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Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT

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PREFLIGHT

Much effort has been expended toward understanding the mechanics of wake turbulence, so-called jet wash, prop wash, wing wash. Results of these studies have been well publicized. But less is known of a similar phenomenon, helicopter rotor wash. The article on page 2, based on an investigation by E. H. Flinn of the Air Force Flight Dynamics Laboratory, sheds some light on this invisible hazard. The information should be of particular value in SEA where fixed wing and very busy helicopter operations share the same areas.

Aircrews may be surprised at some of the figures revealed in "Ground Escape," page 10. While several factors are discussed, the one that struck us most forcibly was the role of training. This is one area where the aircrewman plays a definite part. Ground egress in an emergency can be a highly traumatic experience. Consequently, thorough knowledge of the aircraft egress systems and their use is paid up insurance for the crewmember when the emergency arises.

We think there's a lot of goodies in this month's package, most of them aimed directly at aircrewmembers, our most important customers. Also, we try to respond to requests, so if you have a subject you'd like to see covered, let us know. There's a lot of knowledge and talent in the Air Force and we can usually find a highly qualified type to share his knowledge with ASM's readers. While we're on the subject, we want to say thanks to all our contributors. They are tops in our book.

COVER

1st Lt James F. Carney, of Randolph AFB, Texas. Lt Carney completed 100 missions over Vietnam when he was attached to the 559th Tac Fighter Squadron, 12th Tac Ftr Wing, Cam Ranh Bay Air Base.

Safety Awards

THROUGHOUT history, the military services of all nations have rewarded their members for valor and heroism in the face of the enemy as well as for outstanding achievements in times of peace. Frequently, however, men and organizations have received little thanks and recognition for simply doing their jobs in an outstanding manner.

On pages 14-16 a number of organizations and individuals are publicized for doing their jobs well and thereby winning safety awards in recognition of their contributions to accident prevention. *Aerospace Safety* has covered these awards annually; this year there are two new ones, The Secretary of the Air Force Safety Award and The Chief of Staff Individual Safety Award.

The Secretary of the Air Force Safety Award is the highest Air Force safety ward. Established in 1967, it goes annually to the two major commands with the best overall accident prevention program, one with a military strength of over 15,000, the other with less than 15,000.

The Chief of Staff Individual Safety Award, also established in 1967, is presented to the individual(s) who made the greatest contribution to safety within the Air Force.

Three other awards for outstanding performance are the Colombian Trophy, the Daedalian Flying Safety Award and the Koren Kolligian, Jr. Trophy.

The Colombian Trophy is awarded to a tactical unit for the most meritorious achievement in flying safety during the preceding year. This trophy was originally established in 1935 by the Republic of Colombia but was suspended during World War II and re-established in 1961.

The Daedalian Flying Safety Award goes to the major command having the most effective aircraft accident prevention program. Eligibility is restricted to major commands flying 100,000 or more hours within the preceding calendar year. The trophy is presented during the annual meeting of the Order of Daedalians, an organization of World War I pilots.

Established by the Kolligian family in memory of their son, the late 1st Lt Koren Kolligian, Jr., who was declared missing in a flight off the coast of California in 1955, the Kolligian Trophy is awarded annually to the USAF aircrew member who most successfully coped with an inflight emergency during the preceding calendar year.

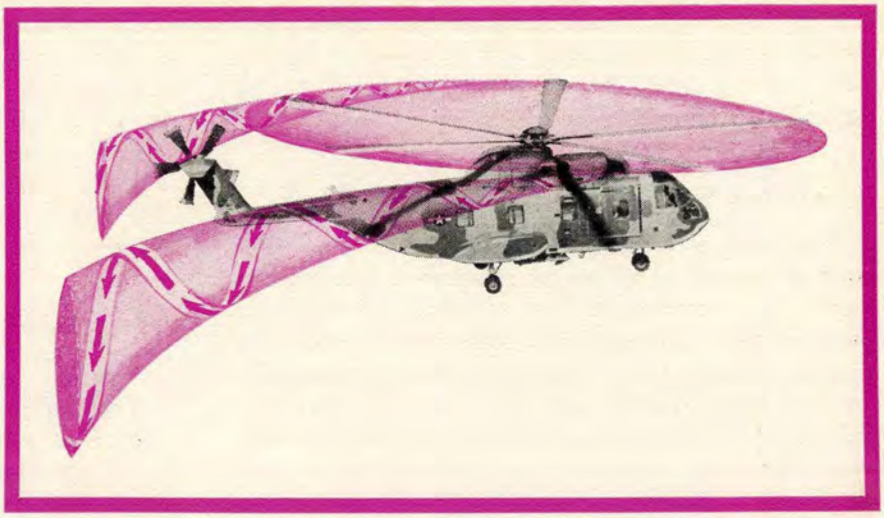
In addition to these awards, there are the Flying and Missile Safety Plaques awarded to units for meritorious achievement in flight and missile safety. Winners of these awards are listed on page 16.

Aerospace Safety congratulates both individual winners and members of organizations recognized with these awards. Your performance is in the highest traditions of the U. S. Air Force and serves as an incentive to those coming after. Well Done.

HELICOPTER ROTOR WASH!

A NUMBER OF MISHAPS HAVE BEEN REPORTED IN WHICH HELICOPTER ROTOR WASH HAS PLAYED A VITAL CAUSE-EFFECT ROLE. HERE ARE SOME CASES IN POINT:

Helicopter rotor wash can be exceedingly dangerous for the aircraft that encounters it, particularly at low altitude. Effect is similar to wake turbulence created by fixed wing aircraft, as these illustrations show.



A C-130 major accident occurred when rotor wash from a hovering helicopter caused the C-130 pilot to lose directional control during takeoff roll. This loss of control was sufficient to cause the aircraft to make an unplanned departure from the runway. The aircraft was destroyed.

- *An O-1 aircraft was damaged while landing during extensive helicopter operations in the vicinity. The O-1 pilot stated that he dropped about six feet, with no apparent stall occurrence.*

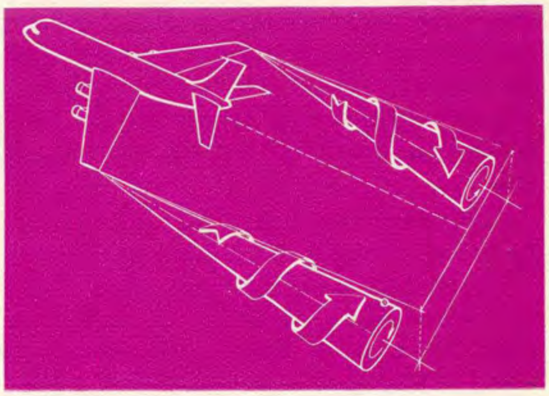
- *On landing approach, a C-123 encountered rotor wash from a helicopter landing in front of him. Rotor wash caused the C-123 to go into a sharp bank. Before control could be regained, it struck another helicopter parked some 200 feet short of the runway in the approach zone.*

- *A C-7 encountered helicopter rotor wash on final approach causing the aircraft to land sufficiently short to strike the forward edge of the runway overrun.*

- *Shortly after becoming airborne, an O-1 encountered turbulence and recontacted the runway. An Army helicopter with engine running was on the ground 15 to 20 feet from the edge of the runway. Turbulence was experienced adjacent to the helicopter location.*

With the rapidly increasing air traffic, both helicopter and fixed wing pilots must be more alert to hazards in their flight paths. As if these visible hazards aren't enough, pilots must guard against the invisible hazards generated by modern aircraft, WAKE/ROTOR WASH TURBULENCE. Periodic review of these subjects will make you more aware and better prepared to handle the situation when you meet it face to face.

Even today helicopter rotor wash effects are not completely understood, so only limited information is available. The following data was condensed from a study by Mr. E. H. Flinn of the Air Force Flight Dynamics Laboratory, where helicopter rotor wash effects are still being studied.



Starting about ten years ago, considerable attention has been given to the operational problems associated with the effects of trailing vortices. Operations within airport terminal areas have received special attention. The vortices which trail from the wing tips of some aircraft in flight are quite powerful and may persist for several minutes after the passage of the aircraft (illustrated above). The average velocity and the total energy of the rotor wash in the wake of a helicopter in forward flight are similar to those for an airplane of the same weight and span flying at the same airspeed. At a distance of one to two rotor diameters downstream from a helicopter with forward speed, the helical vortices shed by the rotor tips roll up into a pair of vortex cores (top photo above). These cores are similar to the vortices of a conventional aircraft. Other problems created by helicopters are associated with the downwash at or near hovering flight. These problems are caused by the vertical air currents hitting the ground.

VORTEX SETTLING, SPREADING, AND DECAY

Since each of the trailing vortices produces a downward movement of air at the position of the opposite vortex, the vortices settle or move downward with time. When vortices are generated more than a few rotor diameters above the ground, they tend to maintain a constant lateral spacing and have a constant downward velocity. As the vortices approach the ground to within two or three rotor diameters, their motion is slowed and they begin to spread apart laterally. The vertical motion ceases at a height of approximately one third of the rotor diameter, and the lateral velocity of the vortices attains approximately the same value as the initial vertical velocity. When the vortices are generated closer to the ground, their initial vertical velocity is less. They tend to settle to a level somewhat closer to the ground and spread laterally at a faster rate than for the first case.

Atmospheric turbulence and the turbulent wake of the helicopter may both be contained in the vortex core. The persistence of the vortex intensity will depend upon the meteorological conditions. A wind of more than about five knots or convective action due to heating would be accompanied by atmospheric turbulence, particularly at the lower altitudes, which would tend to cause more rapid decay or complete disruption of the vortices. Where the vortices are close to the ground, frictional forces between the ground and the vortex-induced airflow would contribute to vortex decay. Available information on the effects described above is not sufficient to permit quantitative conclusions at this time. Investigations have revealed that at some point in the orderly attenuation of the vortices, as shown in Figure 1, they become unstable and deteriorate very rapidly. Although pilots have reported apparent encounters with trailing vortices estimated to have existed for five minutes or more, no actual measurements have been recorded for separation times greater than five minutes. The factors which determine the time of final vortex dissipation are not known.

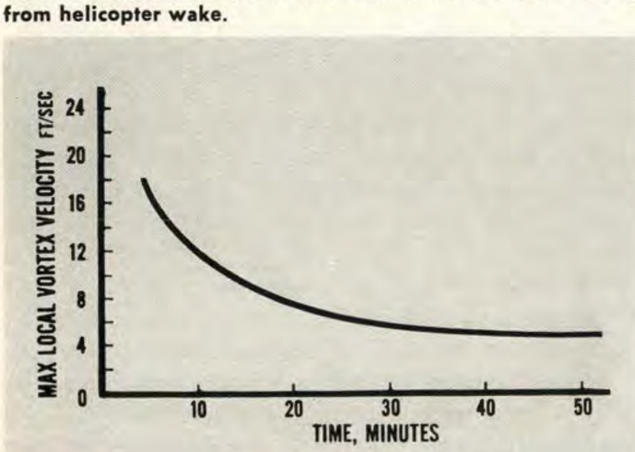
EFFECTS ON AIRCRAFT PENETRATING TRAILING VORTICES IN FLIGHT

There are three modes of penetration of the trailing vortices of a helicopter which will have distinctly different effects on the penetrating aircraft (Figure 2). These modes are cross-track, along-track between vortices, and along-track through the vortex center.

The first mode of penetration (cross-track) would most likely occur during flight in a traffic pattern in the vicinity of an airport. This type of vortex encounter would tend to cause pitching and vertical motions and produce loads on the penetrating aircraft in a fashion similar to that of flight through gusts.

The vertical load encountered in this mode will be a function of time and the ratio of gross weight of the penetrating aircraft to the helicopter generating the vortex. This mode would affect light planes the most with the loads approaching design limits of this type of aircraft. Also, the instinctive control reaction by the pilot to this type of disturbance in a light aircraft could cause a substantial increase in the loads to the extent that the ultimate load could be exceeded. However, since the strength of the vortex is decreasing rapidly with time, little danger of structural damage to light aircraft would occur with separation times greater than one minute. Large aircraft have, in general, slower response to controls in contrast to light aircraft and, therefore, would

Figure 1. Typical decay rate of maximum local vortex velocity from helicopter wake.



Effect of rotor wash is shown by disturbances on water below and behind helicopter.

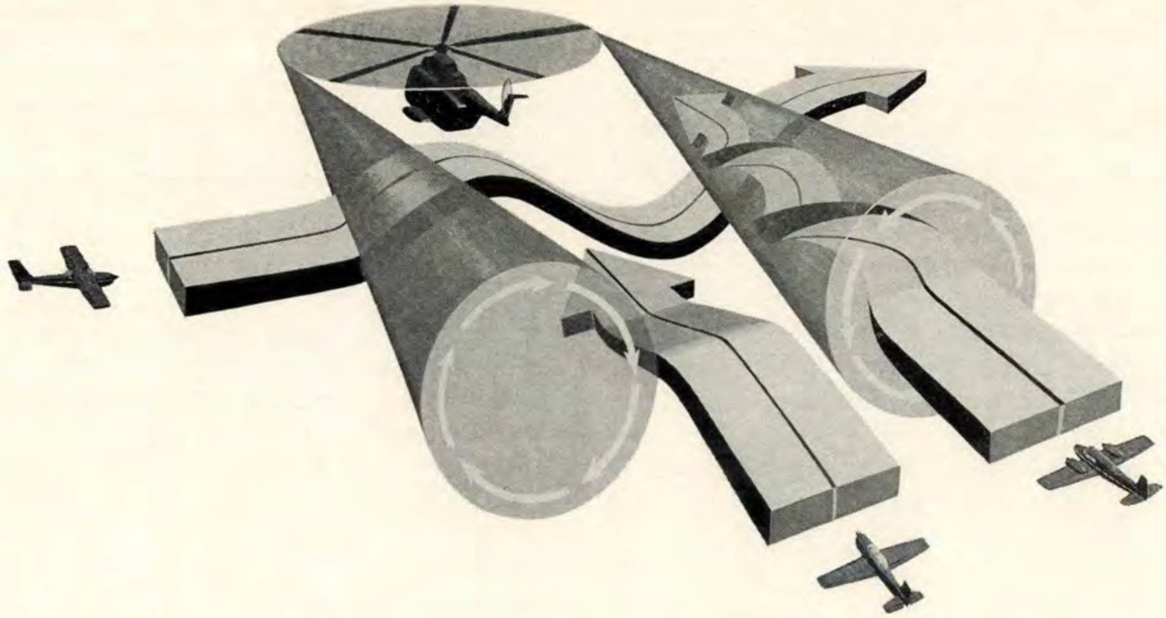


Figure 2. Penetration modes: cross track, along track between vortices, along track through vortex center. Each mode presents certain hazards to penetrating aircraft.

not experience much increase in load due to pilot reaction. Thus, the conditions under which this mode can be dangerous appear to be largely limited to the case of a light plane crossing the wake of a larger aircraft within about a minute after passage. Such encounters could be avoided by any measure which would ensure that the altitude of the light aircraft at the point where it crosses the track of the larger aircraft is at least as great as that of the large aircraft at the same point. Because of the downward drift or settling of the vortex field, this procedure would provide a substantial clearance for the light aircraft.

The second mode of penetration (along-track between vortices) would most likely occur during takeoff climbout, landing approach or formation flying. In this mode a downward flow would act on the penetrating aircraft and cause it to settle or at least reduce its rate of climb. This effect would diminish quite rapidly as the penerating aircraft is forced below the plane of the vortices. However, at very low altitudes it could be very dangerous with the airplane striking the ground before a recovery could be made. A greater hazard in this case is the possibility of the pilot stalling the aircraft in an effort to check the settling tendency. This particular vortex effect can persist up to two minutes after passage of the generating helicopter.

As was pointed out earlier, near the ground the vortices stop settling and begin to spread laterally. Winds can thus have a significant effect on the location of the vortex with respect to a takeoff and landing situation. Head winds move the vortices back toward the takeoff point; however, the lateral displacement tends to lessen the effects of a penetrating aircraft. Crosswinds, especially if light, are generally considered to be most detrimental. If the crosswind speed is equal to the lateral speed of the vortex, this vortex can remain in a fixed position above or on the runway until it is dissipated, causing very serious takeoff and landing problems which will be discussed below. In general, light crosswinds tend to increase vortex encounters close to the ground and decrease the chance of encounter at altitude.

A decrement in rate of climb results from penetrating midway between and parallel to a set of shed vortices. The decrement in rate of climb for various penetrating aircraft is largely independent of the weight of the penetrating aircraft. This would be expected if it is assumed that the rate of climb of the aircraft is the same relative to the vortex downwash as it would be relative to still air. Thus, the decrement in the rate of climb is equal to the vortex downwash velocity which is a function of the weight of the generating aircraft.

The third mode of penetration (along-track through the vortex center) would most likely occur during takeoff climbout, landing approach or formation flying. This peneration mode is perhaps the most dangerous of the three modes. The penetrating aircraft would be subjected to a rotational flow which would induce a rolling motion to the aircraft. The roll rate induced by the vortex is primarily dependent upon the vortex rotational velocity, time and penetrating aircraft size, and is essentially independent of the speed of the penetrating aircraft. This rate of roll available from the penetrating aircraft's lateral controls, however, is proportional to speed. Thus, the degree of controllability of the penetrating aircraft will strongly depend upon the separation time between the generating aircraft and the penetrating aircraft, with the rolling action decreasing quite rapidly with increasing separation time. Substantial lateral upsets are indicated for this mode of penetration at separation times of less than two minutes even for aircraft of equal weight. Recent tests involved a T-28 and an H-19, aircraft of approximately equal gross weights. When the T-28 passed 1000 feet behind and 200 feet below the H-19, a 36 degree per second roll was induced. The pilot had to use about 90 per cent of the total available lateral control in less than one half a second to stay nearly level. This could be very hazardous within 300 feet of the ground in a takeoff or landing especially for light aircraft. Although the upset would tend to be smaller for a large and heavy penetrating aircraft, the extent of the upset that could be tolerated is also less because of a slower recovery due to relatively higher inertias.

It should be pointed out that some of our conclusions on the effects of vortex encounters are based on assumptions with respect to vortex attenuation which are somewhat speculative and only partially supported by experimental results. Atmospheric turbulence and the effects of ground surface could cause more rapid weakening and disruption of the vortices, with less severe effects than noted above. In addition, the effects of a vortex encountered would diminish markedly with increasing distances above or below the plane of the vortex centers.

The possibility of vortex encounters with serious consequences are probably greatest in the landing and takeoff phases of flight operations. Here, successive departing or arriving helicopters and airplanes are constrained to flight paths in essentially the same vertical plane, and the disturbances of the penetrating aircraft would be more hazardous because of the nearness of the ground. One of the more hazardous conditions will exist under a light crosswind condition. If the crosswind speed is equal and opposite to the lateral spread rate of the vortex, it can become stationary and remain right above the runway until it dissipates. In general, crosswinds of four to six knots can cause such a situation to exist. Another of the more serious conditions is that of a missed approach or low-altitude flyby. Again light crosswinds will compound the problem and make it more serious.

CONCLUSIONS

In general, helicopter wakes are similar to wakes of fixed wing aircraft, and it follows that operational problems associated with wake encounter are similar. The lower operating speeds of helicopters, however, can result in higher intensity wakes and consequently more severe wake encounters. Although it has been shown that a rotor wake vortex encounter in flight can be a real hazard, such an encounter requires that the penetrating aircraft be in a certain limited spatial region at a certain time and under suitable atmospheric conditions. Such a combination of circumstances apparently occurs infrequently despite the frequency of high density traffic in terminal areas. Exposure to the rotor wake vortex hazard, particularly in the sensitive takeoff and landing operations, can be substantially reduced by suitable air traffic control procedures which emphasize appropriate sequencing and spacing of traffic and control of flight paths. Basically, the penetrating aircraft should be on or above the flight path of the vortex generating aircraft or have a separation time of at least one to one and one-half minutes if below the flight path of the vortex generating aircraft. The lighter the weight of the penetrating aircraft with respect to the generating aircraft, the more serious is the hazard to be expected. However, as a caution note, the vortex intensity of the helicopter rotor wake is a direct function of disk loading. Thus, helicopters with greater disk loadings will produce wakes of greater intensity at a given speed, regardless of size, and larger helicopters with the same disk loading produce wakes enlarged only in size. As one final note, pilots flying light observation aircraft should observe the above precautions with extra care, particularly when low and slow.

Although this report has not presented any details regarding problems associated with hovering helicopters, a brief review of the literature concerning helicopter downwash impingement research indicates that the following precautions for this type of operation should be noted. In general, helicopters should not be hovered closer than 1000 feet upwind of an active runway or operated at high thrust under no-wind conditions closer than three rotor diameters to other aircraft. A separate study is being initiated to more fully investigate the problems associated with the wakes of rotors at or near hover conditions. ★

the I.P.I.S. approach

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

JAFM 55-9 (TERPS)

JAFM 55-9 (TERPS) is here to stay. Military and civilian instrument approaches are rapidly being converted to meet the new TERPs criteria. As pilots, we are not held responsible for approach design; however, we are responsible for the information provided on approach depictions. Under TERPs, this information is provided in a slightly different format and, judging from the continuing questions, a review of the new format is in order.

The TERPs format is easily identified by the inclusion of aircraft categories. The pilot needs to know his own aircraft category and to understand the values of the information provided.

DH · RVR · HAT · CEILING · PREVAILING VISIBILITY

CATEGORY	A	B	C	D
S-ILS-27	360/24		200	(200 ½)
S-LOC-27	440/24		277	(300 ½)
S-TAC-27	480/24		317	(400 ½)
CIRCLING	520-1 357 (400-1)	620-1 457 (500-1)	620-1½ 457 (500-1½)	720-2 557 (600-2)

RUNWAY · MDA · HAA · CEILING

Runway. Indicates straight-in, type approach, and the numbered runway. The S for straight-in has been most questioned.

Decision Height (DH). An MSL altitude at which a missed approach will be initiated when visual reference with the runway environment has not been established. DH applies only to precision approaches.

Minimum Descent Altitude (MDA). The lowest MSL altitude to which descent is authorized until the runway environment is in sight. MDA applies only to non-precision approaches.

Note the distinct difference between the meanings of MDA and DH. Attempts to combine the two terms in one definition have caused confusion. AFR 60-27 contains the exact definitions, and the May 1968 "IPIS Approach" article offered further clarification.

Runway Visual Range (RVR). The horizontal visibility value electronically measured down the runway from the approach end. RVR, when available, will be reported in feet and will be used in lieu of the prevailing visibility for straight-in approaches. In our example, the /24 indicates a requirement for 2400 feet RVR.

Height Above Touchdown (HAT). This value only pertains to precision approaches. HAT is the height of the DH above the touchdown zone (first 3000 feet of the runway). Touchdown zone elevation is shown on the airport diagram adjacent to the approach end of the runway for ILS approaches. This elevation can never be higher than the published field elevation.

Height Above Airport (HAA). For all non-precision approaches, HAA is the height of the MDA above the published field elevation. The field elevation is the highest point on any landing surface and is frequently higher than touchdown zone elevation.

HAT and HAA, in the past, have been designated for civil use only. This designation is erroneous. HAT and HAA are significant values for civil and military alike.

Weather. (200½) consists of a required ceiling and prevailing visibility. The ceiling is given in feet above the surface and *is the minimum ceiling value required to start the approach.* The ceiling value will always be at or higher than the appropriate DH/MDA. The prevailing visibility is the minimum visibility required to start a circling approach, or a straight-in approach when runway visibility is not available.

Now! Using our sample format, let's take a hypothetical T-39 pilot attempting to make an ILS approach to runway 27. The reported weather is: M2 + 3/8R-K, Runway 27 RVR 2400 feet.

Our example pilot knows he is flying a category C aircraft—which is depicted. (If your category type is not included in the minimum format, you cannot fly that published approach.)

Analyzing the weather, our example pilot finds he has the required 200 feet ceiling and 2400 feet RVR. He has the legal ceiling and visibility requirements to start the ILS approach. Note, the 3/8 mile prevailing visibility does not affect straight-in approach minimums when RVR is reported. The pilot may descend to an MSL altitude of 360 feet (DH) before making the missed approach or landing decision. At this decision height, he will be 200 feet above the touchdown zone elevation—which must be 160 feet. ★

one way

Lt Col H. W. Compton, USAF

SCRATCH two, an instructor and a student pilot, both valuable Air Force assets. The mission wasn't especially hazardous so what caused the accident? Maybe monotony played a part.

Gets kinda monotonous doing the same thing every day, even when it's something as exciting as flying a double barreled jet trainer. It's the same with all of the troops who fly local for a living, the duty instructor pilots, no matter what kind of machinery they drive. The reasons are many but common, I think, to all kinds and sizes of aircraft.

First, we must put ourselves in the IP's shoes. After you've been at it awhile you know the mission, the machinery, and the local area like the back of your hand. A few minutes to scan the student's training file and you know what's on the docket for the day, including the areas for special emphasis. You are making good use of the extra time you spent analyzing the results of the last mission. Now, you remember what he's having trouble with, if anything, and you instantly recall your intended plans for remedying his shortcomings. Next you must confront your charge, eyeball to eyeball.

You brief the student on what you expect of him on the forthcoming flight. The same question always arises about this point in such a discussion: "How can this important job ever get monotonous?"

Maybe a fellow has to work at it for a few years to answer this one;

ticket

but, take it from most any experienced instructor, routines make for ruts, and ruts make for complacency. Months and months of flying almost every day and encountering all sorts of hazardous conditions, induced by both humans and the elements, can easily lead to a "what the hell! I can handle almost anything" outlook.

What is the end product that can cause a fatal accident? For the mishap that started this discussion it was inflexibility. Did complacency cause the inflexibility? We'll never know for sure, but it's a damn good bet! The alternatives that could have saved this crew were there, but the instructor didn't take advantage of them; he got the mental equivalent of gun barrel vision, boxed himself in, and added himself and his student to the already long list of statistics. How'd he do it and where is the proof that a safe recovery could have been made? Well, friends, the labors of a group of experts referred to as an accident board have answered these questions. There wasn't any guess work in this one; it was all there in black and white.

Careful examination and exhaustive tests of the wreckage and available data definitely established that there were no aircraft mechanical malfunctions prior to impact. Both the instructor and the student pilot were fully qualified for the mission. The instructor was briefed on the weather in the airfield vicinity and in the general area; both existing and forecast weather were adequate for mission launch and recovery. After a routine takeoff they cruised along at low level trying to keep a cautious eye out for birds and light aircraft.

The weather rapidly deteriorated and they realized that mission accomplishment was impossible. Two other crews who launched about the same time and were flying the same route aborted and returned to home plate. The IP hedged on the established terrain clearance minimums and found himself in that old box, too close to the ground to maneuver safely and unable to stay out of the clouds. In most Air Force flying machinery we don't have the average bug smasher's alternative of landing on a country road or in a cow pasture. Of course, we never completely rule out forced landings on unprepared surfaces, but we move it to the very bottom of the list when the power plants are purring and the other essential parts are in good working order. While attempting to escape from this hairy dilemma he allowed the bird to enter an attitude from which recovery was impossible in the available space.

What happened? He waited too long to perform that most reliable of all weather escape maneuvers, the 180 degree turn. But! The one-eighty wasn't his only alternative. Having goofed with a capital "G," the time had come to swallow the pride and climb to a safe altitude. That's right! Go IFR on a VFR mission, obtain a clearance and make a safe recovery. Sure there would have been risks involved but the alternatives are not comparable in any way, shape, or form; who can compare the pleasures of a hot meal and shower to being dead. These risks can at least be minimized by using the knowledge of your position to fly in the direction which will expose you to the least amount of IFR traffic. Punishment; shame; ribbing; we can live these down in time if necessity demands, but nobody can justify the sacrifice of lives on the altar of pride or because of inflexibility. Most of us have been caught VFR and had to request an IFR recovery. It can happen almost anywhere in the world. Don't let it happen to you. Know the alternatives and use them when your rear gets caught in a crack. ★

GROUND ESCAPE

Maj Victor J. Ferrari, Jr., USAF, MC, and Robert H. Shannon
Directorate of Aerospace Safety

This article was based on a paper delivered at the 39th Annual Meeting of the Aerospace Medical Association. Technical publication will follow in Aerospace Medicine *at a later date.*

As more sophisticated aircraft enter the inventory they tend to bring with them more complex egress systems, which increases the problem of ground egress. For example, some systems may require as many as six to nine separate actions before the crewman can leave an aircraft on the ground completely unencumbered.

Problems encountered in emergency ground egress led to a study of Air Force experience for five years, in an attempt to define and analyze the factors affecting aircrews during such emergencies. During the study period, 1 Jan 1963-31 Dec 1967, there were 189 major aircraft accidents in ejection-seat equipped aircraft involving emergency ground egress. This represented 16 per cent of the total major accidents in these aircraft. More striking was the finding that, of all major accidents, those with emergency ground egress increased from 10 per cent in 1963 to 26 per cent in 1967. The number for 1967 was more than twice that of previous single years. There were 301 crewmembers involved in these accidents; 12 were fatally injured, 45 received major injuries, 8 received minor injuries. The 12 fatalities were directly attributable to egress difficulties. Ten crewmen received fatal burn injuries and two died from impact injuries when they ejected on the ground to escape severe fires. In the 45 major injury cases, 22 (49 per cent) were burn injuries and 23 (51 per cent) were non-thermal injuries.

Ninety three (31 per cent) crewmembers had difficulties in exiting the aircraft.

In order to evaluate ground egress difficulties, the following factors were investigated: aircraft model, phase of flight, occurrence of fire, personnel injury data, egress difficulties, psychological reaction of crewmembers, and effect of training on egress performance. For the purpose of this study, only those persons whose crew stations withstood impact forces were considered.

PHASE OF FLIGHT

The distribution of emergency ground egress occurrences by phase of flight disclosed that the majority, 231, were associated with the landing phase. These included accidents that occurred on landing and those in which inflight emergencies necessitated subsequent crash/emergency landings. Fifty-eight were during takeoff and the remaining 12 during other phases of operation such as taxiing, engine runup, or after the aircraft had come to a stop.

The relationship of egress difficulties to phase of flight shows that 27 per cent of the personnel involved in the landing accidents experienced subsequent egress difficulties, as opposed to 50 per cent of the personnel involved in takeoff accidents. The reason for the higher incidence of egress difficulty in takeoff accidents is due in part to the rapid onset of the emergency which leaves little time for corrective action. Also, most of these cases involve loss of directional control or power failure too late to effect successful abort.

FIRE EXPOSURE

Fire is the most critical factor in a ground egress situation. This has already been demonstrated as the primary cause of fatalities and major injuries. The magnitude of this problem is evidenced by the fact that approximately 50 per cent of the personnel involved in ground egress accidents were exposed to fire. Significantly, the incidence of egress difficulties was twice as high when fire was present. This clearly demonstrates the adverse effect of psychological stress, such as fire, on the performance of a highly trained man.

DIFFICULTIES

The difficulties experienced during ground egress were quite varied. The largest single category was canopy/hatch operation which was reported in 30 (28 per cent) of the total cases. It should be emphasized that these were not the result of failure of the normal canopy/hatch function per se. Difficulty locating and actuating canopy controls and impact damage were primary cause factors. Other difficulties and the number of occurrences:

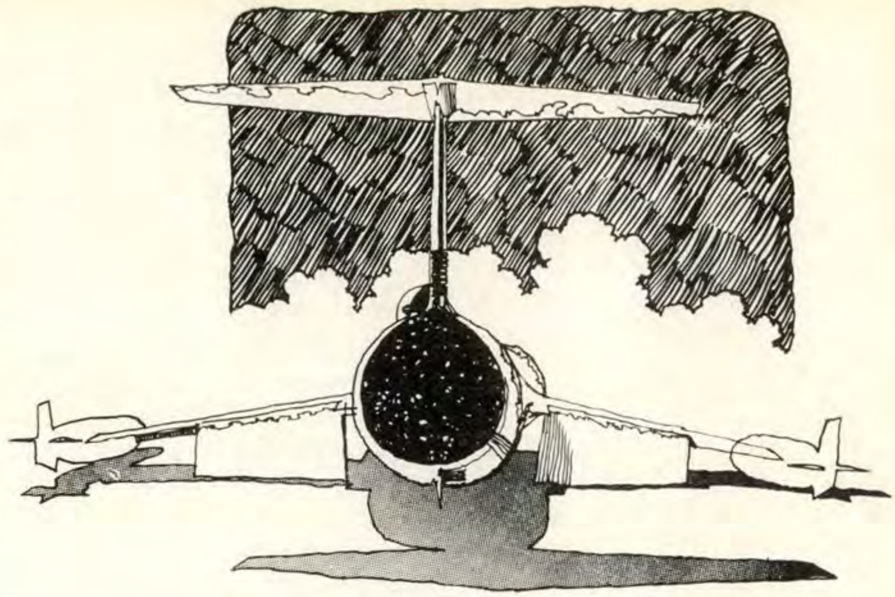
- Personal leads, 19
- Survival kit, 19
- Restraint system, 13
- Personal equipment interference, 13
- Injury, 9
- Other, 4

In most cases, the crewmembers experienced a single difficulty; however, 18 had multiple difficulties.

BEHAVIOR FACTORS

Behavior factors were categorized as *effective, degraded,* and *ineffective*. This was a judgment determination based primarily on the nar-

GROUND ESCAPE



rative description of events. The numbers were relatively small since there has been no emphasis on the reporting and recording of these factors until quite recently. In spite of the small numbers, they graphically illustrate the consequences of adverse behavioral reactions. In 19 cases, it was determined that *degraded behavior* was evident, and in 7 cases totally *ineffective behavior* ensued. Fire was present in 13 of the *degraded behavior* cases and all of the cases involving *ineffective behavior*. Fire undoubtedly was a major factor. Ineffective behavior contributed to at least one of the burn fatalities and both fatal ground ejections. In the ejections, it is believed the crewmembers ejected to escape the fire while the aircraft was stationary. Four other crewmen involved in these accidents survived.

In the majority of the cases, training compatible with the current state of the art in ground egress procedures and equipment was evident. However, as with behavior, training factors were not routinely reported, so the role of training was a judgment determination. We attempted to identify those cases where good training was evident and prevented injury and those where the lack of training possibly contributed to injury and death.

There were 39 definite cases found through this evaluation where the crew exhibited deficient training that could have resulted in a greater number of injuries or deaths had severe fire occurred. This is substantiated by the fact that deficient training was definitely indicated in eight of the injury/death cases.

The role of personal/protective equipment and fire suppression devices in ground egress accidents was also studied. These factors will not be detailed here but, generally, it was apparent that fire retardant materials for clothing as well as personal equipment are necessary to reduce the severity of burn injuries in accidents involving fire. Failure to wear available equipment and premature discarding of equipment before ground egress was a contributing factor in the incidence of burn injuries. It was obvious that fire suppression devices alone cannot be relied upon in the prevention of burn injuries and fatalities in ground egress accidents involving fire. The availability of necessary equipment and the time required to respond are limiting factors. There must be continued emphasis on a rapid ground egress capability.

The following case histories illustrate the basic types of behavior observed in emergency ground egress situations.

An example of *effective behavior* under extreme adverse conditions involved a prelanding cockpit fire. The pilot successfully landed the aircraft in spite of intense heat and smoke. After landing, the LOX bottle ruptured converting the fire to blast furnace intensity. The pilot attempted to leave the aircraft but was trapped by his foot restraints. He forced himself to sit back down in the fire and cut himself free. He left the aircraft after having suffered major thermal injuries. This fire was so intense it melted the parachute, which ran down the pilot's legs into his boots, causing most of his injuries.

A classical case of *degraded behavior* involves a highly experienced F-102 pilot. On an ORI scramble, the aircraft caught fire during the starting procedure. After the pilot failed to exit the aircraft, the crew chief replaced the ladder to assist him. In his confusion, the pilot had accomplished everything to effect egress except lap belt release. Upon later questioning, he could not explain having overlooked this basic and vital step. Only the quick thinking of the crew chief prevented possible serious injury to the pilot.

Totally *ineffective behavior* contributed greatly to a fatality. In this case, an aborted takeoff resulted in a major accident involving catastrophic fire. The pilot opened the canopy, removed his helmet, stood up and attempted to jump over the side. He was probably restrained by the leg strap of his chute. He screamed, fell back into the cockpit, and was not observed to make further egress attempts. The RO exited the aircraft wearing his helmet and chute and received only second degree burns to hands and buttocks. The severity of the fire in this case was not as great as in the first case which was an oxygen-fed fire located between the man's legs. It is obvious that, confronted with the psychic stress of fire and faced with a single failure in the escape process, this man experienced a psychologic incapacitation and died.

A category of behavior not previously discussed, but evident in many situations, is the tendency of pilots in a post-crash environment to revert to former reflex habit patterns. An example of this is the first major accident in an F-111 in which the pilot refused to pull the emergency quick disconnect handle because it was identical in size, shape, color, and location to the ejection actuation handle in the aircraft he was most familiar with.

TRAINING

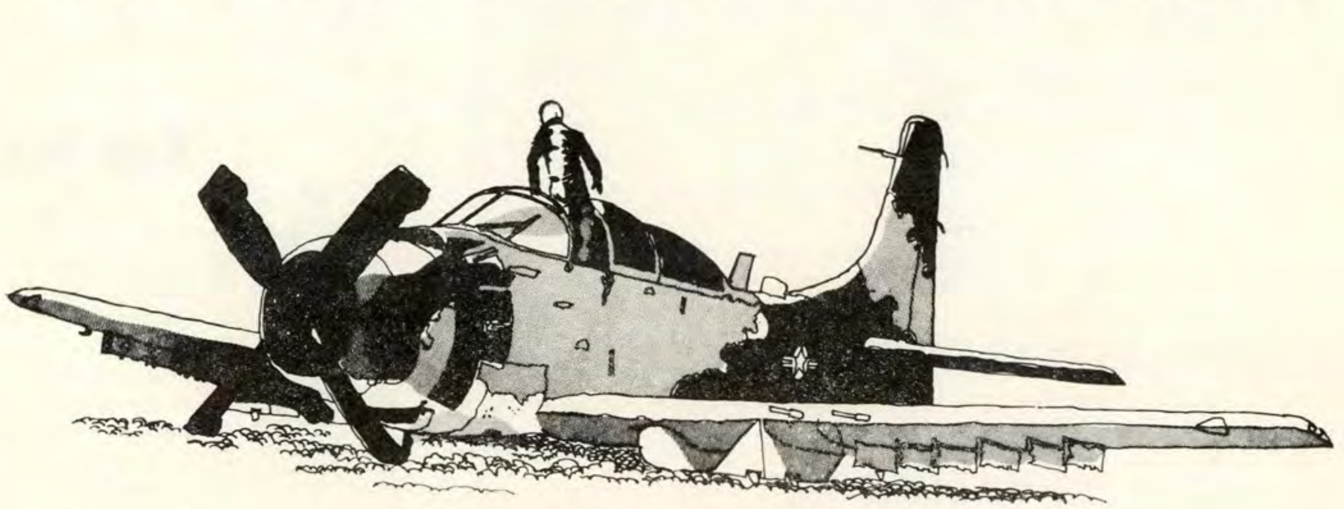
Having defined the major types of behavior problems seen in our population, we now turn to an evaluation of training factors and their interrelationship with human behavior.

Egress training in the USAF has two major components: First, crewmen are taught the design and function of egress equipment to provide them with an understanding of the basic procedures and the ability to trouble-shoot malfunctions. Second, they receive initial and recurring training in egress simulators which develops correct reflex habits. The major problem in egress training results from the transition from one weapon system to another, because of the great diversity of egress systems. In this situation, the crewmember must first unlearn his former reflex habits, then build a new set.

Experience in the laboratory shows that retrained animal and human subjects often revert to former habit patterns when subjected to sudden stress. This phenomenon is amplified by increasing the complexity of the task. This has been vividly demonstrated in accident experience. One advanced weapon system involves as many as four options. These options require eight separate actions for canopy removal, egress with parachute, egress without parachute, and survival kit. Looking at the difficulties encountered with this particular weapon system, it was found that during one period this aircraft accounted for 58 per cent of the egress difficulties in all aircraft. This was in spite of the most intensive ground egress training program devised to date. This clearly demonstrates that the major factor in the design of egress systems is man's psychophysiologic capability.

To sum up, the following factors are evidenced in USAF accident experience:

- Man's performance capability deteriorates with increasing psychic stress, e.g., fire.
- There is a definite correlation between performance decrement and injury.
- There is a definite relation between human behavior patterns in an emergency ground egress situation and the unique problems of egress training.
- Man's psychophysiologic capability to perform in extremely hostile environments must be considered the most important parameter in egress system design.
- The chances of egress difficulties increase dramatically with an increase in the decisions and actions which a pilot must make to effect a successful emergency egress.
- Egress system R&D must minimize the options and actions required for emergency egress. ★



USAF SAFETY

Secretary of the Air Force Safety Trophy

Pacific Air Forces

Best overall accident prevention program of all major commands with a military strength of 15,000 or more personnel.

The well defined and effective accident prevention program of the Command fostered outstanding accomplishments in all areas of safety as reflected by significant reductions in aircraft, missile, ground, and explosives accidents. Eighty per cent of the 1.6 million hours flown in 1967 were in direct combat and combat support. The command overcame severe limitations of adverse weather and terrain, annual rotation of personnel in Southeast Asia, and the environment and austere facilities of forward operating bases. Strong command leadership and superior team work of aircrew, maintenance, and support personnel were responsible for conserving lives and materiel, thereby contributing substantially to the combat capability of the USAF in Southeast Asia.

Alaskan Air Command

Best overall accident prevention program of all major commands with a military strength of less than 15,000 personnel.

The aggressive accident prevention program of the Command achieved a zero accident /incident rate in the missile, explosives, and nuclear categories. In addition, ground accident losses were reduced significantly as was the number of private and government motor vehicle accidents. It is particularly noteworthy that the Command had not experienced a mishap involving munitions in over two years. Command emphasis on safety requirements, as well as safety management from the major Command level down through all echelons resulted in many achievements in accident prevention. In view of the environment in which operations in the Alaskan Air Command are conducted, the record of accomplishments was outstanding.

Colombian Troph

35th Tactical Fi

For its meritorious ac
Tactical Fighter Wing,
of this award. The 35th
411 combat sorties with
aircraft, the unit achie
many adverse factors in
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Daedalian Flyin

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accident rate in the con
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Koren Kolligian

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Major Stocks distingu
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Stocks was the lead pilo
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a rendezvous with a pos
aged aircraft several hun
successfully recovered.

AWARDS FOR 1967

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...ghter Wing

...ievements in flight safety in 1967 the 35th ...han Rang AB, RVN, was selected winner ...FW flew more than 45,000 hours and 28,- ...out a major aircraft accident. Flying F-100 ...d an outstanding safety record despite the ... the Southeast Asia theater such as combat ...ilities, high personnel turnover and hostile

...g Safety Trophy

...mand

...nd, for achieving the lowest major aircraft ...mmand's history, was the 1967 recipient of ... During the period of the award ATC air- ... million hours and made in excess of three ...or aircraft accident rate of 2.0 per 100,000 ...the third consecutive year in which ATC ...te.

..., Jr., Trophy

Stocks

...ished himself by extraordinary achievement ...erial flight on 19 November 1967. Major ... in a flight of four F-105F aircraft attempt- ...dar controlled defensive weapons. Both his ...ft were severely damaged by enemy surface- ...r Stocks sustained severe wounds in his left ... to the wingman's aircraft made an engine ...ite his incapacitation, Major Stocks escorted ...il-out area and provided protective air cover ...rcraft arrived on the scene. He then flew to ...t-strike tanker, refueled, and flew his dam- ...dred miles back to his home base where he

Chief of Staff Individual Safety Trophy

Col Philip Karas

As Director of Safety, Headquarters, Seventh Air Force, RVN, in 1967, Colonel Karas contributed significantly to the Air Force safety effort by planning, organizing, and implementing the Seventh Air Force accident prevention program which resulted in dramatic improvements in flight, missile, ground, and explosives areas. Under his leadership commanders and staffs insured that such pressing problems as landing under adverse weather conditions, substandard airfields, inadequate facilities, and midair collisions were aggressively attacked. Colonel Karas was to a large degree responsible for the reduction in the Seventh Air Force major aircraft accident rate from 12.5 in 1966 to 5.3 in 1967.

Colonel Karas' outstanding accomplishments as Director of Safety conformed to the high standards established for the Chief of Staff Individual Safety Award.

Col James A. Wilson

Colonel James A. Wilson was awarded the Chief of Staff Individual Safety Award in recognition of his contributions to safety during his tenure as Commander, 35th Tactical Fighter Wing, Phan Rang AB, RVN, in 1967. Under his leadership, the 35th Tactical Fighter Wing achieved one of the most outstanding safety records in the Air Force. The Wing's noteworthy accomplishments in operations and maintenance in a combat environment earned the Colombian Trophy for its flight safety achievements in 1967.

Colonel Wilson demonstrated the highest standards of professionalism in welding all units under his command into a viable combat force. He actively participated as an aircrew member in combat missions, and manifested his intense personal interest and participation in and support of the unit's safety effort.

Colonel Wilson's outstanding accomplishments as a commander conformed to the high standards established for the Chief of Staff Individual Safety Award.

Flight Safety Awards

For meritorious achievement in Flight Safety, Calendar Year 1967.

AAC • 17th Tactical Airlift Squadron, Elmendorf AFB, Alaska

ADC • 408th Fighter Group, Kingsley Field, Oregon
• 62d Fighter Interceptor Squadron, K. I. Sawyer AFB, Michigan

AFSC • Air Force Missile Development Center, Holloman AFB, New Mexico

ATC • 3646th Pilot Training Squadron, Laughlin AFB, Texas
• 3501st Pilot Training Squadron, Reese AFB, Texas

AU • 3800th Air Base Wing, Maxwell AFB, Alabama

HQ COMD. USAF • 1001st Helicopter Squadron, Bolling AFB, Washington, DC

MAC • 61st Military Airlift Wing, Hickam AFB, Hawaii
• 89th Military Airlift Wing, Andrews AFB, Maryland

PACAF • 35th Tactical Fighter Wing, Phan Rang AB, Republic of Vietnam
• 20th Tactical Air Support Squadron, Da Nang AB, Republic of Vietnam
• 374th Tactical Airlift Wing, Naha AB, Okinawa
• 37th Tactical Fighter Wing, Phu Cat AB, Republic of Vietnam
• 602nd Fighter Squadron, Udorn RTAFB, Thailand

SAC • 4258th Strategic Wing, UTAPAO RTAFB, Thailand
• 93rd Bombardment Wing, Castle AFB, California

TAC • 64th Tactical Airlift Wing, Sewart AFB, Tennessee
• 16th Tactical Fighter Squadron, MacDill AFB, Florida
• 1st Air Commando Wing, England AFB, Louisiana

USAFE • 494th Tactical Fighter Squadron, RAF Lakenheath, UK
• 79th Tactical Fighter Squadron, RAF Woodbridge, UK

AFRES • 349th Military Airlift Wing, Hamilton AFB, California

ANG • 108th Tactical Fighter Group, McGuire AFB, New Jersey
• 134th Air Refueling Group, McGhee Tyson Airport, Tennessee

Missile Safety Awards

For meritorious achievement in Missile Safety, Calendar Year 1967.

Category I (Air-Launched Missiles)

AAC • 21st Composite Wing, Elmendorf AFB, Alaska

ADC • 13th Fighter Interceptor Squadron, Glasgow AFB, Montana
• 57th Fighter Group, Paine Field, Washington

PACAF • 12th Tactical Fighter Wing, Cam Ranh Bay AB, Republic of Vietnam
• 366th Tactical Fighter Wing, Da Nang AB, Republic of Vietnam

SAC • 410th Bombardment Wing, K. I. Sawyer AFB, Michigan
• 450th Bombardment Wing, Minot AFB, North Dakota

TAC • 4453rd Combat Crew Training Wing, Davis-Monthan AFB, Arizona

ANG • 163rd Fighter Group, Ontario International Airport, California

Category II (Ground-Launched Missiles)

ADC • 26th Air Defense Missile Squadron, Otis AFB, Massachusetts

PACAF • 498th Tactical Missile Group, Kadena AB, Okinawa

SAC • 351st Strategic Missile Wing, Whiteman AFB, Missouri
• 381st Strategic Missile Wing, McConnell AFB, Kansas

Category III (Units Launching Missiles—Test and Research)

AFSC • 6595th Aerospace Test Wing, Vandenberg AFB, California

SAC • 1st Strategic Air Division, Vandenberg AFB, California

TAC • USAF Fighter Weapons Center, Nellis AFB, Nevada

Category IV (Units Engaged in Research, Design, Development, and Other Supporting Activities)

AFSC • Air Force Western Test Range, Vandenberg AFB, California

the SADDEST words

SCENE: A hospital bed occupied by a man about 29 years old, a captain and Air Force pilot. A flight surgeon who knows the patient well has stopped for a chat.

DOC: I heard you were in here. What happened?

PILOT: Well, there was this accident—car, not plane. I got a little busted up, but I ought to be out of here in a couple more days. Gotta come back, though, for some plastic work on my face and to have some bridgework done.

DOC: Were you alone, or were the wife and kids with you? Tell me what happened.

PILOT: Yeah, they were along, but they didn't get hurt, thank God! As for the accident, well it was just one of those things. But you know me, Doc. I plan things, and I'm careful. That's what saved the rest of them. We were on our way to the river. You know I got that boat and I had a week off so we thought we'd run down there for a few days before the summer crowds hit. I had everything ready—spent a week getting the boat cleaned up, motor tuned, food, blankets, cooking tools, and all.

You know what a careful guy I am, Doc, and it's saved my bottom more than once. In fact, when I was in Vietnam and got shot down my planning for an emergency paid off. When I went to survival school I really concentrated—learned all they had to give us. In E&E I learned all the tricks. Then when I got in combat, I thought about what I'd do if I ever got into a real bind. When I went out to the airplane I knew I had my survival gear. I knew all my radios would work. The beeper was properly attached to the chute. I was ready for anything. Then I preflighted carefully. I'd get to the plane a little earlier than most guys, read the 781 carefully and ask questions if I wasn't sure of something. And when I walked around the bird I *really* looked at it. None of that kick the tire bit for me. Then, when the bird got hit and I had to leap out I knew exactly what to do. I had a plan in my mind, see. But that's a long story. Anyway, I was rescued in good shape, finished the tour and came here.

But to get back to the thing that put me in here. As I said, everything was planned to a gnat's eyebrow. We were set for a week of fun and sun and no worries. So, I got everybody lined up and ticked off their equipment—had a checklist I made up. Clothing, flashlights, life preservers, snake bite kit, first aid kit, sleeping bags—the whole nine yards. Then we loaded the wagon—everything in its place and easy to get at.

The day before, I got the car ready. Had the radiator checked, fan belts, tires pumped up, spare okay, jack, shovel—in case we got stuck in the sand, even some boards for the same purpose. The trailer hitch was okay and I made sure the boat trailer was ready to go. Doc, we were set.

Then I got the kids in the wagon. I got a rule—we don't close the doors until seat belts are fastened. I got the kids in and belted and the doors closed. Then the wife and I got in and I made sure she was belted in. I'd checked the house—doors locked, lights out, except one, neighbors notified to pick up the paper and when we'd be back.

Well, everything was going along fine. We had about 60 miles of freeway then got onto that two-lane road that winds back through the mountains, no sweat, the car purred, trailer's smooth. The kids went to sleep after about an hour.

Then, with about 40 miles to go, we went around a pretty tight turn that's blind because it's cut out of the mountain right there, and here came this guy sliding across the road right at us. There wasn't a thing I could do. On one side was the cliff and on the other a dropoff of a couple hundred feet. I slammed on the brakes but he hit us headon.

When I came to I was in bed in a little hospital out in the boondocks. I tell you, I hurt. Three broken ribs, banged up face and broken jaw, one leg felt like a truck had rolled over it.

When I realized where I was, I really flipped. Scared about the family, you know. But in a minute they all came in and not a one of them was hurt. Oh, they had a few bruises and my wife complained about her stomach hurting where the belt held her. But nothing serious.

DOC: I'm sure glad to hear that. But how'd you get it so bad?

PILOT: Doc, you won't believe it. Damndest thing. I was sitting on my cotton-pickin' seat belt. ★

STORM AVOIDANCE

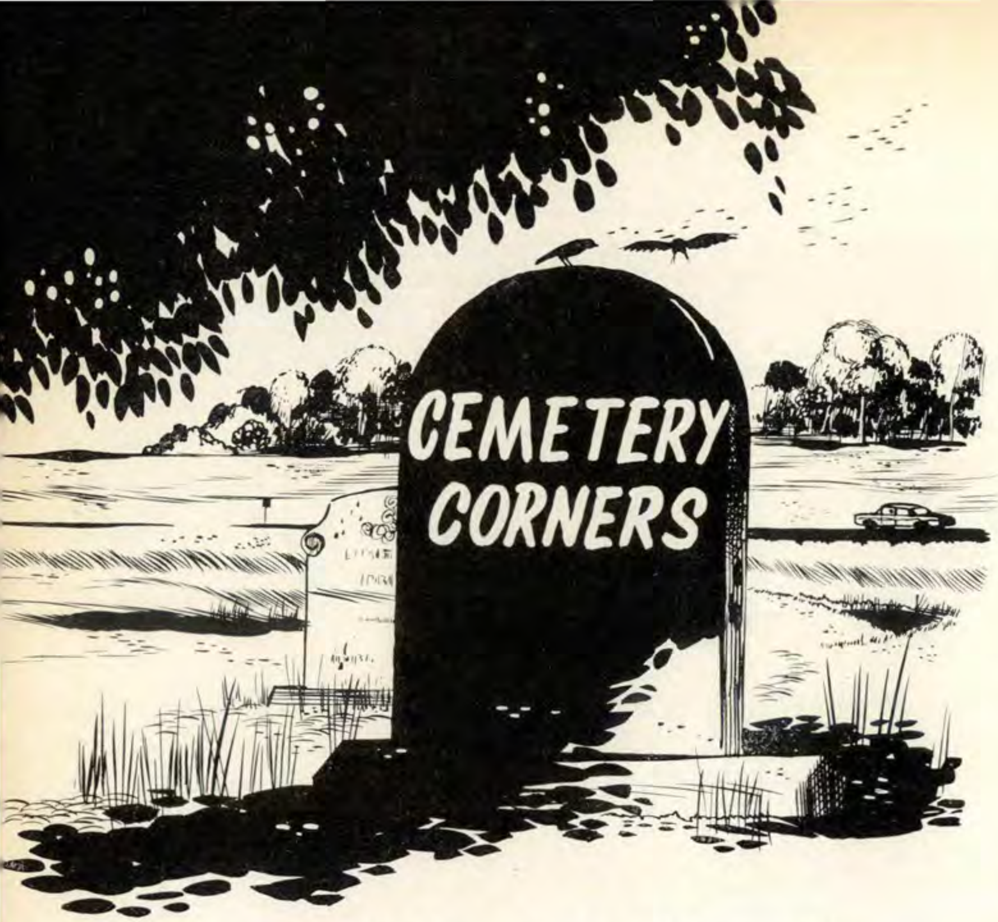
In the article "Eyeballing Storms," March issue, mention was made of United Airlines radar, hail, and turbulence avoidance procedures. Using these, UAL had no hail encounters for a period approaching 12 years.

Unfortunately, there just wasn't space enough in that issue of "Aerospace Safety" for a detailed account of United's procedures. Since they have been so successful and Air Weather Service highly recommends them, the UAL procedures are presented here. ★

		Flight Altitude
No Radar or Radar Inoperative	By visual inspection of clouds, only the height, size, and exterior appearance give clues as to the hazards within. These characteristics do not provide unique indicators of severity and are not available if masking clouds interfere. Avoid by at least 10 miles any storms which have any or all of the following characteristics: taller than 30,000, large in diameter, anvil top, and growing rapidly. To gain more information on storms in the flight path, call military forecasters on Channel 13 or ask ARTCC for assistance. However, remember that ARTCC does not have weather radar and is limited in the weather information it can provide.	0' to 20,000' 20,000' to 25,000' 25,000' to 30,000' above 30,000'
Fan Beam Radar	Fan-beam radars are NOT designed to depict weather hazards. The width of the beam in the vertical produces a return which is not indicative of the actual conditions at flight level. A small intense storm could appear the same as a large weak storm, depending on the volume of the storm intersected by the beam. Therefore, the only useful information gained from this type of radar is the location of most storms which contain possible hazards. Some severe storms may not appear hazardous on the radar and others could be penetrated in complete safety, but no way of determining which have hazardous regions and which are safe can be indicated with this radar.	0' to 20,000' 20,000' to 25,000' 25,000' to 30,000' above 30,000'
Pencil Beam Radar Without Iso-Echo Contouring Circuitry	A pencil-beam radar projects a narrow cone of radiation quite similar in shape to the light beam from a flashlight. As the beam rotates it radiates in a thin disc through the atmosphere. The scope image is then a measure of the severity of the thin portion of the storm intercepted. Monitor long ranges on the radar to avoid getting into situations where no alternative remains but the penetration of hazardous areas. Avoid flying under a cumulonimbus overhang, whenever practical. If such a flight cannot be avoided, tilt the radar antenna full-up occasionally, to guard against a fresh shaft of hail falling suddenly from the overhang.	0' to 20,000' 20,000' to 25,000' 25,000' to 30,000' above 30,000'
Pencil Beam Radar With Iso-Echo Contouring Circuitry	Iso-echo circuitry on a pencil-beam radar cuts off the signal to the scope when it is above a set value. This produces a hole in a strong echo when the central portion of a storm causes the signal to be greater than the set value. A strong gradient is seen as a narrow band between the no-echo region outside the storm and the hole in the center of the storm. Monitor long ranges on the radar to avoid getting into situations where no alternative remains but the penetration of hazardous areas. Avoid flying under a cumulonimbus overhang, whenever practical. If such a flight cannot be avoided, tilt the radar antenna full-up occasionally, to guard against a fresh shaft of hail falling suddenly from the overhang.	0' to 20,000' 20,000' to 25,000' 25,000' to 30,000' above 30,000'

RECOMMENDED FLIGHT PROCEDURES IN THE VICINITY OF SEVERE STORMS

Height	Shape	Intensity	Gradient of Intensity	Rate of Change
	Avoid any storm by 10 miles which is tall, large, growing rapidly, or has an anvil.	The intensity of the storm can only be estimated by exterior characteristics.	No way to determine visually.	Rapidly growing storms shoul be avoided by 10 miles.
	Same	Same	Same	Same
	Same	Same	Same	Same
Maintain a minimum clearance of 5000′ from the visible top of a cloud. If the storm is growing rapidly, increase this distance.	Same	Same	Same	Same
This radar cannot be used to determine the height of a thunderstorm.	The shape depicted is a composite of all regions of the storms intersected by the beam and has little meaning. Avoid all echoes by 10 miles.	The intensity depicted is the average intensity of the volume intersected by the beam and has little meaning. Avoid all echoes by 10 miles.	This radar has no way of measuring gradients.	Avoid all echoes by 10 miles.
	Avoid all echoes by 10 miles.	Avoid all echoes by 10 miles.	Same	Avoid all echoes by 10 miles.
	Avoid all echoes by 15 miles.	Avoid all echoes by 15 miles.	Same	Avoid all echoes by 15 miles.
Since the height cannot be determined by radar, clear the top of the storm visually by 5000′ as a minimum. If the storm is growing rapidly, increase this distance.	Avoid all echoes by 20 miles.	Avoid all echoes by 20 miles.	Same	Avoid all echoes by 20 miles.
	Avoid by 10 miles echoes which have hooks, fingers, scalloped edges, or other protrusions.	Avoid by 5 miles those echoes which have strong intensities and sharp edges.	This radar has no way of measuring gradients.	Avoid by 10 miles any ech which is changing shape, heigh or intensity rapidly.
	Avoid all echoes by 10 miles.	Avoid all echoes by 10 miles.	Same	Avoid all echoes by 10 miles.
	Avoid all echoes by 15 miles.	Avoid all echoes by 15 miles.	Same	Avoid all echoes by 15 miles.
Maintain a minimum vertical separation of 5000′ when flying above an echo. If the storm is growing rapidly, increase this distance.	Avoid all echoes by 20 miles.	Avoid all echoes by 20 miles.	Same	Avoid all echoes by 20 miles.
	Avoid by 10 miles echoes which have hooks, fingers, scalloped edges, or other protrusions.	Avoid by 5 miles any echo which has strong intensity denoted by an iso-echo hole cut in the cloud echo and sharp edges.	Avoid areas of echoes by 5 miles which have strong gradients of intensity. Areas of weak gradients can be flown through if necessary.	Avoid by 10 miles echoes whic are changing shape, height, c intensity rapidly.
	Avoid all echoes by 10 miles.	Avoid all echoes by 10 miles.	Avoid all echoes by 10 miles.	Avoid all echoes by 10 miles.
	Avoid all echoes by 15 miles.	Avoid all echoes by 15 miles.	Avoid all echoes by 15 miles.	Avoid all echoes by 15 miles.
Maintain a minimum vertical separation of 5000′ when flying above an echo. If the storm is growing rapidly, increase this distance.	Avoid all echoes by 20 miles.	Avoid all echoes by 20 miles.	Avoid all echoes by 20 miles.	Avoid all echoes by 20 miles.



Lt Col Karl K. Dittmer, Directorate of Aerospace Safety

GROWING old ain't all bad. When work is a little slow around the office you can always lean back and think about some of the things that turned your hair grey or caused it to fall out. Then, too, you can always dampen youthful conversations by making some statement like: "Shucks, I remember back when Highway 66 was a dirt road."

I can, too. It went by our house and I remember when they paved it. Half a mile to the east they took the pavement across the Rock Island tracks and bent it south around the cemetery. The turn went about 110 degrees and was sharper than it looked. We called it the cemetery corner and it was a fitting name. For some years the experts considered that corner the most dangerous piece of highway in the nation and we were sorta proud of it. Despite huge warnings signs and flashing lights, the ambulance would go by sometimes once or twice a week to collect the victims of that stupidly engineered corner.

We've had a lot of corners like that in aviation, too, We've treated 'em much the same. We post warnings and hope everyone will heed 'em and not get hurt. But show me any item that consistently shows up in safety publications, or must be repeatedly stressed in the classroom, and I will show you a cemetery corner.

Back when I was going through basic—here I go again—they had a cockeyed system for altimeter settings. Ask for one thing and the guy in the tower would give you the altimeter setting we use today. This we used once we were enroute. But leaving traffic or during a recovery we used another setting. This setting gave you altitude above the field and is still in use in some European countries. The system leaves the pilot wide open to error and they spent a lot of time warning us about it in those days. Despite this emphasis, the only fatality we had at basic was when an instructor flew into the ground trying to make an instrument approach. He had the wrong setting cranked into the window. I understand that in countries using this system accident teams start almost every investigation searching for the altimeters. They know a cemetery corner when they see it but seem reluctant to build a new road to avoid it.

We got rid of a real bad cemetery corner when we junked the old radio compass and went to Omni and TACAN. The single frequency approach got rid of another. But we still choose to suffer along with others. To find them, all you need do is look though the safety posters, read this magazine and check the things they stress in the instrument schools these days.

How about Omni and TACAN radials? Have you ever found yourself holding southwest when you were supposed to be holding northeast? Why should the guy in the cockpit have to convert a radial to an inbound heading?

How about our good friend, the round-dialed altimeter? Hoo boy! There's a cemetery corner if there ever was one.

Then we have abort speeds, abort points and things like that. We could get instruments to tell us whether our takeoff acceleration was normal or adequate for the runway available. But that would insult our professional ability. Or would it? We are just starting to discover the value of good angle-of-attack indicators, although excellent systems have been in existence for over a decade.

In the next few years we will be asked to cut the accident rate even though we've managed to get it down to a level that would have been considered rock bottom some years back. To succeed, we'll have to get rid of every cemetery corner we can find—even those we think we've learned to live with. ★

Missilanea

SAFETY PAYS: A 1968 AUTOMOBILE — — —

The ability to identify safety violations pays handsome dividends in the 308th Strategic Missile Wing, Little Rock AFB, Arkansas.

As a means of emphasizing the Wing's accident prevention program, safety technicians stage a different missile maintenance task each month which subtly depicts numerous safety violations. The staged activity is then photographed and distributed throughout the Wing. All personal are asked to identify the safety violations in this photograph. Entry forms are reviewed by the Wing Safety Division and a safety contest winner is selected. If it is established that the winner has practiced excellent safety standards, his reward will be a 1968 automobile for his personal use for one month.

Readers may test their skill by identifying the safety violations in the picture taken on silo level 3 of a Titan II complex. ★

Maj Kenneth H. Martin
Directorate of Aerospace Safety

(Answers on page 23)

ESTABLISHING RESPONSIBILITY FOR SAFETY

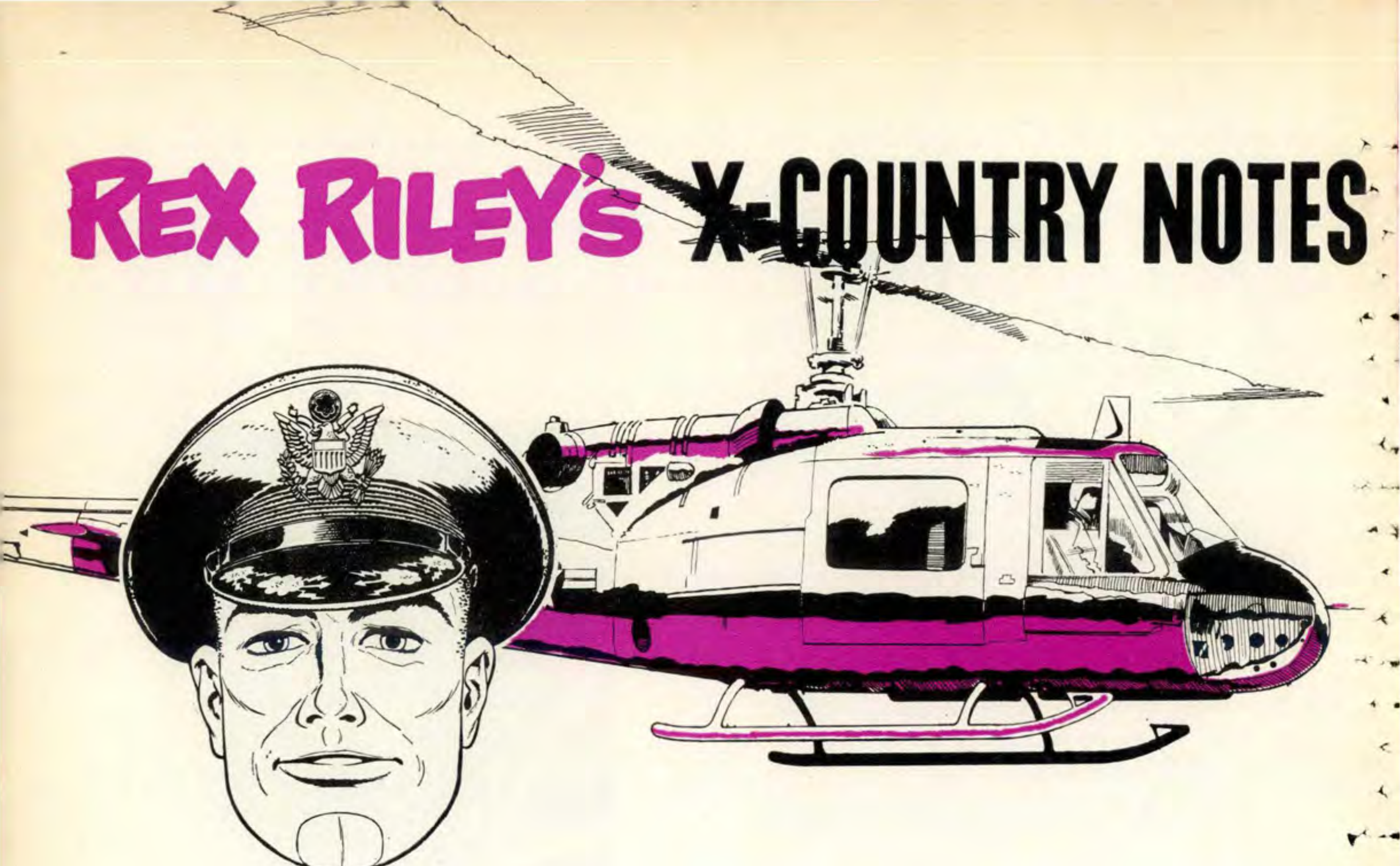
ESTABLISHING RESPONSIBILITY FOR SAFETY — Commanders, particularly those who are newly assigned, sometimes believe that, because they have an experienced safety director on their staff, they can "wash their hands" of all responsibility for safety and get on with their main business of running operations and maintenance. Nothing could be farther from the truth.

The only way to achieve and maintain a safe operation is to place responsibility for safety on an equal status with responsibility for operations, maintenance, training and logistics. Whenever the responsibility for maintaining a safe operation is relegated to the position of a frill that can be attended to only after the more important objectives of daily operations are achieved, accident rates will become excessive and will remain so until line management at all levels devotes adequate attention to accident prevention. If certain crew chiefs or mechanics are not released to attend a safety meeting because they cannot be spared from the flight line or missile complexes, the safety effort will suffer. If work order requests to design and install equipment safeguards are put aside indefinitely because Base Civil Engineering has more "important" work to do, again, the safety program will deteriorate. In short, the basic responsibility for accident prevention rests with line management. It starts with the commander and goes vertically downward through the entire hierarchy to the airman actually performing a task.

What then does the Safety Director and his staff do? Is he not responsible for safety? Yes, the Director of Safety bears very important responsibilities for accident prevention but he serves in a staff, not a line capacity. The Commander establishes the safety objectives of the organization; the Safety Director then insures, through coordinated staff actions, that line management proceeds toward accomplishing these objectives.

Therefore, the success of the organization's safety program can quite often be measured by the degree of personal interest and support rendered by the Commander—and, of course, last but not least, the alacrity of implementing the safety program by the Director and his staff. ★

Major N. A. Stater
Directorate of Aerospace Safety



THE AERO CLUB PILOT was airborne five minutes after engine start. Although the field elevation was more than 7000 feet above sea level, takeoff roll was computed to be 3300 feet of a 5300-foot runway. He used reflectors, which paralleled the first 2500 feet of runway, to help maintain directional orientation. When he passed the last runway reflector he transitioned to his gages and made an instrument takeoff because he thought the end of the runway was closer than it actually was. However, his haste to depart cancelled the possible value of this emergency maneuver because he had failed to allow enough warm-up time to insure reliable gyro flight instrument operation, 15-minute minimum according to the operator's manual.

After lift-off he attempted to level-off to build up speed and flew through a barbed wire fence. The resulting noise caused the pilot to think that he was having engine trouble and he returned for a landing with no further difficulty. Damage was relatively minor and the incident could have been written off with no serious consequences to the pilot, except for one fact: he was carrying five unauthorized passengers. Expulsion from the club is the consequence that this pilot has to live with.

There are some excellent lessons to be learned from this one. First, know the field you are operating from and the necessity to transition to instruments won't come as a sudden shock. Second, any night operations may require frequent instrument observation to preclude spatial disorientation, so give those gyros time to warm up. Third, if you have any doubt about your ability to make a precision instrument takeoff, you'd better delay the flight 'til the next day and restrict your night operations to those times when moonlight enables you to see a horizon. Last, but definitely not least, don't carry unauthorized passengers. Aero clubs have a hard enough time keeping their heads above water without this type of flagrant rule violation.

REUNION: CBI PILOTS — The 23d Annual Reunion of the China, Burma, India-Hump Pilots Association will be held on August 23-25, 1968, in the Kings Inn, Crockett, Texas. Contact Herb Fisher, Aviation Dept., The Port of New York Authority, 111 Eighth Ave. New York, N.Y. 10011. Phone (212) 620-8396.

VALUE OF VISORS — Once again a birdstrike has shown the value of having the helmet visor down. An RF-4C struck a bird which shattered the windshield and broke out both side panels. Because of the windblast and shattered windshield, the pilot was unable to land the aircraft so the IP in the rear seat took over and landed. Fortunately, the front seater had his visor down. It was struck and cracked by pieces from the side panels but the pilot wasn't hurt.

Then five days later a large bird struck the vertical stabilizer of a T-38. Damage was a four- by five-inch hole in the stabilizer leading edge. The student pilot saw the bird directly in front of the aircraft but didn't have time to evade it. The bird passed over the canopy or there might have been another fatal accident.

ALL BEFORE TAXI CHECKS WERE COMPLETED, THE CHOCKS out signal had been given by the pilot and relayed to ground by the marshaller. The chocks were removed and placed in a utility tractor, and the fire bottle was then hitched to the tractor. While the marshaller was walking farther to the front of the aircraft to improve his position, the big transport started moving forward. Simultaneously the tractor driver started moving from his position in front of the aircraft. The ground crewman who had just pulled the chocks shouted a warning to the tractor driver, who jumped from his seat and quickly departed the immediate area. The marshaller turned, saw what was happening, and signalled the aircraft to stop. Brakes were applied but too late. The left nose gear fairing door was damaged. Minor damage compared to what could have happened; lives could easily have been lost.

Causes: the pilot started taxiing before being given the signal; the marshaller didn't clear the area before signalling chock removal; the tractor was operated too close to a running aircraft in a location where view from the cockpit was limited. Come on, troops—SLOW DOWN AND LIVE. Don't waste all those careful preparations by rushing the final action.

HEAVY TRAFFIC CAUSED TOWER to refuse the C-130 pilot's request for a one-eighty on the runway, so he turned off onto a taxiway that doubled as a parking area. Progression was OK 'til they had to taxi between two parked aircraft, one on each side of the taxiway with noses facing the centerline. A security guard on the bird parked on the taxiing aircraft's right, held up his hands three to four feet apart. The copilot, taking this to mean that they had that much clearance, informed the pilot that they had adequate room on the right. In reality the guard was attempting to indicate that the aircraft should stop because there wasn't sufficient clearance. Well, you guessed it; a collision was the result.

The aircraft commander erred because he taxied through close quarters without qualified wingwalkers. Air crews cannot take it for granted that any one, or even most of the people on the ramp are qualified to give taxi guidance. Also, we must all realize that people on the ground want to help those in aircraft; it must be the natural thing to do. So, those responsible for posting security guards should at least make sure that these men know how to give a proper stop signal. Impress them not to try to judge clearances because it takes practice to be sufficiently accurate.

SAFETY DEFICIENCY ANSWERS

1. ELEVATOR DOOR OPEN.
2. WATCH AND JEWELRY WORN.
3. CHIN STRAP ON SAFETY HELMET UNFASTENED.
4. NO CANNISTER MASK.
5. NO TRANSCEIVER.
6. DO NOT OPERATE SIGN REMOVED, AND PENDANT NOT SECURED ON HS-2 ANNUNCIATOR PANEL.
7. NO TECHNICAL DATA SHOWN.
8. NO EAR PLUGS.
9. NO SAFETY LINES/HARNESS.
10. SAC TWO-MAN POLICY NOT COMPLIED WITH.

"BUT IT LOOKED OK TO ME" — How many times have you heard or read about a crewmember's saying those words? Chances are you've given many preflight items a cursory look and then wondered later if you'd forgotten them altogether; I have. A few weeks ago a T-Bird pilot made one of those windy, no-canopy landings that make flying extra exciting. Well, that brand of excitement is from the place called nowheresville and could have been prevented by a little more deliberation on the walk-around. The pilot failed to ascertain that the external canopy jettison lanyard access door was properly secured. It was unlatched, so the slipstream applied Bernoulli's Theorem, opened the door, dislodged the lanyard handle from the retaining clip and fired the canopy initiator.

As so often happens in aircraft incidents and accidents, other malpractices automatically surfaced as a result of the blown canopy. A parachute stowed in the rear seat left the seat and lodged between the rear seat headrest and canopy rail. Had the parachute deployed, the consequences might have been disastrous. The incident report suggested that if it is necessary to carry a parachute in an empty seat the chute should be tied down to the lap belt and shoulder harness. It further suggested that before anyone fabricates a chute container they contact ADC (ADMME-BA), since at one time they had such a container for carrying spare parts and/or an extra parachute. ★

YOUR OWN

BEST FRIEND

OVER the years the Air Force has been amazingly successful in reducing and, frequently, eliminating factors that cause aircraft accidents. But, as the man said, you can't win 'em all. The following account of an accident in which the aircraft was destroyed and the pilot severely injured bears this out.

The flight was a short one—50 nautical miles in an O-1G. The pilot took off at 2100 from one of the big RVN complexes to return to his home base, a small airfield primarily for Army helicopters from which he operated as a FAC.

The base isn't much when it comes to fixed wing aircraft. The runway, 1500 feet long and 60 feet wide, is covered by light steel matting in a poor state of repair. It is rough and highly crowned, making directional control difficult. The sides of the runway are formed by staggered sections of steel matting and the shoulders are not maintained in filled and leveled condition. Whoever laid it out either failed to consider the wind, or had more pressing reasons for aligning the runway, so that there is nearly always a crosswind.

The west side of the north half of the runway is lined with helicopter refueling points, with associated hoses and piping. A helicopter parking pad is situated on the east side of the south end of the runway, with revetments located within 80 feet of the runway centerline. Normally, a fuel truck was parked 1000 feet from the approach end and just 84 feet from the runway centerline. The control tower shuts down for the night and, according to the accident report, the field is considered unsafe.

This was the environment into which this pilot flew on the night of the accident. Weather at the time was generally good—at least six miles visibility, wind 110 degrees at 10 knots. The runway is aligned 17-35, so the usual crosswind prevailed, although this was not considered to be a factor in this mishap. The pilot had been operating from the base for quite a while and had had no trouble with the wind.

The report failed to state what the airfield lighting situation was, but apparently the pilot was using his landing lights.

When the pilot arrived at the field following a 50 minute flight, he set up a modified base leg approximately 45 degrees to the final approach to minimize exposure to ground fire. He turned final for runway 17 at about 300 feet AGL and lowered 15 degrees of flap. Normal crosswind procedure was used.

Immediately after touchdown directional control became difficult. Since he wasn't having any luck with his corrective efforts, he decided to go around. After it became airborne the aircraft began to drift to the right and at about 900 feet from the touchdown point, at approximately five feet in the air, it slammed into the aforementioned fuel truck. It then hit the ground and slid 144 feet before coming to a stop. The seat was thrown forward and the pilot struck the instrument panel which caused most of his injuries. With the help of a crew chief the pilot was able to get out of the wreckage.

Primary cause was attributed to pilot factor—failure to maintain directional control during landing and go-around. The condition of the runway and location of the fuel truck were listed as contributing causes.

This wasn't a spectacular accident. And certainly not as significant as many others. But it does point out some of the hazards that our aircrews have to deal with in a combat environment. Forewarned is forearmed, so recounting this accident may provide a bit of education for those who are on their way to SEA or will soon be going. You will find airbase facilities of almost every conceivable sort—from wide, two-mile slabs of paving to skinny little steel mats, or just plain dirt that gets mighty slick when it rains. There will sometimes be obstructions you have to operate around and both fixed wing and helicopter wash to deal with.

Most of these things you, as an individual, can't do anything about. But you can make sure that you know your aircraft and all its limits as well as your own. In the final analysis, you'll be your own best friend. Don't let yourself down. ★

WOULD YOU BELIEVE that a C-130, with engines operating at ground idle, could blow a light plane up on a wingtip even though it passed about 400 feet to the rear of the big bird. It happened the other day and resulted in an almost total loss of the bug smasher and a cut-up face for the pilot who was taxiing.

You troops who drive the "O" types and all you aero clubbers can use this as a rough guideline: 400 feet to the rear just isn't enough. Take that extra time to get where you're going and don't become another taxi accident victim. Give the monsters a wide berth because prop or jet wash on the ground can be almost as bad as wake turbulence in the air.

AERO CLUB — February Aerobits (page 27) carried an account of an incident involving a Navion L-17, or U-18. It said "In the Navion, the pilot must push the gear handle down and in at the bottom of its travel." An aeroclubber read the item, recognized that part of it was untrue and told us about it. He stated that you don't have to push the handle in at the bottom of its travel. He's absolutely correct; the T.O. says that the LOCK ASSY-LANDING GEAR CONTROL HANDLE falls in on top of the gear handle and prevents it from returning to the UP position until the lock is released. The item should have read "He pushed it down but not far enough." He didn't check for gear lights or warning horn. The club whose bird got dinged in this incident has a couple of Navions, and in both of them the gear handle must be moved very nearly to the bottom of the total downward travel before the lock assembly is effective and all the way down before it slips into the notch. Therefore, all club instructors and check pilots emphasize that the gear handles should be pushed all the way down and shouldn't be turned loose until it's in the notch at the bottom. The pilot in the cited incident was too cocky and not deliberate enough. That was the moral of the story!

THE FAA has taken delivery of the first of 88 "day light" radar displays for use by controllers in airport tower cabs. Ten additional units are scheduled each month during the initial purchase.

Daylight, or Bright Radar Indicator-Tower Equipment, uses a new cathode ray tube (BRITE-1) which has a far brighter picture than a standard TV set. A filter minimizes reflections from the display. BRITE-1 enables the controller to see traffic clearly in bright daylight, whereas conventional radarscopes require semi-darkness.

Use of BRITE-1 will reduce arrival and departure

delays and, connected to existing ASR, extend the controller's view of traffic in a radius of up to 60 miles. FAA expects to connect these systems to Terminal Radar Control automation equipment to provide alpha numerics in the tower cabs.

TECHNICAL ASSISTANCE FOR AIRCRAFT ACCIDENT INVESTIGATIONS — There is some confusion among aircraft accident investigators as to when technical assistance should be requested. Also, once it is determined that assistance is required, unnecessary delays often occur because investigators do not know how to obtain such support.

Attachment 2, AFR 127-4, states that if a materiel failure or malfunction occurs and the cause is not readily apparent, investigators should consider whether it is better to determine the cause through the teardown deficiency report (TDR) system, or to request technical help from the Air Materiel Area (AMA). This support includes the dispatch of technical personnel to the crash site, laboratory analysis of materiel and failed parts, special tests, and teardown evaluation of suspected items through the TDR system.

Technical Order 00-25-115 lists all AMAs and includes the aircraft and equipment for which they have system support management (SSM) or item management (IM) responsibility.

SACB 127-1, Hq SAC (DOSDF)

ABOUT FLASHLIGHTS—Placing flashlights close to aircraft magnetic compasses has been frequently discussed, but, apparently, it bears repetition. Case in point: A pilot was carrying his personal flashlight in the leg of his flying suit. While he was sitting in the normal position, the flashlight, which had a magnetic on-off switch, was located just aft of the right rudder pedal and about 36 inches from the magnetic compass. As the flight progressed the pilot noticed a 30-degree difference between the reading on the magnetic compass and the reading on the gyro compass. The deflection of the magnetic compass was caused by a local magnetic disturbance generated by the magnet on the flashlight.

This incident could have occurred as the result of habits established when using regular flashlights, capable of emitting small amounts of electrical and magnetic energy over a limited range. The type of flashlight involved in this incident, and those which have the magnetic attachment bar, hold far greater potential to release sufficient magnetic energy to affect compass indications, and pose a potential navigational hazard even when placed at a distance from the compass. We have suggestions:

- Don't use flashlights with magnetic parts or attachments.
- Keep your regular flashlight as far away from the compass as possible but still within your reach in case of emergency.

In the Air Force inventory there are many types of compass systems and many compass locations. But even in those aircraft which normally rely on remote indicating compasses, and use the cockpit magnetic compass only as a standby, the improper placement of a flashlight could cause a severe navigational error. ★

Lt Col Paul A. Bergerot
Directorate of Aerospace Safety

USAF AERO CLUB 1967 AWARDS

Thirty-two USAF aero clubs won FAA Flight Safety Award certificates for completing 1967 without an aircraft accident. The awards were presented by FAA Administrator William F. McKee in special ceremonies in Washington D.C.

Base Aero Club	Command
Otis AFB *	ADC
Oxnard AFB *	
Selfridge AFB *	
Suffolk County AFB *	
Tyndall AFB *	
Kelly AFB	AFLC
Det 1, AFSCF Aero Club	AFSC
Arnold AFS *	
Edwards AFB *	
L.G. Hanscom Field	
Patrick AFB *	
Los Angeles AFS	
Lowry AFB	ATC
Randolph AFB *	
Vance AFB *	
Webb AFB *	
McGuire AFB *	MAC
Barksdale AFB	SAC
Blytheville AFB	
Castle AFB *	
Davis Monthan AFB	
Westover AFB *	
Bergstrom AFB	TAC
England AFB	
Langley AFB	
Luke AFB	
McConnell AFB	
Shaw AFB *	
Eielson AFB *	AAC
Misawa AB	PAF
Bitburg AB *	USAFE
Bentwaters-Woodbridge RAF	

* These aero clubs also received the award for 1966.

Keep those cards and letters coming. Write: Editor, Aerospace Safety Magazine, AFIAS-E1 Norton AFB, California 92409.

SURVIVOR

Reference is made to the picture of the survivor on the forest penetrator, page 25 of the April issue. His right hand is in a good position to lose one or more fingers.

Here's a picture showing the proper position to assume. Note that position of arms is basically the same as when lifted with the sling. Note also the use of safety strap. The device used in this picture is called a "rescue seat," similar to a forest penetrator except that the seats do not fold up.

Thank you for your continued efforts to "get the word out."

Sgt Joseph Walenta
Instructor Rescue Specialist
Det 18, Central ARRC (MAC)
Little Rock AFB, Arkansas

Thanks for supplying the photograph showing the proper grip. The intent of the original, of course, was primarily to emphasize that rescuees should hold on tight until they are in the helicopter and not to let go in an attempt to help the rescuers. Incidentally, a safety strap is used but is hidden by the arm of the man being lifted.

FEBRUARY MAGAZINE

I finally got moved enough to write my first fan letter to a magazine. The occasion was prompted by the fantastically realistic cover pic on the February issue, plus the article "The IP" which appears on page 7 of the same issue.

First, the article. I have been an Instructor Pilot for ATC and TAC for the past five years. While Major Lawrence's fine article was, in his own words, "devoted to helicopter instructor pilots," I feel it is applicable to any IP, regardless of aircraft flown. Unless the supervisors responsible for selecting instructor pilots can conscientiously answer the questions posed by Maj Lawrence, the quality of the IP becomes jeopardized. When this happens, the quality of the end product—the student—also becomes affected. This, in an era when the Air Force needs only the most highly skilled craftsmen in its cockpits, simply cannot be afforded. It is not enough for a prospective IP to be just a good pilot. Because a man has the ability to fly an aircraft does not mean he has the ability to teach others to fly it. Both ATC and TAC, I'm happy to say, are aware of this and have established very adequate programs to insure a high standard of professionalism among their instructor pilots. The importance of the job and the tremendous responsibility resting on each IP's shoulders cannot be overemphasized. Fine articles such as Maj Lawrence's serve as a constant reminder of these facts. Keep them coming!

Now about the cover! It took many years for me to get into the F-4 and into combat but then for ten months I flew the most rewarding and exciting hours of my career. The cover pic brings back the tensions, the seeming unreality, the excitement of those missions into MIG country. I was privileged to fly with Col Robin Olds and his Wolfpack, the Eighth Tac Ftr Wing. Currently, I am serving with many former members here at George AFB, as an F-4 instructor. I'd sure like to have a copy of that cover pic—as I'm sure every F-4 jock would.

Here is a further thought: George is a training base for F-4 pilots. Most of our graduates become replacement phantom drivers for SEA. I feel the February cover pic would be a wonderful incentive for these trainees. Maybe we could have enough copies to hang in the pilot lounges for the four training squadrons? Speaking as one who has had several trips "downtown" it is an inspiration to me, and I've been there!

Well, again, congratulations for putting out the best magazine in the flying field. I started reading this magazine before it was AEROSPACE SAFETY 'way back when I was an enlisted GCA operator. Thanks for years of fine reading and keep up the good work. ★

Capt Richard E. Davis
68th Tac Ftr Sq
George AFB, CA 92392

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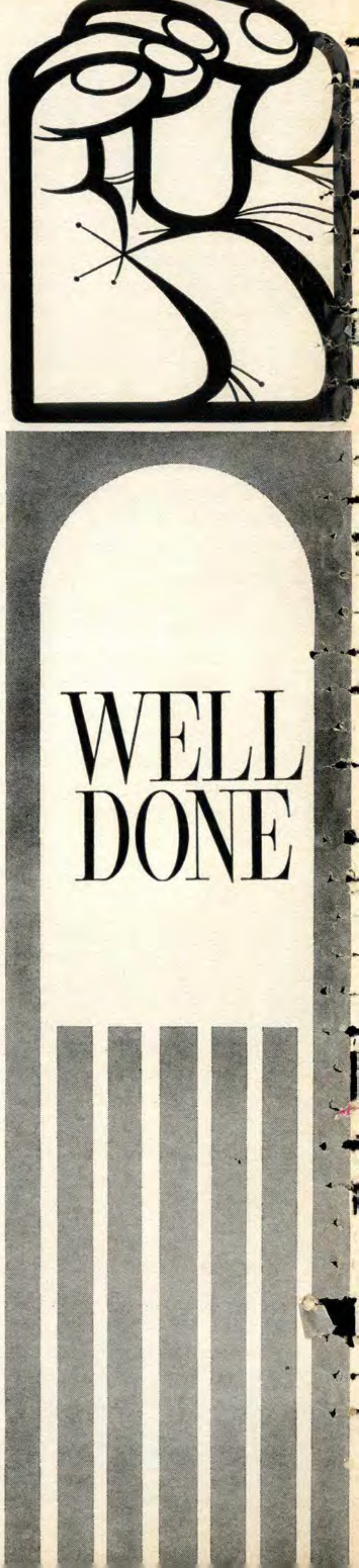

CAPTAIN
Alfred A. Brashear
4408 Combat Crew Training Squadron
Hurlburt Field, Florida

On 7 February 1967, while flying with two students in a C-123, the Instructor Pilot, Captain Brashear, experienced failure of a middle rudder bracket while descending on final approach in a simulated single engine configuration. With the rudder jammed well past full right deflection and bent in the shape of an elongated "C" that protruded on both sides of the vertical stabilizer, the aircraft became virtually uncontrollable and continued to descend in a sharp right turn. With no response from the emergency gust-locks release or the trim tabs, full power was applied to both engines resulting in a violent skid further to the right causing left wing down and serious loss of airspeed and altitude. At approximately 100 feet above the ground, when a crash was imminent, Captain Brashear reduced power and noticed that some semblance of control was returning. Applying power to the right engine, he leveled the aircraft in a shallow right turn with a slight increase in airspeed. Continued experimentation with differential power settings revealed that while aileron and elevator movement aggravated the situation, minimum safe airspeed and altitude could be maintained with power in a continuing shallow right turn. Well past Hurlburt Field by then, he realized his long arc of flight would take him quite close to runway 12 at nearby Eglin AFB. Lowering his gear for the second time, Captain Brashear flew the aircraft onto the runway at cruise airspeed in order to maintain directional control until touchdown. A combination of nose wheel steering, brakes and differential power were used to bring the aircraft to a safe stop.

Captain Brashear's quick evaluation and professional reaction to a very unusual and critical low altitude emergency averted certain disaster to the populated area in his flight path and saved a valuable aircraft and crew. WELL DONE! ★

CAPTAIN
Ronald D. Clisby
20 Tactical Air Support Squadron
APO San Francisco 96337

Captain Clisby demonstrated exceptional airmanship while flying an O-1E aircraft over North Vietnam on two separate occasions. While attempting to locate camouflaged AAA weapons on 20 May 1967 his aircraft was hit in the left wing by a 57 MM burst. The aircraft rolled to the left and commenced a dive. Aileron control was completely lost, the left flap was shot away and there was a large hole completely through the wing. Through skillful use of rudder and power, control was regained and an erratic flight started to home base. The pilot had been wounded and had to administer first aid to himself as he fought to maintain control of the aircraft. When he reached his home station he found heavy crosswinds on the sole runway; the crosswind far exceeded the maximum flight handbook limitation but no alternative existed. Captain Clisby skillfully manipulated rudder, power and elevators to make a safe landing.

Again when flying over North Vietnam on 5 June 1967 Captain Clisby's aircraft was hit by 57 MM fire. He discovered his engine was on fire when smoke started coming from the area around the right rudder pedal. The smoke became blinding and, with no oxygen system, he was forced to place his face into the wind stream so he could breathe and see. A landing was made at a marginal airstrip at a Special Forces Camp. At the last moment the pilot glimpsed a barbed wire barricade across the runway which he zoomed over only to discover on touchdown that his right brake had been shot away. Although the aircraft ground looped, enough control was exercised to preclude more damage.

Captain Clisby has twice demonstrated a cool, professional manner in the face of considerable adversity. His skill and technique as a pilot is clearly superior and justly deserves a WELL DONE! ★

POCKETFUL OF PROBLEMS

The new summer flying jacket pockets have no flaps. So it is possible to get the standard back pack D-ring into the pocket, as shown here.

Or it would be equally easy to hook the zero delay lanyard through the D-ring and into the pocket.

One solution is demonstrated by Captain Bob Sapp, of the 20 TFW, RAF Wethersfield. Photo, right, shows zero delay lanyard hooked from inside out. (Provided by 4525th Fighter Weapons Wing, Nellis AFB.)