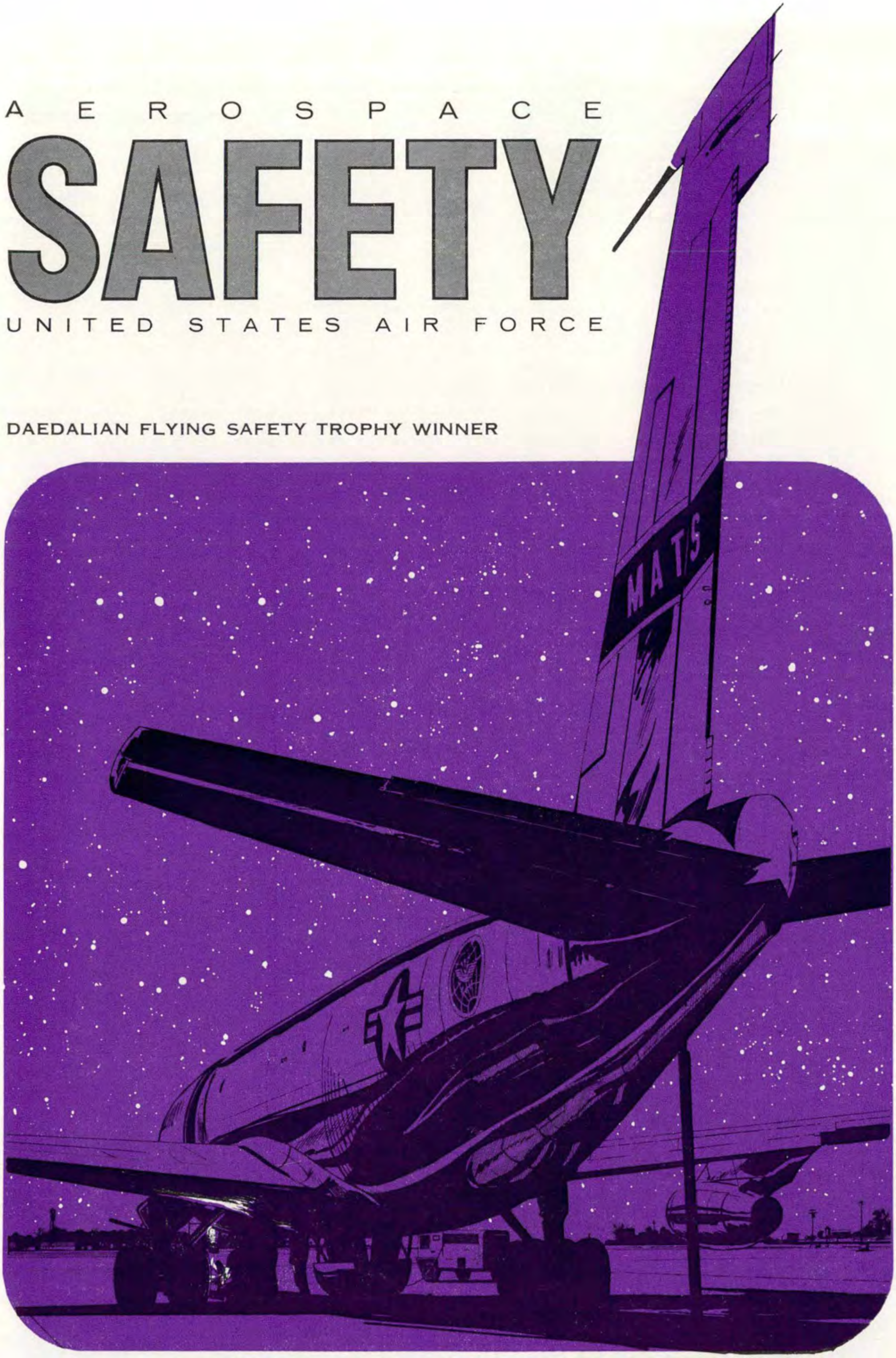
AEROSPACE

SAFETY

UNITED STATES AIR FORCE

DAEDALIAN FLYING SAFETY TROPHY WINNER



JUNE 1964

AEROSPACE SAFETY

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VOLUME TWENTY NUMBER SIX — USAF RECURRING PUBLICATION 62-1

FALLOUT

BUTTON GUARD

The photograph accompanying the article "There's Time to Think," (Feb) did as much for me as the article itself. It stimulated my memory of an incident which occurred to me, and I am curious to know:

a. Was the photo used with the article as a plant—to see how many would notice? If not:

b. I wonder just how many birds are actually flying with the propeller feathering button guard around the "Top" where it provides no protection.

With the guard around the top of the feathering button (as shown in the pic), it is very easy to inadvertently feather a propeller, for example, with your head while entering the pilot's or copilot's seat. When this happened to me, I thought it was just one of those "one in a million" cases. But after seeing your article and photograph, I'm convinced there could be more, and this situation could be more than just embarrassing.

Capt William T. Gosnell
Safety Officer, 2223d Instr Sq (CONAC)
Dobbins AFB, Ga.

It's always encouraging to hear from sharp-eyed readers, but NO, the picture was not used as a plant. The artist selected it as representative of an example in the article. Thanks for writing.

FAA ADVISORIES

Your comments in "FAA Advisories" (December), were very interesting and important. I feel that not enough emphasis is placed on FAA's role in military flying.

Since our Flight Information Publications and FAA rules and regulations are constantly being improved and changing, I feel that a page in each *Aerospace Safety* should be devoted to "FAA Advisories."

Capt Ross L. Meyer, USAF
Selma, Alabama

TOO COZY

We find your article, "Too Cozy," (November issue) very well done and would like your permission to reprint all, or part of the article, for distribution to scientists and other interested persons who might not receive your publication. Also, if possible, we would appreciate receiving several copies of the same issue or tear sheets for our immediate use.

Robert B. Sleight, Ph.D.
Pres., Applied Psychology Corporation
Arlington 7, Virginia

FACTORS IN ANG SAFETY

Although the annual Air National Guard Safety and Commanders Conference, scheduled for 21-23 May, has been cancelled, ANG achievements in safety since their first safety conference in 1957 deserve notice. Since then the ANG flight accident rate has declined to its present low mark comparable to that of the active Air Force. It is quite apparent that commanders and their key staff personnel have accepted, and applied, sound safety policies to all phases of operational and maintenance activity. And it is significant to note that the Guard's present flight safety rate was developed concurrently with increased operational activity, very closely aligned with their active force counterparts.

Additional mission requirements of recent years make the lowered ANG rate even more significant. Jet fighter deployments to overseas bases, mid-air refueling of both ANG and regular component aircraft by ANG tankers, global airlift missions in support of MATS and participation in large scale multi-service exercises such as Swift Strike are examples of operational requirements that have emphasized the necessity of preventing accidents.

The quality of maintenance of many Guard units has been a prime factor in ANG safety. Maintaining the aircraft are many highly experienced men who learned their trades in the Air Force and who have taken their skills into the Guard squadrons. Their know-how and incentive to excel have overcome many problems that go with aging aircraft.

The pilots on the team are real professionals as proven by their ability to maintain flying proficiency while holding down full-time civilian jobs.

Excellent maintenance, highly capable pilots, first-class support personnel and the high caliber supervision the ANG now has combine to produce a strong and reliable supporting arm to the Air Force.

There are still areas of concern, to be sure, but with continued acceptance and application of good safety strategy, I feel optimistic that these problems too will be summarily resolved.

The Air National Guard is an integral member of the Air Force team and has accepted its share of responsibilities with understandable pride and efficiency. It can be assured of continued support of the Directorate of Aerospace Safety within the capability and resources it possesses.

Jay T. Robbins

Director of Aerospace Safety

A Project Roughrider pilot discusses flight problems and gives some tips on the handling characteristics of straight wing, swept wing and delta configuration aircraft.

PILOT EXPERIENCES IN THUNDERSTORMS

Capt Kenneth H. Coffee, Fighter Operations Div., ASD

Why, as pilots, are we interested in severe storms? First and foremost it's a matter of survival. Another good reason is the damage caused to aircraft by hail and severe turbulence. Anyone who flys stands a chance of being caught in a situation which requires flying in the vicinity of thunderstorms. The psychological effect on the pilot who may never have encountered a severe thunderstorm may be serious. There are, however, factors that can enhance safe operations.

At the present time we are much better prepared to cope with severe storms than we were a few years back. My advice would be to avoid thunderstorms if possible; next best is to ask for radar vectors around or between storm cells.

In recent years NASA, the U.S. Weather Bureau, and the Air Force were involved in a program to investigate thunderstorms. The weather bureau was interested in learning more about the physical make-up of individual storms as well as a more accurate means of forecasting when and where storms are to appear. NASA wanted to acquire structural loads data to apply to aircraft which are being designed for the future. Civil jet application was also a prime area of interest. The Air Force was involved for three good reasons, the first being an engine problem with the F-102. We were also concerned with the handling characteristics of straight wing, swept wing and delta configured aircraft. We were interested in various engine-airframe marriages.

For instance, why does the J-57 engine act differently in the F-100 or F-101 from how it acts in the F-102 when exposed to ice crystals and heavy concentrations of water? What are some operating problems peculiar to supersonic flight? What damage does lightning, hail, and water erosion do to an aircraft during a subsonic or supersonic penetration of a thunderstorm?

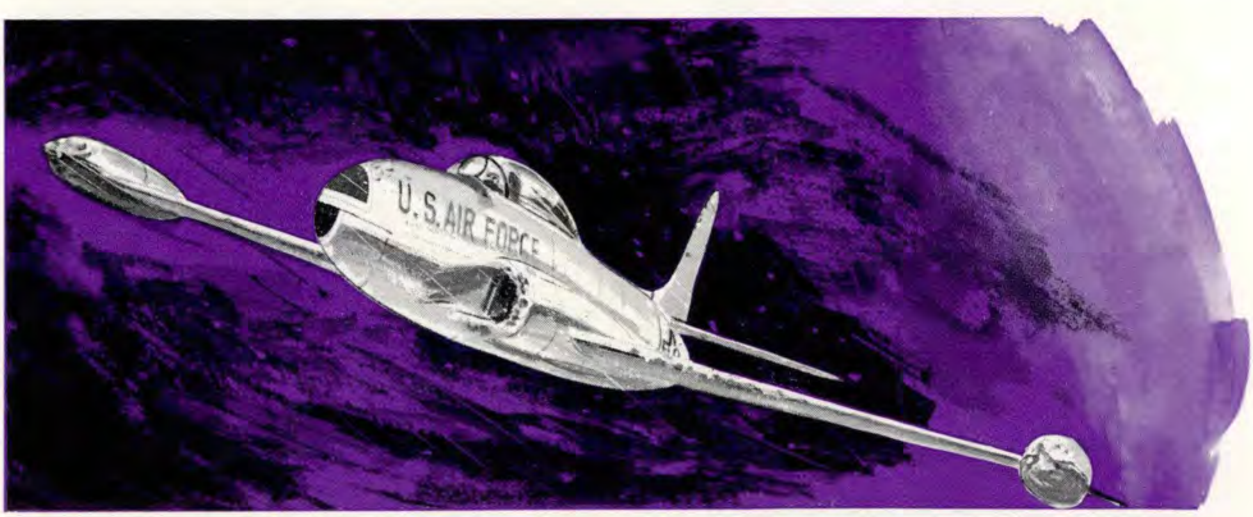
In this program, the Aeronautical Systems Division, AFSC, used various airplanes for thunderstorm penetrations. In 1960 we used an F-106, an F-102, and a T-33. Over 200 penetrations were made with these three aircraft. Since that was our first year of operation, much was to be learned about optimum speeds, flight control problems, FAA clearances and numerous other problems. My job while flying the F-102 was to establish throttle techniques to be used during penetration and to determine whether a continuous ignition system would prevent flameout during a long series of compressor stalls induced by ice crystals.

This would probably be a good place to mention a couple of unusual things which came as somewhat of a surprise: (1) liquid water at 40,000 feet where the outside air temperature ran well below freezing; and, (2) hailstones at 45,000 feet in completely clear air as far as five miles from the storm on the downwind side of the storm. A storm building several thousand feet in a matter of minutes is an amazing sight to behold! The reverse may occur and a storm may be gone in a matter of minutes. It is not unreasonable to observe storms building at a rate of 5000 fpm. For those who haven't seen this occur, it is really something to watch! Some of these storms top out at 70,000 feet or more. I have flown alongside a couple of storms at 50,000 feet with tops that were at least 10 to 15,000 feet above me.

Systematic procedures were established for the actual storm penetrations in order to minimize hazard and overcome some operating problems. The storms were traversed at all altitudes between 15,000 and 45,000 feet and a speed range from 175 knots IAS up to 600 knots IAS. Flight control problems were present in all aircraft but the seriousness varied with speed and also from one aircraft to the other. In the straight-winged T-33 with a .8 Mach limit, high speed or compressibility was a problem. With the airspeed near the mach limit of the aircraft, flight controls were stiff and when strong downward air currents were encountered it was hard to prevent the aircraft from exceeding its designed speed limit. This would no doubt be a problem in light aircraft as well. When the airspeed was slow (175 KIAS) in the T-33, control effectiveness was a problem. In other words, it was difficult to make the aircraft respond at the rate you would desire. Another problem at low speed was being able to maintain the airspeed with full power while attempting to hold a precise altitude during strong down currents. Each time a storm was penetrated an area of noticeable up currents would occur for a period of time as well as an area of down currents for a similar period of time. As it turned out a medium speed was best for the straight wing aircraft.

Flying the T-33 was something like riding a small boat in the ocean. There were times when it was impossible to hold both altitude and speed, so altitude was varied as necessary to maintain the desired indicated speed. The slower speed also helped reduce the turbulence problems by decreasing the effect of gusts and making for a smoother ride. Pitch control was as much a problem as roll.

In the delta wing aircraft, flight control problems were noticeably different from the straight wing. The big difference was pitch control. It was very easy to maintain any desired pitch attitude, regardless of speed. However, upsets in roll become quite interesting at times. On numerous occasions, with full aileron de-



flections against the roll, a bank of 45 degrees to 60 degrees would be attained. Again penetration speed was an important factor for consideration. It was always comforting to have plenty of speed with the F-102 in order to overcome the engine compressor stall problem. Two hundred and forty-one stalls were recorded during a single penetration which lasted approximately four minutes. As a result of this test we recommended that F-102 pilots avoid thunderstorms if possible. But if it's not possible, use continuous ignition to prevent flameout.

During 1960 the F-106 made supersonic passes with speeds up to 1.8 Mach number or about 1350 miles per hour. These penetrations were made a few thousand feet below the tops of the storm, mainly to see what would happen if someone inadvertently ran into a thunderstorm while making a high speed SAGE type intercept. The airplane responded so favorably, particularly the engine, that we decided to use the F-106 exclusively during 1961 to continue the gust loads research. We were thinking in terms of data for a supersonic transport or commercial carrier. It appeared from what NASA learned during 1960 that a speed would be reached above Mach 1 where the gust loads would level off and remain constant as well as making for a reasonably smooth flight through the storm. An analogy would be driving a car over a bumpy road where high speed gives a much smoother ride than some slower speed.

In 1961 the F-106 penetrations were made between 15,000 and 45,000 feet altitude and speeds up to 1.63 Mach number. Because of hail encounters at 1.6 Mach with extensive damage to the F-106, the decision was made to use the T-33 as a hail probe. This approach worked fairly well but it was still not the complete answer, because on two or three occasions the T-33 pilot reported no hail and a couple of minutes later the F-106 would come through the storm and get hit by hail.

Except for a couple of weak areas, the aircraft withstood the hail quite well. Actually the damage caused by water erosion was more serious than that caused by hail. Our engineers figured the impact pressure created by the water at 1.6 Mach was 18,000 pounds per square inch. This pressure would peel flush rivet heads out of the wing, particularly along the leading edge. The plexiglas canopy was worn down about one-fourth inch on the leading edge. Fiberglass antennas were worn away and had to be replaced. Most of the paint was missing after the first few penetrations. If continued flights were to be made at these high speeds, rivets and plexiglas would be of little value for external airframe construction.

Lightning was another interesting phenomenon which was encountered on numerous occasions. I feel sure there are certain storms where enough lightning is present to hit any type aircraft, regardless of size. Of all the aircraft used for penetrations the B-66 was hit most frequently. In fact, it was an excellent lightning rod. Damage to the aircraft was not extensive but I am not sure this could be said about the pilot's nerves. The aircraft became so charged with electricity that when it was discharged numerous small holes were burned in the trailing edge of the ailerons, wingtips, rudder and elevators. These same results held true with the T-33. I recall one particular storm which contained much more lightning than any other storm that I have ever seen. There were times when 15 or 20 bolts would be visible at the same time. Normally a pilot will see a flash or a lightning bolt or perhaps two or three bolts at the same time.

In addition to the lightning I was concerned about the individual who was riding in the rear seat. He was normally the "motor mouth" type but for about five minutes there was not a sound from the rear seat.

I would guess the airplane was struck by lightning 20 or 30 times during the pass with very little damage. The one thing that I clearly remember is that the hair on my head and arms literally stood on end. One time while looking toward the wingtip the aircraft discharged electricity and it appeared that a ten foot bolt of lightning left the front and rear of the wing fuel tank. A couple of lightning strikes were felt in the form of a bump. It was amazing how fierce the lightning looked yet it did so very little damage.

Naturally we experimented a great deal with various types of static dischargers, none of which worked very well. In 1962 the F-100 was equipped with 18 dischargers, three on each end of the horizontal tail, two at the top trailing edge of the vertical stabilizer and five on each wingtip. These dischargers were the only ones we used where communication was not lost some time during the storm. One discharger received a direct hit and actually fused together without doing damage to the aircraft.

During 1962 ASD chose an F-100 and a T-33 to participate in the program of collecting meteorological data for the weather bureau and the FAA. The F-100 was equipped with one high speed camera which operated at 1500 frames per second, for the purpose of taking pictures of hail. Clear pictures were never attained mainly because of poor lighting conditions. Another camera was carried for the purpose of taking pictures of water droplet size. Pictures of the water droplets turned out much better than the pictures of the hailstones. Liquid water content of the clouds was measured, and the electric field was measured in all directions from the aircraft. All these measurements were made in an effort to correlate the data with radar scope pictures for the purpose of more accurately defining the physical makeup of individual storms.

It has been my experience that what you see with the naked eye is certainly deceiving. One storm will be extremely black with only moderate turbulence and no hail. The next one may not look bad at all but as soon as you enter the storm you wonder what you are doing there. When we can look at a ground radar picture and receive an accurate evaluation of a storm a big step forward will have been made in air safety.

Much has been learned about the composition of thunderstorms and the operating problems associated with flying in this type of severe weather. But a vast number of problems remain unsolved and the weather bureau plans to continue their storm research for several years. Meanwhile my experiences have taught me to treat thunderstorms with great respect and to avoid them completely if possible. I think this would be sound advice for anyone flying because as a prophet once said, "Example is a dangerous lure; where the wasp got through the gnat is stuck." ☆

F-89 units set a new high!

SAFETY AND THE GUARD

Col Paul Fojtik, ANG Liaison Officer
Directorate of Aerospace Safety

The Air National Guard for many years has been a prominent part of the Air Force team, participating actively and capably in all facets of Air Force activity. They are included in world-wide USAF airlift missions; they are a part of probably every tactical exercise involving Air Force responsibilities; they are an integral partner in the Air Defense System; and they compete with active and reserve Air Force units for various Air Force awards.

The Guard's accomplishments certainly warrant recognition. To cite an example, the Air National Guard F-89 units last year completed the best flight safety record ever achieved by tactical aircraft utilized daily, throughout the year, in operational units. The rate for 1963 was 2.2 and, for over 11 months of the year, was 0.0! Only one F-89 accident occurred during the year.

In the aerospace safety business, it is fitting that this outstanding accomplishment be recognized. Also, in making a proclamation of this type, some speculation and comment on how this record has developed is in order.

It is true that the F-89 is an old bird—but so are many other aircraft still flying—in fact, this could very well indicate that in spite of the problems which normally develop in the "senior citizens" of the aerospace world, the units possessing the F-89 have accomplished an outstanding safety record.

It is also true that the F-89 has two engines; an engine failure is usually just an incident as compared to an accident in a single engine aircraft. But then there have been, and still are, multi-engine airplanes flying that have a far worse safety record.

The ANG Air Technician maintenance capability is well known and very probably contributes substantially to this outstanding safety record. There certainly could be further speculation as to why the F-89 units *should* have a better flight safety record than other jet fighter airplanes. Many of these same comments could apply very well to any operational aircraft, but it just hasn't developed that way.

All of the ANG F-89 units operate in northern geographical areas, which are considered throughout the Air Force as those for which special considerations are allowed. In addition, these same units are participating in the same alert activities as active units of the Air Defense Command — they don't choose the weather conditions they fly in nor do they choose the time or the mission. Their operation is a direct parallel to active ADC units.

This is why it is in order to single out the ANG F-89 units for special commendation. They not only operate their aircraft in a manner comparable to active Air Force units, but they do it safely under climatic conditions considered by flyers as the worst in the continental United States during much of the year. These pilots do this in addition to working a normal civilian work week which is required to provide the necessities of life for their families.

There is little argument with the fact that Guard commanders, aircrews and support personnel are aware of what their jobs require and that each of their responsibilities is efficiently and energetically accomplished. These are the primary ingredients for an efficient, and safe, operation. ☆

CARQUALS

On a carrier qualification landing, a Navy pilot's F-4 is about to hook a wire.

Strange that, in this land of television watchers, few are aware of a TV spectacular series filmed a few miles off the California Coast, especially since this show is tops for suspense and raw excitement. It plays only to a select audience, well versed in the part played by each actor and the meaning of each bit of action. No matter how seasoned the viewer, it will frequently bring him to the edge of his seat. There are no commercials to break the tension, and for those who can stand the excitement, it is possible to see the program as it is being filmed. This takes more fortitude; ears must stand up under an almost constant shriek of sound; eyes have to watch men flirting with near death, or so it appears to the uninitiated; most of the vantage points provide little protection from a steady 35 mph gale.

The name of the program—CARQUAL; the producer — U. S. NAVY; cast—3500 seamen, naval aviators and a few marines; setting—USS Coral Sea, a 985 foot aircraft carrier.

We were privileged to witness and participate in the filming earlier this year through the courtesy of the producer. As the Air Force is slated to receive several hundred of one of the most important props—McDonnell F4s—we accepted, hopeful we might pick up some safety tips worthy of passing on in this magazine.

For the benefit of landlubbers, it should be explained that the television system is a closed circuit system with cameras buried in the carrier deck and screens placed in the pilots' ready rooms and other points throughout the ship. The system is referred to as "PLAT" (Pilot Landing Aid Television). It allows the viewers to make a close appraisal of the carrier landing approach from a vantage point near the expected touchdown. Furthermore, after the landing the pilot can take a comfortable seat in the ready room and view his complete approach sequence on TV tape.

SAFETY! How is it achieved with such inherent hazards as: cramped areas, the ever present edge of the deck, jet wash, wind across the deck, maneuvering aircraft, moving tugs, wires strung across the deck and, at times, rolling, pitching, rain and darkness? Obviously this is a tremendous challenge, and the Navy, through such things as training, discipline, experience, close supervision, frequent drills and critiques, meets the challenge and accomplishes their mission. To better understand this safety challenge, let's look at some typical hazards, then some solutions.

Looking down from PRIFLY (a glassed in tower-like vantage point from which all primary flight operations are conducted) we watched a plane handler pedaling backward in double time, holding the end of a steel bar with which he was steering the nose gear of a taxiing jet.

Holding our hats in the constant gale we watched another handler jump sideways, stiff legged, until he gained purchase on the deck when the jet wash of a maneuvering A-4D tried to blow him overboard.

More suspense, served in agonizing slow motion, comes with the maneuvering of a plane onto the elevator for delivery to the hangar deck. The pilot, his cockpit hanging out 70 feet above the rushing water, works brakes, throttle and steering in response to the hand movements of a signalman. Watch closely and you'll see the signalman's lips move as he coaxes the plane to follow his instructions, ever so carefully. Were he in full dress, and much older, he could use similar delicate hand movements in leading a symphony orchestra. It may just seem that way, but the pilots make straight ahead movements jerkily, in inches or less, and quickly respond to signals that move the protruding cockpit nearer the center line of the ship.

Tucked against the side of the narrow control island, one plane, fuel state too low for another circuit, is serviced with JP-5. From behind, yellow fires can be seen flickering up in the twin tailpipes. This they call hot fueling. Routine.

Nobody walks on the flight deck. Sweatered handlers, all wearing sound deadening ear muffs, dash out whenever and wherever needed. Sometimes one, sometimes two or three — they are always ready, when and where needed. It is soon obvious that they know where they are going, what they are doing and how to do it. Thirty, maybe forty, were the most ever seen on a single job. During a brief respite from flight operations they put on a race against time to drag out, attach and erect the huge barrier that sometimes must be used to catch a damaged plane. This job—one requiring a lot of muscle—took two minutes and forty seconds. Fast as they were, you get the impression they might even shave seconds if there were a cripple inbound, low fuel state.

They have to run. Jets gobble fuel rapidly at low altitude, especially in high drag configurations, and there are lots of Navy pilots who need landings to remain current. Pick one up as he rolls into the groove. He's at 500 feet in the pattern and as he starts down he calls "ball" when he picks up the meatball of the mirror landing system. Now he concentrates on line up (not too simple really as the deck is canted and the runway keeps sliding off to the right as the carrier steams straight ahead). The trick is to slide over just a hair to the right to offset. In the groove the pilot concentrates on three things—line up, the meatball and his angle of attack indicator. Fortunately all three are arranged in a straight vision field. At 130 knots indicated and with a maximum of 120 feet of touchdown distance in which to catch a wire there are no split seconds for head or eye movements to sort out indicators. If no waveoff, and these are given both via radio from the LSO and with flashing red lights surrounding the meatball, the three and one-half degree approach ends in a strut mashing impact with the deck. Immediately the pilot slams the throttle to military power. If the hook doesn't catch he has flying speed at or before the end of the "runway." If the hook catches he will be hauled to a shuddering stop in 300 feet. There isn't even time for thankful prayer. He raises his hook, gets the all clear signal from one handler, is passed to the next for a right-turn come-on signal, then, on from one man to the next until he has stopped behind the blast fence waiting for the plane ahead to be catapulted off. He's got to get off the landing area, there may be another plane as close as 20 seconds behind.

And they do this at night too, working in the eerie glow of soft red floodlights. They spread the landing interval to about one minute, but not a single person makes light of the hazard of night ops. This is like the bull riding event in rodeo. It takes a lot of people with a lot of know how and no let-up in concentration to do this without accident.

When you've seen this, take one of the hundred or so near vertical stairs they call ladders and heel-walk your way down to the hangar deck. Here you discover what is meant by the crunch problem. Airplanes, wings folded and tails scant inches from the ceiling, are jammed together tight enough to make a veteran parking lot operator shudder.

An F-4 positions for a cat launch.


Plane aligned, bridle is attached.

On the go-around, after wave-off.


Climbout after a missed approach.

CARQUALS

continued

Throughout this maze are tie down chains. Only the careful can avoid tripping over one of these and at the same time avoid a skull cracking against a stabilator, a flap, or a wing.

Now, for a deeper look at safety in such an environment?

First of all, the operation is recognized as a hazardous one. No one can forget, even for a moment, that danger lurks all around. Prevention of accidents must be a concern of each and every man. Absolute discipline is basic to the accident prevention philosophy. No one on the flight deck during air operations unless his job requires that he be there. The Air Boss (Air Operations Officer perched in the PRIFLY Tower) has absolute charge of all activities on the flight deck and in the pattern—everything he can see. The LSO's word is law. When he says "wave off" it means military power and go, now! The instructions of the signalman directing taxiing of a plane must be followed explicitly. A pilot on the cat, at 100 per cent, never cuts power until he has ascertained that the cat will not be fired. The captain concerns himself with running the ship and continuously must make certain that this is done in a safe manner. He has no restricted seaspace, and must avoid collisions with any huge passenger liner or little fishing boat that might be heading his way.

There's a saying that the sea is unforgiving—this includes the "little" mistakes. The story is told of a tug driver who inadvertently selected reverse instead of low and was crushed under an F-4. Deck men are taught to lie flat and grab anything should they find themselves being blown toward the side. Safety netting has been strung around and just below the edges of the deck as a last resort measure. The LSO has a canvas padded hole he can dive into at the last moment. Squat, heavy tugs are parked along the starboard foul line; they make for tighter taxiing, but offer some protection for the men who must work around the cats and the forward elevator. Wires can snap, wheels can come off, control can be lost. And for contingencies when prevention fails there are other procedures. Man Overboard drills are conducted regularly. During day ops a chopper hovers nearby and a destroyer holds position 2000 yards astern. During night ops there are two destroyers, and all aircraft use Carrier Controlled Approach (CCA), the ships' GCA.

Complacency occasionally creeps in, but not often. All hands know that, even at best, there are things that can go wrong with no warning. A wire can break and whip back, under tremendous tension. A nugget (novice) can get vertigo on a night launch and fly into the ocean. Barked shins and bandaged foreheads identify those who forget when hurrying through passageway hatches. There's always danger of being sucked into an intake, although this has not proven as dangerous as working around spinning props.

As to the F-4, the pilots who fly it are sold. Naturally it has the stressed gear necessary for the high sink rate (1200-1400 fpm) landings, a comforting safety margin for normal runway use. Tires are inflated to 450 psi for shipboard operations and stand the strain of design max gross landing weights of 35,000 pounds. Single engine performance is excellent and poses no problem, according to the pilots, although in training operations such as CARQUALS, loss of an engine, or any other emergency, is cause for bingoing the bird to an alternate on the beach. The aircraft has excellent low speed handling characteristics and engine response. On bolters military power is ample to put the bird back in the air before it reaches the end of the deck. Circuits are flown with gear down and full flaps as power reserve and response are adequate to fly out of any trouble. Visibility is excellent and instruments well located for pilot readability.

For those of us used to operating off Air Force installations with a thousand foot touchdown margin vs. 120; with acres of parking space and all kinds of taxi clearance, not inches . . . there comes a new understanding of how inexcusable it is to land short, or have a taxi accident.

But neither words, nor pictures, nor watching this special closed circuit TV program, nor even watching it live, provides a complete feel of this operation. To really appreciate it, ride through an eyeball bulging, harness straining deceleration from over 100 knots to full stop in 300 feet. This will sell you on safety belts and shoulder harnesses. And if this isn't the clincher, get pasted against the back of your seat as your jet is hurtled from dead still to flying speed in 180 feet. You can't seem to prepare for it, or get used to it, but as the flying safety officer explains, "It's comforting, when you get a wallop like that you know you are going to be flying when you go off the end."

All in all it's an exciting operation. There can be no denying the presence of hazards. It's true that a moment's carelessness can spell ACCIDENT. However, exacting as CARQUALS are, the Navy is proving they can be accomplished safely, by men who know their jobs.

Major T. J. Slaybaugh

REX RILEY'S CROSS COUNTRY NOTES

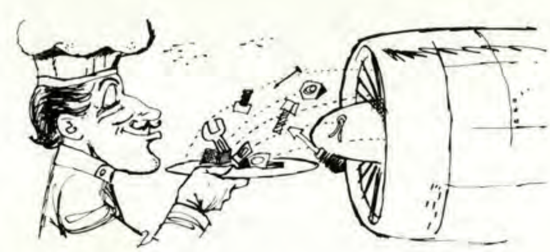
COULD ANYTHING ELSE BE WRONG? Want to hear one where everything went wrong? Tune in on this: After a double flameout the pilot was unable to get an airstart because he forgot to turn the battery switch ON. He had failed to check the battery switch ON during prestart which resulted in complete electrical failure with both engines flamed out. He failed to check the boost pumps ON prior to takeoff. The engines flamed out at 19,000 feet with boost pumps off but the Dash One says this should not happen below 30,000. The pilot failed to properly use his checklist. Supervisors failed to adequately stress use of the checklist. Proper sequence of connecting external power was not followed. Pilot was rushed due to change in aircraft and replacing of a main gear tire. Pilot put his flashlight in the map case where it was not immediately accessible in flight or after bailout. The condensed checklist does not contain immediate action procedure for double flameouts. The crashed aircraft was subjected to fire and explosion due to inadvertent activation of the rear seat rocket catapult by unknown civilian onlookers prior to arrival of military authorities. Pilot's mask was torn off during ejection. The night mission was flown with an inoperative left wing position light. The pilot received a leg injury upon landing due to his inability to judge height above the ground.

THUNDERCHIEF MEETS MURPHY—Recently, a TWX came across Rex's desk stating that all drag chutes on a flight of six '105s failed to deploy. The results were somewhat chaotic. Three of the birds landed at one base where the following happened: One took the barrier on the right hand runway; one blew both tires on the left runway, the third managed to land and stop on R, which had been cleared of the first aircraft.

The other three diverted to another base where all were on the runway at the same time. One took the barrier, the man behind him managed to land and stop in time. The last one in steered around the other two aircraft and went off the end of the runway. He hit some light stanchions and a bulldozer. The bird was well bent but the pilot got out okay.

The drag chute hasn't been a big problem with the F-105, but when Murphy really puts his mind to it, anything can happen. This accident occurred after the six drag chutes were incorrectly installed by personnel at a transient base. Visiting pilots should check installation of drag chutes at transient bases to insure they're properly in place. Rex suggests all maintenance types who ever have to install an F-105 drag chute take a good look at "Thunderchief and the Drag Chute" in the June issue of Aerospace Maintenance magazine. The story has the ungarbled word on the '105 drag chute, its installation and care.

Pilots too would benefit from the article so Rex recommends you jocks dig up a copy of the mag and read the article.

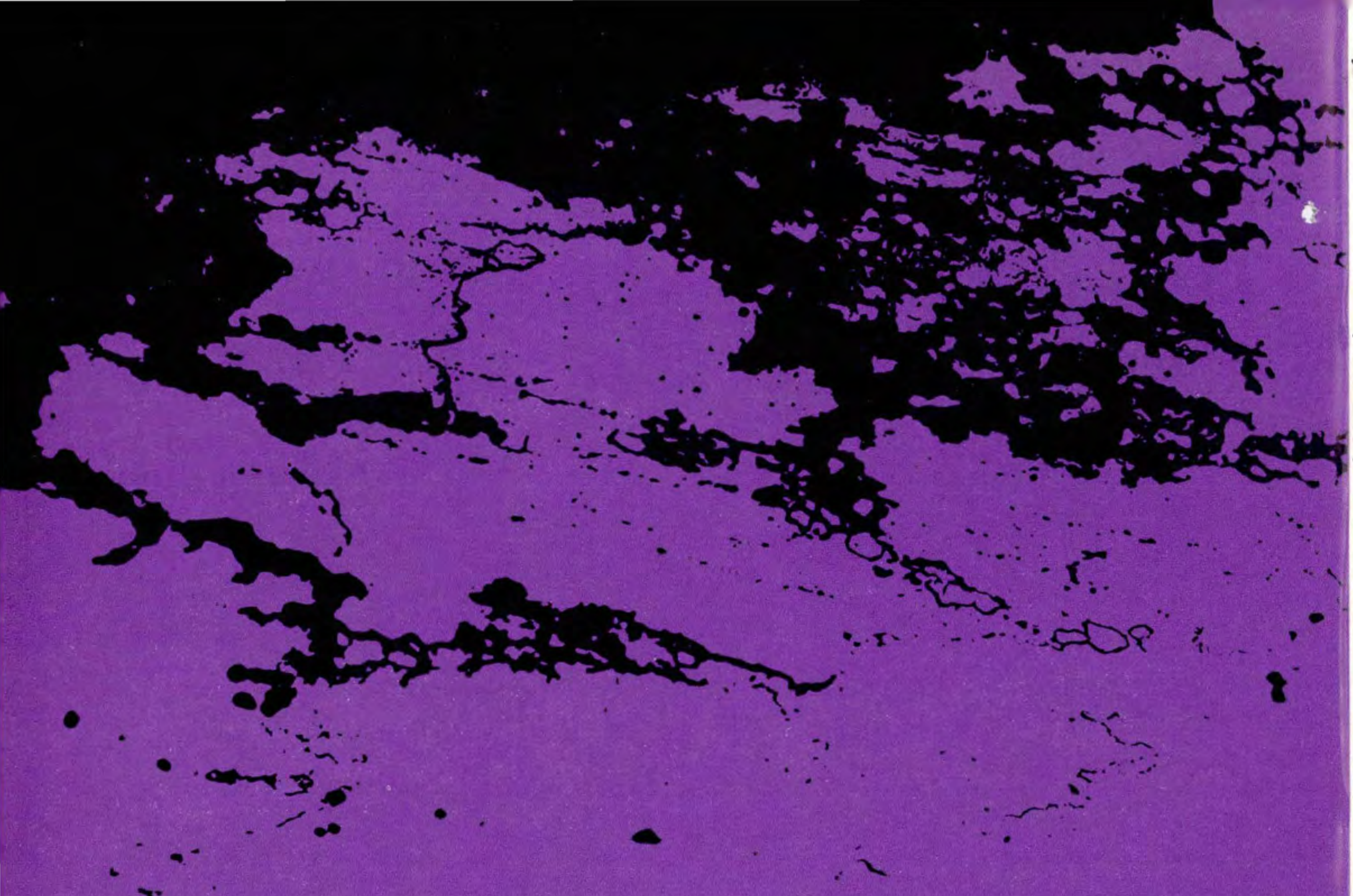


COSTLY DIET FOR ENGINES—Seems Rex has been reading a lot lately about people and equipment being ingested into jet engines. A while back an airman got too close to an intake and the engine grabbed and gobbled up his headphones. This, of course, meant an engine change.

Then at about the same time, a crew chief placed a ladder up to the cockpit of an F-102 that the pilot was shutting down. The crew chief had a canopy jack in his hand with a streamer attached. Well, he missed the streamer and found it and the wire that connected it to the jack in the engine compressor section. Another engine off to the depot for repair!

These are costly mishaps that can and should be avoided, but even more serious are those in which people are the FOD. For example, a crew was performing an engine trim on a deuce when one of the men was pulled into the engine which was going at full mil. The man received multiple injuries but at last report was expected to live.

Rex knows these accidents don't have to happen. He also knows a long lecture probably isn't going to do any good. All he can say is that a little heads-up attention on the part of both workers and supervisors will prevent these mishaps and save some lives and dollars.



CORROSION

WHAT IT IS AND WHAT CAN BE DONE ABOUT IT

Lt Col Reuben B. Moody and Maj George P. Haviland
Directorate of Aerospace Safety

The subject of corrosion has been given some extensive treatment within the Air Force lately. There have been conferences, symposia, technical meetings, surveys and studies, all devoted toward a better understanding of the problem.

Is it really worth all this attention? You will have to judge for yourself.

The Missile Safety Division recently completed a study of in-silo missile system corrosion (Study Nr 41-63, January 1964). During the conduct of the study, many missile sites were visited and the problems were discussed with the people concerned. In addition, some good examples of real live corrosion were observed. Out of this effort emerged two very clear conclusions.

First, corrosion by its very nature is insidious. It quietly eats away at the functional efficiency of our systems. The hazards it creates are sometimes hidden until it is too late.

Secondly, the problem of corrosion is all encompassing. It's big. In fact, if a comprehensive corrosion report were prepared, it would probably look like all the Los Angeles phone books stacked one on the other. So, all this emphasis on corrosion is well directed.

Look at the problem this way: Corrosion can attack every nut, bolt, flange, tube, etc., all the way up to the fantastically large number of individual pieces of hardware which make up the system. Next, there are about ten types or forms of corrosion depending on how they are defined. Now multiply the number of things which can corrode by the number of ways corrosion can work and you have an idea of the size of the problem.

Of course, this approach is an over-simplification. Not all items are prone to all forms of corrosion, nor does this method allow for the time factors involved.

For example, many items in our system can accept a substantial amount of corrosion without any degradation in performance. Items such as large supporting structures, stairways, work platforms, fall in this group. After a while they may not look very good, but there is no need to rush into a frantic corrosion control program.

On the other hand, items such as oxidizer or fuel valves, umbilical disconnects, etc., are items which require immediate attention when corrosion starts.

The point here is that despite the magnitude of the over-all problem, a logical approach based on priorities can help avoid serious corrosion troubles. During the study it was found that the idea of priority lists for the corrosion control effort was not always understood.

The people who battle corrosion on the hand-to-hand basis did understand the need for priority listings but those who were somewhat removed from the chipping and painting didn't get the point. In some cases what was really beautification was being called corrosion control.

Several times the following question came up during the discussions:

If a complex is maintained "battleship clean," nicely painted from top to bottom, structural beams, stairways and work platforms included, is this corrosion control or beautification?

The answer is both. Unfortunately this is expensive in terms of manpower and time. It is much more expensive than a direct approach to controlling corrosion on a selective basis.

During the study, it was found that some organizations concentrated corrosion prevention where it belonged and ignored the work stands and structural beams. This does not mean that such items should be permitted to rust away. But when something is painted for looks, it doesn't necessarily follow that anti-corrosion techniques and materials are used.

The study also showed that corrosion in missile systems has been the cause of numerous component failures and has created several hazardous situations. A listing of these causes by system is contained in the study.

All this indicates the need for an "across-the-board" approach to corrosion. This means that the prevention of corrosion should be emphasized during all phases of system design, development, test, check-out and operation.

For example, the designer should call for compatible materials and anti-corrosion coatings. It must be admitted however, that if the designer has the option of using a new high strength light weight alloy with unknown corrosion characteristics, or an average strength steel with good corrosion resistance, he will probably use the new alloy.

The development agency should check all areas of the over-all system which could be corrosion-prone. Interfaces between equipments made by different contractors should be analyzed for corrosion susceptibility. All of these efforts are important but it is during the installation and check-out phase that the corrosion prevention techniques came to fruition. Despite good design, items can have the protective coating damaged during installation which permits corrosion to start immediately.

The study noted one case where a major item of equipment was delivered to the site, left exposed to the elements and then along with a nice coat of rust, installed in the hole. A coat of paint was hurriedly applied and the corrosion problem became the property of the user. Obviously, the rust should have been removed prior to painting.

The idea of corrosion prevention measures covering all phases of system design, test, etc., is not new. We have adequate coverage in specifications, work statements and other documents. But the press of time, acceptance tests and turn over dates bring sites into the inventory which are already behind schedule in corrosion control. The solution to this problem is difficult since it involves many factors and compromises. However, it is likely that closer control over the techniques used during installation would help to some extent.

Before covering the various forms of corrosion, one additional point disclosed by the study deserves some attention. The subject concerns corrosion control equipment. Power tools are necessary to speed up the removal of corrosion and its by-products. Hand tools simply will not do the job on a continuing basis. Special equipments which can provide access to the out-of-the-way sections inside the complex are needed.

Thus far, some of the findings resulting from the study have been discussed. It has been necessary to use the word "corrosion" rather frequently but as yet no attempt has been made to describe its many

Fig. I. Uniform Corrosion

Fig. II. Dissimilar Metal Corrosion

Fig. III. Intergranular Corrosion

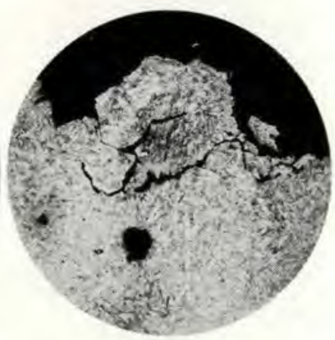
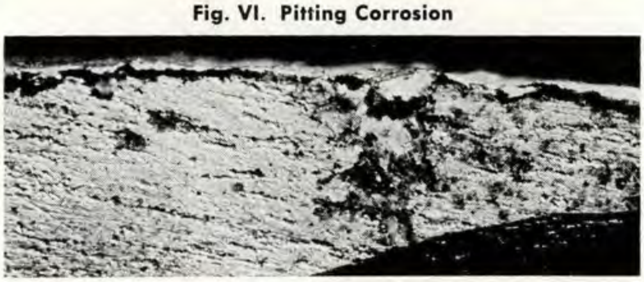


Fig. IV. Fig. V.
Examples of Stress Corrosion

Fig. VI. Pitting Corrosion



forms. Following is a brief description of the various types of corrosion, using photographs where possible and summarizing the information into a table for quick reference.

Uniform Corrosion: This is the most common form of corrosion. It is a general attack on the metallic surface. Designers can provide more metal to give the desired life but in missile systems this is not always possible. For example, the photograph (Nr 1) shows general corrosion of the recirculating tubes caused by condensation—evaporation cycling.

Galvanic Corrosion: This is a complete class of corrosion types involving electrochemical action between two metals or between different areas of the same metal having different heat treatments or other metallurgical differences.

Dissimilar Metal Corrosion: This type of corrosion is a subgroup under the general class of galvanic corrosion. Here the electro-chemical reaction is caused by two different metals in contact with an electrolyte. The electrolyte in most cases is water. Ordinary tap water contains a sufficient quantity of dissolved chemicals to make it moderately conductive. Dissimilar metal corrosion is almost always localized to one or the other of the metals involved. Photograph Nr 2 clearly shows the corrosion on the aluminum nuts used to secure the stainless steel flange. To explain why only the aluminum corrodes, it is necessary to show the following table:

Corroded End of List (Least Noble — 1)

1. Magnesium	6. Iron	11. Copper
2. Aluminum	7. Cadmium	12. Silver
3. Manganese	8. Nickel	13. Platinum
4. Zinc	9. Tin	14. Gold
5. Chromium	10. Lead	

Protected End of List (Most Noble — 14)

If two metals are placed in contact in the presence of an electrolyte, the metal nearer the top of this list will corrode. The farther apart the two metals are, the more aggressive will be the corrosion.

Intergranular Corrosion: This type of corrosion is also a form of galvanic action where the metallic grain boundaries and the grain particle creates a cell in an ambient corrosive solution or atmosphere. Intergranular corrosion is a particularly bad form of corrosion because it attacks the basic grain boundary structure of the metal. Photograph Nr 3 is a striking example of intergranular corrosion of an aluminum alloy.

Some of the stainless steels are prone to this form of corrosion if they are heated. This could occur during welding. The heating causes chromium carbides to collect at the grain boundaries and the corrosion begins.

Stress Corrosion: This type of corrosion is caused by the interaction of a corrosive attack and sustained tension stress. Cracking of the surface is usually present. Stress corrosion is intergranular corrosion but with tension loads either from "locked in" stresses or externally applied forces. Photograph Nr 4 shows an end view of a bolt which failed as a result of stress corrosion. The corroded area is shown as the darker section. The remaining metal then failed from overstress. Photograph Nr 5 shows a micrograph of the same bolt looking across the fracture surface. The intergranular cracking is clearly shown.

Pitting Corrosion: This is a localized form of corrosion in which a break in the passive film occurs. Once broken, a cell is formed between the exposed metal and the passive metal. Such breakdowns in the protective coating can occur at a rough spot, machining mark, scratch or other surface flaw. Pitting corrosion can also occur under a small deposit (weld spatter or dirt particle) which prevents the access of oxygen to the metal. Pitting corrosion proceeds at a rapid rate if the products of corrosion are conductive. Photograph

Nr 6 is an example of such corrosion showing the depth and local characteristics of the pit.

Erosion Corrosion: In this case, the corrosion products are removed by the action of fluid flow or pressures, thus exposing fresh metal to the corrosion attack. The progress of this type of corrosion is very rapid.

Concentration Cell: A form of galvanic corrosion wherein dissimilar electrolytes are in contact with a metal. Not as prevalent as the preceding types of corrosion, it nonetheless is important. For example, corrosion of underground piping in contract with soil of different compositions is a form of concentration cell corrosion.

The following table summarizes the various forms of corrosion discussed and offers some general guidance on reducing the extent of the corrosion.

In practice, T.O. 1-1-2 provides an excellent reference regarding the details of corrosion control and treatment.

Type	*Description*	*Precaution*
Uniform	1. A general attack on unprotected surface. 2. Combined effects of moisture, temperature, condensation and evaporation. 3. Also caused by direct chemical attack.	1. Overdesign structure to accept corrosion. 2. Remove with chemicals or abrasive techniques and apply protective coating. 3. Isolate metal from corrosive environment.
Galvanic	1. Electrochemical corrosion cells are formed. 2. An electrolyte in contact with two different metals or one metal having different characteristics.	1. Avoid dissimilar metals. 2. Use coatings and/or cathodic protection. 3. Place a dielectric barrier between the dissimilar metals. 4. Interrupt the electron flow through the electrolyte.
Inter-granular	1. Galvanic cell between grain boundaries (positive) and grain center (negative). 2. Destroys structural bonding of the metal grain.	1. Different heat treatment, annealing or new metallurgical design. 2. Use stabilized stainless steels or low carbon steels.
Stress	1. Combined effects of tensile stress and corrosive environment. 2. Tensile stresses expose metal to the corrodent.	1. Reduce stress level. 2. Use shot-peening or annealing to reduce the residual stresses. (Shot-peening forms a layer of compressive stress on the surface.) 3. Alter the corrosive environment.
Pitting	1. Incomplete protective film or coating. 2. Particles deposited on metal surface break down the film by creating an oxygen deficient area.	1. Any metallic coating which is anodic to the base metal, i.e., zinc coating on steel. 2. Organic coatings such as paint, asphalt, vinyls, epoxys or rubber.
Erosion-Corrosion	1. Corrosion products are removed by erosion, thereby exposing fresh metal to the corrodent.	1. Sacrificial, nonmetallic coatings. 2. Better design, more metal where it is needed. Use metals which have high resistance to corrosion.
Concentration. Cell	1. Dissimilar electrolytes in contact with the metal. This includes differences in acidic content or oxygen concentration.	1. Coatings, cathodic protection and corrosion inhibitors. 2. Removal of electrolytes.

In conclusion, here are nine methods, depending on the problem, which can be used to control corrosion. The first eight do not all apply to any one case. The last one applies everywhere, all the time.

1. Use materials which are compatible with the liquids and gases with which they will come in contact.

2. Use inhibitors which will form a protective film as the corrosive material comes in contact with the metal.

3. Use coatings such as paint, which do not permit corrosion cells to form since they prevent the completion of the electric path.

4. Use protective materials such as galvanizing or anodizing over the metal.

5. Use counter current electrical flow to oppose the current generated in the corrosion cells.

6. Use environmental controls. Air conditioning processes are sometimes used to remove moisture from the air which might otherwise condense on metallic surfaces and start corrosion cells.

7. Use similar metals whenever possible.

8. Use sacrificial anodes, i.e., more active metals than the metal to be protected. The more active metal will corrode, protecting the critical structure.

9. *Use common sense.* ☆

MISSILE SAFETY AWARDS

Outstanding safety records have earned Missile Safety Awards for the following Air Force organizations. The awards are for performance from 1 January to 31 December 1963.

AAC	• 5010 Air Base Wing, APO 937, Seattle, Washington
ADC	• 35 Air Defense Missile Squadron, Niagara Falls Municipal Aprt, New York • 1 Fighter Wing, Selfridge AFB, Michigan
AFSC	• 6595 Aerospace Test Wing, Vandenberg AFB, California
SAC	• 556 Strategic Missile Squadron, Plattsburgh AFB, New York • 17 Bombardment Wing, Wright-Patterson AFB, Ohio
TAC	• 27 Tactical Fighter Wing, Cannon AFB, New Mexico • 4520 Combat Crew Training Wing, Nellis AFB, Nevada
USAFE	• 38 Tactical Missile Wing, APO 130, New York, New York • 65 Air Division, APO 283, New York, New York
PACAF	• 39 Air Division, APO 919, San Francisco, California • 18 Tactical Fighter Wing, APO 239, San Francisco, California
ANG	• 141 Fighter Group, Spokane International Airport, Washington

MISSILANEA

COMMANDER'S GUIDE—A neat little package is going out into the field via the Missile Safety Officers' Special Study Kit. It's called "Commander's Guide to Missile Safety" and was put together by the Missile Safety Division of the Directorate of Aerospace Safety, DTIG.

The guide is printed on hard paper in seven colors and contains a very brief text and a checklist in the following subjects: Responsibilities, Mishap Prevention, Command and Supervision, Operations, Training, Maintenance, Facilities, Support, Mishap Investigation and Reporting, Mishap Analysis, Missile Safety Surveys, Command Support-USAF, and a list of publications.

The whole works is stapled together in a booklet measuring 4½ x 8½ inches, and it makes a compact, handy reference tool to help commanders and safety people run their programs.

FIRST AID—CHEMICALS. Safety considerations dictate knowledge of first aid procedures for those who work around chemicals. When specific instructions are not immediately available, common sense application of basic first aid rules is recommended.

Vapor or Mist Inhalation: Immediately remove the victim from the contaminated atmosphere. Call medical personnel at once.

Skin Contact: Flush the affected area(s) immediately with water for at least 15 minutes. Remove contaminated clothing. Call medical personnel at once. Wash all contaminated clothing before re-use.

Eye Contact: Do not rub! Irrigate immediately with water for at least 15 minutes, holding lids apart to ensure water contact with all eye and lid tissue surfaces. If necessary to choose between irrigation and contacting medical aid, irrigate for 10 minutes, call medical personnel and resume irrigation.

(Martin-Denver Safety Publications)

ROUTE PROTECTION. A government auto returning from a missile site with three passengers was struck by a train. The driver and two passengers were seriously injured and a fourth man killed. An alternate route was being used which led through a small community and across the railroad tracks. The only warning was the familiar crossarm warning sign. Granted that the sign should have been sufficient, the driver apparently was preoccupied with keeping his vehicle under control on a gravel road covered with snow. The road was slick and the crossing one of those "blind" ones that invites disaster.

The collision resulted in all of the occupants of the car being thrown out. Since the cab was almost intact it was felt that had they been wearing seat belts their injuries would not have been as severe and the deceased would have survived.

This accident points up the necessity for some careful attention as to the routes from base to missile sites. These roads are of all grades and cover almost every conceivable type of terrain. Pick a hazard to driving and you can bet that drivers on some of these roads will encounter it. This calls for a careful survey of all routes to the sites that will be used by Air Force vehicles. Each hazard should be catalogued and action taken to either remove, or warn drivers of, the hazard. Route maps should identify these hazards and drivers should be briefed prior to making a trip.

Another factor to be considered is the condition of the men driving to and from the sites. They may have been working hard all day or night; they may have been on duty for more than 24 hours; they may have to drive many miles in a very tired and drowsy condition.

The conditions may not make accidents inevitable but do increase the possibility. Anticipation of these hazards and contributing factors is necessary to prevent accidents and possible deaths. ☆

DECLARING AND CONDUCTING

Last year Air Training Command experienced thousands of inflight emergencies. Remarkably, only a few of these events involved accidents. The fact that only a very small percentage of these potentially dangerous situations resulted in accidents was due entirely to the pilots' conduct of the emergencies. In the overwhelming majority of the cases pilot analysis, judgment, and action during the emergency was highly praise-worthy and, in several outstanding instances, deserving of official recognition. However, in a few isolated cases, the safety margin was reduced by the pilots' needlessly compromising good flying safety practices.

The term "good flying safety practices" is a generality used intentionally which permits us to express our attitude toward the safety features of operating procedures without the necessity of being specific. This broad phrase is necessary for this article as the diversity of aircraft and missions throughout Air Training Command does not permit us to pinpoint the best actions for individual cases. However, there are areas we can examine which will imply the proper pilot response to any emergency. The detailed actions the pilots then take should be dictated by these responses and by pertinent aircraft operating procedures and limitations. We can examine these areas by asking these questions:

- Why do we declare emergencies?
- What circumstances do we consider emergencies?
- When should the pilot declare an emergency?
- What actions should a pilot take during an emergency?

First, why do we declare emergencies? Obviously, to obtain assistance in eliminating the problem, or to prevent the problem from mushrooming into greater or unmanageable proportions. For example, the pilot may require advice from operations or maintenance in order to extend a malfunctioning landing gear, or to have foam sprayed on the runway to prevent a belly-landing from resulting in a burned aircraft and seriously injured crew. In either case, the pilot is requesting others to help provide a safety margin greater than he can provide alone. Further, by declaring the emergency, the pilot is alerting ground agencies and other airborne aircraft that he is demanding priority use of all control and landing facilities. This notice will permit operations and traffic control agencies to begin immediate planning for the safe and orderly control and recovery of other aircraft should the emergency interrupt scheduled use of the runways. Only rarely can the pilot expect outside aid in the immediate areas of aircraft control and pilot judgment, but the way to a safe full-stop emergency landing can be well-greased in advance by in-position crash units, alerted control towers, and GCA units. First, though, we have to tell them we need their assistance. No one has been turned down yet!

Next, what circumstances constitute emergencies? A quick answer to this question is those circumstances which threaten loss, damage, or destruction of property, or loss of life or injury to personnel. The threat may be immediate, as in loss of an engine at low altitude; or distant, as in the case of unexpected fuel-consuming headwinds on a high-altitude navigation mission. More specifically, we can say that those conditions requiring the use of the emergency procedures listed in the Dash One justify a declaration of an emergency. This, though, is only a partial answer. To be more complete we have to add those situations not covered by an emergency procedure. Those that require considerable pilot effort and skill to rectify, such as many of those cases which received the Air Force "Well Done" award. In fact, to use another generality, we should treat as emergencies all circumstances which tend to make further flight unsafe—whether the threat is real or only suspected. Sound pilot analysis and judgment must rule in this grey area. Consider the old saw, "There are old pilots, and there are bold pilots, but there are no old, bold pilots." It's true there are no old, bold pilots, but our ranks are swollen with old, suspicious, cool, calculating, cautious pilots who have a fine record of mission accomplishment and a spotless flying safety record.

This leads us to our next question: When should the pilot declare the emergency he has encountered? This is the easiest of all to answer—as soon as he has determined he has an emergency on his hands. The sooner, the better. The safety factor with which we begin a flight is reduced at the onset of the emergency and shrinks further with the passage of time. We can't patch the safety envelope but we can insure ourselves of greater freedom to cope with the emergency by alerting others of our difficulties and intentions. Chaos, compounded by disorder, surprise, confusion, and ex-

EMERGENCIES

Capt Guy L. Palumbo, 3510 Flying Training Wing, Randolph AFB, Tex

citement can easily be the result of a pilot's initial radio call that he is at high-key with a dead engine, or on a short final with an unsafe gear. Given the choice, commanders would far rather tolerate repeated mission interruptions by long-notice emergencies than explain a single aircraft which burned on the runway because the crash units were not alerted. We have nothing to gain by delaying our emergency calls, and quite a bit to lose.

During a recent ten-year period the Air Force lost 3500 pilots through accidents. Many of these deaths were caused because the pilots declared their emergencies too late for crash and rescue units to be of any assistance. There is no conceivable instance whereby we benefit from aggravating an already potentially dangerous situation by delaying a declaration of emergency. When confronted with an emergency, report it immediately. The accident you prevent may be your own.

What, then, do we do about the emergency? This answer, too, is simple but can lead to many courses of action and develop ramifications that can't be pursued in this article. However, the two general courses of action that are open in all emergencies are to either cure the condition, or contain it until a safe landing is made. All our emergency procedures are geared to these two ideas, thus the heavy need to thoroughly understand all the operating procedures of the aircraft we fly. Rote is required for all critical items in an attempt to insure the proper pilot response to well-defined situations. But it is not enough to memorize, we must also analyze. It has never been intended that the pilot in all cases blindly follow the step-by-step procedures for an emergency, hoping his automated actions will, somehow, provide the proper response to the problem. Rather, the memorization concept is based on the possibility time may be so critical, or our mental processes so disrupted, we must rely solely on our memory-conditioned reflexes to guide us. But rarely, except in the most sudden, critical emergencies, is there not some time for reflection and analysis, no matter how brief. Individual pilot proficiency and experience will determine whether or not the time margin will allow more calculated response to the emergency. Time permitting, the checklist should be used for all emergency procedures, including the critical action portions, as directed by AFR 60-9. This requirement does not preclude other courses of action should the pilot's analysis and judgment indicate he should modify or even discard the recommended procedures. Our Flight Manuals specifically caution us in this respect, stating in effect, "Instructions in this manual are for a pilot inexperienced in the operation of this aircraft. This manual provides the best possible operating instructions under most circumstances, *but it is a poor substitute for sound judgment*. Multiple emergencies, adverse weather, terrain, etc., may require modification of the procedures" (emphasis added). This is not a license to steal. It's merely a reminder that all adverse circumstances cannot be anticipated and defined for programmed action, that the final responsibility for the conduct of all flight operations rests upon the pilot. Neither is it a directive for the pilot to attempt to prevent the accident at all costs. In no case is the crew to be jeopardized for the sake of the aircraft. We can't argue with success, according to a popular adage. However, success in handling an emergency is predicated not on the ultimate recovery, but on the *safe* recovery of the crew and aircraft.

Though the mission requirements command our greatest attention, a safety-in-flight theme is interwoven with operating needs in all our flying activities. This safety theme is the predominant concern during emergencies. Command and operating elements must necessarily accept those risks inherent in flying but once the mission has been aborted by an emergency, safe conduct of the emergency must receive first consideration. ☆

EMERGENCY WELL HANDLED

Recently, student pilot 2d Lt John M. Johnson, Jr., was flying a T-38 at 42,000 feet when both engines flamed out. Lt Johnson was about 60 miles from Williams AFB at the time.

Rather than leave the aircraft immediately, he turned toward base and tried an airstart without success. "Everything my instructors had said to me, and all the emergency procedures checklists they had made me memorize in the past year, suddenly came through very clearly," Lt Johnson remembers. "Considering the amount of control I had over the aircraft, speed, weather conditions, my direction and distance from the base, I decided to ride it out."

The aircraft entered clouds at 34,000 feet and without power the only attitude instruments available were the pitot static group and the turn needle. With the turn needle he was able to keep the wings level. Then the canopy began icing up. Lt Johnson decided that if he did not have an airstart he would eject at 10,000 feet.

Fortunately, at 16,000 he got the left mill going and the other one eventually started at 4000 feet. During turn to final the right engine flamed out again but Lt Johnson continued and made a single engine landing. ☆

PROBLEM OF A

MORGUE STATISTICIAN

I'm a morgue statistician. I'll explain, since neither title nor job description has ever been listed in Air Force pubs. I tabulate the Air Force's ground injuries and fatalities, and record a brief of the cause. It's not difficult, really. I might describe it as very simple accounting. All I have to do is list the fatalities in one column, the major injuries in another column and the minor injuries in a third. Sometimes I have to make corrections, like when a major injury dies I have to add to the fatalities. Of course I have to deduct one from the major injuries when I do this to keep my records in balance.

At first I didn't know if I could last in this mortuary management specialty. But I was talked into giving it a good try because much of the effort to reduce the fatals, the majors and the minors would be based on accurate actuarial statistics I would record. However, as a statistician, I soon realized that there was no apparent progress being made. Occasionally one category or another would change, but the totals in the fatals, majors and minors held steady, showed slight increases, actually. Finally, in order to forget the job after 1630 I took to thinking only of numbers. I refused to visualize a fatality as a nice-looking young airman in a blue suit, or a major as his 20 year old buddy rolling his way down a hospital corridor because his legs were permanently paralyzed. I even got so that if I saw an airman limping, or using a crutch, or with a leg in a cast, I looked the other way. I made it a point to disassociate such indications with my minors.

That is, I tried to. I was never fully successful because of the brief narrative descriptions that they insist I write for each number I add to the fatal columns.

Just to give you an idea, here are some that I had to write the day before and the day after a holiday (holidays are my most difficult times).

Fatal—Airman was passenger in POV that went into a curve at high speed, left the road and struck a light pole, skidded and hit a second pole broadside. Subject thrown 160 feet by impact. Driver had been drinking.

2 Fatal—Both airmen were in POV and had passed a vehicle when their car went into a skid, was struck by oncoming car. Both subjects were thrown from car. Driver unknown.

2 Fatal—Both airmen in POV which failed to make a turn and crashed into a canal. Driver unknown.

1 Fatal—Airman working on engine of his auto when a blade came off the fan and hit him in the head.

1 Fatal—Officer and family in POV on icy road when involved in a head-on collision.

2 Fatal—Airmen were in POV which struck center fence dividing a freeway, spun, struck another vehicle, spun again striking and killing a motorcycle patrolman. Both subjects thrown from vehicle.

1 Fatal—Officer was driving his sports car when he failed to make curve. Speed at time of accident estimated by highway patrol at 120 mph.

1 Fatal—Airman was passenger in POV which went out of control on a curve, sideswiped an oncoming car, and turned over.

1 Fatal—Sergeant was in boat, pulling on anchor rope. Rope broke causing subject to fall into water and boat to capsize.

1 Fatal—Airman discovered in his trailer, dead from asphyxiation caused by a faulty heater.

You know, one thought keeps coming back to me. None of these people figured this could happen to them. I read somewhere that drivers involved in accidents all have one thing in common and that's the attitude that "all is well." Apparently this attitude is almost a prerequisite to getting involved in an accident. If a driver is going to be caught short in accident-causing circumstances, he must not be expecting them. Maybe we need a new safety slogan: If you drive—Worry! ☆

BiRDNeST ON THE GROUND

G. C. Tate, General Dynamics/Fort Worth

TIME WAS, POST ICARUS, when the pilot in trouble could cinch up his goggles, stow his map, grab a guy wire, step over the side, then chute to safety. Later, came such niceties as rocket assists, bottom snappers, automatic timers, lanyarded survival packs, bailout bottles and so on. Before enough mods had been made to these to effect an ejection success of better than four-fifths, along came another innovation: the capsule.

Tried out first on bears, the capsule has been made available for B-58 crews. By pulling a couple of levers they can encase themselves in a metal and plastic cocoon and initiate a sequence that ends up with encapsulated crewmembers drifting down from disabled aircraft.

Now we learn of the crew escape pod (pictured with some degree of artistic license). With the pod—planned for the F-111—the crew compartment separates from the airframe and is lowered to the ground by a recovery parachute. When the proper handles are pulled by the crew, ejection initiators are fired which begin a series of events: the crewmembers inertia reel, the emergency oxygen system, emergency cockpit pressurization and rocket igniter are activated. Then the severance system actuates starting delayed ignition for drag plates, parachute deployment, pod repositioning, landing attenuation system, emergency battery and rescue aid radio. After this, an exploding wire detonates, explosive bolts at main structural attach points separate, controls are decoupled, electrical connections separated, and leading edges of the stabilization flaps are detached from the wing structure by a detonating cord. The escape pod and airframe separate. As the pod falls through 15,000 feet the main recovery chute deploys.

If the landing is on water, the pod floats. It also contains such post landing survival goodies as first aid kits, knives, rations, transceiver, signal mirror, and other standard survival equipment.

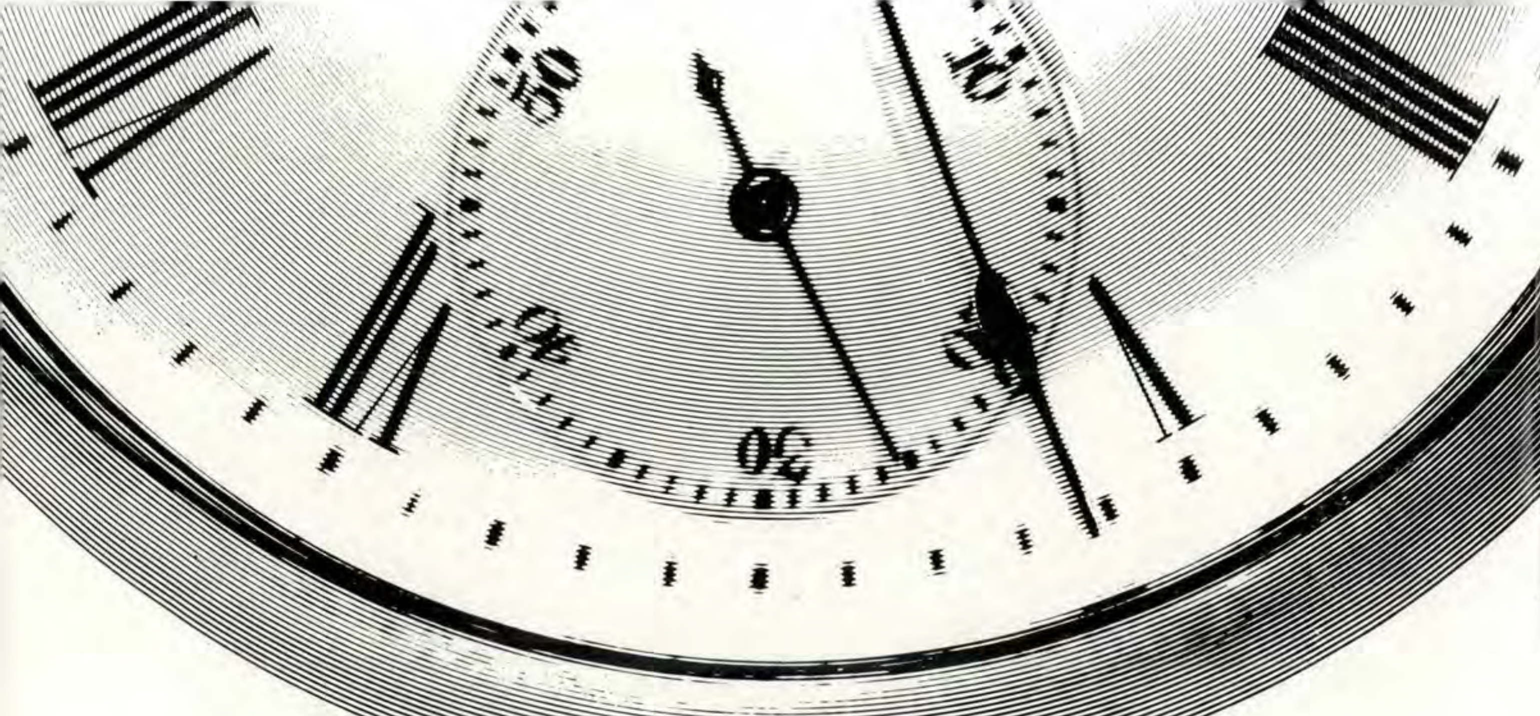
The F-111 escape pod has been designed so that the maximum "eyeballs out" load factors and "eyeballs down" load factors are each well within the limits of human tolerance.

The escape system must protect the crewmember from rotational tumbling. Using pitch and roll plates, the F-111 escape pod is designed to be stable from the instant of launch.

During descent, the pod provides windblast protection for it is the same cockpit within which the crew has been flying. The cockpit escape pod protects the crewmembers during descent by providing emergency cabin pressurization, emergency oxygen, and the structural protection of the cockpit from cold and wind blast.

To attenuate the landing shock, an inflatable bag on the forward end of the capsule absorbs shock caused by descent velocities of up to 30 feet per second combined with a 20 knot drift, a 10 degree parachute oscillation, and on a 5 degree slope.

When all this becomes reality, and when everything works as advertised, crewmembers will have a more reliable, safe escape system with their own bird's nest on the ground. ☆



HOW LONG IS A MINUTE?

Listen closely to the second hand on your watch. Count sixty ticks. Seems like a long time, doesn't it?

You are sitting in your bird in takeoff position on the end of the runway. Behind you is an aircraft on final approach. You have been cleared for immediate takeoff. Just then your flashlight slips to the floor and rolls under the right rudder pedal. The next minute SEEMS like an eternity.

Conversely, how long does a minute seem at high station when you have to check the time, adjust power, report, run a checklist, listen to chatter, sort out and react to that which is pertinent and, of course, fly the airplane?

Now for a specific case—the reason for this article. A jock crashed into mountains. He crashed approximately three minutes after he had been told "If no communication is received for one minute while in the pattern or five seconds on final . . ."

No one will ever know, for sure, why he failed to execute lost communication procedures. Without going into all the details and extenuating circumstances as to why a Guard transmission, or any other safeguard, failed to prevent this accident in the three minute interval, let's examine the question, "How long is a minute?"

Surely the minutes, three in this case were not very long. A pilot flying a jet aircraft, near the ground, in weather, in a terminal area while other aircraft are being recovered is in an extremely busy environment. And minutes pass in a hurry.

Regardless of the *apparent* length of a minute in this environment, there is one thing for sure—a jet aircraft covers about three to four linear miles for each minute that passes. These miles may be in a straight line, may be in curving lines as in part of a teardrop—in rare and usually disastrous cases they may be nearly vertical and in one minute a jet can travel three plus vertical miles and end up punching itself a smoking hole.

Before exploring possible aids to flying these last minutes more safely, one more aspect bears consideration—how does the pilot know when to start his timing in order to execute lost communications procedures. Obviously he is too busy to check the second hand on his clock at the end of each communication received, then make a mental note that a minute hence he has to make his move. At best, all he can do is estimate. This brings us right back to the crux of the problem—how long is a minute? How, whether minutes are fleeting or dragging, is he to measure the standard 60 second minute?

At best, he can only estimate. We've already pointed up the difference in apparent length due to pressures—here's a test you can try on others. Have them check the second hands on their watches to pick a starting time, then when they estimate a minute has elasped, have them record the number of seconds in their estimated minutes. Of course they will vary, and, based on limited test data, most test subjects will estimate well short of an actual minute, *particularly* if all they are doing during the time period is waiting until they think their minute is up. Of course, there is no end to the amount or direction speculation can take in a project of this kind—do people with a lot of nervous energy always estimate the duration of a minute to be less than the slower methodical types?

In any case, there are enough variables to make the safety precaution, "If no communication is received for one minute . . ." a difficult matter to pin down.

What then, if pilots are to be protected in this potentially hazardous environment? Here are some suggestions:

• Know the terrain in the area. In some places—Taipei, for instance—there is high terrain all around, and a pilot who loses communications or becomes disoriented or confused should start an orbital climb until he reaches sufficient altitude to clear obstructions. In many others there are clear quadrants—fly a northeast heading at Lages, a westerly heading at Oxnard, fly west and climb at Norton.

• Make it a point to study maps of the area and the letdown routes. This way a mental image can be kept in mind as to the position of the aircraft in relation to terrain hazards at all times. Then, should loss of communications or disorientation be experienced you immediately know which is the safe way out at any particular point during the approach. At March AFB large maps with SIDs and approaches superimposed are on display for just such a purpose.

Use all the NAVAIDS available. Though the approach may be GCA, if there is an ILS for the same runway always tune it in, identify it, and give it an occasional cross check. If you have both UHF and VHF, have GCA transmit simultaneously on both so that you can switch to a backup if need be. If no ILS is available for the landing runway, crank in the ADF, or VOR or TACAN. Of course, be sure you have the TACAN-VOR selector switch properly positioned. Then pick up the needle occasionally in your cross check. If things don't look right ask, and if doubt exists, take the pre-planned safe way out. This is a lot more reliable than trying to estimate the seconds in the minute that started with the "last communication."

If other chatter stops, particularly if you lose side tone, be suspicious.

Our apologies if, when you started this article, you expected to get the word on the exact length of a minute. But we trust you may have acquired something that may, in actual practice, help you even more in missing a socked-in pile of rocks. Sometimes a reminder of the inadequacy of a safeguard and suggestions on how to combat it may have more accident prevention value than a pat answer to a question such as, "How Long Is A Minute?" ☆

TWX's

ACCIDENTS, INCIDENTS AND ALMOST . . .

FLYING SPEED—Not an Air Force bird, but shows what could happen. On final the pilot's airspeed indicator showed 142 knots and the copilot's 120. The approach was continued, using the copilot's airspeed indicator and normal flare speed. The pitot static systems were drained, checked for condensation and the lines blown out. During the following takeoff roll an abort was made when the copilot's and navigator's airspeed indicators registered zero. A small fly and a piece of leaf were removed when the right pitot static system was dismantled, and the thread on the pitot head angle fittings was found damaged.

ONE OF THE REASONS given as contributory to an aircraft accident (crashed into mountains) was listed as failure of the pilot to monitor Guard channel during a GCA approach. One of the reasons given for his not monitoring Guard on GCA was the probability of transmissions on Guard blocking out pertinent transmissions of the GCA controller. One of the reasons listed as to the reason for the number of transmissions on Guard was the common practice of using this frequency for *NON* emergency traffic.

One of the reasons some cause factors are listed as contributory in accident reports is to identify factors which, had they been recognized and properly acted upon, might have prevented the accident.

SUCKER SADDLES. The flight of two F-102s were just topping the thick cirrus layer at 45,000 feet as they went through the saddle between two thunderstorms. They were indicating Mach .8, 220 knots, and unable to climb any higher. Beyond the saddle they found another thunderstorm, top estimated at 50,000 and couldn't turn without losing airspeed. Ignition buttons were pressed and the aircraft penetrated the storm, on course. In less than one minute severe bangs were felt followed immediately by a flameout. Throttles were not moved until after flameout and there was no increase in EGT. Attempts to catch unwinding engines with ignition depressed were unsuccessful. Ignitions released and emergency fuel selected as RPMs unwound through 45 per cent. Throttles were stopcocked and airstarts were attempted on the emergency fuel systems. Normal fuel was selected and airstarts were accomplished at approximately 25,000.

PEOPLE PROBLEMS. An observer noted something fall from the aircraft as it broke ground on the takeoff roll. The pilot was advised by the tower and requested to return. The base operations duty officer found the right hand crew compartment life raft hatch cover approximately half way down the runway. The life raft remained sealed. The hatch cover apparently struck the right hand HF antenna upon separation since the antenna was torn loose at the forward mast. The life raft had been installed immediately prior to this flight. Installation was not performed in accordance with current maintenance instructions which require that the aricraft be placed on a red cross until installation is inspected by a seven level supervisor. ☆

The question pilots sometimes face is whether to get rid of the canopy or keep it as a protective shell. The author examines this question in . . .

Jet Fighter CANOPY JETTISON

Capt Donald H. Volz, Sacramento Air Materiel Area, McClellan AFB, Calif

To jettison or not to jettison the canopy? This question has often come to my mind, especially since the time I witnessed an F-100F crash on takeoff. The result was two fatalities after one pilot jettisoned the canopy and ejected when the fuel tanks exploded. Because of the quick action of the crash crew I felt the pilots would have survived had the canopy been retained.

In my present position as Flight Manual Manager for SMAMA's prime aircraft I have had the opportunity to examine this question more closely. Present guidance on this subject instructs pilots to jettison the canopy of the airplane prior to any imminent crash landing to provide for means of immediate escape and to prevent entrapment.

Recent investigations, however, have shown that in many cases it may be more advisable to retain the protection afforded by the canopy. A review of accident records revealed that, in several instances of controlled crash landings which resulted in aircrew fatalities, the crew might have survived had the canopy been retained. (DTIG defines a controlled crash as: One in which the pilot was able to exercise sufficient control so that the plane's initial contact with the terrain was such that the accident was potentially survivable.) In each of these cases, (1) the crash oc-

curred on an airbase, (2) the canopy was jettisoned during or prior to the crash, and (3) the fatal injuries resulted from the ensuing inferno or from flaming fuel splashing into the cockpit.

Two accidents on record show interesting contrasts. One, in which the pilot could not eject or jettison the canopy, was a crash on an airbase with the ensuing "ball of fire." The crash crew was on the scene and extinguished the fire in about one and one-half to two minutes. When the canopy was removed the pilot inside was alive and uninjured, although he was very hot and had lost a great deal of weight. In the other, the crash occurred off base and in some trees. The canopy was retained and, during the crash and slide, flaming fuel scorched the canopy. However the cockpit rode through the flames intact, and the pilot emerged uninjured.

With the assistance of DTIG (Life Sciences Group), it was determined that it is advisable to retain the protection of the canopy when a crash is imminent on an active air installation. For a crash on other than an active air installation the general guidance is to jettison the canopy. However, because of the many factors and possibilities involved, the final decision should be left to the discretion of the pilot. Analysis of this problem, indicates that the following factors and procedures should be considered by all aircrews of jet fighter airplanes:

Accident statistics show that fire occurs in approximately 45 per cent of all controlled crashes.

The post crash fire of a controlled crash is usually not an instantaneous complete engulfment in flames. (Especially if external fuel tanks have been jettisoned.)

If a crash does result in immediate engulfment in flames, however, the absence of the canopy will most certainly result in immediate fatal injuries to the crew.

The heavy plexiglas canopies and pressurized cabins can afford definite, temporary protection from heat and flame.

The possibility of entrapment due to inability to open the canopy or because of position of the aircraft has been shown to be quite remote.

The installation of the canopy break-away tool, becoming standard in many jet fighters, eliminates (to a large degree) the danger of entrapment due to inability to open the canopy.

Most active air bases maintain a fire-fighting unit on runway alert, thereby decreasing the reaction time to an on-base crash.

When the canopy is jettisoned in flight the pilot is subjected to conditions to which he is unaccustomed and this may compound an already tense situation.

If the canopy is jettisoned before the airplane comes to a stop barrier webbing, cables, or wires can enter the cockpit and injure the pilot.

After a crash in which the canopy has been retained the crewmembers should unfasten all personal equipment and leads, *attempt* to remain calm, and assess the situation. If a crash crew is on hand allow them to bring the situation under control before attempting escape. If there is no crash crew the following guidelines should apply:

(1) If no fire is apparent open the canopy by some means which will not ignite possible fuel fumes (manually, by use of canopy breakaway tool, etc.).

(2) If fire is noted jettison the canopy and abandon the airplane.

At the recent F-100 Flight Manual Command Review Conference this subject was discussed. The resulting decision, concurred in by DTIG, was that in the emergency procedures the step CANOPY-JETTISON will be changed to CANOPY-AS DESIRED. A condensed discussion, similar to the one presented here, will then give the aircrews guidance on the many factors involved. ☆

FAA ADVISORIES

Robert L. Terneuzen,
FAA Liaison Officer
Directorate of
Aerospace Safety

THANKS — A great big "Thank You" to all the fellas who wrote those encouraging letters. With time, and your help, the column may prove to be of some value. To help in this effort, how about more suggestions and questions? Why not let me hear from you—pilots, AFCS and FAA controllers? I'll bet we can generate enough interest between us to make this page a real source of information. If you have a question that stumps me I promise to research and publish the answer, or if it's a suggestion having to do with traffic control, I'll submit it to the FAA or AFCS for further comment and discussion. You've all grumbled at times about having something done about this or that; now here's your chance to be heard and perhaps helped. Feel free to submit your gripes. Just remember, give me a break and include a suggested improvement in the situation. Address your correspondence to either the editor or: FAA Flying Safety Liaison Office

AFIAS-F8, Norton AFB, California.

RADIO TECHNIQUE — FAA, ARTC Centers have noted that many USAF pilots are not reporting their altitude in INITIAL radio transmissions. The information concerning this procedure is published in both the Enroute Supplement (page 291) and FLIP Planning, Section II (page 10). Example: "Chicago Center, Air Force 12345 Joliet niner thousand, over."

LIGHTNING AND CAT REPORTS — Washington/FAA has requested that all pilots report lightning strikes, clear air turbulence and turbulence that has caused damage to aircraft or injury to passengers or crewmembers.

Prompt reporting of strikes and particularly turbulence can then be relayed to following aircraft for possible route or altitude changes.

EVALUATION TO REDUCE POSITION REPORTS IN A RADAR ENVIRONMENT — The safety and effectiveness of air traffic control depends largely on accurate position information. In order to provide separation and safely expedite aircraft movements, controllers must have accurate information on the progress of each IFR aircraft. Radar is the most accurate, least time consuming media through which this information is obtained. In a radar environment where aircraft position information is updated at frequent intervals pilot position reports are generally superfluous. Elimination of these reports can substantially reduce frequency congestion, provide controllers additional time to analyze the constantly changing traffic situation and permit the flight crew to devote more time to other cockpit duties.

The Air Traffic Service, FAA, has developed a program to eliminate pilot position reports over designated compulsory reporting points while a flight is operating in a radar environment. An evaluation of this program has been underway in most Western and Central Region facilities for some time. Pilot reaction to this program has been highly favorable and no major discrepancies have been detected. However, since this represents a major change in long-established air traffic control procedures, prior to implementation the evaluation of this program will be expanded to include most areas of radar coverage within the U. S.

The following procedures will be used in conducting this evaluation:

- Pilots of radar identified aircraft which will remain under radar surveillance may be authorized to discontinue position reports over fixes designated as compulsory reporting points. The controller will grant this authorization using the phraseology "OMIT POSITION REPORTS."
- When a pilot has been authorized to omit position reports, the controller—at the time radar service is terminated or at his discretion—will issue instuctions to resume normal position reporting using the phraseology "RESUME NORMAL POSITION REPORTING."
- Pilots shall monitor normal air traffic control communications frequencies. On initial contact when changing frequencies, pilots should establish contact as specified giving altitude or flight level.
- Pilots of aircraft operating below flight level 240, who have been advised to omit position reports, will be furnished the appropriate altimeter setting when passing compulsory reporting points as observed by radar. ☆

Services Standardize Safety

New agreements to standardize aviation safety practices, procedures and definitions have been reached in a tri-service conference at the Army Aviation Center, Ft. Rucker, Ala.

In a two day meeting, April 14 and 15, Brigadier General Jay T. Robbins, director of Aerospace Safety USAF, Rear Admiral E. C. Outlaw, commander of the Navy Aviation Safety Center, and Colonel Robert M. Hamilton, director of the Army Board for Aviation Accident Research (left to right in accompanying photo), also laid the groundwork for future agreements in other areas of aviation safety.

A major agreement was the establishment of identical criteria and definitions for major and minor aircraft accidents. Regulations in each of the services are expected to be changed.

Also discussed were the various kinds of exposure for computing accident rates. All three services will soon have the capability of computing rates based on flying hours, landings and flights. For purposes of in-service accident analysis each service will use the exposure or exposures that best suit its particular requirements. For the purpose of consolidated reports or releases the three services can mutually agree on a suitable rate.

The three services also agreed to use common terms in defining ejections and parachute sequence, with use of common terms to be limited to the three aviation safety centers.

The Army, Navy and Air Force leaders decided to continue their efforts toward common medical reporting for accidents and greater cooperation between accident investigators and crash rescue personnel.

First steps were taken toward a program to orient the public on its conduct at scenes of aircraft accidents. A broad public relations program will be developed with the goal of educating the public on not handling aircraft parts found at accident scenes and on not destroying other evidence that would be helpful to investigators.

RED FLIGHT'S RECORD

It's Red Flight Day in Selma, Ala., and Dallas County, as Bernard A. Reynolds, Dallas Co. Probate Judge (left), and the Honorable Chris B. Heinz, Mayor of Selma (right), sign a joint-proclamation announcing the event in the presence of Col Richard L. Ault, base commander, Craig AFB, Ala.

When a T-37's high speed tires squeaked sharply on the concrete runway at Craig AFB one morning last winter, more than another routine pilot training flight had been completed. The safe termination of that flight marked the 50,000th consecutive hour of accident-free flying for Red Flight personnel.

In recognition of the Safety achievement, Chris B. Heinz, Mayor of Selma, Alabama, and Bernard A. Reynolds, Dallas County Probate Judge, signed a joint proclamation specifying one day as *Red Flight Day in Selma and Dallas County.*

Since then the record has been kept intact. Red Flight pilots and students had flown 52,275 consecutive accident-free hours as of 1 April.

During the 83-month period since 5 April 1957, the flight has graduated more than 650 students while they and their instructors made more than 208,000 takeoffs and landings during more than 34,700 flights.

The flight's 14 instructor pilots have never had an aircraft accident of any kind. Eleven of them have over 1000 hours of rated accident-free flight time in aircraft of all types (recip and jet); 10 have earned Distinguished Jet Pilot Certificates for having completed 1000 rated accident-free hours in jet aircraft. Six of those 10 men have flown more than 2000 safe hours: Capt Rollin R. Lerch, Flight Commander (2137); Capt Donald W. Schalk (2502); Capt Kenneth R. Shatzer (2338); Capt Karl E. Klute (2110); Capt James H. Fleming (2131), and Capt Lawrence E. Butts (2198).

"Marks such as these don't just happen," says Col Richard L. Ault, Craig AFB commander. "They are the byproducts of top aircraft maintenance, standardized training methods and men who won't settle for being less than the best pilots in the business. ☆

Aerobits

LOCATOR BEACON—A pair of Navy aircraft were on a training mission when the wingman had to eject over rough mountainous terrain. The situation was such that he did not have time to inform the lead pilot. In fact, Lead did not know what had happened until he heard an emergency beeper on Guard channel. The beacon was attached to the wingman's seat pack and the lanyard was attached to the seat. When the pilot separated from his seat, the beacon was automatically activated. Lead looked around, noted that his wingman was missing and made a quick one-eighty. He spotted his buddy and alerted the Western Air Rescue Center which sent a helicopter. The pilot was located, recovered and evacuated for medical treatment of an injured back within two hours.

Undoubtedly this pilot's beacon made possible his quick recovery and possibly saved his life. Air Force crews will soon have similar equipment in the URT-21. Testing should have been completed by now and these beacons should be showing up in the P.E. shops soon.

HAZARDOUS CARGO—Recent occurrences indicate that a tightening up is in order in the movement of explosives and other hazardous cargo. For example, a contract carrier pilot parked his aircraft loaded with explosives in front of Base Operations. About 30 minutes later he notified the dispatcher as to the nature of the cargo. Air Freight had been advised as to the flight and cargo sometime previously but had not notified Operations. The pilot, assuming Operations was familiar with the cargo aboard, did not report his cargo prior to landing.

Carelessness of this sort, along with many reported discrepancies in packaging and marking seems to be common. Action on the part of all concerned is called for immediately before some act of carelessness results in a catastrophe. In view of the above, the following minimum controls are emphasized in addition to adherence to the general safety precautions and compatibility chart contained in AFM 71-4:

1. Aircraft carrying high explosives should not be parked among other transient aircraft or near any vital installation or building.

2. Notification must be received prior to the aircraft's landing.

3. Crews and passengers must be completely briefed on nature of items and proper precautions to be observed.

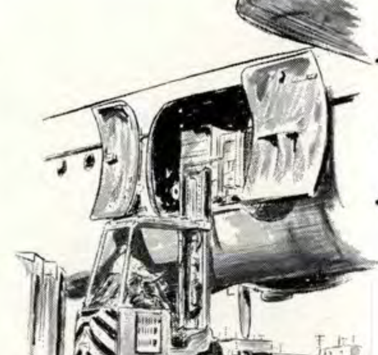
4. Commanders will be briefed regarding the properties, their proper handling, first aid, and measures to be taken in the event of an inflight emergency.

5. Commander will prohibit smoking and ignition of matches or lighters in compartment containing explosives.

6. Fire Department will be notified of any aircraft carrying explosives—parked, landing or taking off from the base.

7. Pilot will make known the contents of the cargo and request appropriate priority for his aircraft during takeoff or landing, taxiing and parking aircraft loaded with explosives.

The success of the explosives safety program during air shipments and the prevention of a possible disaster are dependent upon how well we disseminate these instructions and insure understanding by those concerned.



IN CASE OF EMERGENCY. The Air Force has provided quite a few devices and procedures for use in case of emergency. And Air Force pilots spend a lot of time learning how to use these devices and practicing emergency procedures. Here's a series of events that illustrate in the last four minutes of one mission, why it's all necessary.

On descent to penetration altitude the F-104 pilot noticed heavy fumes in the cockpit as he reached 23,000 feet. Within seconds the oil pressure dropped from 30 psi to 12 psi, the oil level light illuminated and nozzle failure was experienced. The pilot declared an emergency and requested a direct vector and mileage to the field. GCA responded immediately with the information requested and, because of the proximity of the field, initiated descent immediately. The aircraft entered the tops of a heavy overcast at 18,000 feet. Configuration was: 89 per cent RPM, takeoff flaps and 275 knots IAS. Extremely heavy rain and turbulence were encountered in the descent and GCA gave constant heading corrections and distances to the approach end of the active runway. Based on this information the pilot varied his rate of descent by use of speed brakes so as to break out of the overcast as close in to the field as possible. Breakout occurred at 3500 feet, about four miles from the end of the runway. Oil pressure had dropped to 6 psi and nozzles were at 7/10 at this time. A straight in approach with takeoff flaps was established with gear held until flare. Final was flown at 200 knots and touchdown was made 1000 to 1500 feet from the threshold. The drag chute was deployed and max braking attempted. The pilot began experiencing directional control problems and the tower advised that the chute was a streamer. The pilot began using only moderate braking to retain directional control as a barrier engagement was inevitable. The MA-1 barrier was engaged at the center of the runway with the cable catching the main gear doors. Throttle was stopcocked at engagement. Runout was 323 feet. No damage to the aircraft.

UPS AND DOWNS. On takeoff the pilot noted that the elevator trim was operating in reverse. The pilot recognized the problem immediately and took action to retain complete control of the aircraft. He remained in the local area with a chase aircraft until fuel was burned down to landing weight. A successful landing was accomplished. Maintenance had been performed on this aircraft just prior to this flight for removal and replacement of the elevator trim actuator. During repair of the elevator trim actuator, the actuator was inadvertently wired in reverse. The actuator was installed on the aircraft and a trim check was made; however, the reverse trim was not detected by the person installing the actuator, the inspector who signed off the installation, the crew chief on preflight, nor the pilot during his preflight check.

Courtesy ATC's "Approach to Safety"

AERO CLUB AIRCRAFT—A broken front spar of an L-17 horizontal stabilizer was discovered recently during postflight inspection. The spar was broken across its entire thickness immediately outboard of the root rib, including gusset shown in FAA A.D. Note 52-26-1. The aft spar and root rib were all that kept the stabilizer attached to the aircraft.

AFLC recommends that all aero clubs possessing L-17s have the aircraft inspected. Inspection can be made by removal of stabilizer root fillets and, with inspection mirror and light, forward spar can be thoroughly inspected at the rib and forward stabilizer attach fitting.

Aerobits

ACCESS DOOR DIDOES. As the airspeed increased on climbout the pilot noticed a buffeting of the rudder and a slight vibration in his trusty T-Bird. All engine instruments were normal so the gear was recycled on the assumption a gear door might be hanging. This did not correct the situation so another aircraft was requested to make a visual check. The chase pilot advised that the left upper engine access door, plenum chamber door, was full open. A controllability check monitored by the chase pilot revealed the door stayed full open at 160K, approximately four inches open at 130K and full closed at 120K. A straight in approach was made at 120K. Landing was without incident.

Investigation revealed all fasteners were intact except one which was broken, obviously the only one used to secure the door. The aircraft was airborne for approximately 25 minutes, at speeds up to 250K, before the fastener failed. Had it failed at the higher speeds, the door could have been torn from the aircraft, damaged the tail section and resulted in complete loss of control. It has happened in the past.

The aircraft had been ground aborted the previous day for fluctuating fuel pressure. An engine specialist had opened the panel to bleed the fuel pressure transmitter and failed to secure the door when the job was completed. He also neglected to make a 781 entry referencing the loose panel. Postflight was not required since the aircraft was not flown. On the early morning preflight, the crew chief failed to see the loose fasteners. The IP and student then failed to catch the discrepancy on their preflight. At least three persons should have looked at the fasteners but not one noticed they were loose. Why?

Cold? Darkness, no flashlight? Rushed preflight?

Courtesy ATC's "Approach to Safety"

P.D. MCCRIPE—Those letters stand for something and if you don't know what it is, you'd better take a walk over to the P.E. shop and find out. The crew of a T-Bird almost bought it the other day when the pilot tried to operate at high altitude while breathing ambient air.

This crew, a pilot and observer, was scheduled to fly a mission at 39,000 feet. At about 35,000 the pilot's symptoms of blurring vision and blue fingernails made him suspicious and he went to 100 per cent oxygen. Soon he began to fly erratically, diving and climbing the aircraft and allowing the wings to drop first on one side and then the other. Finally, after the back seat occupant urged him several times to descend, he went into a dive with full power. He cut the power only at the urging of the observer. At a lower altitude, the pilot's symptoms disappeared and he landed the aircraft.

Inspection of the aircraft oxygen system revealed no discrepancy. Condition of the masks of both men was a different story. Both were dirty and had a distinct odor due to improper cleaning. Besides, they had not received routine care in 60 to 90 days. The real culprit was the CRU-8/P connector on the parachute harness which failed at the snap ring, allowing the pilot to breathe ambient air.

The P.E. shop personnel deserve to get their knuckles rapped, but how about the pilot? Proper preflight inspection of the equipment should have turned up the faulty connector as well as the overall condition of the mask. Remember P.D. MCCRIPE. ☆

WELL DONE

CAPT. CHARLES W. BROZ

59 FIGHTER INTERCEPTOR SQUADRON, GOOSE AIR BASE, LABRADOR

On 4 September 1963 at Goose Air Base, Labrador, Captain Charles W. Broz and another squadron pilot, Captain Arthur P. Kearney, were flying a training mission in a TF-102. After completing the first intercept at 30,000 feet, 150 miles northeast of Goose Bay the pilots were attempting to retract the armament doors when an explosion was heard. Air rushed in around the cockpit and the aircraft began to vibrate considerably. The right front windshield had blown out, subjecting both pilots to severe windblast and extreme cold. Captain Kearney, in the right seat, grabbed a piece of the radar hood, which was breaking up, to hold in front of him and lowered his visor. Captain Broz declared an emergency and began a descent toward the base. Armament doors could not be retracted. This plus the lower altitude necessary to avoid the extreme cold more than doubled the fuel required for return to base. During descent least vibration occurred between 220-240 KIAS. Aircraft was leveled between cloud layers at 15,000 feet and slowed to see if landing should be attempted.

At 200 KIAS the buffeting and vibration became severe. In spite of this Captain Broz decided to attempt the landing. He began an IFR descent planning to make a TACAN approach to the base, but the TACAN proved unreliable. At 8000 feet bits of glass began to fly into the cockpit and the glass covering the instruments began to ice over. Captain Broz scraped the ice off with his hand, while Captain Kearney held up the pieces of radar hood obstructing the instruments. As the aircraft descended, buffeting became such that reliable communications between aircrew and air to ground could not be maintained. This ruled out a radar approach. By this time both pilots were extremely cold and shivering uncontrollably. Captain Kearney, subjected to the full windblast, was becoming incapacitated. They climbed to get VFR on top and were informed that an F-102 would be vectored to them. They broke out of the clouds at 21,000 feet and joined on the other aircraft. Penetration was begun at 240 KIAS. The clouds were thick enough to make formation flying difficult even under normal circumstances. On final approach buffeting became so severe that Captain Kearney could not read the large numbers on the lead aircraft. The weather proved to be lower than reported so Captain Broz flew wing to 500 feet and then made a normal landing. Captain Kearney believes that ejection would have been impossible for him after the second descent. He and Captain Broz had been exposed to severe cold and windblast for 45 minutes. Both pilots were taken to the hospital, warmed up, checked for frostbite and released.

Captain Broz distinguished himself by meritorious achievement while participating in aerial flight. This achievement has earned him a WELL DONE. ☆

CITATION for the award of the 1963

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The Daedalian Flying Safety Trophy is awarded to the Military Air Transport Service for having the most effective aircraft accident prevention program of all major air commands for the calendar year 1963. During the period of this award, the Military Air Transport Service established the lowest accident rate in its history. The magnitude of accident reduction attained was outstanding in view of increasing operations directed toward military mobility exercises and special assignment missions. Again in 1963, of all the passengers carried on scheduled transport missions, not one life was lost. By conserving materiel and manpower while accomplishing its worldwide commitments, the Military Air Transport Service has made a substantial contribution to the mission of the United States Air Force. This accomplishment was the result of superior teamwork of unit commanders, aircrews, maintenance and support personnel. The achievement made by the Military Air Transport Service in aircraft accident prevention perpetuates the highest standards and traditions established for the Daedalian Flying Safety Trophy, and reflects the highest credit upon the command and the United States Air Force. ☆

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