UNITED STATES AIR FORCE • JUNE 1970

# Aerospace SAFETY

COVER PHOTOGRAPH by Kenneth L. Hackman, Aerospace Audio-Visual Service.

UNITED STATES AIR FORCE

# Aerospace SAFETY

JUNE 1970

## FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS



## SPECIAL FEATURES



## REGULAR FEATURES



DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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JUNE 1970 AFRP 127-2 VOLUME 26 NUMBER 6

# the name's the same

**AEROSPACE SAFETY,** Aerospace Maintenance Safety and Nuclear Safety magazines merged three months ago and we asked you to help us find a name, one that would reflect the expanded subject matter of the new magazine.

You gave us some 1100 different suggestions, so selecting a title wasn't easy. But the die is cast, the new name is indelibly printed on 65,000 copies of this issue. The name is AEROSPACE SAFETY.

To all of you who sent in suggestions—Thanks. Our original intent was to send a personal thank-you to each of you. But with such a response, that is beyond the realm of practicability. So please accept this in appreciation of your interest.

With so many entries the variety was outstanding. Some were way out, others were quite conservative. Perhaps some of you were pulling our leg, like "Age of Air-quarius." How about that plastered across the front every month? We like to blow our horn but "Aerospace Klaxon?" Really!

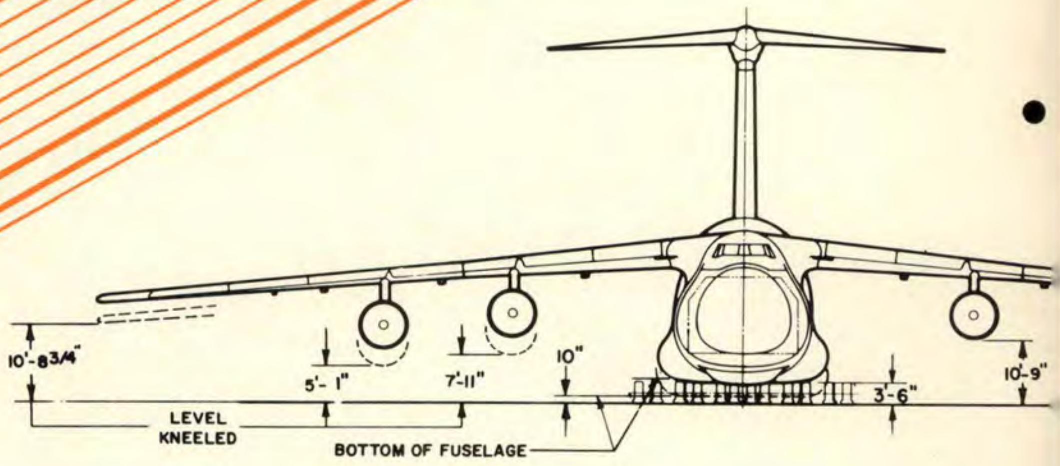
We got a lot of acronyms, those words made up of a group of initial letters. Like "BASH" (Bluesuiters' Aerospace Safety Hybrid), and "FAN GEMS" (Flying Aerospace Nuclear Ground Explosive Missile Safety).

Many of the suggested titles were accompanied by drawings of possible designs. One officer got his whole family in the act and sent in an entry for himself, his wife and one each from the children. They spent an evening at it and with each title was a drawing illustrating how the title would look.

Finally, the title AEROSPACE SAFETY was retained because it was considered to best represent, in fewest words, the many areas of interest covered by the combined and enlarged magazine. In case you are wondering, it was also the most suggested title.

So the name's the same but the magazine is different. We hope you'll like the new format which includes all the major areas of accident prevention in one publication. And we are looking forward to hearing your ideas and suggestions for making it as informative and useful as possible for you—the reader. ★

# C-5 JUMBO *is here!*




For several years we have been seeing items in newspapers and magazines about the C-5. Milestones along the way included the letting of the contract, rollout, first flight, and testing, along with numerous articles attesting to its awesome size and tremendous capabilities.

An intensive training program has been in progress for some time for the crews and maintainers that will operate and keep this big bird flying. Finally, the C-5 is operational and you — Operations, Maintenance, Supply, Civil Engineering, Food Services, and so on — had better be ready for its arrival at your base.

Although the C-5 will be the biggest airplane you will have ever seen, and the size and capacity of its consumables will present some problems, it is not the purpose of this article to alarm anyone. It is a pretty broad coverage primarily to inform non-MAC base personnel of some of the things they will have to expect when these birds land at their base. Let's take it from the time it appears in the area through departure.

First to feel the impact will be the air traffic controllers—the guys in Approach Control and the tower. This bird is big and heavy and it is propelled by four 41,000 pound thrust, 8½ to 1, by-pass fan engines. So it's going to have a lot of turbulence behind it that will demand much respect. Traffic patterns will have to take any nearby general aviation airports into consideration.

Various suggestions have been made for operations of other aircraft when a C-5 is taking off or landing. Among these are

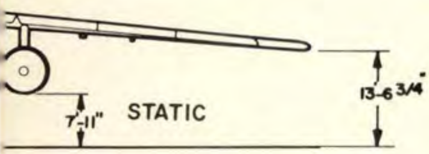
- A two-minute interval for takeoff behind a C-5.
- Landing beyond the C-5 touchdown point and, consequently, beyond its wake turbulence.
- Takeoff prior to where the C-5 breaks ground, and climbs above the C-5 flight path to keep above the wake turbulence.

Once the aircraft is on the ground a lot of other people get into the act. The wingspan of this bird is 223 feet. Therefore, the wings will extend beyond the borders of many runways, certainly beyond the edge of the taxiways, and will overlap present ramp taxi lanes.

Normally, except at a somewhat primitive base—and the C-5 was designed to operate into unprepared fields—obstacles off the sides that could strike a wingtip should be no problem. But something else is: vehicles and taxiing aircraft should stay well back from intersections, not only for clearance but because it takes some power to move this bird. Operating weight, without fuel or payload, is about 325,000 pounds and it can gross up to 769,000 pounds, so you can see that quite a bit of push will be exerted when it is taxiing.

Jet wake velocities have been a matter of concern; the Directorate of Aerospace Safety recommends that aircraft and vehicles avoid jet wake with a velocity of over 50 mph. This speed has been measured at 150 feet behind the tail of the C-5 with engines at taxi power. Even at idle power, you can expect wind velocities of 50 mph at the tail of the aircraft and 35 mph at 25 feet behind the tail (see jet wake illustrations, page 5).

Palletized cargo rolls from the newly developed Air Transportable Dock onto a C-5 at Marietta, Ga., for flight to Pope AFB/Ft. Bragg, NC. The dock can be transported by C-5 Galaxys to forward areas, offloaded and set up to handle arriving palletized supplies.




Dimensions reflect ground clearances on a smooth surface at a gross weight of 730,000 lbs with 245,000 lbs wing fuel load.

Marshaller is a long way down from cockpit of C-5—about three floors.


High-lift Calavar is part of AGE for C-5. Horizontal stabilizer is 65 feet above the ground.

So don't taxi or cross too close behind the C-5. Your bird or your truck could be upset and you could be subject to a lot of blowing debris —remember, the outboard engines are 70 feet from the aircraft center line and they will hang way over on a 75 foot taxiway. Recommended spacing for aircraft taxiing behind a C-5 is at least 600 feet, or 2½ lengths of the C-5.

If you have a congestion problem, then it may be necessary to tow the big fellow. And this is going to be quite an operation. You've seen a lot of towbars but you've never seen anything like the one for the C-5. First, there's a special towing tractor designed to tow aircraft weighing up to 750,000 pounds. The tractor weighs 70,000 pounds and has 25,000 pounds of removable ballast. It is powered by a 575 hp diesel engine. The towbar is 40 feet long, weighs 4400 pounds, and is air transportable only in the C-5. This thing is a real monster and you'd better have highly qualified operators if you own one of these rigs.

Another piece of AGE that you'd better get familiar with is the *Calavar*. This is simply a high reach truck with an extendable arm mounted on it. The unit is about 40 feet long, 8 feet wide, has a 125 foot reach and is C-5 air transportable. It can be used for maintenance and is essential for deicing the aircraft.

Now you've got the airplane to the ramp and are ready to park it. Be prepared to allocate 1.25 acres for this bird. Two or three of them are going to eat up a lot of ramp. If you are really ready for the C-5, getting it into position shouldn't be too difficult. But there are some things you had better plan for. Like the jet wake, if the bird is taxiing. Maintenance stands on the ramp, or cans, fire extinguishers and other items that may be parked on or near the ramp can easily be blown over or into various other things such as people, buildings, cars, airplanes. You will want to be extra careful about ramp cleanliness.

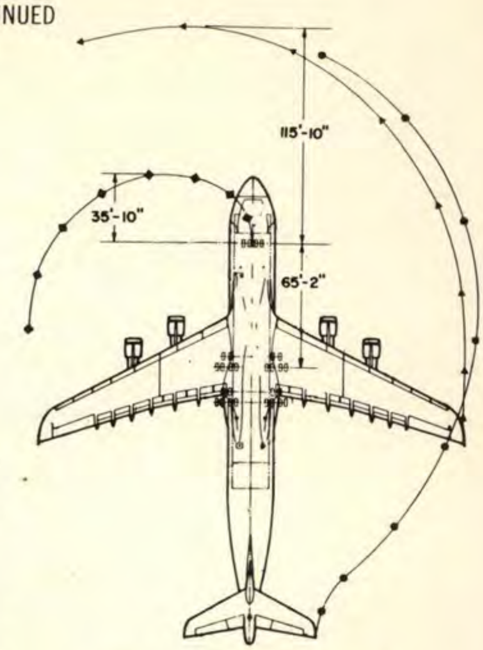
And there will be a lot of noise. Big engines—big noise. So marshallers will need ear protection. Also a marshaller in front of the airplane is going to be a long way from the cockpit. From the pilot's seat it is like looking out of a third story window at a man halfway down the block. Throw in the sun glaring through a dirty windshield, or heavy rain and the pilot could have difficulty seeing the traffic director's signals.

Right now it looks like a towing team will consist of two people in the cockpit, a tractor driver, a towing director, two wing walkers and one at the tail. And they are all going to have to be able to communicate with each other. We're not certain how this is going to be done, but MAC is considering the use of portable radios of some sort. This alone could be a major item in that the ideal equipment would probably be built into a helmet that would provide earphones and noise protection with a boom for a mike (an item of this kind has been under test). Several would be needed and would have to be well maintained.

Now the airplane is parked. Do you know what it contains? Is it parked in such a way that both the front and rear ramps can be utilized, if that is required? If only the front ramp is needed, is the bird parked

Aft passenger compartment on upper deck.

# C-5 CONTINUED




TAXIING TURNS 60° NLG ANGLE
Gross Weight ....450,000 lbs.
Surface ............Dry pavement
Aft MLG ............Free caster
Max. NLG angle 60°
Thrust ..............Asymmetrical
Taxi Speed ........4.5 mph

so that using that ramp is not blocked by a building or equipment. Remember the bird may be carrying Army tanks or trucks, or perhaps heavy palletized containers that require the use of 463L equipment.

Earlier we mentioned the word *consumables*. Very briefly, here are some of these and maximum amounts that could be required. Fuel—49,000 gallons; engine oil—9.1 gallons per engine tank; constant speed drive oil—1.5 gallon per each CSD tank; APU oil—.5 gallons each, two tanks; oxygen—100 liters for crew and upper aft troop compartment; potable water—224 gallons total for galleys in flight station, troop compartment, cargo compartment and 36 gallons for lavatories; frozen meals—300 for crew and passengers; rain repellant—500 cc in two pressurized bottles; hydraulic fluid—283 gallons.

Servicing has been pretty well simplified on this bird, but there are some special requirements. For example, there are two refueling adapters in the left main gear pod and two in the right pod. With the aircraft kneeled (you've probably heard that the C-5 has a unique kneeling system by which the fuselage can be lowered to within 10 inches of the ground) the refueling adapters are 38 inches above the ground. If the bird is not kneeled you'll need either some tall guys or something for them to stand on because the adapters are 72 inches above ground level. Fueling can be done from hydrants or trucks at 55 psi with a flow rate of 600 gallons a minute each for a total of 2400 gal/min. Refueling from hydrants should go quickly, but what if you are doing it from trucks? During a quick turnaround you'll have several fuel trucks converging on and leaving the aircraft, along with other assorted vehicles and people. To keep everything sorted out and orderly will require planning, training and practice to insure an efficient, nonhazardous situation.

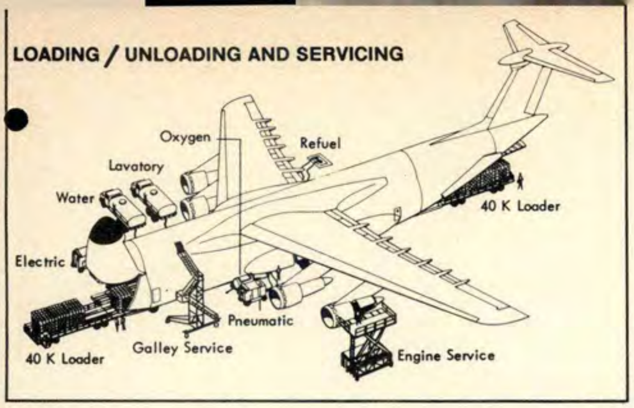
One of the unique things about the C-5 is its kneeling capability. This can be used in more than one way: Kneeling for on and off-loading and as an asset to you maintenance types, this feature makes a dandy jack for tire changes. But, as is frequent with something out of the ordinary, kneeling the aircraft will require careful direction and execution. You can imagine the results if the aircraft were kneeled with an engine stand under an engine. Or with work being performed in the wheel wells.

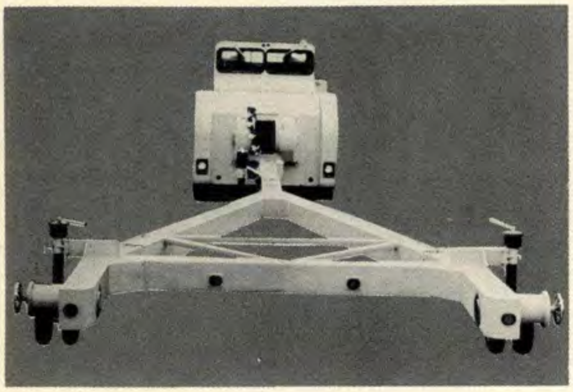
In case of fire (and remember, a C-141 was destroyed by fire on the ramp of a major Air Force base) is the fire department equipped with everything it needs to handle a fire in an airplane this big? And have fire crews been thoroughly trained in the location of hatches and windows, heights and distances—things they will have to know about the C-5? (The Feb/Mar 70 USAF Safety Kit contained material on this subject.)

Because of its size and certain features, servicing this aircraft will present some problems. Someone, probably the loadmasters, will have to direct all servicing and on-load—off-load operations, especially when all of these are taking place simultaneously. In certain circumstances an awful lot of people will be in and around this bird. Replenishing consumables alone will put many people and their equipment on the scene, and if maintenance is required, there will be that many more, some of them conceivably more than 200 feet apart. Obviously careful surveillance is a must to prevent injury to people and damage to the aircraft.

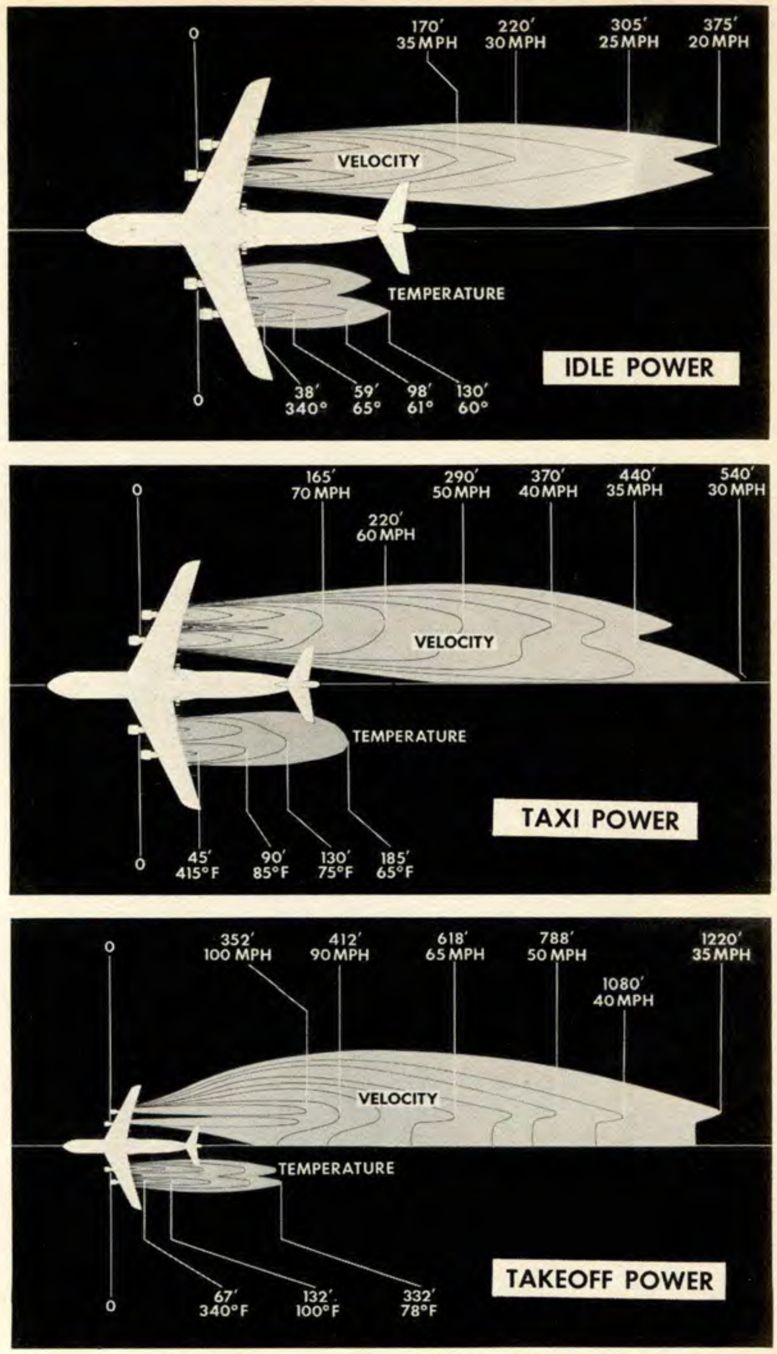
Admittedly what is to follow is very remote, but let's hypothesize for a moment. Suppose a C-5 had to make an emergency landing at your base and await a MAC maintenance team and parts before it could depart. To paint the picture really black, let's fill the aft upper troop compartment with 75 troops, with another 20 people up front. Most bases cannot be expected to provide instant housing and food services for this many people dropping in out of the blue. But it could happen. This doesn't mean every base has to be spring loaded to handle such a situation, but it would be a good idea for the housing and food services people to have a plan for just such an emergency in order to expedite things as much as possible.

Now let's move the C-5 out and off your base. But before we go here are a few details we didn't cover on the way in. This airplane is 242' 10" long and the horizontal stabilizer is 68' 8" wide and 65 feet high. You are familiar with the wing-growth phenomenon of swept wing aircraft,



Tractor and 4400 lb tow bar. Unit is air transportable in C-5 only.




Charts above show velocity and temperature of air in C-5 engine wake.

but this bird's tail grows, too. In fact, it can grow beyond the arc of the wing tip when the bird is turning. Under certain conditions this can be as much as six feet. (See the Dec/Jan 69-70 USAF Safety Kit item on turning radius for details.)

There are some other figures worth remembering here. With full tanks, the outboard engine nacelle clears the ground by 7′ 11″ and the wing tip clearance is 13′ 6″. From the aircraft centerline to the wing tip is a shade over 111 feet. On a 75 foot taxiway, assuming the bird is in the center, the wing is going to overhang the edge of the pavement nearly 74 feet. The outboard nacelle will be 29 feet past the edge.

The problems and hazards these dimensions present have caused MAC to recommend preferred taxiways for the C-5. Crews will be furnished airfield diagrams for selected bases. Tower ground controllers should not only be familiar with all taxi routes but should understand C-5 requirements.

Whew! It's off and gone. You have just survived your first visit by the world's biggest airplane. There were a couple of things at the last minute but you were prepared for them. Traffic on the public street just a few hundred feet off the end of the runway was stopped so you won't have any claims for damaged or overturned cars or motorcycles. And the tower had to hold up takeoffs behind the departing mammoth two minutes, but nobody was in any particular hurry to go off after that bird.

If all of this seems like a bad dream, take comfort in realization that the C-5 is an airplane. Not just any old airplane but, nevertheless, something you are familiar with. To make sure you know what to expect —and what to expect from you— MAC has surveyed the bases in the MAC system and prepared an Airfield Suitability Survey Checklist. Study it and see how you stand. The April-May USAF Safety Kit contained a copy. Also, for those who have a requirement, an airfield suitability kit and survey checklist are available from MAC hq. Write MAOASN at Scott AFB for a copy. ★

# SUMMER STORMS

## understanding the assistance available to you will help you avoid them . . .

Thunderstorm season across the great central plains area of the United States is well under way. Some of us have already tangled with the turbulence, lightning and heavy rains this season. Over the years, most of us have jousted with thunderstorms at one time or another—with varying degrees of success. Sometimes the storms have won!

If there's been any learning outcome from these encounters with some of nature's wildest displays of authority, it has been that we have nothing to gain from these bouts. Maybe you could call it a matter of degree. Up to a certain intensity, with a given airplane, you can test the power of a thunderstorm and come away in one piece. Not unscathed, mind you—we've all seen pictures of airplanes that were intentionally flown through thunderstorms during tests. Dented and battered by hail, in some cases they were overstressed. Seldom were they in condition to immediately turn around and perform a tactical mission after their thunderstorm penetrations.

If necessary, we could probably work up elaborate charts depicting the intensity of a storm (using whatever parameters seemed best at the moment) that this airplane or that airplane could successfully penetrate and still be expected to perform its mission one hundred percent.

Then all you'd need would be the ability to accurately tell from the outside just what the inside of a thunderstorm is like. And that's where the catch is.

The weatherman does a tremendous job of identifying the conditions which will be conducive to thunderstorm generation. He can tell you what general intensity to expect in the storms when they form. And within the range of each weather radar, he can refine his forecast by the minute as the storms develop. But he can't tell you exactly what you'll find inside any one specific storm cell at any given moment. The radar doesn't give him the information that is important to you—vertical gust velocity and location, differentiation between water precipitation and hail, severity of icing.

The trouble is that the characteristics important to us, those that can make an aircraft thunderstorm penetration successful or unsuccessful, are all extremely transitory in nature. Vertical currents within a storm cell are unpredictable, they change in size, intensity and location so rapidly that it would be almost impossible for one airplane to follow another through a storm and encounter the same conditions. And as the vertical currents change, so will precipitation patterns change—and the occurrence of damaging hail will change.

Okay, neither the studies that the weatherman conducts nor his radar can tell us accurately what to expect inside a thunderstorm. And we know that without being able to pick our way carefully through a storm, to traverse only the most benign areas, we may without warning stumble into conditions that our air machines are not built to withstand: gust loadings, shear and gust reversals, severe and damaging hail. And it's obvious that Air Traffic Control radar can do no more than weather radar in this respect. Even when the radar operator is devoting his full attention to trying to keep you out of trouble, he can tell you of little more than the existence of a storm. You need to know a lot more than that before you poke an airplane into a thunderstorm.

It's pretty easy to avoid a thunderstorm when the buildup is standing bright and clear, unshrouded by other clouds. That kind of a storm is simply a no-excuse situation. With the uncertainty over what's inside, and knowledge gained from experience, it's just plain foolhardy to venture into a storm when you know it's there.

So what about the thunderstorm that is buried in other clouds, high altitude cirrus or stratus at lower altitudes? It is this kind of storm that most often gets us into trouble. We suddenly stumble into it without warning when we've been cruising peacefully along in smooth clouds. (The pilot carrying airborne radar along with him may have a better chance to avoid even this, but we'll confine ourselves here to only the most vulnerable—those without radar aboard.)

Just about as soon as we started using radar for air traffic control, we realized that it would be a terrific aid in helping us avoid damaging storms that are otherwise hidden from view, either by other clouds or darkness. As a matter of fact, we have been so successful in steering around (but not through!) thunderstorms with radar guidance from the ground, that, in some cases, we've overdone a good thing. Far too often in the last few years weather forecasters have heard pilots reply, "No trouble with that line of thunderstorms, I'll just have ATC vector me around the bad spots." These are the same pilots who have the loudest tales to tell at the bar of how ATC "let them down" last time they asked for (often demanded!) help.

There are very good reasons why an air traffic controller is unable to give you the undivided personal attention you ask for in getting through an area of storm activity. First, of course, the controller's primary responsibility is to provide you safe separation from other aircraft. He may not provide you any other services which would infringe upon his ability to do that. Second, communications congestion, limitations of the radar he is operating, or the volume of traffic, can limit his ability to give you special attention.

This aspect of communications discipline is pretty easy to understand. No need to discuss it at any length.

All ATC radar isn't the same, and the capability to display precipitation density varies. Circular polarization (CP) on many sets eliminates all but the heaviest areas of precipitation from the scope. When CP is turned off, very heavy returns may clutter the scope until it is unusable for even traffic separation.

All this is not to say that you should hesitate to ask for help in circumnavigating severe weather. Whenever he is able, the controller will do his best to assist you. And you can do a lot to make the controller's assistance even more effective, by updating him on conditions as you encounter them. Due to the transitory nature of thunderstorm weather, intelligence the controller has received from pilots rapidly becomes out of date. By giving him specific information on altitudes, intensity and the nature of severe weather as you encounter it, you make the radar controller's assistance to the pilot coming along behind you much more valuable.

You can also help the controller, and other pilots in the vicinity or following you, by requesting route or altitude deviations as far in advance as possible. Enroute, you have an excellent chance of having your request granted when you allow some time for planning. Away from terminal areas less congestion allows more freedom to deviate. In higher density terminal areas more traffic coordination is required and complex departure and arrival routes make deviation much more complicated.

Within their capabilities, controllers will recommend route deviations to avoid severe weather when they are aware of it. When alerted to the existence of hazardous weather, they will often turn on their normal radar if they have been operating in secondary (beacon-only) mode, provided this doesn't result in making their scopes unusable for traffic control.

When you're dealing with thunderstorms, or flying through areas of other severe weather or turbulence, nothing is more important than good judgment. Avoidance is the key word, and understanding ATC's capabilities and limitations will go a long way in tuning up your judgment.

Go visit an ATC Center some dark and stormy night—you'll come away impressed! ★

# LOST and DOWNED

**BRIEFS OF RECENT AIRCRAFT ACCIDENTS**

## A-1

Power fluctuations during climbout caused the pilot to make a precautionary landing. He saw flame and sparks emitting from the left side of the aircraft at touchdown and when the flight leader called "get out," he extracted successfully. The aircraft was destroyed by fire and ordnance explosions. In his hurry to get on the ground, the pilot had forgotten to lower the landing gear.

## RF-4

An angle of attack system malfunction caused the pilot to assume he was stalling out. He pushed forward on the stick and went straight in—apparently not cross-checking his other gages. The backseater ejected successfully.

## T-33

During flight test of a new altimeter, the pilot attempted to test its performance by simulating a low level weapons delivery maneuver. He hit electrical cables; caused major damage to the aircraft. The pilot was flying too low in an area he had not visually cleared prior to his "test" run. Also, he had not been briefed on obstructions in the test area.

## C-123

Thinking he could turn off at the first taxiway and save taxi-back time, the pilot abandoned his GCA approach to touch down near the approach end of the runway. He lowered flaps from "takeoff" to "land", called for props to full increase but added no power. Increased drag rapidly dissipated airspeed and produced an excessive sink rate. The right landing gear failed at touchdown.

## C-123K

On takeoff roll the aircraft entered a left turn despite application of full right rudder, right brake, differential recip engine power and nose wheel steering. After traveling 629 feet through a marsh the aircraft came to a stop with jets at 100 per cent and recips at idle. The nose gear had a built-in 12 to 15 degree left turn due to improper adjustment procedures by maintenance. The pilot contributed: Dash One abort procedures call for propeller reversing which would have shut down the jets.

# BIRD STOPPERS

Without drag chutes the aircraft accident picture for the past several years would no doubt have been much different. These things are life savers and bird savers. In a word—they work. But people sometimes render them inoperative.

Daily, throughout the Air Force thousands of drag chutes are installed and the percentage of good chutes is so high that we have come to depend on the chute for its slowing effect. In fact, some aircraft designs are influenced by the relationship of runway length to brake effectiveness-drag chute effect in stopping the airplane. Imagine then a pilot's feelings when he pulls the drag chute handle and nothing happens.

So, what is to follow is not about a *happening* but, rather, about some non-happenings — drag chute failures that have occurred this year.

When the F-4 touched down and the pilot raised the drag chute handle—nothing! The chute simply fell undeployed onto the runway. Why? Because the drag chute door mechanism was out of adjustment.

The same thing happened to another F-4, except that the cause was slightly different: the chute was improperly installed. Which reminds us of a flight of four F-105s a few years ago. They landed at a base away from home and had their drag chutes repacked and reinstalled there. On returning to home base, in inclement weather, all four had drag chute failures, and two of them wound up in accidents.

Sometimes when a drag chute system fails it culminates a series of problems and, as in the following case, it lets the pilot down when he really needs the chute at a critical moment. With utility hydraulic system failure, the F-100 pilot declared an emergency, lowered the gear and flaps with the emergency system, and landed. When he went for the chute it jettisoned, and he found that his brakes were ineffective, except for directional control. He got the hook down and took the barrier at 118 knots. Hydraulic system failure was due to a ruptured line. The drag chute failed because someone improperly adjusted the retaining jaws.

One more case, another F-100. Shortly after takeoff the crew heard a thump but couldn't determine what caused it. They found out when they landed and the chute did not deploy. It had fallen out in flight. Another case of improper installation.

Nothing is to be gained by adding to this list; they all read about the same: improper installation, linkage out of adjustment, etc. The problem is really the human element. If the linkage is properly adjusted and the chute is installed correctly, then it will work when the pilot needs it. If the job is botched, then there's a good chance the system won't perform as advertised.

If your job includes working with drag chutes, put yourself in the aircrew's place. Imagine how angry you'd be if a mechanic fouled up the brakes on your car and you couldn't stop when you really needed to.

Pilots can take out a bit of insurance by being familiar with the drag chute system on their airplane and inspecting the installation when possible. ★

## new method of predicting runway stopping distances offers exciting possibilities


# combat traction

**Maj David L. Elliott**
**Directorate of Aerospace Safety**
**and**
**Capt Jim Martin**
**AFSC Test Division**
**WPAFB, Ohio**

WE'RE ALL ACCUSTOMED to seeing the Base Ops vehicle driving down the runway at 30 mph and practicing stopping when the runway is wet. Soon you may see this same vehicle speeding down the runway at 60 mph and practicing stops.

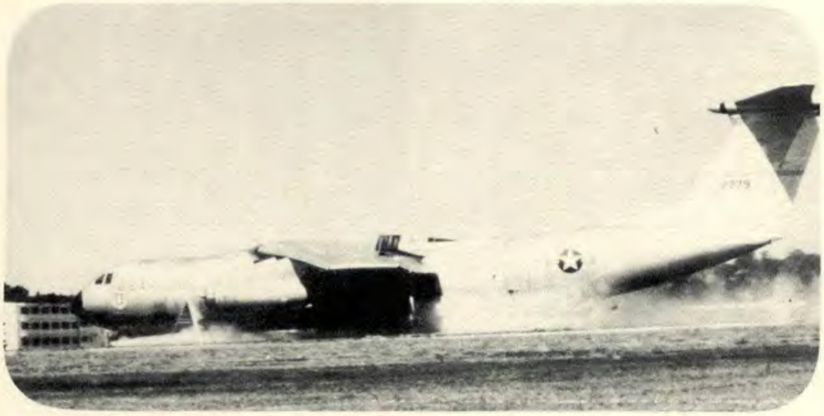
If you take a closer look you'll see some differences that will raise some questions. For example, one front and one rear wheel will have a slick treaded tire. You will see some extra switches, caution lights, and warning placards on the dash. It may even have a roll bar.

It's all a part of a new method to predict the relative slickness of a runway, and unlike the present RCR system, it works—under all conditions, on all runway surfaces.

The new method of predicting runway slickness grew out of a world-wide Pavement Grooving and Traction Studies Conference in 1968 at the NASA Langley Research Facility. Many theories were presented on the causes of pavement slipperiness and how to control the contributing parameters. But they were just theories that required testing.

For example, further research into a vehicle that could predict stopping distances for aircrews was based on a study conducted by NASA at Wallops Island. It was found that a direct relationship existed in stopping distances for three separate vehicles: the F-4 Phantom, the Convair 990 and a NASA Plymouth station wagon with special diagonal braking. This diagonal braking vehicle consisted of one unbraked front tire for steering and one for braking, one unbraked rear tire for directional stability and one for braking.

Consequently, the Conference recommended a joint USAF/NASA test to determine if a diagonal braking vehicle could accurately predict stopping distance ratios for wet runways or runways covered with slush, snow or ice that would be applicable to all aircraft. There were other



Survey by joint NASA-USAF team equipped with diagonal braking Ford and specially-instrumented USAF C-141 surveyed runways throughout U. S. Preliminary results point toward development of a system which will greatly increase accuracy of wet runway stopping distance predictions for aircraft on any runway surface.

recommendations, perhaps most important of which was to evaluate existing runways to include surface treatments such as grooving, porous asphalt, various surface textures and the size of pavement aggregates. NASA and USAF got a temporary marriage permit and gave birth to Project *Combat Traction*.

USAF furnished a C-141 with crew and a "Combat Traction" project officer. NASA furnished a Ford 500 XL, Walter B. Horne, and some engineers. The C-141 was instrumented with stopping distance measuring gear, multi-directional accelerometers, yaw indicators, and a calibrated speedometer that worked from the nose wheel. Ice check lights were wired to come on when the brakes were applied. White Xs were painted on the wheels so a skid was easy to detect by ground observers.

The Ford was instrumented with a stopping distance measuring device, diagonal braking, a calibrated speedometer, a "G" recording device, and black Xs were painted on the wheels. Everything was air transportable, even the engineers.

In selecting runways, the team tried almost every conceivable surface treatment for comparative analysis. It had to be proven that a true stopping distance ratio existed between the 500 XL, the C-141 and the previous test conducted with the F-4, the 990 and the Plymouth. If this stopping distance ratio was valid, then it could be assumed that a comparative analysis could be accomplished for different runways.

The laboratory was the US, Canada, and Europe. The team visited 31 airfields in the wet runway test to evaluate concrete runways (grooved and ungrooved) and asphalt surfaces (slurry seals, bituminous, grooved and porous). Snow-covered runways, icy runways, and wet icy runways were evaluated during Phase II.

The wet runway test was conducted first. Summertime being what it is, the snow and ice phase was delayed.

The wet runway data was largely obtained by artificial soaking or wetting of the runway. This was done in several different ways: Water trucks, fire trucks, road construction water trailers and in a couple of cases, Mother Nature.

**SO THAT THERE WOULD ALWAYS BE** a constant base line for the data, the C-141 landed first on a dry runway. The airplane slowed to 100 kts using the calibrated speedometer. Maximum braking was applied with antiskid and held until the speedometer read 15 kts. The C-141 was not brought to a full stop because at 15 kts the antiskid cuts out and a different stopping condition would exist. It's not a true distance for stopping the aircraft, but it is a stopping distance covering a specific parameter that provided a constant base for comparison and was the basis for the wet to dry ratio.

The Ford then made a dry stopping distance run from 60 mph to a full stop. The left front and right rear wheels were locked until the car was stopped. The relative dry stopping distances for the C-141 and the Ford were, for all practical purposes, constant, regardless of the runway or runway surface treatment.

The next step was to water soak the runway by all means possible. The C-141 was airborne, waiting,

# combat traction CONTINUED

and the Ford at the pit, engine running. When the proper depth was obtained and the runway cleared, the Starlifter pilot made his approach and landing—spoilers—at 100 mph MAX brakes—release at 15 mph. When the runway was clear the Ford took the active to conduct his run—60 mph—brakes. Stopping distances, Gs and speeds were recorded on a graph.

At each base the RCR was taken with the Base Operations vehicle in accordance with AFR 60-13 and TO 33-1-23 on both wet and dry runways to obtain data for comparison. Thirty-one airfields later, the C-141 went in for a periodic inspection and the Combat Traction team started reducing the data to intelligible digits and making plans for the snow and ice test.

**SNOW AND ICE** conditions were available in December and the airplane was available in late January. The weather held and the test began at K. I. Sawyer on a runway covered with packed snow. Then at Loring on glazed ice and at NAS Glenview on wet glazed ice, then Alaska—Northern US or wherever the runways could pass the rigid physical.

In one case the runway was so slick that only a taxi type check was made. The snow and ice test was conducted by first off-loading the Ford, conducting a run and notifying the aircrew of the stopping distance ratio. This worked exceedingly well. The predictions were very accurate. At Loring AFB, for example, the Ford predicted a stopping distance ratio of 3.4 to 1. When the airplane figures were compared, while the team was enroute to the next blizzard, they reflected an exciting identical 3.4 to 1 stopping distance ratio.

On a secondary runway at one base, when the RCR was recorded at 1, the stopping distance ratio (icy to dry) was 5.0 to 1 or infinity, whichever comes first. Aircraft maneuverability precluded landing on this runway. Nose wheel steering was of no use and braking was nil. The maneuvering technique found to be most effective for the C-141 was first to taxi very slowly—less than five knots. When a stop became necessary, idle reverse thrust was sufficient to bring the aircraft to a complete stop in less than 100 feet.

Turning was a bit more involved. The optimum technique was found to be to first stop the aircraft, then place the two engines on the inside of the turn in reverse. Then by advancing the two engines on the outside of the turn together with increasing reverse on the two inside engines, the aircraft would pivot in the desired direction. At first there was a tendency to pivot past the intended direction, so it was decided to make the pivot in small increments, maintaining good control at all times. (The surface was so slippery that it was impossible to load the Ford aboard the C-141 because of the complete loss of traction.)

The test was completed in late February. The data are voluminous and will require months to reduce completely, but so far the indications are that some new approaches to the old problem are on the horizon. The diagonal braking vehicle accurately predicted the stopping distance ratio of the airplane within ten per cent of the actual stopping distance under all conditions; whereas the James Braking Decelerometer was found to be completely unusable for predicting accurate stopping distances on wet runways. Recalling one test in particular, RCR readings were averaged to 17 which predicted a 300 foot increase in stopping distance for the C-141. The actual increase in stopping distance was 2500 feet or a wet to dry ratio of almost 3 to 1.

Most significant is the fact that our really fine looking concrete runways have average stopping distance ratios, wet to dry, of 2 to 1 with some as high as almost 3 to 1. This, incidentally, is when water depth is too shallow to cause dynamic hydroplaning.

It was found that wet concrete runways are generally slicker than wet asphalt runways. But the test also showed that two runway surface treatments could create a true wet to dry 1 to 1 stopping distance ratio. One is an asphalt treatment, the other works beautifully on concrete (porous asphalt for asphalt runways and the one-fourth inch deep by one-fourth inch wide with one-inch spacing groove for concrete surfaces).

**THE TESTS** established that the RCR system is fairly accurate for snow and ice conditions. This is because the coefficient of friction remains constant with speed on ice or snow covered surfaces. Therefore, an RCR reading taken at slow speed provides an accurate basis for predicting braking action at any speed.

Air Force Systems Command is already designing a modification to provide a diagonal braking vehicle for Air Force use.

Until the data are reduced, plotted, verified and approved, we've got to live with what we've got. When the water depth/touchdown/speed/tire pressure combination is conducive to dynamic hydroplaning, you will have to treat the landing as an emergency.

When the runway is wet, use an RCR of 9. That sounds like overkill but some runways have been tested that have a slickness equal to a stopping distance ratio of almost 3 to 1 wet to dry—*that's an RCR of 9.* ★

# alert

**Useful tips from UEIs**

## Observations noted during Unit Effectiveness Inspections

**Transient aircraft with forward firing ordance** was parked facing a hangar and fire station, presenting an explosives safety hazard. Aircraft were parked by TA without notifying the fire department, MMS or safety.

An MHU-2 trailer **loaded with AIM-4 missiles** was left unattended on the flightline with the engine running. Neither tractor nor trailer was chocked.

A simulated exercise demonstrated that crash rescue and LBR firemen were **unsatisfactory in their emergency procedures** for evacuating incapacitated pilots from a fighter aircraft.

**Inadequate maintenance preflight supervision.** Aircraft tire pressures were being set 20 psi below TO specs because personnel had not reviewed six-months-old TO change.

There were no formally trained aircraft arresting systems maintenance personnel at Base X. (ATC has a formal barrier maintenance course at Sheppard AFB and a mobile training team.)

In a fighter wing **25 per cent of the IPs tested** missed radio out procedures and 18 per cent missed the question on low level navigation weather minimums.

Instrument shop benches were congested with parts and tools; **floors and test equipment were dirty.** Rubber mats were not available at benches where high voltage was present, and there was no exhaust system installed in the spray painting area.

Driver training and qualification programs were inadequate. **Drivers generally lacked competence** in basic techniques of vehicle operation: lugging and grinding gears, riding clutches, jack rabbit starts. Furthermore, they were unaware of the hazards of carbon monoxide and the safeguards against its effects.

Organization did not maintain record of ALSAFECOM messages and they could not be found **in the flying units.** Routine handling of one message delayed inspection of ejection seats 48 hours. ★

# the books tell how but they don't spell out

# the why of maintenance procedures

Lt Col Peter J. Pearson, Directorate of Aerospace Safety

*Factual determination of the causes of accidents and incidents is vital to mission accomplishment and a successful accident prevention program. Therefore, highly qualified investigators search out all factors that caused or could possibly have contributed to the mishap. Only after careful analyses and study is the primary cause factor determined and all contributing causes listed.*

**THE COMPARATIVELY FEW AIRCRAFT** accidents (a mere four to five per cent) that have been attributed to maintenance error during the past few years is a tribute to our maintainers. Their dedication in the face of long hours, exposure to the elements, hard and grueling work, personnel shortages, skill shortages and increased operational commitments is unquestioned. The maintenance man is a unique type, proud of the fact that his is one of the world's most difficult and demanding professions, while patiently understanding that public adulation and praise have been the traditional prize of the heroes who operate the machines he maintains and cherishes.

The maintainers' profession, however, continues to be racked by many disturbing factors that tend to degrade its inherent professional image. Not the least of these factors are emergency combat situations and attendant personnel procurement and training problems. So, an increase in accidents with maintenance-induced contributing factors

is no surprise. In 1968 and 1969, maintenance error was determined as primary or contributing in 12 per cent of the accidents. True, as stated before, only a relatively few have been considered primary; but the fact remains that the accidents would not have happened in many cases, had the maintenance-induced contributing cause factor not been present.

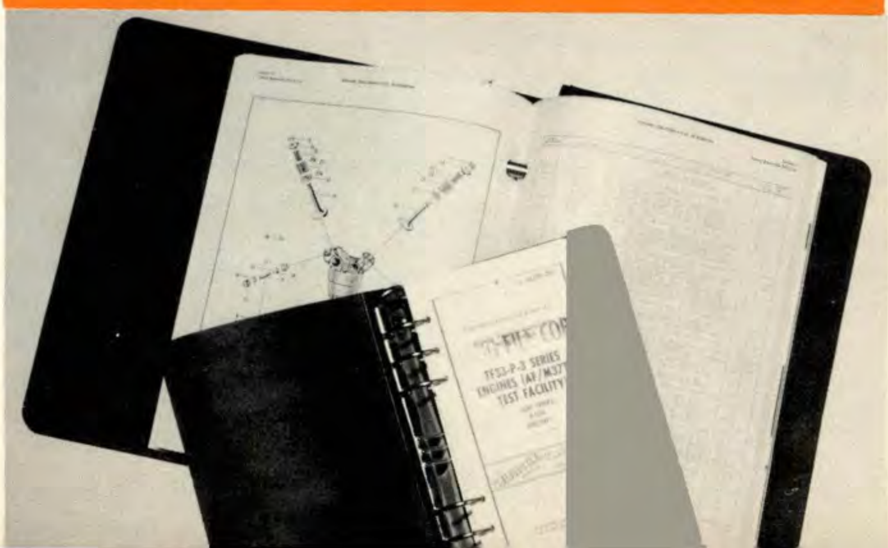
This is not to say that these maintenance mistakes were the result of intentional negligence or carelessness, since no right-minded ground crew would knowingly dispatch an unsafe aircraft. Such errors, however, do result from haste, preoccupation, lack of coordination, or mistaken reliance on "improved" methods. Mission pressure and the laudable desire to fulfill the requirements results in bolts not being installed or torqued, panels not secured, or guns not dearmed.

When the problems of work or home weigh heavily upon a man, concentration on the job often suffers and it is entirely possible that he will omit a cotter pin or miss a flicker of stray voltage. Occasionally, shift changes occur at critical points in maintenance actions, and inadequate crew communication results in a flight control remaining disconnected, spray bars untorqued, or improper fuel service rendered.

The conscientious, clever, and resourceful mechanic is sometimes his own nemesis. His attempts to reduce manhour requirements often lead to procedures which do not follow those stipulated in technical directives; generally, with an unrecognized loss in reliability or quality. Breakout and deflection force checks substituted for visual inspection of flight control cable routing will not always detect a cable misrouted under a bracket.

The well-worn subject of adherence to checklists has been discussed to the point of exhaustion with, hopefully, beneficial results. Last year, an A-37 was scheduled to be ferried to a West Coast air base, but its nose gear retracted during the start. Investigators determined that the gear handle was in the UP position. Pilot error was assessed as the primary cause, but maintenance was a contributing factor. Had the pilot followed the checklist properly, the accident would not have occurred. However, it would be just as appropriate to apply the same reasoning to the maintenance crew's actions. Had they *not* left the gear handle up, or had they checked to see that it was down on the preflight, the accident would not have occurred.

Here's another "whodunit" but the aircrew wasn't around to rebut the findings. When their many-motored monster reached takeoff speed, the nose pitched abruptly up and a tragic crash resulted. Maintenance had been performed on the



CONTINUED

# the "why" of maintenance procedures

aircraft, and a defueled fuel tank had not been refilled. Failing to detect the condition, the aircrew did not set correct trim. Pilot factor was, of course, assessed as the primary cause; but, had maintenance made the non-standard fuel load distribution known to the right people, or if the fuel load had been properly configured, the accident would not have occurred.

Aircraft configuration changes present ready-made pitfalls to the complacent, and routine drop-tank removals and installations are probably the biggest traps. Sometimes, because of their desire to meet mission requirements, or their lack of understanding of the necessity to comply strictly to tech order procedures, maintenance crews make grievous errors. High on the list of such errors are installing tanks without benefit of torque wrenches and using unauthorized release and lock checks. Inadequate inspections of the release mechanisms are common. Like the old roof that leaks only when it rains, a release mechanism is not needed when the tank is off—and the crew is usually in a hurry to get it installed, so they don't take the time to check it. The two following accidents, wherein maintenance error was determined, tragically illustrate the point.

One crash occurred following a formation takeoff. Apparently, Lead's engine failed immediately after liftoff. One tank separated, probably when the pilot tried to jettison both tanks. The result was a serious imbalance at a critical phase of flight. Had the tanks released simultaneously, the chances were good that the fatal crash would not have occurred.

In the second instance, a heavily loaded fighter blew a tire on rotation, and the pilot properly elected to continue the takeoff. But when stores jettison was initiated, one 450-gallon drop tank remained—with predictable consequences. Had a clean jettison occurred, it is unlikely that the accident would have occurred.

Another fuel foul-up involved a fighter. A defective fuel quantity indicator had been properly recorded in the aircraft forms, but the bird was released for flight. The aircraft had not been completely serviced and, unfortunately, the pilot's preflight inspection was cursory. The primary cause of the subsequent crash was assessed as pilot error; but, again, the aircraft should not have been released for flight with an inaccurate fuel gage or an improper fuel load.

Failure of drag chutes to deploy have resulted in some altogether unnecessary catastrophes. Generally speaking, these failures have been rarely assessed as primary accident cause factors; but, they have certainly been responsible for compounding pilots' difficulties after their troubles had commenced. In one such instance, one of our fighters was returning heavy and landing from a GCA. The drag chute failed to deploy, the tail hook failed to catch the barrier and all gears were sheared when the aircraft ran off the runway. Naturally, the pilot picked up the tab; but, he'd have been in the clear if the drag chute had been properly installed.

If technical instructions were to contain complete information as to **why** an action must be completed as outlined, the size of the publication would be prohibitive. Therefore, until we discover some better means of instilling a knowledge of the "why" of maintenance procedures, we will have to rely on the old requirement to adhere without deviation to the published procedures and checklists. ★

# Toots

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

Dear Toots

A checklist step that requires checking fuel container markings should solve the aircraft mis-servicing problem in all units.

TSgt R. G. Rawson
Nellis AFB, Nev

Dear R. G.

*It might, were it not for those types who fill in the Block 15 and 16 entries merely as a matter of form; they'd probably do the same with the checklist. A forthcoming revision of AFM 127-101 will require a POL checklist, and that flight line supers identify aircraft and type of fuel when ordering. Anyone who thinks an extra step in the servicing checklist might help can submit an AFTO Form 22.*

*Toots*

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Dear Toots

After a heated argument recently, I consulted TO 00-20-5 to refresh my memory concerning the correct use of the AFTO Form 781A's "Discrepancy" and "Corrective Action" blocks.

The argument arose over which line should the documentation begin on—the first vacant line or second one. The TO has a sample application showing both the discrepancy and corrective action beginning on the second line but does not give an explanation for this procedure. The only explanation the TO gives for using the first vacant line is in the "Discrepancy" block where the pilot enters on which flight the discrepancy had taken place.

I was taught in Tech School to use the first vacant line on both the "Corrective Action" and the "Discrepancy" blocks with the exception of the pilot's entry of the flight number in the "Discrepancy" block. Since

then I have seen both procedures used on a single 781A. Please help me settle this argument and keep forms uniform.

A1C John D. Duvall

Dear John

*You're right! The samples in TO 00-20-5 are confusing! I got in touch with the people at the AMA that are responsible for this tech order, and would you believe? The portion of 00-20-5 that you asked about is under revision right now. So the nice men there are going to take a good look at the illustrations for the 781A. In the meantime, they say you are supposed to use the first line in the discrepancy and corrective action blocks. Of course, local directives may go into more detail on how the blocks are to be used, as long as they don't violate TO 00-20-5.*

*And I'm sure you know where to find the procedure for correcting errors you may find in any TO. (It's in TO 00-5-1, for all you other guys who couldn't think of it.)*

*I'm real proud of your interest in neatness and uniformity of the forms you work with.*

*Toots*

# THE I.P.I.S. APPROACH

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

### DECISION HEIGHT

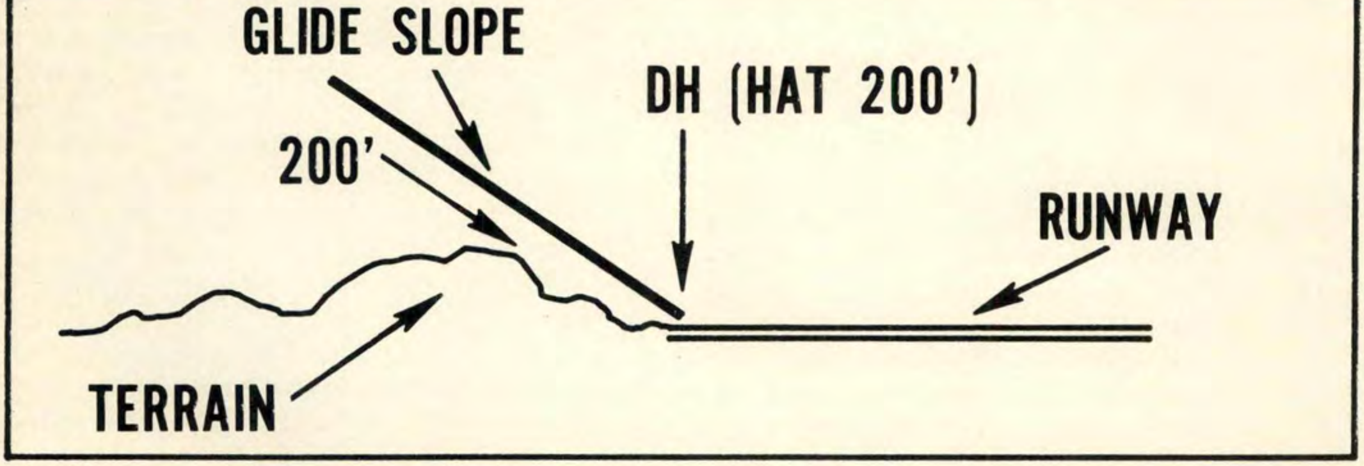
**Q** How far below decision height (DH) is considered unsatisfactory on an instrument check flight?

**A** There is no specific tolerance that can be established for descent below a DH. The DH is a point on the precision glide path (ILS or PAR) where the pilot makes his decision to land or execute a missed approach and is not intended to be a minimum altitude below which the aircraft will not descend. If the pilot decides to execute a missed approach at DH, it is only logical that the aircraft will go lower than DH while transitioning to a climb. If the performance of certain aircraft is such that a specific DH will not permit a safe execution of a missed approach, then the DH should be adjusted accordingly. This is normally done at the Major Command level.

During an instrument check flight the emphasis should be placed on the pilot's adherence to proper aircraft procedures when executing a missed approach at DH and not how far below DH the aircraft goes.

**Q** Can I use a radar altimeter to determine DH on an ILS approach?

**A** No. As you know, the radar altimeter measures the altitude directly below the aircraft. Assuming the HAT for an ILS is 200′ it is possible that you would reach 200′ on the radar altimeter (depending on terrain) prior to reaching the DH point. The diagram below illustrates this.



## ILS

**Q** Why is glide path interception considered the final approach fix on an ILS?

**A** Reference JAFM 55-9 (TERPS), par 930. This is no longer true. The new TERPs states that: "The final approach segment shall begin at the point where the glide slope is intercepted, and descent to the authorized decision height (DH) begins. Where possible, this point shall be coincidental with a *designated FAF* (outer marker, compass locator, DME, radar, or other approved compatible radio fix.)" You as a jock are really not too interested in where the final approach *segment* begins, but now the FAF will be the OM or a substitute fix in most cases. TERPs further states: "At locations where it is not possible for the point of glide slope interception to coincide with a designated FAF, the point of glide slope interception shall be located PRIOR to the FAF. Where a designated FAF cannot be provided, specific authorization by the approving authority is required."

## FINAL APPROACH CONFIGURATION

**Q** The IPIS teaches that final approach configuration and airspeed should be established *prior* to FAF. Why prior to?

**A** The philosophy behind this is that nonprecision approaches are usually based on timing from the FAF to the missed approach point. If you are not at a constant airspeed from the FAF on in, your timing will be inaccurate and a missed approach more likely.

## VORTAC APPROACHES

**Q** What navigational equipment is required to fly a "VORTAC" approach?

**A** JAFM 55-9 (TERPs), par 500, describes a VORTAC procedure as follows: "When both the VOR and TACAN azimuth elements of a VORTAC station will support it, a single procedure, identified as a VORTAC procedure, may be published. Such a procedure may be flown using either a VOR/DME or TACAN airborne receiver." The connotation is that DME is required. Most approaches published as a "VORTAC" procedure will require DME fixing somewhere in the procedure, which would preclude flying it with only a VOR receiver. However, some do not, and some even show a timing table for the final approach. Extreme caution should be exercised and a very thorough study of the procedure should be accomplished if a VORTAC approach is to be attempted with only a VOR receiver. Don't forget to check the missed approach instructions, too! !

## POINTS TO PONDER

• On an ILS the decision height (DH) is based on altimeter reference only, while PAR DH is on altimeter reference or determination by the controller, whichever occurs first. Can PAR decision height (DH) procedures be changed to coincide with ILS and eliminate the determination and transmission by the controller entirely?

One of the problems in making an across-the-board change in this procedure is the type of equipment we have in our AF aircraft. If a Major Command has aircraft with more sophisticated equipment and feels the pilot only should make this decision, a command directive would seem to be in order. The procedures in AFM 51-37 are intended to cover the majority of our equipment and pilots and are not meant to be restrictive where equipment or judgment allows a safer, more precise flight using other procedures.

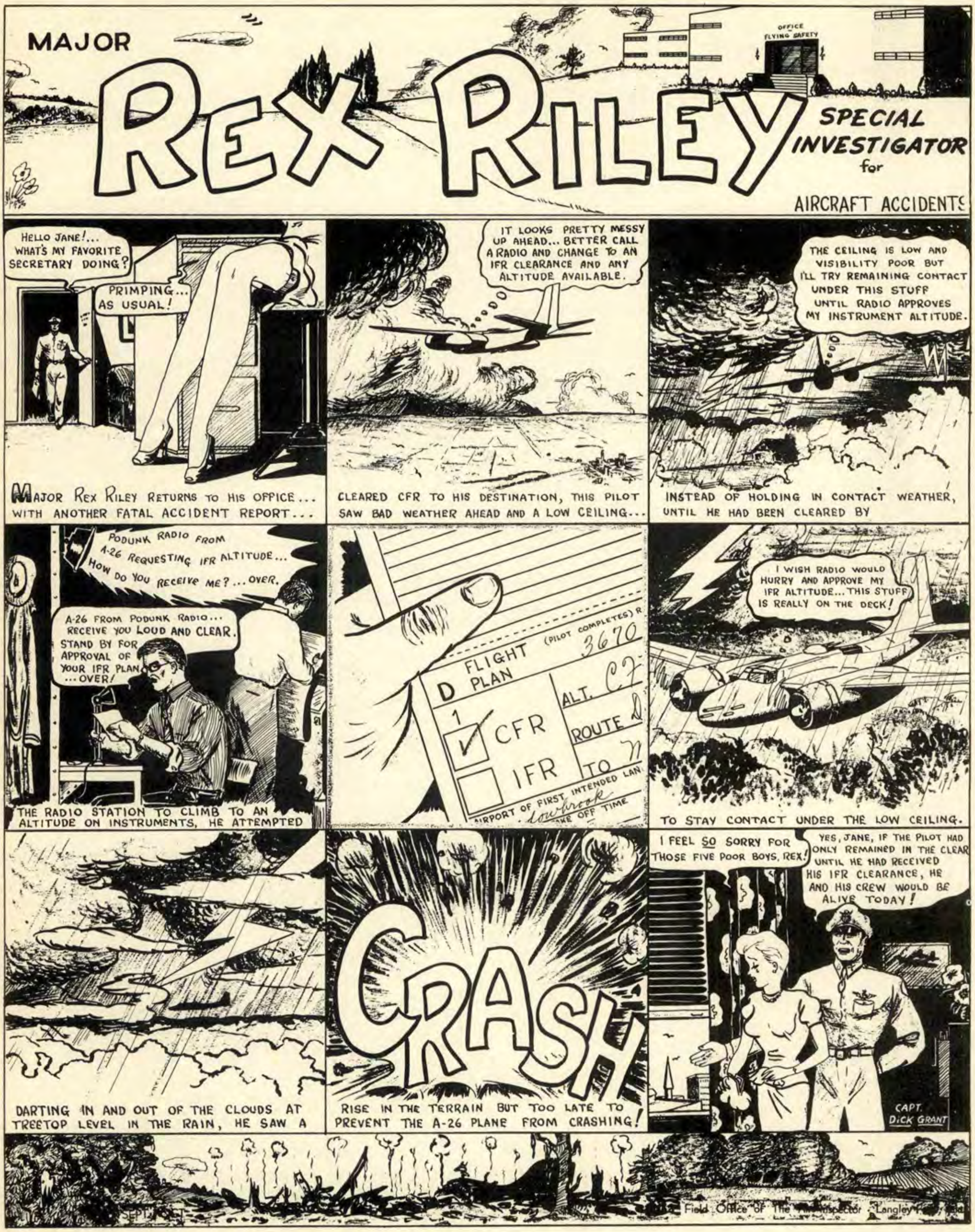
• Do you realize that some landing minima may change because of new TERPs criteria? Check your terminal charts and IFR Supplement.

• Are you aware of the nonstandard VASI at some Air Training Command bases? ?

Check the IFR Supplement! ! ★

## CORRECTION

In the May 1970 IPIS APPROACH article, paragraph 2 of the answer under Holding Patterns, lines 5 through 7 should read: If the holding pattern is *charted, the controller may say only* "cleared to (fix), hold (direction)." (Changed wording in italics)—ED.



MAJOR
REX RILEY
SPECIAL INVESTIGATOR for AIRCRAFT ACCIDENTS
OFFICE FLYING SAFETY
HELLO JANE!... WHAT'S MY FAVORITE SECRETARY DOING?
PRIMPING... AS USUAL!
MAJOR REX RILEY RETURNS TO HIS OFFICE... WITH ANOTHER FATAL ACCIDENT REPORT...
IT LOOKS PRETTY MESSY UP AHEAD... BETTER CALL A RADIO AND CHANGE TO AN IFR CLEARANCE AND ANY ALTITUDE AVAILABLE.
CLEARED CFR TO HIS DESTINATION, THIS PILOT SAW BAD WEATHER AHEAD AND A LOW CEILING...
THE CEILING IS LOW AND VISIBILITY POOR BUT I'LL TRY REMAINING CONTACT UNDER THIS STUFF UNTIL RADIO APPROVES MY INSTRUMENT ALTITUDE.
INSTEAD OF HOLDING IN CONTACT WEATHER, UNTIL HE HAD BEEN CLEARED BY
PODUNK RADIO FROM A-26 REQUESTING IFR ALTITUDE... HOW DO YOU RECEIVE ME?... OVER.
A-26 FROM PODUNK RADIO... RECEIVE YOU LOUD AND CLEAR. STAND BY FOR APPROVAL OF YOUR IFR PLAN... OVER!
THE RADIO STATION TO CLIMB TO AN ALTITUDE ON INSTRUMENTS, HE ATTEMPTED
D FLIGHT PLAN (PILOT COMPLETES) 3670
ALT.
ROUTE
TO
1 CFR
IFR
AIRPORT OF FIRST INTENDED LANDING
I WISH RADIO WOULD HURRY AND APPROVE MY IFR ALTITUDE... THIS STUFF IS REALLY ON THE DECK!
TO STAY CONTACT UNDER THE LOW CEILING.
DARTING IN AND OUT OF THE CLOUDS AT TREETOP LEVEL IN THE RAIN, HE SAW A
CRASH
RISE IN THE TERRAIN BUT TOO LATE TO PREVENT THE A-26 PLANE FROM CRASHING!
I FEEL SO SORRY FOR THOSE FIVE POOR BOYS, REX!
YES, JANE, IF THE PILOT HAD ONLY REMAINED IN THE CLEAR UNTIL HE HAD RECEIVED HIS IFR CLEARANCE, HE AND HIS CREW WOULD BE ALIVE TODAY!
CAPT. DICK GRANT

# REX RILEY'S CROSS COUNTRY NOTES

On the opposite page is the first Rex Riley poster of a 23-year-long series. Created by Captain Richard A. Grant in 1947 at Langley Field, Va., the Rex posters have done great things for the Air Force flight safety program and have remained practically unchanged in style from Dick Grant's original idea. In 1949 Master Sergeant Steve Hotch picked up the assignment, retaining the cartoon presentation of an aircraft accident brief—and the shapely secretary's legs. The latest Rex artist, T/Sgt Dave Rider, is now assigned to AF Audio-Visual Service at Norton AFB.

## LOOKING FOR TROUBLE

There's more than one way to get in trouble. One is to accept the ATC clearance without thinking about the consequences.

Recently a T-37 IP and his student, approaching destination, were cleared down to FL 180 with an Expect Approach Clearance time which would require them to hold at the VOR. Two or three minutes from the station, in stratus, they began picking up structural ice. And they remained in clouds for the nine minutes they held before starting penetration. That's when the ice warning light came on briefly. The wings of their Tweet had three-fourths inch of ice, the windscreen a little less. At 17,000 feet they were in the clear and by 8000 the ice had sublimated. Wings, windscreen and the right engine intake appeared clear to the IP.

On the go from a low approach, the right engine flamed out. Then the student saw ice on the left intake. They restarted the engine and landed. But engine troops could find nothing wrong. Apparently ice inside the intake had been ingested, causing the flameout. Fortunately, they had two engines.

And the pilot could have asked for a change of altitude when he was holding! ★

Lt Col Richard A. Grant, as a Captain in 1947, had flown as an unconventional warfare pilot in the South Pacific and European theaters when he used his newspaper cartoonist experience and created Major Rex Riley. After leaving Rex in 1949, he earned master jump wings, served four tours with Army Special Forces and one with the Navy Seals, won Thai and Korean Guerrilla jump wings. He completed a colorful and rewarding career 1 April when he retired at Mather AFB.

THE

## REX RILEY *Transient Services Award*

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

# what's MEP?

## . . . a new kind of tool for the maintenance man

Willie N. Bowman, WRAMA, Robins AFB, Georgia

A valuable tool for Maintenance Managers at all levels may have escaped your attention. This tool is the Air Force Maintenance Evaluation Program (MEP) the sole purpose of which is to assist you in resolving your maintenance problems. This is accomplished through field evaluation of a wide array of products, processes, equipment, tools, regulatory publications, specifications and ideas.

The program applies to Motor Vehicles, Aerospace Ground Equipment, Corrosion Control, Turbo-jet and Turbo-prop Engines, Avionics, Ground Communications-Electronics-Meteorological Systems and Equipment, and Civil Engineering. The examples below give you a better idea of the scope of the program and what the projects normally entail.

## P-10 FIRE TRUCK

The P-10 truck was commercially developed employing commercial standard components and parts. It is a fast action unit employed to transport a rescue team with equipment to combat fires and cut rescue openings in the fuselage of aircraft, while heavier fire fighting equipment is on the way. A one year field evaluation under the MEP indicated the P-10 truck has operational advantages and costs $12,455 less per unit than the older R-2A vehicle. Repair parts will be more readily available for the new truck. Most important, it will provide faster rescue service.

## CORROSION PREVENTION (AGE)

Corrosion damage to Aerospace Ground Equipment (AGE) has been recognized as extremely costly to the Air Force. Southeast Asia operations have been particularly affected by this problem. Evaluation of a process involving blast cleaning, a flame-sprayed zinc protective base coating and vinyl finish coating for AGE was conducted to determine if this system could be economically used as a depot processing method. Prior laboratory evaluation of the process had indicated it to be better than the most widely used standard AGE coating system. The evaluation revealed that the cost of coating materials for the flame sprayed zinc process was significantly less than the cost of the standard military coating system (MIL-P-38336 and MIL-C-38412). A projected saving of $200,000 per month for material used at the depot led to immediate implementation of a flame sprayed coating process at SAAMA.

## TACAN MODIFICATION

The AN/ARN-21 TACAN navigation system in T-39 aircraft required excessive maintenance manhours due to failure of the Distance Measuring Equipment to lock on station. An MEP project was initiated to evaluate a proposed modification. During field evaluation, additional modifications involving relocation of the aircraft antenna were found necessary. Under some flight conditions, the nose landing gear had interrupted the antenna operation. After modification, the antenna was 96 per cent more effective in overall ground station interrogations. Follow-on action is being taken by the T-39 system manager to prepare a field-level Time Compliance Technical Order providing for similar modification of the T-39A aircraft fleet.

While these examples give you some idea of the types of evaluations performed, the variety extends much further. AFR 66-8 is the charter for the MEP. It explains the scope of the program and tells who does what to cause an evaluation to be made. In general terms, when you recognize a maintenance problem or you wish to have a new idea or concept evaluated, write to the MEP Monitoring Agency through the normal chain of command (Address: WRAMA [WRNEP], Robins AFB, GA, 31093) outlining the problem and nature of evaluation desired. If the improvement came about through the suggestion program, include the suggestion number. The monitoring agency will perform any additional research required and process the request through the complete cycle to finalization of the project.

Each 90 days, the Maintenance Evaluation Program publishes a project status report. This report contains the current status of all projects in the evaluation stage, those for which evaluation has been completed and resulting actions are being taken, plus a resume of the projects completed during the reporting period. If you desire to be placed on distribution for this report, contact the program monitoring activity listed above.

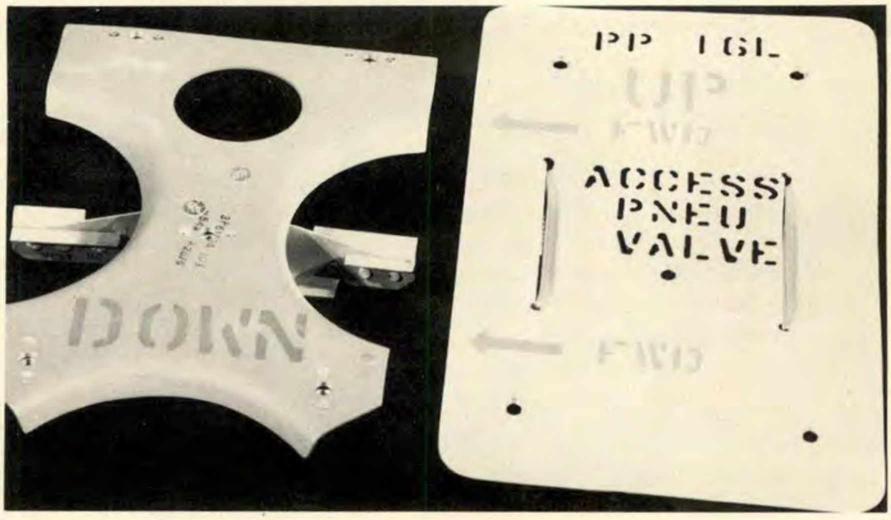
It should be noted that the difference between MEP and the suggestion program is that the MEP is an evaluation in the field, while the suggestion program is more or less a behind-the-desk evaluation.

Use the services of the Maintenance Evaluation Program when you need assistance in resolving your maintenance and operations problems. Numerous customers from squadron level through major commands have found the program very useful in keeping their organizations in tune with the times. ★

# Tech topics

BRIEFS FOR MAINTENANCE TECHS

## C-141 • missing panel




**C-141** During postflight inspection a C-141 pylon blowout panel was missing. The flight engineer, when questioned, stated that the panel was in place when he performed his takeoff and climb checklist. Both the blowout door, P.N. 3P61635-115, and the spider assembly, P.N. 3P61634-101, were missing. Further investigation revealed that it is very easy to install the blowout panel upside down and that it is quite difficult to detect. In this upside-down position a one inch space at the base of the spider could allow the spider, panel and all, to slide down and off, providing one of two conditions exists: (1) The bottom two screws that hold the panel to the spider are not tight, (2) if the bottom portion of the panel is bent enough to allow it to overlap the pylon skin.

The photos show an easy way, developed by the 438th Military Airlift Wing, to detect an improperly installed pylon blowout panel. Stencil each panel with the words, UP and FORWARD with arrows pointing in the appropriate direction.

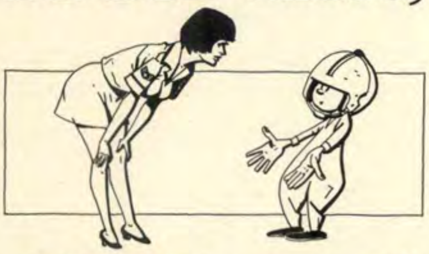
The stenciling, along with the position the louvers are in, will give a positive indication of a properly or improperly installed panel.

In view of the number of problems encountered with this particular panel, all personnel, air as well as ground crews, should be especially watchful to insure that the pylon blowout panel is properly installed. ★

## missing nose wheel

**THE LEFT NOSE WHEEL** of an F-4 was discovered missing after the aircrew had completed an uneventful landing and taxied into the parking area. The wheel, which had fallen on base, was recovered and, after inspection, was reinstalled. The axle nut, lock screw and keyed spacer, were not recovered. According to the report, the primary cause of the incident was undetermined. The most probable cause was Maintenance because the TO gives two different axle nut torque values, depending on which of two different wheels is being installed. This incident points out the importance of following the TO, step by step, until job completion. ★

# look ma, no oil!



**DURING CLIMB** after takeoff a T-41 instructor pilot noted engine RPM falling off. While he pumped the throttle in an attempt to increase RPM, the engine froze. The IP set up a forced landing glide straight ahead; however, high tension power lines caused him to execute a 90 degree right turn. He then saw farm buildings in the proposed rollout area and made another 90 degree right turn. He landed the aircraft in a wheat field without damage.

Investigation revealed there was practically no oil in the engine. When the sump plug was removed less than one pint of oil ran out. The aircraft had just undergone the first 50-hour inspection after engine change. After the crank case was drained it was never refilled, but the aircraft had been returned to the flight line as operationally ready. The instructor pilot states he observed 7.2 to 7.5 quarts on the oil dip stick during his preflight inspection (probably residual oil). He further stated that two separate engine instrument checks prior to takeoff did not reveal any irregularities.

Someone didn't follow through on his job. If you can't be there personally, make an entry in the AFTO 781A. ★

# a case for safety wire

**THE PILOT OF** an O-2 noticed oil, or hydraulic fluid, on the tire when the gear was lowered in preparation for a GCA practice approach. He aborted the approach and climbed to 2500 feet. Then the rear engine oil pressure dropped to zero. The engine was shut down and a landing accomplished without further incident.

Maintenance personnel discovered the quick drain valve plug lying in the engine cowling. The drain plug had not been safetied which allowed the plug to back out and all engine oil to escape. ★

# bug-a-boo

**WHEN PARTS** and assemblies are removed and hydraulic or pneumatic lines are disconnected, caps or plugs provide protection for more reasons than to exclude dust. Some mechanics overlook, for example, the bug bug-a-boo. Bugs look for quiet, dark holes to crawl into. Open lines are ideal to them. Mud daubers may even call them home. One simple capping substitute, like aluminum foil, is insufficient because it does not fit closely; plastic wrap is better. A rubber band is additional security around the plastic wrap. Bugs are also a nuisance in aircraft wing or fuselage cavities. Bugs crawl into these dark areas and die or hibernate. Fumes, in turn, may kill them if they don't die naturally. As the bugs deteriorate, with moisture present, formic acid is commonly formed and severe corrosion results. Care must be taken to assure removal of bugs from the aircraft. Vacuuming provides good results. ★

*J. H. Cates, SMAMA (SMNET)*
*McClellan AFB, CA*

## maintenance reel news

**THE FOLLOWING NEW USAF** films are available through your local base audio-visual library or audio-visual servicing activity. Installations without film service can order from the USAF Central Audio-Visual Library, an Aerospace Audio-Visual Service (MAC) unit, Norton AFB, California 92409.

Requests should contain complete film titles and serial numbers. Because of heavy demand, please give alternate showing dates and films. All films are 16mm with sound.

**TF 6132 AVIONIC MAINTENANCE SAFETY.** Defines hazards of high voltage equipment and radioactive tubes. Demonstrates use of emergency equipment. Explains dangers of radiation, engine noise, ingestion, and hot gases emitted from aircraft. Demonstrates method of grounding test equipment. 16 Min. Color.

**TF 6302 THEY CALLED IT FIREPROOF.** The scene of this film is a supposedly fireproof hospital. As the story unfolds, many infractions of fire safety rules are seen. Combustible material is everywhere. A tour of laundry and kitchen facilities shows unhygienic conditions. Sudden fire brings death and damage as a sad conclusion. 21 Min. Color.

**TF 6313 F-111A/FB-111A WEAPON SYSTEM**—Ground Handling and Servicing. Demonstrates complex handling and servicing procedures for the F-111. Includes parking, installation and removal of safety devices required for static aircraft; placement, correction and removal of ground support equipment; fuel, oil, hydraulic and air checks; refueling and defueling procedures; and danger areas in and around operating engines. 11 Min. Color. ★

## engines will eat anything

**ENGINE FOD.** Engines will eat dust plugs, but rarely will they survive the ordeal. Take the case of the T-38 being checked on the runup pad. Maintenance was ops checking the Nr 1 engine for an EGT problem. Both engines were being operated at a little over 90 per cent when a loud noise was heard and Nr 2 rolled back. The engine was immediately shut down and checked. It was found that all stages of the compressor section were damaged because the engine tried to swallow the intake plug. Why was the intake plug left in? Because maintenance goofed. Why did maintenance goof? Because they did not religiously follow the checklist before starting engines. They had performed maintenance on Nr 1 engine and were performing an ops check without completing the "Before Engine Start" checklist. Perhaps maintenance was trying to save time, or was it just plain negligence? Follow your checklist and eliminate expensive FOD. ★

## non-reversible gages

**DURING A B-52** fuel top off, the center wing tank shut off with a gage indication of 24,000 pounds, instead of the required 29,800 pounds. The refueling supervisor noticed that the fuel gages for the forward body and center wing tanks were reversed. He called for instrument shop assistance and continued the refueling. An extra 5000 pounds was believed to have been put into the forward body tank, with intentions of transferring it to the center wing tank after the correct gages were installed. However, prior to arrival of the instrument personnel at the aircraft the flight crew arrived. The pilot had the crew chief dip the tanks. The forward body tank contained 3400 pounds, and the center wing tank contained 33,600 pounds of fuel. This put the C.G. out of limits. When instrument personnel arrived, they reversed and recalibrated the gages. Fuel was transferred to correct the C.G. and the fuel system indicated normally.

Imagine what a catastrophe this incident could have turned into if not corrected in time. Crew chiefs, insist that all work be documented and don't allow anyone to work on your aircraft without the proper work order. ★

# GRASS YES... FINGERS NO!

Every year, along with robins and aphids, this season brings the guttural sound of the power mower turning shaggy grass into a carpet-like lawn. And every year there are some fingers, toes and eyes sacrificed to these grass chewing monsters.

Supervisors scratch their heads and try to think up new ways to prevent mower mishaps. And well they should. Last year there were 275 man days reported lost due to mower accidents; the cost of injuries per individual ranged from $52 to $2250.

You may have been mowing the grass for years at home, or possibly on the job, without a nick, so you wonder how people can be stupid enough to get hurt. Well, it's easy. There are basically three ways in which one can get seriously hurt with a power mower. You can be struck by a whirling blade, hit by a rock or other object hurled at you by the blades, or, in the case of the electrical mower, shocked, burned or even electrocuted!

Most injuries are associated with rotary mowers. The whirling blade can chop off fingers and toes quite efficiently, so if you wish to preserve your digits don't let them get in contact with that blade when the mower is running. Another hazard with all mowers is the possibility of an object being picked up and thrown at the operator. The resulting injury can be lethal at worst and painful at best.

Electrically powered mowers present the same hazards, in addition to the possibility of shock from worn cords and operation on wet grass.

Here are a few ideas that will prevent injuries and help you get the most work out of your power mower, whether in your own back yard or on the job.

- Inspect the blade of the rotary mower and make sure that it is sharp and not cracked. If it is cracked it should be replaced. A plastic-tipped blade may be the answer. Air Training Command evaluated one type that sells for $7.95. Their test indicated that plastic-tipped blades are most suitable for the type of mower you would use at home.

The best thing about this blade is its built-in safety feature. During the ATC test a leather boot was placed under a power mower with about an inch of the boot toe within the arc of the blade. In one and one-half seconds the metal blade slashed open the boot. Then a boot was exposed to the plastic-tipped blade for eight seconds. Result: the boot was scuffed but not penetrated.

- Keep the mower clean. It will work better and will last longer because cleaning will retard corrosion and there will be less chance of clogging.

- Don't do any work on the mower with the engine running. With an electric mower be sure the power cord is disconnected.

- Don't fuel the machine while the engine is hot. Let it cool for a few minutes to prevent a flash fire, then fuel it using a funnel.

- Police the area prior to mowing. This way you can remove the bigger rocks, metal bits and pieces and sticks that will jam the mower or be thrown back at you. Also, you can prevent damage to the blades in this way and save a repair job on the sprinkler system by making sure that pop-ups are not stuck in the up position.

- Wear appropriate foot gear. On the job, AFM 127-101, para 0401.6 (3) 1 states that personnel operating power mowers will wear safety toed shoes. At home, we recommend these if you have them. Otherwise, wear boots or heavy high topped shoes. (If you operate a power edger wear goggles with safety glass.)

- Don't allow children to operate power mowers of any kind.

- If you must work on a slope, don't try to pull the mower uphill—work horizontally instead of up and down. Then if it gets away from you, you won't have that churning monster charging in your direction.

- With an electric mower or edger, be sure the cord and plug are in good condition and that the ground lead is connected. Don't operate on wet grass; don't run over the cord. ★

# *Sympathy* or ACTION?

**James H. Smith**
**SAAMA, Kelly AFB Texas**

"That widget is in the warehouse, and it is colder than a well-digger's hip pocket here in Alaska. Why do you need that number? You ought to know who sold you those widgets. We got used to one report system, and then you changed it completely. How about some sympathy for us in the field?"

From his tone of voice, the sergeant would like to rub my nose against the widget. That might not be a bad idea; at least I could read the numbers on it.

I am in San Antonio. It was February and the temperature was 31 degrees. I have the warmest sympathy for any troops north of Amarillo. But sympathy won't keep them from drawing a defective widget, installing it in a cold-soaked airplane, only to find that it won't work and they have the whole job to do over. Action to get good widgets in stock will do more for the troops than all my sympathy.

If a cold climate doesn't fit your station, substitute "Arizona," "hotter than blazes," and "July." We'll have a similar conversation with you this summer, unless the stock of widgets has been fixed.

The records do show where we have bought widgets, from several different low bidders. They have been overhauled by other low bidders and by two Specialized Repair Activities. To correct the manufacturing or repair procedures we need to know who goofed. To purge bad widgets from stock, we have to identify them by source. We must have the numbers!

You are the expert on your defective item. We haven't seen it. We don't know exactly what went wrong unless you tell us, or send a photograph to show us. We don't have any facts you don't give us.

Your reports don't always give the facts we need.

Here is one example on my desk:

(1) The Federal Stock Number does not agree with the part number or the nomenclature.

(2) The part number does not belong to the manufacturer shown as the item source.

(3) The item identified by nomenclature and in the narrative is not prime at this AMA; the report is misrouted.

Taking action with all the contractors that might be involved, armed with this report, would be like hunting one elephant by attacking the herd, armed with wet ammunition.

Some boners are more amusing than confusing. Even so, how do you convince a contractor that the troops followed the tech order in using his complicated equipment, when the officer or NCOIC obviously did not follow TO 00-35D-54 to fill in the blanks on a simple one-page report form?

Ninety per cent of the reports we receive have obvious errors or omissions. The average is about three boners per form. There are errors in distribution on about one-fourth to one-third of the reports.

Before you laugh too loud, grab your last Quality Unsatisfactory Materiel Reports and score them carefully against the attached checklist. Use a CURRENT copy of TO 00-35D-54 and TO 00-25-115.

THE QUALITY DEFICIENCY REPORT FORM, ITS CONTENTS, AND ITS DISTRIBUTION, CHANGED COMPLETELY ON 1 JANUARY 1970.

Here are a couple of tips to help you route the new Quality Unsatisfactory Materiel Reports (QUMRs, DD Form 1686):

(1) There are only six action agencies for QUMRs: SAAMA (SANMQ), WRAMA (WRNMQ), SMAMA (SMNMQ), OCAMA (OCNMQ), OOAMA (OONMQ), and Hq AFLC (SGMEO) for certain items in Federal Supply Group 59.

(2) To identify a management code to the responsible AMA, use Atch 2, Chap 2, Vol I, Part Two, AFM 67-1, borrowed from your supply people.

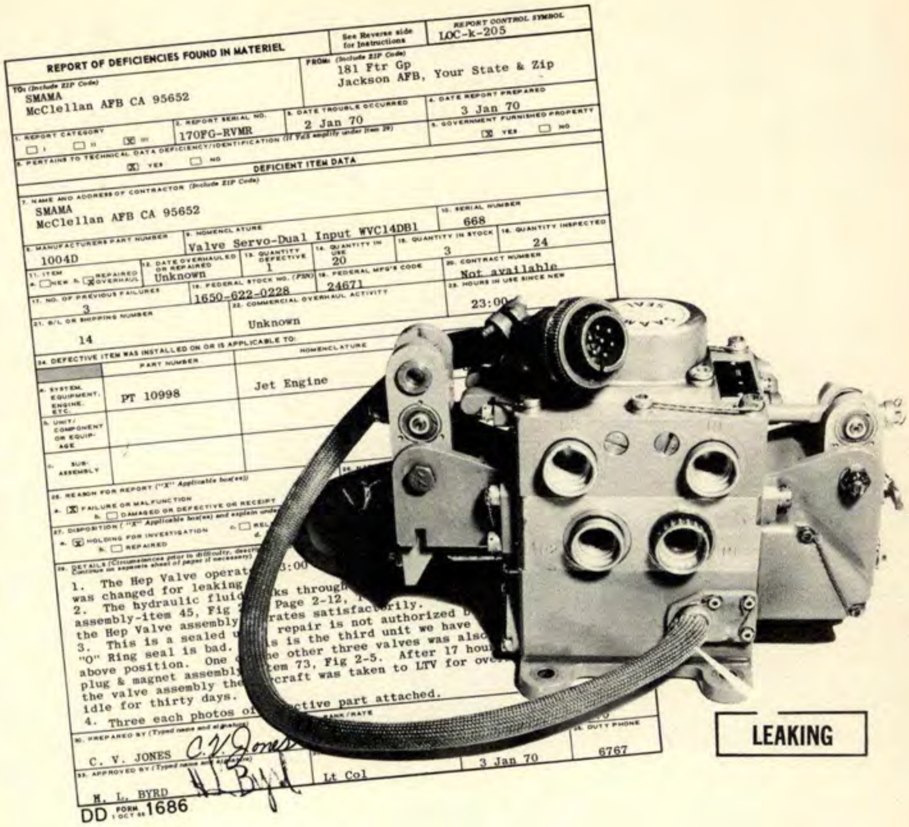
Will the defect show in a photograph? If so, were photographs submitted? The exhibit will be shipped to the item source. Even though we now write the final reply, we don't see many exhibits here at the AMA. Photographs let us see exactly what went wrong, too.

Contractors sometimes accept a well-written report, backed up by good photographs, without asking for the exhibit. Good photography can pay for itself in shipping charges alone.

Were exhibits offered? The contractor thought his item was good. We have to show him it wasn't, particularly if we want him to repair or replace it at no charge. Having the solid hardware available to support the QUMR and the photographs will put the Air Force in a much better bargaining position, even when we don't have to actually ship the exhibit.

Several units consistently submit accurate, complete reports that comply with TO 00-35D-54 and satisfy all the items on the attached checklist. Their reports get better replies and more effective action.

"You have my sympathy, Sergeant. But there are several different widget manufacturers, and to correct the problem you reported I will need some more information. You will have to get me the numbers."★




A properly completed form along with a good photograph will expedite correction of a deficiency. The hardware in question is even better.

## QUALITY UNSATISFACTORY MATERIEL REPORT

# (QUMR, DD FORM 1686)

# CHECKLIST

| | Check Point | DD 1686 Block Nr | Required Information | TO 00-35D-54 Reference |
|---|---|---|---|---|
| ( ) | 1 | — | "Quality Control" type at top of form | Par 3-16 |
| ( ) | 2 | 1 | Report Category | Par 3-17 |
| ( ) | 3 | 2 | Report Serial Number (check for proper format) | Par 3-18 |
| ( ) | 4 | 3 | Date Trouble Occurred | Par 3-19 |
| ( ) | 5 | 4 | Date Report Prepared | Par 3-20 |
| ( ) | 6 | 5 | Tech Data/Deficiency | Par 3-21 |
| ( ) | 7 | 7 | Name and Address of Contractor | Par 3-23 |
| ( ) | 8 | 8 | Manufacturer's Part Number | Par 3-24 |
| ( ) | 9 | 9 | Nomenclature | Par 3-25 |
| ( ) | 10 | 10 | Item Serial Number | Par 3-26 |
| ( ) | 11 | 11 | Item New or Repaired/Overhauled | Par 3-27 |
| ( ) | 12 | 12 | Date Overhauled or Repaired | Par 3-28 |
| ( ) | 13 | 13 | Quantity Defective | Par 3-29 |
| ( ) | 14 | 14 | Quantity in Use | Par 3-30 |
| ( ) | 15 | 16 | Quantity Inspected | Par 3-32 |
| ( ) | 16 | 17 | Number of Previous Failures | Par 3-33 |
| ( ) | 17 | 18 | Federal Stock Number | Par 3-34 |
| ( ) | 18 | 19 | Federal Manufacturer's Code | Par 3-35 |
| ( ) | 19 | 20 | Contract Number | Par 3-36 |
| ( ) | 20 | 21 | Bill of Lading or Shipping Nr | Par 3-37 |
| ( ) | 21 | 22 | Commercial Overhaul Activity | Par 3-38 |
| ( ) | 22 | 23 | Hours in Use Since New or Overhaul | Par 3-39 |
| ( ) | 23 | 24 | Defective Item Installed On or Applicable To | Par 3-40 |
| ( ) | 24 | 25 | Reason for Report | Par 3-41 |
| ( ) | 25 | 26 | Nature of Malfunction | Par 3-42 |
| ( ) | 26 | 27, 29 | Disposition | Par 3-43 |
| ( ) | 27 | 29 | Details. Follow prescribed Outline? Complete? Clear? | Par 3-45 |
| ( ) | 28 | 29 | Distribution | Par 3-13, 3-15, 3-45 |
| ( ) | 29 | 30 | Typed Name, Signature, and Phone | Par 3-46 |
| ( ) | 30 | 32 | Date Signed by Initiator | Par 3-48 |
| ( ) | 31 | 33, 34, 35, 36 | Name, Date, Rank, and Phone of Reviewing Officer | Par 3-49, 3-50, 3-51, 3-52 |

# combat maturity

Capt Victor Vizcarra, AFFTC

**THE UNITED STATES AIR FORCE** is composed of the best trained personnel in the world, as they were before the conflict in Southeast Asia. At that time most aircrews had received this training and acquired their flying experience under peacetime conditions.

Now with five years of armed conflict in Vietnam, the majority of pilots have served a combat tour. This force has matured and added actual experiences to the mission in which it has been so well trained. Now the question may be asked, "What has this maturity done for the pilot once he has returned to a noncombat assignment?" What has he gained from those moments when the old adrenalin was really pumping as he rolled in on a target that was shooting back, instead of some bombing circles with associated scoring towers? (If you weren't in the ordnance delivery business, don't let the first few paragraphs of this article lose you. The adrenalin pumped just as hard in other missions such as logistical support, FAC, chopper, etc. So read on, you should have matured also.)

To answer this question, it is necessary to review the maturing phases which most individuals experienced in their combat tour.

First, if you'll recall, almost every man was a Tiger, fully confident, maybe even over-confident, because of having received the best training in the world. This confidence in many cases made us forget some of the things we had originally been taught, but not continually practiced. Such as in practice, you always had a standard pattern in the bombing range. Through necessity, it was always the same old range with multiple passes.

You soon learned in the real thing that you just can't fly standard patterns or unnecessary multiple passes. At least not continuously and survive. So you say, "What about that excellent training mentioned earlier?" It was there. You were briefed and trained properly. Remember the tactical ranges and participation in war games and exercises? However, due to economics and safety, most of the time you practiced on the standard gunnery range. And man is a creature of habit. So with this and the confidence instilled, many reverted to the way they practiced, and had to relearn lessons previously taught.

If you were lucky enough to survive through observation and experience, it didn't take long to mature into the second phase. This is where you became a real professional, putting everything you learned and experienced into accomplishing the mission in the most efficient manner. This is not to say that the well trained but inexperienced combat pilot wasn't accomplishing the mission initially. He was, but he was doing it while taking unnecessary risks due to his inexperience and by relying on old habits. Now that he quickly relearned what he'd practiced during war exercises and on the tactical range, the mission was being accomplished in the manner he was originally taught; get the mission done and get back so you can do it again.

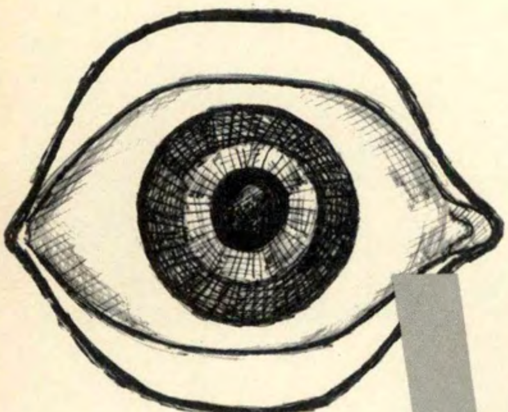
One might say you've reached Utopia, the ultimate, when you've matured to this stage. True, but think back and you went through one more final stage from which one can still draw a basis of good experience. Remember what it was like as your tour was coming to an end? You acquired a case of "get homeitis," but in this case, it made you more cautious. You continued to accomplish the mission efficiently, but with more concern for getting the old pink body home to the land of the big BX. You did this by not taking any chances. Besides becoming a professional, an expert, you also became your own flying safety program.

So now that you're back home to what seems like just a routine job, what is the state of your maturity? Unfortunately too many pilots reverted back to that first stage in combat. You're well trained, but over-confident. You haven't been shot at recently, so you're not all pumped up and ready for any eventuality. You've been briefed on emergency procedures, practiced them in simulators, etc., but you haven't experienced the actual event. So, to many pilots, the day-in and day-out flying becomes a routine thing.

Once in a while they'll read a safety article or hear of a friend who experienced an accident or incident which will perk them up for a short time. Unfortunately, not enough to make them the professionals they were once they matured in combat. For instance, how many times have you checked your personal equipment and survival gear before each flight as you did in combat? The point is, why wait to experience an emergency before you really bone up on what you are going to do to handle the situation? In combat, you had everything preplanned. You knew which way you were going to jink as you pulled off the target, for example, before you even took off.

So before you strap in that cockpit for that everyday "routine" flight, preplan and think about what actions might become necessary to make you a professional in your attitude toward the routine mission. And when you're ready to file that flight plan to get home after that TDY or cross-country and you feel "get homeitis" creeping up on you, think back about how you reacted to it during your end-of-tour combat missions. In short, maintain that maturity you acquired from combat; it was earned and it saved your life —and it will continue to save your life in the non-combat environment.

(Reprinted from AFSC *Professional Approach*) ★



# VISUAL ASPECTS

**Capt James R. Hanson**
Piedmont Airlines

## your key to avoiding near collisions

These photos were taken 1.25 seconds apart by the lead ship of four RF-84s. The two F-4s do not show on either the preceding or following frames. Although the two flights weren't on collision courses, its obvious that if they had been, the collision would have occurred less than 1.25 after the second photo was taken. From first sighting, the pilots would have had less than 2.5 seconds to react! (Thanks to Maj John Calhoun, Alabama ANG and TAC ATTACK)

Until such time as a Collision Avoidance System and/or Pilot Warning Indicator is in use, with ALL aircraft participating, we will continue to operate in a hit-or-miss environment.

These systems will reduce the mounting communications load which is part of the radar advisory problem today. There are many weaknesses in the radar system, so we must not let the words "radar contact" lull us into a false security. We must educate ourselves for today's problem of living with unknown traffic.

Many collisions and near collisions could be avoided by understanding visual collision avoidance. Many pilots, regardless of their experience level, do not understand rate of closure and, therefore, how to evaluate and take proper action when another aircraft enters their near airspace.

It should have been a part of our original training, but I have never seen a requirement for it in any curriculum. A good understanding of the problem will make a safer and a more relaxed pilot.

The military pilot learns to set up a collision course in order to join up in formation and to hit an aerial target in gunnery. We all, whether realizing it or not, set up a collision course with some point on the ground when we approach for a landing. Let's visualize what takes place.

Whether using an instrumented glideslope or a visual one, there is a predetermined point of interception. If this spot rises on us we will undershoot, if it moves toward us we are overshooting.

In the air the same holds true. When we see another aircraft and it has movement—left, right, up or down—we know that we will not collide. We will pass off opposite to the direction of observed movement. The rate of movement governs the margin of separation.

This means that any turn, climb or descent we make that increases the rate of movement also increases

# VISUAL ASPECTS

the separation. This maneuver need not be violent except in a case where there is a high rate of closure and the aircraft stays in the same relative position.

There is one important thing to remember, YOU CANNOT HIT ANYTHING WHICH HAS MOVED OUT OF THE SPOT FROM WHICH IT WAS FIRST OBSERVED. It must become stationary at some point in order for there to be a collision. A difference of altitude is all that is needed to avoid a collision.

This is all a collision avoidance system needs to accomplish; however, visual avoidance is not that simple, so points need to be learned and visualized. A most common error is turning in the wrong direction, with a consequent increased chance of collision.

The old fighter pilot's rule of always turning toward the enemy and keeping him in sight as long as possible, is still the rule in visual collision avoidance. By keeping him in sight until the danger is past you remain in control of the situation. There is an exception to every rule (see Figure 1). As seen in "D" we would climb if the other aircraft were descending. Carefully visualize yourself in the following level flight and common altitude situations and the "keep him in sight" rule should become clear. Each of these situations may be a near miss but not a collision.

Some might question "D" because it is an automatic near miss, but it is a definite near collision not a possible collision. If a turn in the direction of the other aircraft's movement were made he would have been lost from sight and there would be no way to know when it

**PICTURES OF THE EARTH** as seen from space graphically illustrate something that we pilots have known for a long time: The atmosphere is a layer of brightness surrounding the earth.

But many of us have not stopped to realize that most of the brightness clings close to the surface of the earth. We often fly *above* much of it.

The brightness of the sky is caused by sunlight being scattered by atmospheric particles. And at any altitude the degree of brightness is proportional to atmospheric pressure and density. So at 18,000 feet, you have half the atmosphere —and half the brightness—below you. At FL 400 you have four-fifths of the brightness below you.

Your eyes, recessed beneath the overhang of forehead and brows, are naturally protected from the glare of this atmospheric brightness when you are on the ground. But at altitude, with the light direction reversed, glare floods unhindered into your eyes, causing discomfort and then fatigue. When you're flying without protection from this glare, even in a clear, cloudless sky, your vision outside the cockpit is quickly impaired.

Don't hesitate to use your tinted visor or wear dark glasses when you encounter brightness conditions that will tax your eyes. But be sure the glasses you wear are optically correct, Air Force issue.

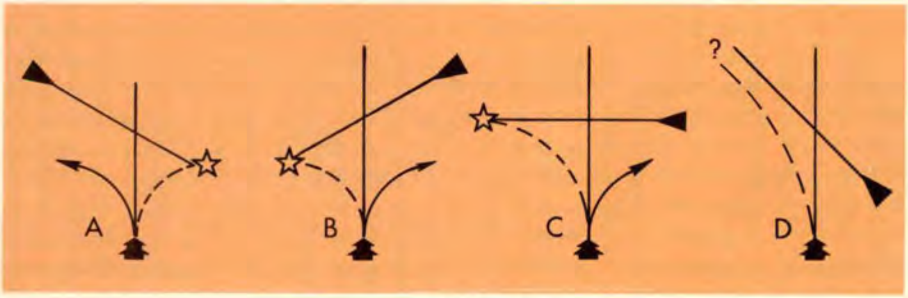



**FIGURE I**

would be safe to turn back. Losing sight means losing control of the situation and full dependence on the other pilot to see and avoid.

Some points to remember when meeting an aircraft head-on are the following: *When head-on and in level flight*—go down and turn right. Down to keep him in sight and turn so that if he sees you he will react in an opposite turn. (The right turn is an FAA regulation when meeting an aircraft headon).

If you see an aircraft head-on but are uncertain of his altitude look for the following signs. If any belly or underwing shows you should go down and turn right. If you see any part of the top of the airplane you climb and turn right. This is one time when you lose sight of him, but you were already projected to be above him so you are increasing the separation by making him move faster.

A point to remember when looking for called targets is to area scan. Pick an area and stop your eye movement. In this way you will pick up anything moving across this area. In other words, look and stop, look and stop. By virtue of his movement we know he is not a potential collision UNLESS he makes a change of direction which will slow his apparent movement or cause him to become stationary.

The moving target attracts attention and so it is not as hard to see, but the stationary target does not attract attention and is the ONLY one where a mid-air collision results.

*(Reprinted with permission of ALPA)* ★

**ME CATCH SPACE MYOPIA??** You've gotta be kidding—I'm only flying an O-1!

By the way, what is it—like contagious?

No, it's not contagious, but it can affect any pilot flying any airplane on a clear, cloudless day. It's just the fancy, flight surgeon way of describing the trouble you have when you're trying to scan the sky for other airplanes and have nothing to focus your eyeballs on.

We've all had the disconcerting experience of knowing there's another airplane at two o'clock, ten miles away, and being unable to see it—until it suddenly pops up two or three miles close, and you take violent evasive action in the split second before collision would occur. Would you believe this is perfectly normal under certain conditions?

Usually, when you look at an object, your eye takes about one-fifth of a second to bring it into sharp focus. It does this through a process of trial and error, ranging the focus in and out until you see the best picture. When you are looking into an open expanse of sky, or a flat, undefined background of clouds, you cannot pre-select infinity focus—or 12-foot focus, or anything else. Instead, your eye drifts randomly between near and far focus. On the average, your eye is likely to be focused somewhere between three and six feet.

To you in the cockpit, searching the sky for that bogie that is still too small to catch your attention, this is important. Instead of your eyes being at infinity focus, where they will be most likely to notice a tiny speck at the earliest moment, they are focused just the other side of the canopy glass.

But there is a solution. You can learn to make your eyes work for you when you're looking into an empty visual field. The trick is to make your eyes focus at optical infinity and then stare out into that great glaring void.

Optical infinity for the average human is only about ten or twelve meters (call it 30-35 feet) from the eye. So to run your focus out to infinity, look at your wingtip, if it's that far away, or at another bird in the formation. Or at the ground—or anything over 30 feet away. Then, look for that bogie. Your eyes will remain focused at infinity for about 20 to 30 seconds.

# EXPLOSIVES SAFETY

for munitions, weapons, and egress techs

## MK 24 MOD 4 FLARE

**APPARENTLY** a red mark on the lanyard of certain of these flares has caused problems. Load crews noted the red mark on the lanyards, thought the flares were armed and got rid of them. Actually, the flares were okay. The red mark is a manufacturer's indicator for proper lanyard installation. Occasionally, due to slips in QC, the red painted portion gets to showing above the top of the ignition dial.

This is a case of the word not getting into the tech data, thus the troops were not aware of the true condition of the flare. OCAMA is having the color changed in an effort to end the confusion.

## CHECKLIST DISCIPLINE

**WHEN** working with explosives there is one thing that must never be forgotten. Explosives are designed to go boom when called upon. Otherwise they would be useless or so hazardous that they would be worse than useless. It is for this reason primarily that step-by-step procedures are spelled out and briefed in the form of checklists. It should not come as a surprise, therefore, when someone is injured as the result of not adhering to the checklist, as the following example indicates.

The load crew was downloading CBUs, two -24s and two -49s, and a sergeant began defuzing a CBU-49. When the fuze was clear of the CBU he saw that the battery firing device was still attached. Then the fuze detonated in his hand.

Supervision was listed as a contributing factor because the crew chief did not personally insure that all fuzes were properly safed prior to their removal. But he was one removed from the primary cause. The sergeant who was defuzing the CBU brought on his own injury because he omitted a vital step in the checklist—*he forgot to install the safety pin.*

## BOMB DUMP?

**IT WAS** five o'clock in the morning, approaching the end of a long night shift when the sergeant left the munitions operating area at an overseas base, towing a trailer with six MK 82 bombs. On the access road going to the flightline, he noticed that one of the bombs was sliding forward on the trailer cradle. By the time he could get his vehicle stopped, two bombs had come off their cradles. Fortunately, this time the only damage was some bent fins.

But that didn't change the fact that the trailer was missing two tie-down rings—and the sergeant had accepted the load of bombs improperly secured.

# POOR PLUMBING

**WHEN** a SUU-16 gatling gun starts coming apart—look out! Fortunately, when one started acting erratically on an F-4 recently, the crew quickly aborted the pass and brought the bird (and gun) home. They had made seven varied practice bomb passes on the range and started into the strafe portion of the mission. On the first gun pass it seemed to them the gun was rougher than normal, and the impact pattern on the range was wider, more scattered than usual. When the same symptoms occurred at the start of their second pass, the Phantom crew stopped firing immediately.

On the ground, it didn't take long to determine that the gun barrel diffuser had not been properly installed. It had fallen out on the range during the mission.

In another unit when similar problems arose, the verdict was that their gun plumbers had not been applying the torque to the barrel diffuser that is required by tech data. They promptly inspected all their SUU-16 and SUU-23 diffusers for correct torque.

# EGRESS EXPLOSIVES ACCIDENT

**TROUBLE** often arrives a step at a time, as illustrated by a recent accident which could have been prevented at any one of three points.

First, an aircraft in reclamation status did not have explosive egress components removed. Next, the auxiliary canopy removal handle safety pin was not installed. Finally, a worker not familiar with egress systems inadvertently pulled the handle, causing the canopy cutter assembly to fire. A sergeant working on the aircraft was injured.

So we have a "For want of a nail . . ." situation. If the explosive egress components had been removed, if the safety pins had been in place, if the worker had known not to pull that handle, there would have been no accident.

# MUNITIONS LOADING

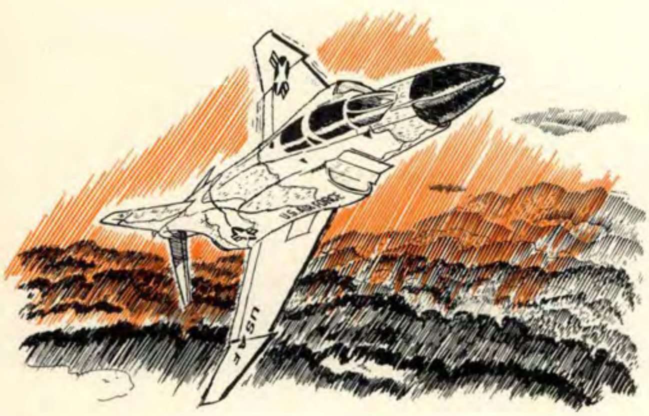
**BECAUSE** theirs is such a critical job, munitions and weapons specialists must be meticulous in the performance of every task. The following will show why.

Two sergeants were attempting to load a CBU-49 on a centerline MER. In an attempt to lock the CBU in the bomb rack, excessive upward pressure from the MJ-1 lift and body pressure applied by one of the men on the aft portion of the CBU caused it to pivot on the aft inboard roller. The forward section of the CBU raised over the forward outboard roller and the dispenser fell, damaging the nose and fin assembly and injuring one of the men.

Improper loading technique was the primary cause but there were a couple of contributing factors: Aircraft and other equipment were making a lot of noise and the crew mistakenly thought they heard the front lug lock in the rack; the men were possibly rushing the job. ★

# *Ops* topics

**SHORT BURSTS FOR OPERATORS**



## DON'T DIG

The mission was air combat maneuvers and the flight of four F-4s had split up into two elements. Lead of the attacking element had accelerated to Mach 1.2 in a nose-low turn pulling five to six G. As he closed to gun range his concentration on the tracking problem intensified and he increased back pressure to keep the picture the way he wanted it. Just about that time the airplane decelerated to subsonic—and he felt it dig in.

With the pass pretty well fouled up he broke it off, and noticed 10 G on the meter!

After he landed, the maintenance people found the right engine forward mount had failed and the whole engine had shifted.

The F-4 in this incident had just been modified with TCTO 831, the three-pound bobweight, which gives you a considerably lightened stick feel force in pitch. The pilot, with over 600 hours in the bird, had a well-developed feel for the less sensitive elevator control before the mod.

But there's more to it than that—any F-4 will dig in as it goes from supersonic to subsonic if you're holding G. And it says so right in the Dash One. The aerodynamic effectiveness of the slab increases as you decelerate through the transonic speed zone. So even if you don't move the stick under these conditions, you're going to increase G. Of course, if you squeeze in a little more G at the critical moment, as this pilot did, you're just asking for trouble. And it can be abrupt at high G.

So think about it next time you're in a similar situation. The maintenance guys get real unhappy—and besides, it can ruin a good pass.



## TIRE INSPECTION

Maintenance is constantly looking for more efficient ways of getting the job done faster. One such time saver some bases are now using involves postflight tire inspections. This system calls for stopping the aircraft a few feet from its final parking spot, inspecting the tires (in accordance with TO 4T-1-3, para 3-3), then having the aircraft commander taxi the few remaining feet to the final parking spot.

This system seems to be working well, except for a few cases in which pilots didn't know what was going on. Reports indicate that some thought they were being stopped because of an emergency, such as fire.

So, Mr Aircraft Commander, if Maintenance tries to stop you before you are all the way into the hole, it's probably so the ground crewmen can look at that part of your tire that will be on the ramp when you make your final stop for the day.

## AERO CLUB SAFETY AWARDS

Thirty-three USAF Aero Clubs earned FAA Flight Safety Awards for accident-free operation in 1969. The awards were presented by FAA Administrator John H. Shaffer in a ceremony at FAA headquarters.

Aero Clubs are an important part of the Air Force recreation program with more than 10,000 members in 76 clubs operating 424 aircraft. Flying in 1969 approximated 265,439 hours.

Award winning clubs:

Otis AFB
Oxnard AFB
Perrin AFB
Stewart AFB
Chanute AFB
Randolph AFB
Vance AFB
Charleston AFB
McGuire AFB
Castle AFB
Ellsworth AFB
Grissom AFB
Griffiss AFB
Robins AFB
Arnold AFS
Hanscom Field
Holoman AFB
Los Angeles AFS
Maxwell-Gunter AFB
March AFB
Ramey AFB
Westover AFB
Whiteman AFB


## UNSCOREABLE AT 7

The F-4 crew wasn't familiar with the range, but they'd been through a complete briefing. Arriving at the range, the flight had to hold while some work was done on the targets. When the range officer finally cleared them on the range, he told them to drop on "the barge." This was a bit confusing to the new crew, because there had been no mention of a barge target during the briefing—there had been a ship target. Then suddenly they spotted a sunken barge in the water, set up their pass and dropped a Mk 106. Impact was 8000 yards short of the pre-briefed ship target.

Two lessons in this one: Use the right terminology; if the manuals call it a ship, don't call it a barge. But more important, if you're uncertain about which target you've been assigned, go through dry. This time it was just a sunken hulk and no one was injured. Next time it could be a lot worse.

### FLIP CHANGES

In future issues, this space will be used to provide notice of forthcoming changes to DOD Flight Information Publications (FLIPs). Changes, as they occur, are noted internally in the products. However, the Aeronautical Chart and Information Center (ACIC) has requested the assistance of **Aerospace Safety** in providing advance information. ACIC, located in St. Louis, Missouri, is the DOD Executive Agent for world-wide production and distribution of Flight Information products.

## ARRESTING SYSTEMS

Only six Emergency Unsatisfactory Reports (EURs) were submitted on USAF aircraft arresting systems during 1969. That figure is inconsistent with barrier problems reported through other media—such as excessive rollback following arrestment, cable and tape failures, deck sheave bearing failure, troubles with remoted MA-1A systems on wide runways, and jet-blast effects on MA-1A intermediate barrier stanchions. This indicates that numerous problems are not brought to the attention of the proper agency for correction.

*(AFSC Safety Management Newsletter)*


## ANALYSIS OF AN ANALYSIS for Phantom Phlyers

In the article "Analysis of an Incident," (April '70 issue) we made a significant boo-boo. The article concerned BLC malfunction immediately after takeoff, and what you do when the BLC light illuminates after you've raised the flaps—and then goes out after a few seconds.

In the first paragraph on page seven, we said, "...when the BLC light goes out treat it as you would a fire warning light—check the circuit." At first reading it sounds like a good idea, but the trouble is you can't check the BLC light circuit from the cockpit. You can check all the lights on the telelight panel, but all you accomplish is a check of the bulbs, not the circuits.

On page eight we said, "... If the aircraft commander had checked the warning light circuit... he would have been able to minimize the damage to the airplane..." We all agree now there's no way to effectively check the circuit. The only course of action when you've seen a BLC light is to lower the flaps, leave them down, and bring the bird back home.

## TVOR VOICE

Reference "Into the Hillside" in the February 1970 *Aerospace Safety,* I assume the accident involved an F-106 aircraft. It mentioned that the pilot failed to monitor the TVOR voice frequency on the ILS receiver. Having flown the bird for eight years, I have yet to receive TVOR VOICE ON THE ILS receiver due to the fact that there are 20 preset ILS frequencies, all ending in odd tenths MHz.

If you have information about how to receive a TVOR on an ILS frequency, I will be happy to pass it on to our jocks.

**Maj Frank P. Walters**
**95 Ftr Intcp Sq**
**APO San Francisco 96570**

*When we called the squadron involved in the accident we were briefing, we learned that they have placed their local TVOR frequency in channel 20 of the ILS receiver. Unless you have a requirement for all 20 ILS frequencies, this sounds like an excellent idea.*

## KUDOS FOR "AEROBITS"

I wanted to take a minute and thank the staff of *Aerospace Safety* for the help that magazine has been to me, and I'm sure to many others. I am a Physiological Training instructor and for the past four years have used your articles for emphasis in every lecture I've given.

In combining the safety magazines, I hope you will not do away with the AEROBITS feature. This area has truly been of interest to me since it gives "good poop" in personal equipment, egress and so many other fields.

**SSgt Noel F. Tillman**
**4780th USAF Hospital**
**Perrin AFB, Texas**

*See "OpsTopics," page 38.*

## POMOLA

The February issue of *Aerospace Safety* depicts the Navy's POMOLA. As suggested in the accompanying article, POMOLA may be an answer to some of our problems with landing short, particularly at forward operating locations such as encountered in SEA. It may also be an answer to the problem of cargo aircraft landing long and fast under these same conditions.

Are there any Air Force projects presently under way to look into the feasibility of using POMOLA for forward airfields where more sophisticated systems are either unjustified or impractical? Now that the C-130 is getting an angle of attack indicating system, some form of visual glide slope indicator is needed for a complete VFR precision landing system. I feel that the POMOLA concept could be incorporated in a lightweight, easy to install system that combat control teams could erect quickly along with the standard runway marking panels they now use. Would you please send any information you have available on POMOLA, including addresses to which I can write to get the views of organizations actually using the system.

**Capt Henry A. Stevens, III**
**Dyess AFB, Texas**

*We are sending you a copy of a blueprint supplied to us by the Navy along with a Poor Man's VASI that Colonel Erbe of this directorate installed in Vietnam. If we can be of further help, let us know.*



☆ U. S. GOVERNMENT PRINTING OFFICE 1970 391-399/10

# UNITED STATES AIR FORCE WELL DONE AWARD

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

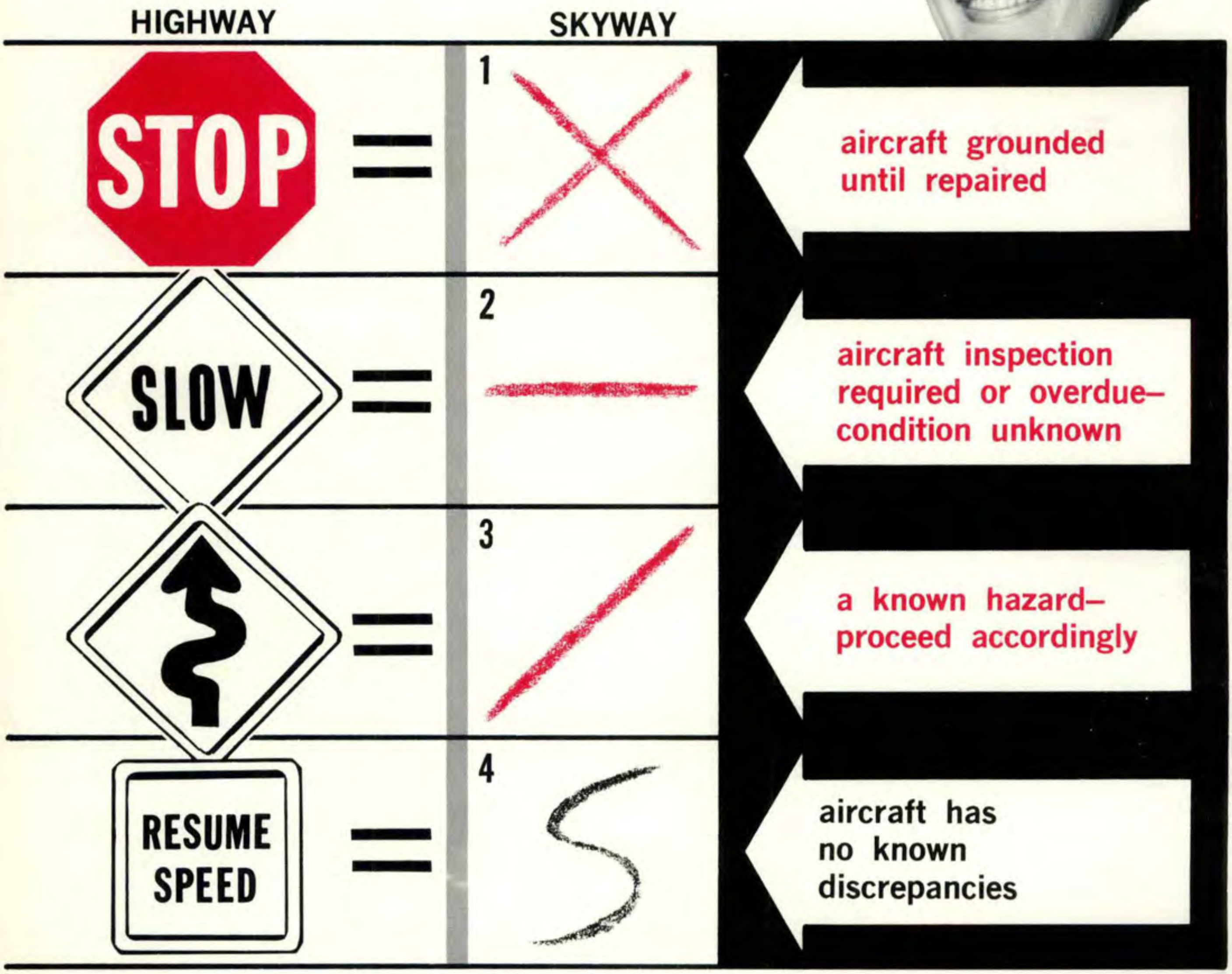
# First Lieutenant Alan O. Williams

22d Special Operations Squadron, APO San Francisco 96274

On 29 June 1969, Lt Williams was flying as wing man in a flight of two A-1s on a night combat mission in Southeast Asia. Over the target area at 8000 feet, the engine of Lt Williams' aircraft stopped running, then started again with heavy vibrations accompanied by widely varying RPM, manifold pressure, and torque meter indications. Lt Williams jettisoned his ordnance and headed for one of two emergency landing fields. He left the power where it was at the time of failure, 80 psi torque and 2200 rpm, and began a slow climb at 140 KIAS. A check with both emergency fields showed that the weather was below minimums, so Lt Williams headed for the nearest suitable airfield, 110 nautical miles away. He was able to climb to 15,500 feet with the power available. Twice, on the way to his alternate, the engine quit, but he was able to get it restarted both times. At 12,000 feet and 22 miles from the field, the sump warning light came on. The engine erupted in a flash fire, then quit completely. Since he was unable to get a restart, Lt Williams shut down the engine, placed the propeller in low pitch and set himself up for a deadstick landing at an unfamiliar field. He turned off all non-essential electrical equipment, including all radios except FM, to conserve battery power. Communications were spotty between him and Lead because of a rapidly failing battery. He positioned himself at high key, 5000 feet above the runway, lowered the gear and one-half flaps and made an uneventful forced landing, touching down in the first 2000 feet of a 10,000 foot runway.

Although a relatively new pilot graduate, with 440 hours total flying time, 110 hours in A-1 aircraft, Lt Williams proved himself entirely capable of handling a serious inflight emergency terminating in a successful night deadstick landing. WELL DONE!

# signs of our times




**CONSULT TO 00-20-1, SEC 3 FOR PROPER SYMBOL ENTRY ON AIRCRAFT FORMS**