . . dust caps frequently not used . . . outgoing PME dirty . . . storage bins not labelled, making it difficult to identify incoming and completed PME . . . scheduler did not keep track of work status, and so on.

One of the most important functions in the maintenance complex is the Precision Measuring Equipment Laboratory. Would you like to depend on this one? One commander did.

VEHICLE MAINTENANCE

• Among many discrepancies at one base inspectors found: Machine shop machinery and tools dirty and greasy, floor likewise . . . paint peeling from exterior and insulation falling from walls inside building . . . TO file and office in complete disarray. An excessive number of vehicles had received recurring maintenance—electrical, brake and tuneup—four to five times in six months. Others were out of commission for months—one six months for electrical and exhaust system repairs, another for five months for electrical repair. A bus without a brakedrum and another vehicle with the engine removed were parked outside with no protection, exposing various components to the elements.

It would seem, in this case, that there was a complete absence of management, from the Motor Pool NCOIC up through the Base Commander. The condition of this facility is reminiscent of another motor pool, several years ago, that could not adequately support the fire trucks. They, in turn, failed when an aircraft crashed on the runway, leaving firemen helpless to assist the crew trapped in a burning aircraft.

These are just a few of the many instances of poor management brought to light by inspectors. Findings range from minor items to extremely serious discrepancies. But even the seemingly minor items can have serious implications. For example, at one base the crash grid maps in the field kits did not match the one in use in the command post. Could this result in confusion, serious delay and the possible loss of life in event of an aircraft accident?

An Air Force manager at any level is in a very demanding business. To be successful he must exercise not only his mind but his feet. He will also find it necessary to get his hands dirty once in a while. And he must have a certain amount of that stubborn skepticism credited to Missourians, whose favorite phrase is **"Show Me!"** ★

THE I.P.I.S. APPROACH

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

Q In the "IPIS Approach" article of September 1971, you stated that for an ASR approach, the radar controller is required to discontinue approach guidance when the aircraft is at the MAP or one mile from the runway, whichever is greater. The lowest published ASR minimums are ½ mile visibility and 2400 feet RVR. If I'm one mile out and can only see ahead one-half mile, how do I land?

A If the ASR approach was to a runway with **no** approach lights, the required visibility would be at least one mile. ASR minimums of ½ mile/2400 RVR for Category A and B aircraft are only authorized when the "no-light" visibility value is one mile and credit is applied for a lighting system which provides lights 3000 feet into the approach zone. These systems are coded (A), (A_1), (A_3), and (B) in the approach lighting legend of the instrument approach procedures booklet. Short Approach Light System (SALS), coded (A_2), may also be applied provided Runway Alignment Indicator Lights (sequenced flashing strobes) are added so that the total system length is 3000 feet.

Thus, when you are at the MAP one mile from the runway, you should be able to see ahead one-half mile. At least a portion of the approach light system should be visible and should provide sufficient visual cues for you to continue the approach to landing.

Q I have noticed that some non-precision approaches which appear to be straight-in, do not publish straight-in minimums. Conversely, approaches which require considerable turn to align with the runway are listed as straight-ins. What's the story?

A You've just touched on a rather complicated subject. For straight-in minimums to be published, certain TERPS criteria must be met. Basically, a straight-in approach *cannot* require the pilot to:

a. Turn more than 30 degrees to align with the runway; or

b. Side-step more than 500 feet to align with the runway centerline; or

c. Descend more than 400 feet per mile from the final approach fix altitude to the runway elevation (optimum is 300 feet/mile). If any of these conditions are violated, only circling minimums may be published.

Consider an on-airport TACAN placed 550 feet from the runway centerline. If the final approach radial exactly parallels the runway centerline (090 degrees in Figure 1, Example A), a side-step maneuver of more than 500 feet is required. If you sight the runway some distance out, the side-step maneuver would hardly be noticed. However, only circling minimums could be published even though the maneuver will appear to be a straight-in approach.

A different final approach radial may be selected by the approach designer which will eliminate the side-step maneuver. In Example B, the final approach course of 060° requires a 30 degree turn to align the aircraft with the runway. This is within the criteria for a straight-in approach and straight-in minimums would be published.

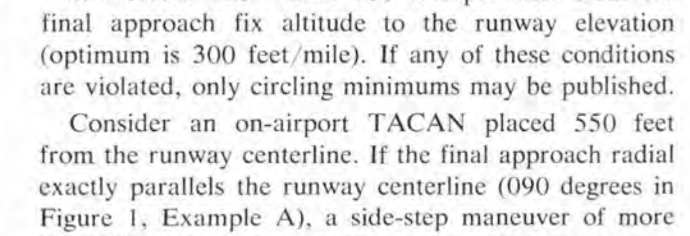

FIGURE 1

A less common problem is the descent gradient in the final approach segment. Straight-in minimums can be published only when this descent gradient does not exceed 400 feet per mile. The example in Figure 2 shows descent of 2100 feet in 5.0 nautical miles, or 420 feet per mile. Note that descent gradient is computed to the runway elevation and NOT to the MDA. While straight-in minimums cannot be published, the actual landing maneuver may, for all practical purposes, be a straight-in approach. ★

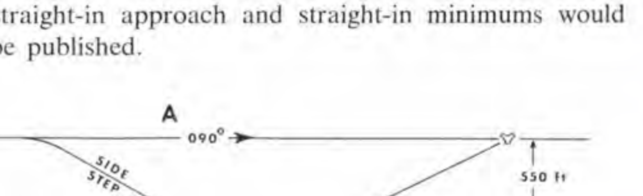

FIGURE 2

taxi!

"Ladies and gentlemen, this is the captain speaking. We have just been struck by another aircraft . . ."

Disaster? No. The Boeing 707 was waiting for takeoff and was struck by a C-124 which was trying to maneuver around behind the 707 to get into run-up position. The C-124 copilot advised the pilot that it would be close, but that he believed they could clear the airliner. The scanner standing in the top hatch concurred, agreed that clearance would be minimal but stated his belief that they could clear the other aircraft. Not a disaster, but certainly a needless waste of time and resources which could have been prevented with a minimum of trouble.

In another recent mishap, a T-29 was cleared to taxi to the active runway from a civilian ramp on a large international airport. Immediately after the brake check the left wing struck a lamp post. None of the three crewmembers saw the pole.

A T-33 pilot, taxiing blithely along after landing, crumped his right tip tank on the fender of a red and white fuel truck which was parked on the taxiway. Visibility was unrestricted. Sure . . . he was following the yellow taxi line, and the fuel truck shouldn't have been where it was. But guess who bought the crump.

Sometimes it takes two or more. The F-4 crew chief gave the pilot the "come ahead" signal to pull out of the chocks . . . and watched while the F-4 taxied over the ground power unit which the crew chief had neglected to remove. Neither the crew chief nor the pilot had bothered to clear the area before taxi.

Communications can be a problem, too. While parking a B-52 after a night mission, the pilot was following an approved taxi line when he thought he received a left turn signal from the marshaller on the left wing. He obediently complied, swung 28 feet to the left and struck a blast fence paralleling the taxiway. The marshaller stated that he gave no left turn signal and, furthermore, when he saw the huge bomber swinging left he gave a series of "stop" signals. The pilot stated that he interpreted the signals as "continue straight ahead!"

AFR 60-11 says, with admirable brevity, "Aircraft will not be taxied at any time within 10 feet of an obstruction." It goes on to say that aircraft being taxied within 25 feet of an obstacle must have at least one wing-walker (two, if there are obstacles on both sides). There is a provision for excusing *locally-based* aircraft from the wing-walker rule IF:

(A) Established taxi lines are marked, AND

(B) Obstacles are either permanent in nature or consist of other aircraft parked in established parking spots.

Please note that the wing-walker exception applies only to locally based aircraft.

Prevention of taxi accidents boils down to taking a little care. Anyone who is authorized to handle an aircraft should appreciate the value of:

- Taxiing at *moderate* speed—and surely we all recognize that weather, available light, congestion, strange-field operation, etc., have a bearing on what a moderate taxi speed really is!
- Clearing the area before taxiing. Tower clearance doesn't mean that light post won't catch your wing, and the crew chief's "come ahead" won't guarantee (as we've seen) that he's removed the power cart.
- Understanding the marshaller's hand or wand signals. One good recommendation to come out of these incidents is that anyone authorized to handle an aircraft receive annual refresher training on marshalling signals.
- Stopping the aircraft in case of doubt or confusion. It's darned hard to have a taxi accident with the airplane stopped. And the time spent in making sure the obstacle clearance criteria are met doesn't approach the time it would take to repair a wingtip (not to mention the paperwork)!

No, a taxi accident isn't usually a disaster. But it's sure a bother, and expensive. Like the old saying goes, "There's absolutely no excuse. . . ." Have a care, and you might save yourself a lot of trouble! ★

"I should have checked the NOTAMs."

LADY LUCK WAS MY PASSENGER

With a shiny pair of wings on my left breast, I walked into Operations and reported to the senior officer. The spit-shined shoes, the tailored, crisp khakis and the snappy salute obviously reflected the recent months of cadet military training.

"Lt Sharpie reporting as ordered, sir."

"Sam, I have to send two T-Birds to McClellan AFB by tomorrow afternoon for inspection and depot maintenance. I want you to take one since I'm short of pilots. You will leap off in about two hours on Major Oldhead's wing. Any questions?"

"Yes sir. Will we be going direct to Sacramento today?"

"No, I believe Major Oldhead wants to RON in the Los Angeles area tonight and then fly into McClellan tomorrow morning when the weather lifts. I know you're just out of pilot training, but stick with Major Oldhead and you shouldn't have any problems."

As an eager young member of the flying fraternity, I gathered all my flying gear and rendezvoused with Major Oldhead at Base Operations. The older pilot briefed the flight plan, but not with the thoroughness required by Air Training Command regulations.

"We'll one-hop it into Williams AFB and gas up, then smoke into Los Alamitos NAS where we'll RON. I have some friends I want to visit tonight. When McClellan's weather lifts tomorrow, we'll leap off and get the birds there on time. Normal formation procedures will apply. I'll lead, do the navigating and radio chatter. Any questions?"

"No sir!"

The two T-Birds taxied onto the active runway and stopped in front of mobile control for run-up. After quickly checking his instruments, the leader looked back at his young charge. I nodded and we started rolling.

After 1000 feet of roll, I fell behind and announced:

"Tiger 2 aborting. Fuel fumes are coming in through the pressurization vents."

"Rog, two. I'll go on and wait for you at Willie. Get your bird fixed quickly. We want to get to L.A. by sunset."

"Rog."

The fuel fumes were indeed coming into the cockpit, as was fuel. A check valve in the tip tank pressurization system was stuck open allowing introduction of fuel into the cockpit air conditioning system. Maintenance quickly analyzed the malfunction, but was unable to repair the aircraft right away.

Finally, after repairing and checking the aircraft properly, maintenance released it to me; but the hour of sunset in Texas had long passed. However, the mission to deliver the aircraft to McClellan AFB still existed. Within a half hour, one lonely T-Bird sped down the runway and into the night.

The flight to Arizona was beautiful. The full moon, the bleak West Texas landscape and the cloudless sky all emphasized to me that I had *"slipped the surly bonds of earth and danced the skies on laughter silvered wings. . . ."*

After a "grease job" landing at Williams AFB, I strode into Base Operations and inquired about Major Oldhead. "He left you this note, Lieutenant. Wants you to meet him at McClellan tomorrow by noon," the dispatcher blurted out.

I took a quick look at the wall map and checked the time. I estimated arrival at L.A. by midnight.

—After being away from home for almost two years, it's going to be great to see my mom and two brothers. I won't call them now. I'll wait until I land. Shouldn't take too long for them to drive out with all those new freeways.—

The thoughts of the reunion went through my mind as I calculated the distance and heading from Phoenix to Los Angeles.

"No sense in going too high on this one. I've got plenty of gas."

The minutes seemed to pass more slowly now as the waning period of another calendar day was coming to an end. The silver T-Bird knifed through the dark desert night westward toward the Pacific coast. As a young lad growing up in the city of Los Angeles, I had often dreamed of flying toward my hometown from the vast expanse of the desert. I had read many descriptions of aerial views of this city of millions of lights that was sprawled in a basin surrounded on three sides by mountains and on the fourth by the sea; but I had never personally seen this spectacle. Now, flying my

own bird, I was about to gaze upon one of the most beautiful man-made artistic patterns. As I came closer to the glow on the horizon, I lost even more altitude to skirt over the mountains low enough to suddenly come upon the edge of the bowl of lights. Weather predicted clear skies with no smog, but a strong chance of fog developing along the coast after midnight. The myriad of lights came into view, and the sight was indeed as I had read and heard of so many times. For miles in every direction I was surrounded by multicolored lights and highways. But, it was time to land since traces of fog were forming along the coast and in patches inland. I called Los Alamitos tower:

"Los Alamitos, AF jet 1234, over."

No response!

"Alamitos tower, AF jet 1-2-3-4, how copy?"

Still no response as the aircraft approached the hazy coastline.

Hm-m-m, better circle a bit until I obtain landing instructions. I wonder which of those fields is Alamitos. I'll call Long Beach and check my radios.

"Long Beach tower, AF jet 1234, over."

"AF jet 1234, this is Long Beach, go ahead."

"Say, Long Beach, would you call Alamitos tower for me and see if their radios are on and would you get landing instructions for me, please?"

"Rog, -34, stand by."

Several minutes passed as the T-Bird circled over the bright city, descending slowly.

"AF jet 1234, this is Long Beach. Be advised Alamitos is off the air. They shut down at sunset, you know. This information is in the NOTAMS. They advise you go to an Air Force Base, over."

"Oops, my apologies to Los Alamitos. I have a change in flight plan. Ready to copy?"

"Rog. Go ahead."

"Rog. I'll land at uh, uh . . ."

I thought of the several Air Force bases that were in the area and related them to driving distance from home.

". . . uh, Norton AFB."

"Rog, we have that and we'll relay to flight service. Good luck. Long Beach out."

Now the problem of finding Norton AFB existed. Charts and maps quickly filled the cockpit. However, because of a weak flashlight, low altitude and the knowledge of being near home, I did not continue a logical search for the solution of my problem. Instead, distracted by a low fuel warning light, I decided to use some skill and cunning in order to save time.

"Norton tower, AF jet 1234, over."

"1234, this is Norton, go ahead."

"Rog, Norton, land one T-Bird, VFR."

"Rog, 1234, Norton landing 05, winds calm, altimeter 29.97, report initial. Pattern altitude, 3200 feet. Be advised patches of fog south and west."

"1234, Rog."

Armed with this new information, I headed in the general direction of San Bernardino and, mentally aligning myself with 05, called:

"Norton, would you turn up your runway lights, please?"

At that instant, it seemed that all of the runway lights in the basin, aligned with 05°, went full bright. To complicate matters, the amber fluid that once filled the fuel tanks was almost gone.

"Norton, sorry to bother you again, but could you please flash your runway lights a couple of times?"

The flicker of a parallel row of lights shot through the glare of the many lights below like one of the search lights used at a Hollywood

A premiere. A subsequent diving maneuver put the T-Bird on initial at the prescribed altitude with more airspeed than called for. However, a judicious use of speed brakes prior to the pitch soon brought everything back to normal and again another *grease job* landing ensued.

As I shut down the engine and looked up at the moon, now partially hidden by the forming fog, I thought: . . . *"and, while with silent, lifting mind, I've trod the high untrespassed sanctity of space, put out my hand, and touched the face of God."*

If the aircraft in this incident had ended up as a pile of deformed metal and plexiglas, the Flying Safety Officer investigating the results would have traced the cause to several factors. Fortunately, I completed my mission and did not have to explain what had transpired. But in my own mind, I knew that I had come close. Pride kept me from disclosing any of the details of this mission. As far as anyone was concerned, this was another normal point A to point B flight.

However, had I told the Flying Safety Officer all that had happened, corrective action could have been taken to prevent other pilots from running into the same problems. Serious deficiencies in the areas of maintenance, operations, training and overall flight management were evident in this episode, as you must agree. These deficiencies, however, did not come to light until a series of subsequent aircraft accidents. The resultant investigations and reports indicated a need for drastic changes within the organization, but only after the loss of several lives and airplanes.

Anonymous reports of close calls are necessary and valuable tools that every Flying Safety Officer uses to prevent accidents. Every Flying Safety Officer vigorously seeks to investigate these anonymous reports, whether they be formal USAF Hazard Reports or just written notes. Not to do so eventually results in longer, costlier and oftentimes painful formal investigations.

Have you had a close call recently? Let your Flying Safety Officer know about it immediately. Let him know **now** before someone else trods *"the high untrespassed sanctity of space"* and is not as fortunate as I. ★

IN ACCIDENT INVESTIGATION

Don't jump to conclusions

According to the files maintained in the Directorate of Aerospace Safety, the first recorded aircraft accident investigation occurred in 1908 when Orville Wright and Lt Selfridge made their ill-fated flight at Ft Myers, Virginia. However, research has unearthed an accident investigation which occurred well previous to our 1908 accident.

It seems that the brothers Montgolfier, Stephen and Joseph, had been experimenting with large paper bags which they filled with smoke, their mistaken theory being that they were creating a cloud which would ascend to the same height as other clouds. In any event, they constructed their balloon of linen covered with paper to a size of 52,000 cu ft and launched it from Versailles on 19 September 1783!

A small car was attached, in which were placed a sheep, a cock, and a duck, which thus had thrust upon them the distinction of being the first balloonists. The descent occurred eight minutes after the start, and the sheep and duck were uninjured. The cock had not fared so well, and his condition was gravely attributed by the savants present to the effects of the "tenuous atmosphere of the upper regions." Calmer subsequent diagnosis, however, indicated that he had been tramped upon by the sheep.

MORAL: The investigating members of the board should not let themselves be influenced by savants! ★

LIFE SUPPORT BRIEFS

MAJ CHARLES LEHMAN, Directorate of Aerospace Safety

T-33—'TAINT SO

"I know the Dash One says the T-Bird seat will get me out at zero altitude and 120 knots if everything is perfect, but I'm sure not going to go out on the deck right after takeoff if I can zoom."

That kind of thinking *can kill you*. But isn't altitude always your best friend in an ejection? Well, usually it is—but in the T-Bird there are some other considerations.

The key here is airspeed. That wonderful rush of wind is the *only* thing that will pull your nylon security blanket out of the pack. In the case of T-Bird chutes, it takes about 85 knots to do the trick. Any less and that chute is going to be mighty slow in opening.

Let's say your bird quits at 50 feet on takeoff from a 5000-foot strip. You've got 150 knots, so you zoom for an up vector and all the altitude you can get. Right?

Wrong! If you zoom to 200 feet and 110 knots, you're in trouble!

It takes about one second after you leave the cockpit before you start separating from the seat, which pulls your lanyard. During that second you lose almost half your airspeed. And that's the stuff that opens parachutes. By the time your lanyard pulls the rip cord pins, you don't have enough airspeed to open your chute reliably. Now there's only one way to gain airspeed without an engine—dive. But you'll be diving toward the ground without wings. At 32 ft/sec/sec it's not hard to figure out that falling is a poor way to get airspeed to open a parachute. You have to fall a long way to get that 85 knots.

The lesson here is simple. On a very low altitude ejection, try to zoom for an up vector and more altitude, but *don't ever go below the Dash One minimum ejection airspeed.*

WHAT A WAY TO GO

Over the years we've lost a lot of people because their parachutes were exposed to fire. Sometimes it happened in the cockpit, and sometimes the chute was burned as it passed through the crash fireball during parachute descent. Either way the canopy failed, and the man under it fell to his death.

Well, the Life Support System Program Office (SPO) is doing something about it. They're trying to develop fire-resistant parachutes. The biggest problem is the bulk of current canopy fabrics. If Nomex or some other material can be made to about the same bulk as parachute nylon, maybe we'll be able to survive pre-ejection flash fires, or excursions through a fireball.

PHOR PHANTOM PHLYERS

Those pesky F-4 leg garters may soon go the way of leather helmets and silk scarves. An electromagnetic restraint system is in the mill to eliminate all the straps and buckles. With this system you'd simply wear a little metal plate in a pocket on the rear calf of your "G" suit. An electromagnet would lock your calves to the seat during ejection to keep your tootsies from flopping. As soon as you're safely out, and slowed down a skosh, the magnet loses power and normal sequencing continues. The prototype was shown at Langley in December. We should have some operational tests in a year.

NOMEX

Those Nomex flight suits have already made some pretty spectacular saves, but they have one little quirk—they only protect what they cover. If your arms hang out of sleeves that have been chopped off, you can get burned. You wouldn't cut a piece out of your parachute to make it more comfortable would you? Leave the sleeves on, and if you roll them up while you're in the squadron area or at the stag bar, roll 'em down before you fly!

PAT HAND—ALL ACES

There's a new ejection seat on the horizon—ACES. The Advanced Concept Ejection Seat (ACES) was conceived to meet the escape needs of the new generation of aircraft. The seat is designed to give a stable ride; get you out safely at zero altitude—even with a high sink rate; eliminate seat/man/chute involvement; provide a hit-and-run survival kit for combat, plus a normal kit; and allow single point release for ground egress. In tests it met and exceeded our expectations. ★

SEE IT LIKE IT IS

Water doesn't present much of a problem for a fish; he sees better in it than out of it. Pilots, on the other hand, are bothered a lot by water, especially when trying to fly through it.

Rain causes poor visibility, reducing the amount of light available. Water on the windscreen also induces a refraction error which makes objects appear lower than they really are. It works like this:

First, the reduced transparency of the rain-covered windscreen causes the eye to perceive a horizon below the true one (because of the eye response to the relative brightness of the upper bright part and the lower dark part). Second, the shape and pattern of the ripples, particularly on sloping windscreens, causes objects to appear lower. Either condition may be present. If both are present, the effect is cumulative and may be as much as five degrees, or a 100-foot error each 1200 feet of lateral distance.

Conventional methods of clearing water off the windscreen aren't always very effective, and the problems occur in almost any kind of aircraft you could name:

- A twin-engine prop-type transport was involved in a major landing accident during a heavy rainstorm. Water on the windscreen hindered visibility to the point that the pilot, erroneously thinking he was approaching the threshold, crashed well short of the runway.
- At least one jet fighter-type aircraft has experienced instances of overheated and cracked windscreens when the jet blast rain removal system was left on during taxi.
- An OHR from an armed-recce pilot complained that the windshield wiper on his bird didn't clear the part of the windscreen the pilot looks through.

In response to the problem, SMAMA's Service Engineering Division conducted an expedited investigation, running tests of rain repellent products. Tests were conducted in various locations, in such diverse aircraft as the F-104, F-84, F-100 and EC-121 aircraft, and it looks like they have come up with a winner.

The product is REPCON (for Rain Repellent and Surface Conditioner), Federal Stock Number 6850-139-5297.

REPCON uses an isopropyl alcohol carrier with a silicon wetting agent. It is applied manually to the windshield, using a soft cloth. The alcohol then evaporates, leaving the wetting agent on the windshield, which is then polished with a clean, dry cloth to remove excess residue. The wetting solution makes the windshield very smooth and causes the water to bead. The water then flows readily off the windshield. A small amount of wind or use of blowers or windshield wipers enhances the performance even more.

One application is good for at least 50 flight hours under normal flight conditions. During continuous rainy weather, REPCON should be applied each 25 flight hours.

The photo at the beginning of this article was taken from the cockpit of a C-121G in landing configuration with windshield wipers OFF. REPCON has been applied to the copilot's window and to the right half of the center panel. The remainder of the windscreen is untreated. Note the clarity of the VASI lights and the runway sideline on the right, contrasted with the hazy images and glare-filled screen on the left. Aircrews flying the tests stated that the photograph is conservative; that the difference, as seen from the cockpit, is actually much more pronounced, and that even with the windshield wipers on high speed the difference was significant. The treated windshield, in fact, made the difference between seeing the ground and not seeing it in some phases of flight.

There seem to be no disadvantages to using the solution. Pilots involved in the tests liked the results: no change in index refraction; no film buildup; no effect from light exposure, throughout the spectrum from ultra-violet to infra-red; no effect from high temperature; and no objectionable side effects.

The stuff is cheap (less than ten cents per application) and can be applied by hand in three minutes to a clean, dry windscreen. It will clear the complete windscreen and canopy, reduce runway light glare, and may eliminate the need for hot air rain removal systems which waste air needed for thrust (!) or air conditioning.

REPCON is fully approved and recommended by SMAMA for all aircraft windshields and canopies that are either glass or plexiglass. The solution hasn't yet been available through USAF supply channels, but should be any day now. Meanwhile, units can purchase immediate requirements directly from the manufacturer. TO 42D4-1-4 will provide instructions for application. ★

FTR GP FLIES 50,000 HOURS ACCIDENT FREE

SSgt Charles Brown watches as 1/Lt William Campenni logs the 100,000th flying hour since the last jet fatality in the 112th Fighter Group (top). TSgt Earl Ferricks greets Captain William Gadd on completion of 50,000 flying hours since the Group's last aircraft accident.

When Capt Bill Gadd landed his F-102 at Greater Pittsburgh Airport last Oct 27, he had just logged the 50,000th hour since the 112th Fighter Group's last accident.

The Pennsylvania Air National Guard unit had barely finished celebrating when another milestone was recorded. This time the honors went to Lt Bill Campenni. When he touched down, the 112th had completed 100,000 hours of single engine jet time since a fatality.

The unit's last fatal accident occurred in 1962 when a C-47 crashed. The last jet fatality was on 19 Feb 1956, when an F-84F crashed after a low altitude engine failure, due to center main bearing failure.

Col Edward J. Bollen, commander of the 112th, is proud of the unit's accomplishments. But, he says, "the great work of a lot of fine controllers in the Cleveland Center and Pittsburgh Approach Control have helped make it possible. We think those guys are the greatest."

The 112th's record represents time in T-33, F-84F, F-86L and F-102 aircraft.

Well Done! ★

USAF AERO CLUB DIRECTORY

The information contained in this directory is the latest available, and includes all currently operating aero clubs. If there are any inaccuracies, please forward corrections to Aerospace Safety for publication.

Read the directory like this: Base name, hours of operation, fuel octane available and phone number. All clubs have oil available. Clubs located on base are printed in black, and those located off base are in color with the name of the airport. HAPPY LANDINGS!

STATE, CLUB & FLYING LOCATION	SERVICE AVAILABLE	PHONE NO.
ALABAMA		
Maxwell-Gunter AFB (AU) Maxwell AFB AL 36114	0800-Sunset 80/100	293-6212
ALASKA		
Eielson AFB (AAC) Eielson AFB AK	0830-1400 80	377-1223
Elmendorf AFB (AAC) Elmendorf AFB AK	24 Hours 80	752-4167
ARKANSAS		
Blytheville AFB (SAC) Blytheville AFB AR 72315	0730-1700 80/100	763-9305
Little Rock AFB (TAC) Little Rock AFB AR 72076	0730-Sunset 80/87	988-1234
ARIZONA		
Davis-Monthan AFB (SAC) Davis-Monthan AFB AZ 85707	0800-1700 80	327-7632
Luke AFB (TAC) Phoenix-Litchfield Muni Phoenix AZ	0800-1700 80	932-3911

STATE, CLUB & FLYING LOCATION	SERVICE AVAILABLE	PHONE NO.
CALIFORNIA		
Beale AFB (SAC) Beale AFB CA 95903	0900-1700 80/100	788-2220
Castle AFB (SAC) Merced Muni Aprt Merced, CA	0800-Sunset 80/100	722-3638
Edwards AFB (AFSC) Edwards AFB CA 93523	0730-1630 80/100	277-2474
Hamilton AFB (ADC) Hamilton AFB CA 94934	0800-1700 115/145	838-3800
March AFB (SAC) March AFB CA 92508	0800-1700 80	655-3980 653-7912
Norton AFB (MAC) Norton AFB CA 92409	0800-1700 80/100	885-5812
Travis AFB (MAC) Tolinas Air Strip Travis AFB CA 94535	0800-Dark 80	437-3470 437-2880
Vandenberg AFB (SAC) Vandenberg AFB CA 93437	0900-1800 80	734-5328
COLORADO		
Ent AFB (ADC) Peterson Field Colorado Springs CO 80912	24 Hours 80/100	635-8911 Ext 4310
Lowry AFB (ATC) Buckley Field Denver CO	0730-1600 80	553-3660 Ext 508
USAF Academy (USAFA) USAF Academy Air Field Colorado Springs CO 80840	0800-1800 80/100	472-4423
FLORIDA		
Eglin AFB (AFSC) Eglin AFB FL 32542	0730-Sunset 80/100	822-5948/5559
Patrick AFB (AFSC) Patrick AFB FL 32925	0800-1700 (24 Hr notice required) 80/100	494-4356
Tyndall AFB (ADC) Tyndall AFB FL 32401	0800-1700 80/100	286-5870

STATE, CLUB & FLYING LOCATION	SERVICE AVAILABLE	PHONE NO.
GEORGIA		
Moody AFB (ATC) Valdosta Muni Aprt Valdosta GA 31601	Daylight 80	244-1527
Robins AFB (AFLC) Robins AFB GA 31093	0800-1700 80	922-2634
HAWAII		
Hickam-Wheeler AFB (PACAF) Wheeler AFB HI 96515	0730-1900 80	656-161
ILLINOIS		
Chanute AFB (ATC) Chanute AFB IL 61868	Closed to transient aircraft.	893-9181
Scott AFB (MAC) Scott AFB IL 62225	0930-1730 Daily 0800-1700 Weekends	256-4394
INDIANA		
Grissom AFB (SAC) Grissom AFB IN 13440	Daylight 115/145	330-7145
KANSAS		
Forbes AFB (TAC) Forbes AFB KS 66620	0800-1700 80	862-0721
McConnell AFB (TAC) McConnell AFB KS 67221	Daylight 80	685-6731
LOUISIANA		
Barksdale AFB (SAC) Barksdale AFB LA 71110	0800-1630 80	423-8871
England AFB (TAC) England AFB LA 71301	24 Hours 80	448-5609
MAINE		
Loring AFB (SAC) Loring AFB ME 04750	0830-1230 115/145	328-3207/ 7440
MARYLAND		
Andrews-Bolling AFB Hyde Aprt (HQ COMD) Clinton MD 20735	0800 Dark 80	297-9229
MASSACHUSETTS		
L. G. Hanscom Fld (AFSC) L. G. Hanscom Fld MA 01730	24 Hours 80/100	861-5731
Otis AFB (ADC) Otis AFB MA 02542	Daylight 115/145	563-2986
Westover AFB (SAC) Westover AFB MA 01022	24 Hours 80	593-3183
MINNESOTA		
Duluth Intl Aprt (ADC) Duluth Intl Aprt MN 55814	0730-2030 80	727-7615
MISSISSIPPI		
Keesler AFB (ATC) Keesler AFB MS 39534	0700-1800 80	868-3849
MISSOURI		
Whiteman AFB (SAC) Whiteman AFB MO 65301	0800-Sunset 80	563-3311
NEBRASKA		
Offutt AFB (SAC) Offutt AFB NB 68113	24 Hours 80/100	292-1517
NEW JERSEY		
McGuire AFB (MAC) McGuire AFB NJ 08641	0800-1700 80	723-4900
NEW MEXICO		
Holloman AFB (TAC) Midway Airport NM 88310	Daylight 80/100	437-0480
Kirtland AFB (AFSC) Kirtland AFB NM 87117	Prior request 80/100	242-4184
NEW YORK		
Griffiss AFB (SAC) Griffiss AFB NY 13440	Daylight 115/145	330-7145
NORTH CAROLINA		
Seymour-Johnson AFB (TAC) Seymour-Johnson AFB NC 27530	0730-1700 80	736-1864
OHIO		
Wright-Patterson AFB (AFLC), Wright- Patterson AFB OH 45433	0900-1800 80/100	255-4848
OKLAHOMA		
Tinker AFB (AFLC) Tinker AFB OK 73145	0830-1800 80	732-7321 Ext 2467
Vance AFB (ATC) Vance AFB OK 73701	0700-Sunset (By Request) 80	234-6241
SOUTH CAROLINA		
Charleston AFB (MAC) Charleston AFB SC 29404	0800-1600 80	747-4111 Ext 3614
Shaw AFB (TAC) Shaw AFB SC 29152	0800-Sunset 80/100	666-3123
TENNESSEE		
Arnold AFS (AFSC) Arnold AFS TN 37389	0800-1700 Mon-Fri 80/100	455-2611 Ext 7621
TEXAS		
Bergstrom AFB (TAC) Bergstrom AFB TX 78743	0800-Sunset 80	385-4100 Ext 2301
Randolph AFB (ATC) Randolph AFB TX 78148	0830-1900 80	652-5349
Sheppard AFB (ATC) Sheppard AFB TX 76311	0800-1700 80	736-2160
Webb AFB (ATC) Webb AFB TX 79720	1000-1800 80	263-1344
UTAH		
Hill AFB (AFLC) Hill AFB UT 84401	0800-Sunset 80/100	621-5535
VIRGINIA		
Langley AFB (TAC) Langley AFB VA 23365	0800-Sunset 80/100	764-2743
WASHINGTON		
Fairchild AFB (SAC) Fairchild AFB WA 99011	0800-1700 80/100	244-9292
PUERTO RICO		
Ramey AFB (MAC) Ramey AFB PR	0730-2200 100	22251 7287
EUROPEAN AREA		
Bentwaters/Woodbridge (USAFE), RAF Bentwaters, Suffolk, UK	Daylight 91/96	-2557
Bitburg Air Base (USAFE) Bitburg AB, Germany	Sunrise-Sunset 80	-7410
Camp New Amsterdam (USAFE) Hilversum Airport The Netherlands	0900-1800 80/100	02157-345
RAF Lakenheath (USAFE) RAF Lakenheath, Suffolk UK	Sunrise-Sunset 80	Eriswell 2551 Ext 2106
Sembach Air Base (USAFE) Sembach AB, Germany	0800-Sunset 80/87	06302-7-7630
Torrejon Air Base (USAFE) Torrejon AB, Spain	Sunrise-Sunset 115/145	-6457
RAF Upper Heyford (USAFE) Upper Heyford, England	Sunrise-Sunset 100	-2893
PACIFIC AREA		
Air Forces Korea (PACAF) Kunsan & Osan AB, Korea	Daylight 80	4424
Clark Air Base (PACAF) Clark AB, Philippines	0600-1800 100	23214 23182
Kadena Air Base (PACAF) Yonten Airfield, Okinawa	Daylight 115/145	24296 24460
Kanto Plains (PACAF) Yokota AB, Japan	0700-2400 115/145	225-8925
Misawa Air Base (PACAF) Misawa AB, Japan	24 Hours 87/115/145	3381

Ops topics

LOOK OUT!

The O-2 was on a dual, continuation-training mission at a civilian airport. On downwind for the fourth landing, the pilot placed the gear handle down, but at that time both pilots were distracted by the erratic flying of a light aircraft in the pattern. Their concern for avoiding the other aircraft, which forced them to a wider than normal base leg, was sufficient distraction to cause neither pilot to check for positive gear down indications. And, of course, in accordance with Murphy's Law, the gear extension system chose this time to malfunction. The result was a great screeching of metal, bending of props, reddening of faces and spending of money.

Boy, is that an old song! Anytime something unusual happens in a landing pattern or while running a checklist—any distraction that breaks the normal train of events—there ought to be a great, big, neon light flashing in our minds, saying "LOOK OUT!"

Several recommendations come to mind:

• If something happens in the pattern that forces an alteration of the normal landing sequence, break out and re-enter. Insistence on a normal approach and adherence to standardization will all but eliminate the inadvertent gear-up landing.

• If a checklist sequence is broken by some external distraction *start the checklist over!* It doesn't take that long to run a before-landing checklist, and the peace of mind is beyond price.

• Be on guard against distractions and disruptions of routine. Keep that neon sign flashing and LOOK OUT!

TAKE A VOTE

The aircraft commander of the C-130 thought the ailerons were a bit stiff immediately after the bird broke ground. It seemed as though too much force was required to obtain the desired bank angle. He thought it might have been his imagination, though, and didn't mention the problem to his copilot. When the mission they were on was aborted (for reasons unrelated to the condition of the airplane), they returned to their local area for transition work. The pilot turned the aircraft over to the copilot for proficiency work, and the copilot immediately complained about the force required to move the ailerons. The A/C took the controls back and landed the aircraft—full stop.

Now it shouldn't take a committee to decide something is wrong with the control system of an aircraft; but as long as there's one available why not use it? One of the benefits of having two pilots and an engineer up front in a complicated aircraft is the capability of talking over a problem and arriving at a solution. The A/C in this case could have given the controls to the copilot soon after takeoff (without saying anything about the problem) to test the copilot's reaction to the controls, and put to rest any doubts he had about the airplane's condition . . . or about his imagination. Failure to use the rest of the crew to lighten the cockpit workload is a little like opening a can by bashing it against the corner of your electric can opener; you're using the tools, all right, but not the way they're intended to be used.

Maintenance could not duplicate the malfunction. However, this was the first flight since the replacement of the aileron boost assembly, so the unit replaced the booster package a second time, flew a FCF on the bird, and cleared the problem.

HURRY UP AND WAIT

On takeoff roll, just at liftoff, tower advised the OV-10 pilot that the left rear canopy door had opened. The pilot continued his takeoff and requested closed traffic. As he turned downwind, at 120 KIAS, the canopy door departed, struck the right prop blades, punched a small hole in the right side of the fuselage and dented the leading edge of the elevator. The pilot continued his pattern and landed without further incident.

There is evidence that the pilot did not make a thorough preflight inspection. He was under pressure, launching on a search/rescue operation. The tendency under these conditions is to resort to taking shortcuts such as kicking the tires, cranking the engines and getting airborne. Experience proves, however, that the time saved doing this is almost never of significant value. Spending the time required to insure that the job is done right often *saves* time as it certainly would have in this case!

HIGH--BUT WITHIN LIMITS

The T-33 was scheduled for an FCF following an engine change. During engine start EGT rose to 880 degrees C.—high, but not exceeding the 900 degree limiting temperature, so the FCF was continued. Takeoff EGT was normal; but during climb the EGT rose again, to 750 degrees, and the fire warning light began flickering on and off. When the pilot retarded the throttle, the EGT dropped back to the normal range and the fire light went out. The pilot then declared an emergency, flew a minimum-power flameout pattern and landed without further incident.

Okay, okay—the starting EGT was within limits. But it wasn't *normal!* Now let's be sensible—if you go out every day for a month and start up a T-Bird, and the EGT on start always runs around 750 degrees—and on the thirty-first day the starting EGT tops out at almost 900 degrees (which is the engine-change point) —*something is wrong!* Don't fall into the old "Well, it was within limits" trap. If that engine tries to tell you something, LISTEN TO IT!

Incidentally, maintenance changed engines and finally replaced the starter fuel control—which was defective.

FLIP CHANGES

Revised Schedule for Section IIA FLIP Planning: Beginning 2 March 1972, Section IIA Charts and Book will be revised and distributed together every 56 days. Three cumulative planning change notices updating those products will be distributed at 14-day intervals, (i.e., 14, 28 and 42 days), after the publication date.

J-Bar/Arresting Gear: Commencing with the 6 Jan 1972 IFR Supplement, Jet Barrier/Arresting Gear cautionary notes are no longer included in the aerodrome remarks section.

GOOD JOB!

There has recently been a sizable influx of new pilots to MAC'S C-141 wings, and this has naturally posed an experience-level problem in aircrew management. Several wings have established the policy that, when the crew includes a fully-qualified aircraft commander and first pilot, one of the new pilots will be sent along as third pilot; the purpose, of course, is to provide the new pilots with the opportunity to observe MAC's world-wide operation from the ground up, so to speak.

Recently a C-141 took the active at an overseas base and started its takeoff roll. The crew included one of the "third pilots." As the aircraft accelerated through 40-50 knots, the third pilot, from his position in the jump seat, called "REJECT"—and the aircraft commander, with great respect for his continued good health, complied. Turned out that the young man in the jump seat had noticed the elevator trim passing four degrees UP. By the time the aircraft had rolled to the end of the runway, the trim was passing 12 degrees UP.

The third pilot should be commended for his sharp-eyed alertness; the aircraft might have been controllable after takeoff, but then again, it might not! And the aircraft commander should be commended for the atmosphere of crew coordination—even including the "extra" crewmember—which he obviously maintained on the flight deck of his aircraft.

BATTEN DOWN THE HATCH

As the T-38 taxied in from a dual instrument mission, the student opened his canopy. From the corner of his eye, he saw something flash by. Simultaneously, the IP noticed the EGT on the right engine increasing and shut the engine down.

Investigation revealed a U.S. High Altitude Approach book on the front frame of the compressor. The student had failed to insure that all his publications were in the map case prior to opening his canopy.

PARTIAL PANEL RECOVERY

In earlier days of aviation, student pilots undergoing instrument flight training were suitably impressed with the necessity for becoming proficient in partial panel instrument flying. Partial panel was something that was drummed into the student during basic instruments and remained with him the rest of his career. On any given instrument check, the pilot who could perform well on partial panel was usually assured of a "pass," but poor partial panel performance probably caused more pink slips and aggravation than any other single factor relating to instrument flight.

Today, even though there is less emphasis on partial panel instrument flight than there once was, and the occasions when its use becomes a necessity are rare, the following incident proves the value of partial panel proficiency and awareness.

Reported ceiling was 350 feet, and an F-4 was on GCA final with 4500 pounds of fuel remaining. The pilot was on instruments, with no outside references, when the VVI began indicating a climb—even though the ADI continued to show a descent. The pilot immediately initiated a partial panel recovery to "on top" and VFR conditions. After getting in the clear, the ADI appeared to be working normally, but the pilot was experiencing a bad case of vertigo. Because of this he declared an emergency and requested a letdown on the wing of another aircraft. Subsequently, an F-4 in the area joined him and brought the ailing *Phantom* down for an uneventful landing.

During bench check, the ADI was found to be sticking in pitch and roll.

This incident points up the necessity for constant full-panel cross-check of instruments when flying solely by reference to the gages. Although partial panel instrument flight in modern jet aircraft is strictly an emergency procedure, partial panel proficiency is good life insurance. Ask yourself: How would you have done in the situation above? How about your students? Or the last guy you gave an instrument check to?

(—from U. S. Navy WEEKLY SUMMARY)

NEAR-MISSED APPROACH

The EB-66E pilot called Command Post 100 miles out and asked for the current airfield status and weather. The weather reported at the time was 3000 and six, thunderstorms southwest and overhead moving northeast, occasional lightning and moderate rain showers. The pilot requested a GCI/GCA approach and was cleared to the initial approach fix for runway 24.

At four miles, on final, the aircraft entered heavy rain, and at three miles the controller called that he had lost radar contact and directed the pilot to make a missed approach, if the field was not in sight.

One-half mile from the threshold, and still descending, the aircraft struck a power line. Immediately afterwards, the aircraft broke out of the overcast abeam the threshold and left of course, and the pilot executed his missed approach. During the missed approach the crew noted a right yaw, the left main gear indicating an intermediate position, the right engine EGT at 80[illegible] degrees C. and the RPM decreasing. The pilot shut down the right engine and maneuvered the aircraft to a clear area to recycle the landing gear. After cycling, they got a safe down indication on all three and the pilot maneuvered the aircraft to a successful single-engine landing.

This was only an incident—even though it cost twenty grand to fix the airplane—but it came awfully close to being a messy major accident. The pilot stated that, when radar contact was lost, he immediately transitioned to a TACAN approach/missed approach. He also stated that he had mild vertigo and that he thought he had broken the descent. In our book, there's no such thing as a "TACAN approach/missed approach," and having even a mild case of vertigo should dictate an immediate and *positive* missed approach. Additionally, the MDA for the TACAN approach is 300 feet AGL, and the DH for the PAR is 200 feet AGL, and neither the navigator nor the EWO advised the pilot that he was passing either altitude.

It seems safe to say that no one on this crew had a very high regard for his own safety or for the loss in combat effectiveness represented by the damaged aircraft. They're darned lucky they're still around to profit from their mistakes.

And maybe the rest of us can learn something, too. ★

REX RILEY'S
CROSS COUNTRY NOTES

Like everybody else I'll do some talking about the weather in hopes that maybe we can do something about it. Not that we can change it but perhaps we can avoid painting ourselves into a box. An airplane driver friend of mine dropped into the office the other day with a question about a problem he ran into while cross-country. Seems he received his weather briefing at 0730 with a proposed departure of 0830. The destination was forecasting an 8000 foot ceiling with no significant weather. He launched on time for a one plus 30 enroute. Being alert to the possibility of any weather situation changing on any flight, he contacted the enroute forecaster and found that the ceiling was now 500 overcast with rain (as it turned out, heavy rain). After landing he stormed into the weather office ready to do battle but found that he had to stand in line behind four other pilots with the similar complaint, that what they had experienced and what had been forecast were worlds apart. The forecaster at destination told them all that an amended forecast had been put on the wire at 0800. However, when a message goes on the wire at a certain time it doesn't mean that all stations will get it immediately. One of the questions that arose out of our discussion was, does the Weather Service have the responsibility to contact the pilot when there is such a radical change in the amended forecast? The obvious answer is no, the pilot is the one ultimately responsible for making sure that the weather is okay at his destination. No procedures have been established that task any of the weather personnel to track down the pilot and warn him . . . some forecasters do, but it is unlikely to happen if the weather station is busy. So, the moral to this story is, don't assume that weather conditions are static. Looking at the locations of the Pilot to Forecaster stations throughout the US in the Enroute Supplement, it's hard to imagine a pilot that is very far away from a weather station. It was rather obvious from the conversation between the pilots who were talking to the forecaster at my friend's destination, that they were extremely surprised by the 500 feet and heavy rain. Let's avoid surprise like this and know what the weather is before arriving at the IAF.

* * *

Placed in a conspicuous spot in a base operations we recently visited was something which might be of some interest to other base ops troops. In a neatly arranged display board were two sets of envelopes. One contained HR forms with the address of the safety office printed on the outside of the envelope. In the other stack of envelopes was a space for an "Any Gripe" report. In other words anything that anyone felt should be brought to the attention of the safety office has a straight channel. The name of the submitter was optional. This seems like a real good idea to us. Some gripes are not of the HR breed but are simply something that should be brought to the attention of a responsible individual. Nice work, Kelly. Anyone else have ideas that might improve the transient services?

THE

REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Col
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Cali
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor, Aerospace Safety Magazine, AFISC, Norton AFB, CA. 92409.

The other day I was looking for an item in Tech Topics and it struck me that many of those briefs that appear in the magazine each month describe the causes of accidents that for some reason didn't happen.

Like the brief in April about a stuck throttle in a T-37. Lack of safety wire allowed the throttle linkage to disconnect.

Or the one in March about the F-4E with a jammed control stick. Somebody left a bolt in the rear cockpit stick well.

Then there was the one about an F-100 with hydraulic system failure. The bird got dinged when the hook failed to catch the barrier cable. But the whole thing was caused by a hose of improper length, which caused chafing and eventual failure. We told you about that one in September.

It was hot in July but not as hot as the bearing rollers that fused the retaining nut to the axle on the right wheel of a C-123. Somebody left off the wheel retaining nut safety bolt.

Did you see the one in June about the F-4 in which there was an explosion during GCA low approach? After a single engine landing it was found that the left engine had eaten a bolt. Another was found in the engine bay. They were engine mounting bolts that sheared because they had been damaged during installation.

These are just random samples from hundreds of like cases. When you take the time to read all those published over the period of, say, a year, it scares you. Especially when you consider that the items published are only a fraction of the total.

1971 was a very good year. The Air Force had the fewest accidents in its history. So somebody was doing something right. Like you maintenance types. You did a great job, and you deserve credit.

Nevertheless, there were many reports of maintenance malpractice, some of them with very serious results. I think we can do better. Why not shoot for a whole year without a single accident caused by maintenance?

Imagine what that would mean, if we can do it!

Toots

Dear Toots

Para 6-2c, TO 4T-1-3 requires tires and wheels be initially inflated inside an inflation cage. The tires we have pre-positioned at our overseas base were built up at a stateside base, leak checked, deflated to 20 psi and shipped to our station.

My question—Is it safe and legal to inflate our pre-positioned tires not utilizing an inflation cage?

Confused Captain

Dear Confused

The tire and wheel assembly does not have to be placed in the inflation cage for reservicing to operational pressure. However, should you have any reason to believe that an assembly may have been damaged in shipment, it would be wise to use the cage. The way we look at it is that the cage was provided for your protection. You can't go wrong using it.

Toots

Dear Toots

I have a question concerning the use of the AF Form 124A, Publications and Forms Requisition. Some individuals in my shop say that this form can be used to requisition tech orders at base level, and I say it cannot. Please clarify this subject. Does a base have the authority to supplement AFM 7-2 to include the use of this form at base level for requisitioning tech orders? What reference says if this can or cannot be done?

SSgt George A. Rudy
Edwards AFB, Calif.

Dear George

AFM 7-1 states that AF Form 124 and 124A are used to requisition publications and forms other than TO's. I know of no command supplement that authorizes its use to request tech orders. AFM 7-1, para 75, refers you to TO 00-5-2 to submit your technical order requirements.

Toots

Dear Toots

Although I have no problems to write to you at this time, I would like to congratulate you on the fine article in the December issue—The Responsibility for Accurate Technical Data. This is the only way to have sound procedures and top notch aircraft maintenance. I enjoy your articles. Keep up the fine work.

SMSgt David Segura
Det 1, 150 Tac Ftr Gp, ANG
Albuquerque, New Mexico

Thanks for writing, Dave. You are absolutely right about tech data, and top notch maintenance is the only kind we can afford.

Toots

QUOTE OF NOTE

"Patriotism is one of those ideas that is hard to pin down. Like leadership—if you attempt to define it—you put a fence around it—limit its scope—it is much too complex to be imprisoned in words. But to understand it is to remember that patriotism is a love—a love of country—and love is something we all can grasp. It is for richer—for poorer—in good times and in bad—it is loyalty that develops an attitude to serve—to sacrifice—even your life—to protect honor and country. That is what patriotism is all about."

General Jack J. Catton, Commander, Military Airlift Command
Washington, D.C., 19 September 1971.

Tech

pulling the streamer is a no-no!

The B-52's bomb release lights indicated all bombs had released. The remainder of the mission and the return to base were uneventful.

During postflight inspection, the aircrew discovered that three of the M-117 bombs were still aboard. A closer inspection revealed that bomb station 19 had released onto the safety pin. The red streamer was missing from the pin and the pin had not been removed! The bombs at station 23 and 27 had released and were piggy back on station 19!

This aircraft had been a spare, so the safety pins were not removed during normal preflight. When the crew was required to launch to replace another aircraft, the individual removing the pins pulled the streamer, which separated from the pin.

All unit personnel have been briefed that even though only minimum time is available, safety pins will not be removed by pulling the streamer. The pins will also be counted to insure that the correct number has been removed.

he blew it

The crew chief of an O-2A removed the front engine cowling and placed it on the ramp two feet in front of the engine. Later an engine run-up was necessary so the crew chief climbed aboard, started the engine and . . . you guessed it. The cowling was drawn into the prop. The cowling was destroyed and the prop had to be changed.

Inexperienced man? Not hardly. This individual had more than ten years experience in the aircraft maintenance field.

chocks alone won't do it

Chocks alone will not hold an aircraft at high power settings. An F-106 recently proved this when it made a speedy exit from a shelter during engine run.

The weapons system was being operationally checked following depot modification. The armament personnel notified the APG lead man that they were ready for engine run to check out the loop resistance. The lead man climbed aboard, started the engine and stabilized RPM at idle while the armament personnel completed their checks.

At this time another individual, who was checking out the shelter exhaust silencer, handed the operator a note requesting that he advance power to bring the silencer temperature up to 200 degrees. As power was advanced the aircraft jumped the chocks, exited the shelter, struck a wooden trailer with the left wing and came to a skidding stop in front of another aircraft.

Looking back over what led up to this incident, we find that the aircraft had been secured for engine run earlier in the day, bridle connected and steel chocks in place. However, the bridle and steel chocks had been removed and replaced with wood chocks to get a work stand in place. The operator was not on the brakes during the engine run, as he had not given instructions for the bridle and steel chocks to be removed and he thought the aircraft was properly secured for high power settings.

Regardless of **prior** status of an aircraft, a quick check of the forms and a walk around before engine start is essential, as this mishap indicates.

COMMANDERS: *Do you know that approved procedures are being followed in your unit?—RO.*

T-bird gear problem

After an hour of pilot familiarization flight and three normal patterns, the T-Bird IP noticed a nose gear unsafe indication and the approach was discontinued.

All attempts failed to help the situation. A chase plane reported that the mains were down and locked but the nose was up with the doors open about two inches. When fuel was depleted to 70 gallons, the T-Bird was landed on a dry lake bed.

The problem was traced to the nose gear up line restrictor orifice. A piece of red plastic was lodged in the orifice preventing return fluid flow from the actuator. Investigators were unable to discover where the plastic came from, but one thing's sure: it didn't get there by itself.

topics

BRIEFS FOR MAINTENANCE TECHS

you got it, George-George

The T-38 was number two in a formation takeoff. The student experienced a slight pitchup, and the IP took control. Thinking the student had induced the pitchup, he raised the gear and flaps and continued the mission.

Later in the flight, as the gear and flaps were lowered, the aircraft again pitched up—as expected with flap/stabilizer interconnect failure. The mission was terminated with a no-flap landing.

The cause was maintenance: The forward end of the flap/slab interconnect cable was not connected to the actuator bell crank. The attaching bolt was in the cable end (where it is sometimes placed during boattail removal.)

This incident resulted from a chain of events reflecting a gross absence of professionalism. The maintenance crew didn't connect the cable during boattail (aft section) installation and also failed to perform the operational check required by the TO. The supervisor who cleared the red cross failed to note the discrepancy. The ground and flight crews both missed the discrepancy during the before-launch check. The last chance crew also failed to notice the improper position of the slab.

This looks like a classic case of letting George do it—and George being away for the day.

proper B nut maintenance

After 1.3 hours of flight a main transmission oil leak was discovered on the HH-3E. The initial spray type leak soon developed into a large stream. The pilot made an emergency autorotational descent to a safe landing on a grass field.

The cause: an overtorqued B nut. A leak had been reported at this fitting prior to the flight. The corrective action was to tighten the B nut; however, the B nut was obviously overtorqued, which led to inflight failure.

If you have a leaky fitting, extra tightening is not the answer. Look for the reason; remove and examine the sealing surface for damage in the form of scratches, nicks, burrs, or cracks. Also don't overlook foreign material. Examine the threads of the nut for damage. A false torque reading can be obtained if damage is present.

During any maintenance operation, take a good, hard look at the B nuts. If any impending maintenance or materiel failure can be detected and corrected, the reliability of the entire system will be increased.

HH-43 lost door

Thirty minutes into the training flight of the HH-43B, the pilot heard a loud thump while turning to base leg and immediately selected a landing site. As the turn was completed, the pilot saw the copilot's door flutter to the ground. Landing was accomplished without further incident.

Inspection of the aircraft revealed that the door had hit the inboard vertical stabilizer as it left the helicopter.

Maintenance bought this one. Five days prior to this incident maintenance had removed the copilot's door. During removal the mechanic had reinstalled the fore and aft door blocks upside down to prevent loss of blocks and screws while the door was off. Unfortunately, during reinstallation of the door the mechanic failed to notice the improper position of the blocks. The helicopter flew 5.6 hours prior to loss of the door.

It should be emphasized here that when parts, nuts, bolts and washers are removed, they should be placed in suitable parts bags and properly identified. They should never be installed improperly, even for safekeeping.

a bad bargain

Two flightline types, a MSgt and SSgt were working on a T-33 canopy actuator. As work progressed, the MSgt decided that, to complete the job, the front seat would have to be removed. He had previously installed some of the safety pins and disconnected the quick disconnects.

After the MSgt removed the thruster bolt in preparation for

Tech topics •

BRIEFS FOR MAINTENANCE TECHS

seat removal, he called maintenance control and requested egress personnel to remove the seat. They were dispatched but the MSgt became impatient after about five minutes and decided to go ahead with the seat removal himself. When the seat was raised about four or five inches the M-32 initiator fired, activating the lap belt release and rotary actuator.

The safety pin had not been installed in the initiator nor was the trip linkage disconnected.

We have highly trained and specialized personnel to do specialized work. This MSgt knew the right procedures but failed to wait for the egress personnel to do the job they were trained for. Compare the few minutes the MSgt was trying to save with the time required to correct his mistake.

F-111 fod

When the F-111's gear was retracted after takeoff, the unsafe warning light stayed on. The emergency checklist was initiated. The utility hydraulic isolation switch was positioned to "pressurize" and at this time the crew felt a thump as if the gear were cycling. The warning lamp remained on. A visual inspection by a second aircraft revealed that the gear was up and the doors closed. The gear was then extended with the normal system and all three indicated down and locked. A successful full stop landing followed.

The cause: foreign object. A bolt was lodged between the main gear up lock actuator rod end and the gear beam. This prevented the uplock linkage from reaching the overcenter when the hook was in the open position.

must reading for maintainers

A maintenance goof cost the Air Force several hundred dollars, and if the pilot hadn't been sharp there could have been a much more costly accident.

After takeoff the T-39 gear handle was raised and the crew observed a steady red light in the gear handle. Gear handle was lowered and indications showed the main gear down and locked, but the nose gear was unsafe. As a possible solution to free the nose gear, an attempt was made to engage the main nose wheel steering system. As expected, this system would not engage without the aircraft weight on the main gears. However, the standby nose wheel steering system operated when airborne, due to a faulty ground electrical relay. Thus, when the pilot moved the nose gear steering switch to standby, the nose gear steering green light came on. Subsequent rudder movement apparently dislodged the nose wheel and the gear extended, but was cocked 30 degrees to the right. On touchdown the pilot held the nose off as long as he could but when elevator control was lost, the nose gear touched down and the bird veered right and went off the runway.

The problem was caused by sloppy maintenance. Somebody repacked the nose gear strut and during reassembly the lower bearing slipped back from the keys on the barrel assembly. The mech didn't notice it and when he torqued the gland nut, the barrel assembly rotated, which secured the inner bearing 30 degrees left. This forced rotation of the gear to the right and it stuck in the well on retraction.

The TO calls for jacking during strut servicing and a retraction check. When the strut was serviced the aircraft was not jacked and consequently no retraction check was accomplished.

Surely we can do better.

COMMANDERS: *Are you aware that misuse or non-use of tech data is a common write-up by UEI teams? Is your organization guilty?—RO.*

pintle hooks

Who would think that a simple-looking pintle hook on the back of your vehicle could cause problems. It has and it does. A recent incident indicates that we still have some pintle hooks that have not been properly modified in accordance with TO 36-1-44.

A sergeant was dispatched to pick up a trailer load of MK-82 bombs and deliver them to the storage area. Enroute the trailer got loose and took off on its own. During investigation of this incident it was discovered that the safety pin hole had been drilled in the wrong location. The hole had been drilled to within one-eighth inch of the bottom edge of the trip lock. This allowed the trip lock to be inadvertently pinned in the unlocked position.

TO 36-1-44, para 1-A states that it is the responsibility of the maintenance officer to assure that the hole is correctly line drilled through the upper jaw and latch of the hook. It might be wise for you maintenance officers to review TO 36-1-44, then take a look at the pintle hooks installed on your vehicles. Another point to keep in mind is lubrication; excessive lubrication combined with dirt and grit will prevent the upper jaw locking spring from properly seating the lock device.

T-29 torque problem

The T-29 was cruising at 16,000 feet when the number two DC generator failure light, the alternator-generator (AG) low pressure light, and the alternator failure light came on.

The number two DC generator and the alternator were turned off, the AG system was shut off, and the electrical load was reduced. The navigator reported fluid leaking from number two nacelle.

During descent, the navigator reported smoke coming from the number two augmentor tubes, and the engine was shut down.

Cause—the "B" nut on the alternator hydraulic pump pressure line, at the fire wall quick disconnect fitting, had not been properly torqued during build-up, permitting it to loosen during flight.

tires

A recent UEI at one of our bases turned up several discrepancies in the tire change/tire service area:

• During a 28-day period, 34 tires were replaced for cuts. Of those 34, 25 were found to be still within safe limits. Further investigation revealed that only three tire cut depth gages were available in the entire wing!

• During the same 28-day period, 63 tires were replaced for excessive wear. In 80 percent of these, the wear was caused by under-inflation. Deeper digging by the team turned up the fact that the air compressor in the tire shop was redlined at 250 psi—while tires on the unit aircraft required 265-280 psi for proper inflation. At the squadron level, not enough pressure gages were available. Of the ten gages assigned to one squadron, six were unserviceable; of 11 assigned to another squadron, eight had been in the PMEL lab for more than a week.

It's hard to believe that anyone would try to maintain a space-age weapons system with barnstormer equipment. You can't do the job without proper tools. If you don't have 'em, get 'em.

COMMANDERS: *Are you using* your *tools to make sure your people have the ones* they *need?—RO.*

wanted–supervisor

The C-118 was cruising at 12,000 feet when the pilot felt a slight jar. He looked out and saw that the entire ring cowl from number one engine was missing.

Several people were at fault in this one. First, the maintenance team at a transient base attempted to remove the cowling to correct an inflight discrepancy. They loosened some of the camlocks but were unable to remove the cowling. After their attempts to remove the cowl failed, they neglected to tighten the camlocks and also failed to make any form entries as required by tech data.

No direct supervision was available to the maintenance team even though it was known they were not familiar with this type aircraft.

The flight engineer also failed to inspect the cowling for security, although he had been informed that inexperienced personnel had attempted to remove it.

Good supervision is the key to successful aircraft maintenance. Sound supervision and diligent use of tech data would have prevented this incident.

COMMANDERS: *What instructions have you given to* your *flight engineers to insure that proper supervision* is *available in case maintenance is required at a transient base? Does your Transient Maintenance have the tech data they need to do their job? Do they use it?—RO.*

EXPLOSIVES SAFETY

INADVERTENT FIRING

The F-4 returned from a range mission with three BDU-33 practice bombs still on board and one 2.75-inch rocket left in the SUU-20, and the load crew was dispatched to dearm the aircraft. When dearming was completed, the aircraft taxied back to the parking ramp, where the same crew downloaded the bird.

Twenty-five minutes later the crew was again called out, this time to upload another aircraft—but the job was never completed. As part of the load for the second airplane, they used the stores they had earlier downloaded. And while performing a continuity check on the SUU-20, the 2.75-inch rocket, *which had never been removed from the pod,* fired.

The result? One airman suffered burns and laceration to the right arm and shoulder—and his left eye was so badly damaged that it had to be removed.

The cause? Failure to follow TO procedures, of course.

THE RESPONSIBLE CREW CHIEF

A crew chief has one of the most responsible jobs in the Air Force. He can seldom afford to be wrong, since lives and equipment are usually at stake in any action he takes. Although no lives were lost in the mishap to be described, the cost was more than $8,500 and there was a potential danger to human life.

The crew was dispatched to load CBU-24s on an aircraft in the fast turn area. The crew chief sent a sub crew of two men from his team to remove impulse cartridges from the aircraft's previous load while he completed the post load check on the previous load.

When the chief arrived to start aircraft preparation for the load, the sub crew informed him that all impulse cartridges had been removed. However, during functional check of the centerline Aero 27 rack, two impulse cartridges fired, jettisoning the centerline MER with four fuzed CBU-24s to the ramp. Although the sub crew was cited as contributors to this incident because they failed to remove all the cartridges, the crew chief bought this one because he failed to *insure* that all impulse cartridges had been removed, as called for by the TO.

COMMANDERS: *Are your supervisors fully aware of their responsibilities, both those inherent in the job and as directed by tech data?—RO*

CONVERSION OF STOPPING DISTANCE MEASURING EQUIPMENT USED INTERNATIONALLY

FIGURE 3

MU-METER	JAMES BRAKING DECELEROMETER (RCR*)	STOPPING DISTANCE RATIO	TAPLEY* METER	SKID* METER	MOTNE CODE	VERBAL CODE
.7	23.5	1-1	.70	.70	5	good
.65	21	1.2-1	.65	.65	5	good
.60	19.3	1.3-1	.60	.60	5	good
.55	17.7	1.4-1	.55	.55	5	good
.50	16.1	1.5-1	.50	.50	5	good
.45	14.5	1.65-1	.45	.45	5	good
.40	12.9	1.8-1	.40	.40	5	good
.375	12	1.9-1	.375	.375	4	medium-good
.35	11.3	2.0-1	.35	.35		
.325	10.5	2.1-1	.325	.325	3	medium
.30	9.65	2.2-1	.30	.30		
.275	8.8	2.4-1	.275	.275	2	medium-poor
.25	8.05	2.6-1	.25	.25	1	poor
.20	6.45	3-1	.20	.20	1	poor
.15	4.8	3.5-1	.15	.15	1	poor
.10	3.22	4.1-1	.10	.10	1	poor
.05	1.6	6-1	.05	.05	1	poor
0	0	00-1	0	0	1	poor

*used on snow and ice only

WHOA WOES *continued from page 3*

and NASA, is evaluating two systems for wet runway evaluation, the Mu-meter and the diagonal braking vehicle. Both of these systems have had some success in providing a runway surface input to the stopping distance formula for aircraft.

There are three other systems in use that are adequate on snow and ice but are not valid on wet runways. These are the James Braking Decelerometer, the Tapely meter and the Skid-meter. These systems are basically the same. All three are horizontal "G" meters that measure maximum G developed in a stop. The Tapely meter and the Skid-meter read in coefficient of friction, and the JBD reads rate of velocity change, or deceleration in feet per sec/sec.

There are two codes used throughout Europe that may cause some misunderstanding for the uninitiated. They are the verbal code, and the Motne code. To understand the verbal and Motne code relationship to RCR carefully review Figure 3. Keep in mind, a braking action of "good," using this code, can be misleading.

ANTI-SKID

Anti-skid systems have been developed that are excellent for preventing locked wheel skids on dry runways. These same systems, however, can cause trouble on wet runways. Anti-skid systems *became very important* with the development of power boosted brakes. With some aircraft it was almost humanly impossible to detect a skid in time to prevent tire failure. Anti-skid systems, however, would apply braking pressure until the tire would start to slip, then decrease the pressure slightly and gently reapply it. This would continue until the aircraft came to a stop. On dry runways the systems worked great.

On wet runways less brake pressure was required to cause a slip, and a decrease in pressure might not permit the tire to spin up. The anti-skid systems decreased pressure as a function of time. The ingredient left out of the formula was the tire spinup time required under all conditions. This is an essential ingredient because the cornering force, or the side force capability, is dependent upon the wheel rolling. The tire could enter, say, a 25 percent slip and brake pressure would decrease to allow the wheel to spinup, but the spinup was not complete before pressure was reapplied. The sensing element would recompute a 25 percent slip based on the speed of the wheel at the second brake application instead of the speed of the aircraft. After four or five such applications the wheel may come to a complete stop, not spin up and the anti-skid system, which cuts out below 15 or 20 knots, thinks the aircraft is parked in the dearm area, when, in reality, the aircraft is speeding down the runway at 85 knots or so.

In an effort to prevent locked wheels at low coefficients of friction the newer anti-skid systems sense skids at lower brake pressures and, rather than decrease brake pressure, release pressure to zero to permit spinup. If the spinup is slow, however, the same succession of applications and releases that was characteristic of older systems can occur, and with the same results.

Cornering force is necessary to maintain control of the aircraft on the ground. *When a tire is in a locked wheel skid it has no cornering force.* It must be stressed that with lower coefficients of friction, a total skid is not required to eliminate side force capability. NASA research has shown that with an RCR of 8, a 25 percent slip ratio would result in essentially zero cornering ability. This 25 percent is significant because that is the point at which many anti-skid systems release or decrease brake pressure. If, at the time the anti-skid system cycles, the aircraft goes into a side slip, spinup is again impaired. As side force capability is decreased with rotational skids, forces available for spinup are decreased with side skids.

CROSSWINDS

We repeat—"*When an aircraft wheel is locked in a skid it has no cornering force.*" If hydroplaning occurs, or if the brakes lock up due to low coefficients of friction, use of rudder will very effectively change the direction the aircraft is *pointing*. However, if no cornering force is available on the tires, use of rudder alone will not change the direction the aircraft is *going*. If other controls are not available, and a crosswind exists, the aircraft can be expected to depart the runway at a rate roughly equal to the crosswind component. Aerodynamic controls alone, under these conditions, cannot keep an aircraft on the runway. When all tires are totally dynamic hydroplaning, crabbing on the runway will provide a thrust vector, and perhaps sustain you long enough to go around or snag the approach end arresting gear, if you're lucky enough to have both a hook and a compatible arresting system.

Under slippery runway conditions, a skid must be broken the same way you do in a car. That's not easy considering that the aerodynamic control first used to turn the airplane back to the original track on the runway is usually the rudder. It would be desirable to have a nose wheel that would at all times stay aligned with the runway regardless of which way the aircraft is pointing.

NASA researchers have stated that on a typical wet runway surface a tire will lose its cornering ability when a side slip of more than 13 degrees is exceeded. A problem in controlling aircraft on wet runways is that, by the time you realize you are in trouble, this 13 degree side slip may be exceeded.

McDonnell-Douglas is addressing this problem in the F-15 by adding a limited authority, full-time nose wheel steering system. This system will turn only 15 degrees either side of centerline. The nose wheel will not steer until the nose strut is compressed; if the pilot has demanded rudder control, the nose wheel will slowly align itself with the rudder position. As pressure is built up in the system it will steer as demanded but only to ± 15 degrees. Pilots will probably not know whether the correction is from rudder effectiveness or from nose wheel steering. It's not important where the control is from if control is maintained. This system does provide nose wheel steering for control on wet runways for aircraft that steer through the rudder pedals, and does so without abrupt or excessive nose wheel steering changes. In aircraft with nose wheel steering wheels, this problem is not so acute, but it must be remembered that excessive angles or abrupt changes can induce skids when you don't very much need them.

SUMMARY

When a total dynamic hydroplaning condition exists, control is almost impossible. Braking is nil. And the ability of many "good" pilots to stay out of trouble is questionable. Even at speeds below total dynamic hydroplaning speed, the relative slipperiness of the runway, combined with a partial dynamic hydroplaning condition, can result in loss of braking effectiveness. Control problems should then be expected and alternate courses of action considered. Under some conditions a go-around or an approach end engagement may be the *only* alternatives.

In moderate to heavy rain it is common for standing water to exceed the depth necessary for dynamic hydroplaning. Snow and ice are slick and can cause serious control and braking problems. If snow and ice are to be melted by use of a thawing agent, drainage is essential or a hydroplaning pool may be formed on the runway.

Nose wheel steering is a valuable aid but abrupt control changes or excessive angles will cause loss of cornering ability.

There are so many variables in the interaction between an aircraft tire and a runway that a system to predict absolute performance is still a long way down the road. Ball park figures are the best you can expect. As has been said, the only way to really tell F-4 performance on a particular wet runway is to fling it down the runway and see if it floats. It has been decided that being prepared for the worst and knowing the alternatives available is a better method. ★

NUCLEAR SAFETY AID STATION

[redacted]

The accident/incident/deficiency (AID) report, particularly the Dull Sword, is frequently received incomplete, not because the information is not available but because it is not included. A recent Dull Sword involved the application of excessive power (about three times the proper voltage) to a nuclear-weapon-loaded aircraft. The AID report gave a detailed account of why the power was applied but contained neither information concerning tests on the aircraft armament circuitry and weapon test nor test results. When an AID could affect monitor, control, and release circuitry, or cause a weapon malfunction, a report with complete, detailed, factual information, including test results, is an absolute requirement. To prevent wrong assumptions, and perhaps panic telephone calls and messages, be sure your AID report is complete, particularly when weapons are directly involved.

POLICEMAN, DON'T RATTLE THAT DOOR!

Remember in the local neighborhood how the friendly policeman would check stores by turning the doorknob and rattling the door? However, when applied to US Air Force Weapons Systems, this practice can cause problems. Recently, at a missile launch shelter, the shelter doors appeared to be slightly ajar. Security alert team (SAT) personnel renewed the policemen's habit by pushing and pulling on the shelter doors to reset the alarm. In attempting to shut the doors the lock became unlatched. One SAT member entered the shelter alone, pushed the sliding door, and exited through the personnel door. An accident/incident/deficiency (AID), Dull Sword, involving violation of the Two-Man Policy was submitted. Investigation led to improved maintenance procedures, stenciled door operating instructions, and improved training procedures. Rattling the door is no substitute for proper safety procedures.

[redacted]

Unauthorized entry into your special ammunition storage area should trigger a security alarm through the intrusion detection alarm system. Will it register an alarm if the activating circuitry or electrical power is interrupted? A recent report indicates that at one location the circuitry could be disconnected or the power removed without resulting in a security alarm. As simple a thing as cutting a wire at any one of the several locations could eliminate the alarm system. If your system is not fail safe, you are suffering from a false sense of security. A simple test will tell you.

[redacted]

control

maintenance nerve center

CMSgt JACKIE L. SMART, 63d Hq Sq, Norton AFB, Calif.

its task. This section is called, depending on what command you're in, Job Control or Workload Control. Perhaps this article will give you an idea of what is done and why it must be done in order for our aircraft to fly.

Job Control is sometimes referred to as the "Nerve Center" of the aircraft maintenance complex and, in actuality, it is just that. Its function is to control all maintenance on all aircraft, twenty-four hours per day, seven days per week. Exactly how it goes about this function varies from command to command but basically they all perform the same tasks. The number of personnel required to operate a job control section also varies as to skill levels required. This article is being written with a Job Control in the Military Airlift Command as a guide.

[redacted] man seems to operate independently and yet they are all working toward the same end result: *Get the aircraft repaired and airborne on time.* To dispel your immediate impression of organized confusion, let's take a typical aircraft on a typical scheduled mission and see what happens.

At approximately 1500 hours the Senior Controller receives tomorrow's flying schedule from Plans and Scheduling. Aircraft No. 666 is scheduled to depart at 0100 hours tomorrow morning. To make things less complicated, let's say 666 is already in commission and remains so until shortly before the flight crew is scheduled to arrive at the aircraft.

At 2130 the aircraft controller receives a call on his radio from the flight chief stating, "666 has a [redacted]k on number four brake [redacted]nber two UHF is in- [redacted]The aircraft controller [redacted]ork order on an AFTO [redacted]or each of the discrep- [redacted]ives the job numbers to [redacted]ief. He then passes the [redacted] order to the Avionics [redacted] Squadron (AMS) con- [redacted]he hydraulic leak work order to the Field Maintenance Squadron (FMS) controller. He enters both discrepancies on the aircraft "slat" on his control board and instructs the Aerospace Ground Equipment (AGE) controller to dispatch a jack to 666, in case it is needed for a brake change. He now makes certain that the Senior Controller is fully aware of the problems and what he has done to correct them.

Meanwhile, the AMS Controller has called the UHF work order to the radio shop on his hot line and has instructed the AGE controller to dispatch a vehicle to pick up the specialist at the shop and deliver him to 666. He then plots the work order on his specialist control board and informs the aircraft controller that he has dispatched the specialist.

At the same time, the FMS controller has called the hydraulic shop and the wheel and tire shop on his hot line and has given them the work order on the hydraulic leak. He also plots the work order on his specialist control board and informs the aircraft controller that he has dispatched specialists to cover the job.

The AGE controller notifies the AGE branch by radio to deliver a jack to 666 and to accomplish the specialist pickup and delivery. He repositions a magnetized tab which represents an aircraft jack on his AGE control board to show the exact location of the jack.

The aircraft controller is kept informed by radio on the progress and problems encountered with the discrepancies on 666. Every discrep-

TSgt Gary R. Jones, Field Maintenance Specialist Controller, plots a work order that has just been given to one of the shops under his control.

TSgt Virgil V. Vess, Senior Controller, maintains current status of all aircraft on the base. The Senior Controller is the number one "decision maker" in the maintenance control complex.

Sgt Don Jenkins, Aerospace Ground Equipment Controller, sets up a parking spot for an inbound aircraft.

SSgt Maynard Roderick, C-141 Aircraft Controller, placing a call to base supply to check on the status of a needed part.

MSgt Ernest P. Pollard, C-141 Aircraft Scheduler, plans next week's flying and pre-plan maintenance schedule.

ancy must be closely monitored from call-in to completion.

The Senior Controller has observed all that has taken place and has kept the Airlift Command Post informed of the problems and progress.

At 2245 both jobs are called in as "completed" and all the controllers' paperwork is closed out and the control boards wiped clean of the two discrepancies. The flight crew completes their preflight inspection and launches on time.

This has been a greatly simplified example of how an unscheduled job is handled by the personnel in Job Control. Multiply this example by 30 or 40 aircraft and add literally hundreds of scheduled work orders and you can readily understand that this is no easy task but that it is a job that must be done. Job Control personnel establish all work priorities and monitor supply delivery priorities. This effort minimizes the peaks and valleys that would otherwise occur and produces a smooth workload flow.

The men assigned to Job Control must be highly qualified, dedicated individuals who can consistently perform under pressure. They must be willing to work varied shifts, including weekends and holidays. In short, they must be "professionals." ★

MAIL CALL

ground effect

In the December 1971 issue, the two polars in the "Ground Effect" article have been mislabeled. The "out of ground effect" legend has been attached to the "in ground effect" C_l vs. C_d data, and *vice versa.*

PETER W. YOUNG
395 Strat Msl Sq
Vandenberg AFB, Calif.

You're right. We contacted the engineers at Northrop and they confirmed the transposition in the legend. Thanks for your sharp observation.

more magazines

I recently surveyed the units in my wing and found out that one squadron was on the mailing list for one copy of your fine magazine. Since this made me a bit suspicious, I checked a bit deeper and found that they were only getting one copy of the command magazine and one Driver magazine. All these publications provide excellent accident prevention material and should be available to everyone. Wonder how many other units are in this shape?

Concerned Wing Safety Officer

We wonder, too. Maybe all squadrons should be surveyed and the PDOs contacted if too few copies are available.

tire pressure checks

I look forward each month to reading *Aerospace Safety*. There are usually several articles of special interest to me as a Depot Quality Assurance Specialist. One such article was "The Primary Cause—You," in the December 1971 issue, which reported a tire that was found to be 90 pounds low. I receive many Quality Unsatisfactory Materiel Reports (QUMRs) each month reporting tubeless tires to be leaking through the sidewall vent holes. The only purpose of these vent holes in the sidewall of any tire is to release air that normally diffuses through the liner. Since we know a certain amount of diffusion will be occurring constantly, the periodic tire pressure checks cannot be overemphasized.

Many tire QUMRs have been submitted reporting tires that checked satisfactorily on initial leak check, but became excessive after 15 to 20 landings. The contractor's investigation indicated the tires had been operated in an under-inflated condition causing damage to the liner with resultant excessive air loss through the vent holes. Fortunately, these tires were removed prior to the loss of the aircraft, but the potential is still there. To my knowledge, none of these reports has been traced back to the responsible person not having a tire gage, but they indicate that the gage was available but not properly used.

R. C. CROUCH
OOAMA (MMMQ)
Hill AFB, Utah

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UNITED STATES AIR FORCE WELL DONE AWARD

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

Captain PATRICK W. MULDOON

3d Tactical Fighter Wing, APO San Francisco 96264

On 31 March 1971, Captain Muldoon was piloting an F-4D aircraft on a night air-to-ground gunnery mission, when some flares hung up. Returning to base, Captain Muldoon heard a muffled explosion in the rear cockpit, immediately followed by a severe pitch down, left roll, and right yaw. He immediately depressed the paddle switch, thereby disengaging the stability augmentation system and eliminating the associated transients. The aircraft was quickly returned to level flight. The cockpit then rapidly filled with dense smoke, and fire was evident beneath the rear cockpit ejection seat. Captain Muldoon turned the generator switches off, selected one hundred percent oxygen, notified his Weapons System Operator to do the same, and pulled the emergency vent knob. The fire ceased and the smoke cleared from the cockpit. All unessential electrical equipment was turned off, and the ram air turbine auxiliary generator was extended. No fire was evident under these conditions.

Captain Muldoon directed his wingman to take the lead for a GCA approach to the field and declared an emergency with the control tower. However, due to extreme difficulty in controlling the aircraft in formation at 250 knots and below, the approach was discontinued. Captain Muldoon elected to make a single ship approach and a no-flap landing to maintain an airspeed for best controllability and to prevent the possibility of asymmetric flap extension. The landing gear was blown down with the emergency extension system, necessitated by the lack of electrical power to the landing gear control. The hook was lowered on final approach, and an approach end arrestment was made.

Captain Muldoon's assessment of the situation and ability to properly accomplish the corrective actions for several different emergencies make the recovery of the aircraft without further incident a truly outstanding feat of airmanship. WELL DONE! ★

In *this* world the United States Air Force leads the way in aircraft accident prevention

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