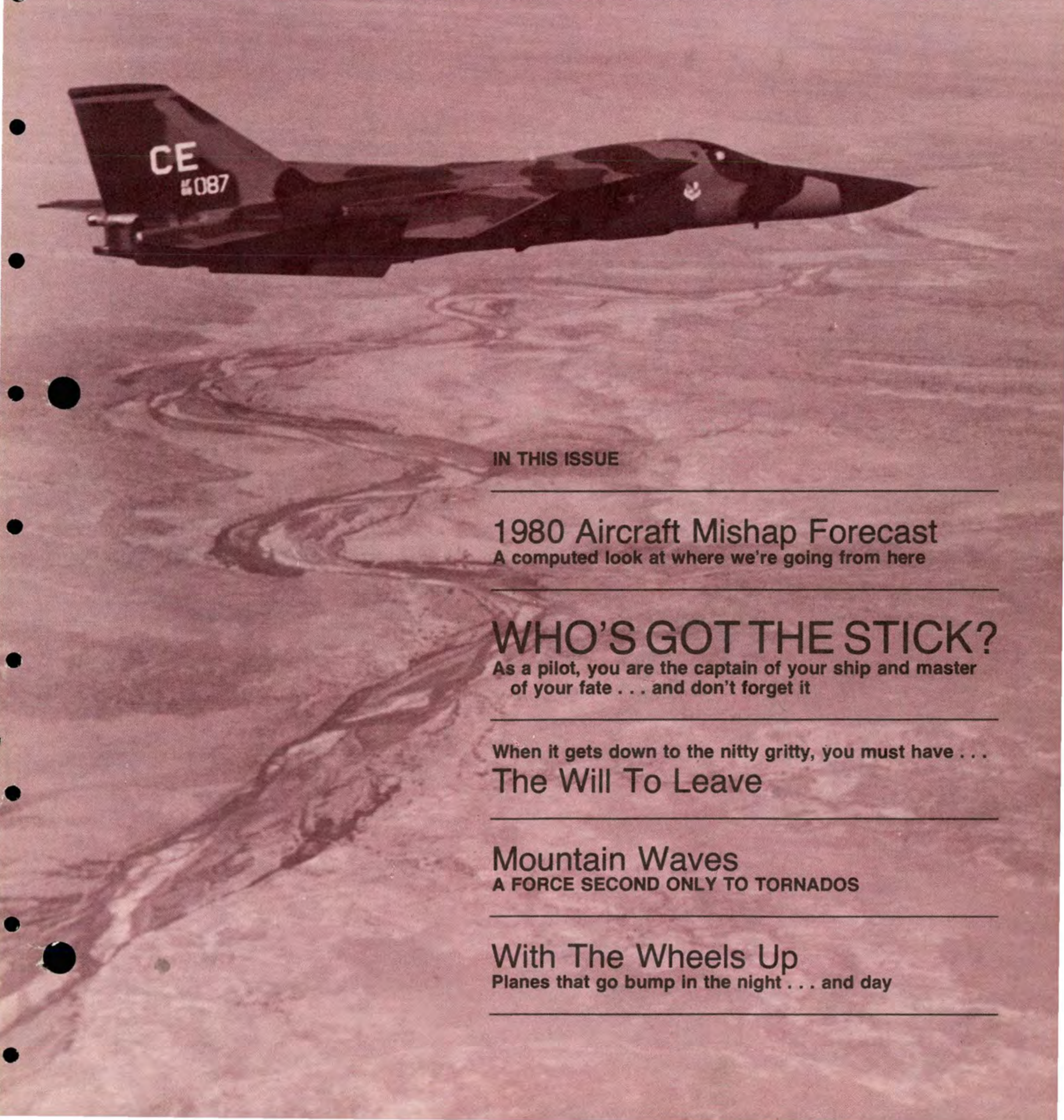
AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS MARCH 1980



YOU GOT IT!

■ When I hang up this blue suit and my fighter pilot togs the first of March, after 35 years, I'm not so sure they will stay put. But before I do, there are a few things I have said many times that I want to say once more.

First of all, flying is fun; it is also a deadly serious profession. Akin to that, I'm an ops type! I've always been an ops type, and I'm proud of that. Secondly, I'm a safety guy. I've always been a safety guy, and I'm proud of that, too. I never had the title of a safety guy until I became the Director of Aerospace Safety, but I've been a commander: an aircraft commander, a flight commander, a squadron commander and a wing commander. In each of those capacities, I was a safety guy, because safety is a function of command in each one of them. Safety is also a by-product of strong leadership. So is good management. *We manage resources–we lead people!*

Positive, strong leadership by the flight leader, the element leader or the aircraft commander is the key to successful mission accomplishment. The mission is not successfully accomplished until everyone is safely home. If we are to continue our historical reduction of aircraft mishaps, we must decrease the number of them caused by human factors. That is a leadership challenge. There are no dumb pilots. When a pilot makes a mistake, we must remember that somebody trained him, somebody committed him and somebody scheduled him. Leadership by those "somebodies" can prevent mistakes that lead to disaster.

Safety is not paramount—readiness is. Readiness is probably more important now than it has been at any time since World War II. The loss of over a wing of airplanes a year has an unacceptable impact on our combat capability. So I challenge each of you with an old adage—lead, follow or get out of the way.

As Director of Aerospace Safety, I have had tremendous support from across the Air Force and our sister services. I have enjoyed the challenge that goes with the job. I enlist that same support for the new guy. Be ready, fly smart and don't relax until you, your crew or your flight is back, mission accomplished —safely. You got it! ■

Garry A. Willard, Jr.

GARRY A. WILLARD, JR
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Director of Aerospace Safety

UNITED STATES AIR FORCE

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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1980 Aircraft Mishap

MR. ROGER G. CREWSE · Directorate of Aerospace Safety

■ A mishap forecast should be the reflection of mishap potential which exists in the support and operation of our equipment. If we have accurately defined the types of mishaps our weapon systems are likely to have, based on their history and the mission which they fly, and if we are able to accurately assess our current trending, then we should be able to accurately forecast what will happen in a future period.

The forecast that we are talking about here is the aircraft mishap forecast for 1980 and it is based on 3,200,000 flying hours. The reason the flying hours are so important is that each element of an aircraft's mishap history has a mishap rate per 100,000 hours established for it. If, of course, we fly more than 3,200,000 hours we should have more mishaps. If we fly less than 3,200,000 hours we should have fewer mishaps.

This relationship isn't exactly a direct one, because if we fly a lot more than 3,200,000 hours and our maintenance and supply folks cannot handle it, the mishap potential starts to rise; therefore, the rate starts to rise, resulting in a mishap number out of proportion to the increase in flying hours. By the same token, if our flying hours are reduced substantially, aircrew proficiency may become a problem and once again the mishap numbers may not reduce in proportion to the reduced number of flying hours.

There is one other point that needs to be made on forecasting and it is this: If the mishap potential is one-third of a mishap per 100,000 hours, then 300,000 hours must be flown before that potential is fully cycled. If at the end of 300,000 plus hours that particular type mishap has not occurred and the trending is down, then it would be safe to assume that the mishap potential has reduced, either through training, modification programs, or because we were wrong in the first place.

If a potential of .33 mishaps does exist in the aircraft and it flies 100,000 hours a year the first year, then the potential would be .33 of a mishap; the second year would be .66 and the third year 1, if in the preceding 2 years the mishap in fact did not occur.

The potential is a must when examining the type of mishaps each aircraft has. For instance, for the A-7, the mishap potential for a pilot-induced control loss mishap in 1980 is 2.55 mishaps based on 100,000 hours to be flown. We believe that this potential is too high. It was established without automatic maneuvering flaps installed on the aircraft. We believe that while the potential *was* 2.55, the actual now, with AMF coming in, will be 1. When AMF are installed on all A-7 aircraft, that potential may drop even further, perhaps to approximately .33 instead of 2.55 mishaps per 100,000 hours. Enough of the numbers and the methodology. The forecast is what we really set about discussing in this particular piece.

During 1980 we forecast 91 Class A mishaps (see Chart 1 for mishap definitions) for a rate per 100,000 of 2.8. We believe that those 91 Class A mishaps will result in 81 destroyed aircraft for a rate of 2.5 destroyed aircraft per 100,000 hours. We also believe that there will be 74 Class B mishaps in 1980, resulting in a Class B mishap rate of 2.3 per 100,000 hours flown (Chart 2).

Forty-four mishaps will result from operational factors. Logistics mishaps, that is maintenance, part failures, design, etc., will account for 43 Class A mishaps in 1980. Weather, miscellaneous factors, and undetermined mishaps will be involved in four Class A's during

FORECAST

CHART 1
MISHAP CLASS DEFINITIONS

A. **CLASS A MISHAP.** A mishap resulting in:
   (1) Total cost of $200,000 or more for injury, occupational illness, and property damage, or
   (2) A fatality, or
   (3) Destruction of, or damage beyond economical repair to, an Air Force aircraft.

B. **CLASS B MISHAP.** A mishap resulting in total cost of $50,000 or more, but less than $200,000, for injury, occupational illness, and property damage.

C. **CLASS C MISHAP.** A mishap resulting in:
   (1) Total damage costs of $300 or more, but less than $50,000. or
   (2) An injury or occupational illness resulting in a loss workday case involving days away from work, or
   (3) A mishap which does not meet the above criteria but for which reporting is required. . . . —*From AFR 127-4.*

CHART 2

Forecast 1980 Mishaps (Based on 3,200,000 Flying Hours)

	RATE	NUMBER
Class A	2.8	91
Destroyed	2.5	81
Class B	2.3	74
Total Class A and B	5.1	165

1980 CLASS A FORECAST

TYPE MISHAP	
Operations	44
Logistics	43
Other	4
Total	91
Rate	2.8*

*3,200,000 flying hours.

1980 DESTROYED AIRCRAFT FORECAST (Based on 3,200,000 Flying Hours)

TYPE MISHAP	TOTAL	TYPE MISHAP	TOTAL
Control Loss (Pilot Induced)	14	Aircraft Fuel	2
Collision/Gnd (Non-Range)	12	Landing Gear	4
Collision/Gnd (Range)	6	Bleed Air	1
Midair	6	Hydraulics/Pneumatics	1
Takeoff/Landing (Pilot)	4	Structure	2
Engine Failure	16	Electrical	3
Flight Controls	6	Miscellaneous	4
		Total	81

1980 for the total of 91. The total number of mishaps reflect an expectation that we will have slightly fewer Class A's and destroyed aircraft mishaps during 1980 than we did in 1979, and slightly more Class B mishaps than we did in 1979. While the numbers of mishaps are not expected to change substantially from last year's experience, the makeup of these mishaps will be quite different, we think.

Last year, 65 of the 94 Class A mishaps were operational in nature. This year we forecast only 44 will be. The last quarter of 1979 and the first month of 1980 have signaled, we think, a valid downward trend in operational mishaps. The majority of the operational reductions are expected in the fighter/attack aircraft.

Last year there were 51 fighter/attack operational Class A mishaps. This year there are 29 forecasted. The reductions are in two major areas – collisions with the ground and control losses. We have forecasted eight fighter/attack control losses for 1980 as opposed to the 17 which occurred in 1979. We have forecasted seven fighter/attack collisions with the ground nonrange for 1980 as opposed to 16 which occurred in 1979. Eighteen of the 22 fewer operational mishaps we expect to have this year than last, then, are in the fighter/attack collision with the ground and control loss categories.

Why do we expect the large reduction? For one thing our commanders and our aircrews have learned a lot about our mishap exposure during the past 2 years, and

FORECAST

continued

what they have learned has been converted to action and that action has been effective the last 4 months. The collision with the ground and control loss categories were the ones that soared in the past 3 years over all norms established in the 1970s. These two categories we believe will be most responsive to corrective action. The remainder of the operational categories in the fighter/attack aircraft mishaps will remain rather stable. They were low, they stayed low, and we think they will remain low during 1980.

In the logistics area quite a different picture is expected from what occurred last year. We hope we are wrong but we think that we lucked out in a good many areas. Our logistics trending has remained high. The Class Cs indicate that we were extremely fortunate in many, many instances involving engine, flight control, electrical and fuel system malfunctions.

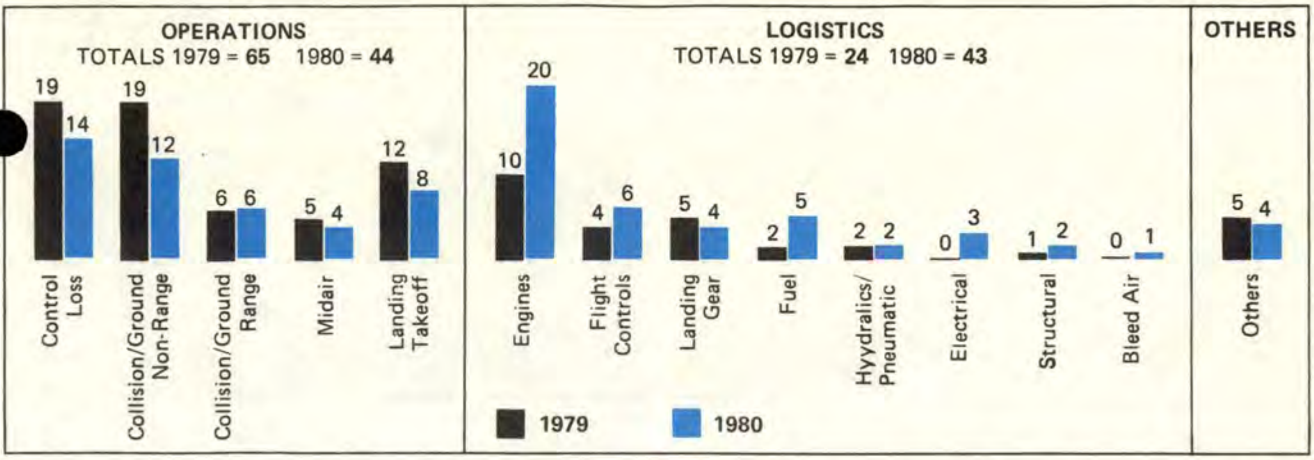
Last year we had 24 Class A mishaps involving logistics factors. In 1980 we think this will rise substantially to 43. The largest increase is expected in those Class A mishaps which are engine-related. Ten occurred last year – we think 20 will occur this year.

All aircraft types are expected to experience increases in engine-related mishaps. Ten of the 19 increase in logistics related mishaps we forecast for 1980 will be caused by engines. The remainder of the increases are made up by small increases in flight control, fuel systems, electrical systems, and structural failures. The rationale for the increases follows.

We don't believe the F-15, A-7, F-105, or F-106 can repeat last year's superb performance in the engine category. We expect the heavies will also have engine problems. We have seen Class C upward trends and Class B mishap frequency increases in the B-52, C-135, C-141, and C-5s. These numbers are small, and while they probably are no problem for supply, maintenance, or for the operations folks, they do provide Class A mishap exposure. The exposure is primarily because of fire or heat damage or catastrophic failure which damaged the aircraft. It is also possible that one of these failures will occur just at the wrong time and the pilot will not be able to cope with it.

Landing gear failures seem to be on the rise in all types of aircraft, but considerable action underway at the present, we believe, will cope with the gear malfunctions, and we don't expect to see a Class A increase over last year. With the Class B's it's a different story which will be discussed later.

Flight controls, fuel systems, and bleed air problems also seem to be on the rise, based on our current trending. All aircraft are involved. Bleed air failures, both bleed air and engine parts which carry bleed air, seem to be on the rise almost across-the-board. While the frequency is low, their potential to cause the loss of an aircraft is extremely high. We may have undercalled this category.



As it works out, engines, fuel systems, landing gear components, flight controls, bleed air, and electrical systems are where the majority of our logistics exposure exists and it always has. Last year's fine performance, which resulted in the lowest number of logistics mishaps in our history, was directly dependent upon mishap frequency improvements in those systems just mentioned.

Our Class Bs are almost entirely logistics in nature. Thirteen of the 74 which are forecasted for 1980 are operational. Eleven of the 13 involve landing mishaps and two, takeoff mishaps. In 52 of the 74 which are expected to be logistics in nature, 12 involve engine-related malfunctions, 20 engine FOD, and 10 landing gear failures. We expect a slight increase in our Class B's over last year and the year before, primarily because higher cost engines and airframes are entering the inventory in ever-increasing numbers. The $50,000 Class B threshold will be reached more easily with less damage than with the older aircraft. The 20 engine FOD Class B mishaps will result primarily from F-15, F-16, and F/FB-111 aircraft. Their overall FOD rate isn't higher or as high in many cases as other aircraft, but the engine value is such that the $50,000 threshold is reached with less damage as compared to some of the other engines in the inventory.

Landing gear failures (which include wheels, tires, and brakes), as we mentioned earlier, have been signaling an increase for the past 10 to 12 months. Trending is up. The damage resulting from these types of failures more often is Class B than Class A, but the fact is, the potential in these systems, primarily fighter and cargo aircraft, is high.

Birdstrikes, lightning strikes, hail damage, facilities, etc., make up the remaining nine of the Class B mishaps we expect to have in 1980.

It is important to remember that our forecasts are not goals. The forecast is based on our evaluation of the exposure in our weapon systems, converted to mishap numbers, and it supposes that nothing will change during the period the forecast covers. If something changes to increase exposure then, of course, the numbers will go up. On the other hand, if something changes to decrease exposure, then the numbers will be reduced. Repeat — these are not goals.

There should be no warm feeling if the numbers shown are met at the end of 1980.

A realistic and attainable goal on the other hand, would be 78 to 82 Class A mishaps for a rate of 2.5. To accomplish that goal would require holding the operational mishaps to the level forecasted, or lower, and having no more than 36 logistics mishaps. Is it possible? Of course it is. We only had 24 logistics Class A mishaps last year. Probably a greater challenge is reducing the operational mishaps from the 65 which occurred in 1979 to the 44 which we have forecasted for 1980.

Have we ever had as few as 44 operational mishaps in our recent history? We certainly have, and it wasn't very long ago either. In 1977 the Air Force experienced 42 Class A mishaps resulting from operational factors. That same year there were 38 Class A mishaps which resulted from logistics factors. Nine miscellaneous/undetermined/other type mishaps accounted for the remainder. A grand total of 89 Class A mishaps occurred in 1977.

The final word is that the United States Air Force mission is not safety — it's the defense of our country. Safety is a product of an efficient, effective operation. The better we do the job and accomplish our mission, the fewer mishaps we will have as a welcome and natural byproduct, and that should be our goal! (A detailed, by aircraft, forecast will appear in the April issue of the *Air Force Safety Journal*.) ■

Wire Strike!

During 1979 seven USAF aircraft were involved in wire strikes, two of which were destroyed and their crews killed. Two of the aircraft were helicopters. Although USAF experience is not as great as the Army's, with its many low flying helicopters, the loss of any aircraft or crew is serious business. Many of the Army actions are applicable to our low flying aircraft; therefore, we are presenting this Army narrative on low level wire strikes, from U.S. Army *Flight Fax*.

Synopsis

■ An OH-58 on an area surveillance mission during a field training exercise hit several telephone wires strung across a river. The copilot made an approach to a sandbar 1,100 feet downstream, with wires dragging from the right skid. Just before the aircraft was landed, the dragging wires caused the nose to tuck, and the aircraft crashed nose low. The pilot, copilot, and crew chief sustained major injuries.

History of Flight

The aerial surveillance mission was delayed two hours due to poor visibility in the area. When the flight, consisting of an OH-58 and an AH-1G, was able to take off, visibility was estimated at one mile with no ceiling. Visibility improved during the mission to about two to three miles with haze and fog.

All three modes of terrain flight were used. The copilot was flying the OH-58, while the pilot performed navigation duties.

Near the end of the mission, the pilot told the copilot to cross a river on a diagonal course to check one more area. As they left the higher ground of the hills, the copilot started a descent to conform to contour flying techniques. Seconds later, the pilot saw wires in front of them just before the helicopter, flying at 50 knots and 70 feet above the river, hit the wires.

The copilot selected a sandbar in the river as his landing site and started an approach. Just before the aircraft was landed, wires dragging from the right skid caused the nose to tuck and the aircraft crashed. Both pilots were able to exit through an opening in the aircraft, but the crew chief, because of his injuries, remained in the aircraft until medevac personnel arrived.

The area was not the normal training area for the unit. Before the exercise, 1:50,000 tactical maps were issued to the aviators. Two units were assigned training missions in the area to locate and mark hazards and allow the aviators to become familiar with the area. Hazards were posted on one map. The map was made available to all aviators so they could post their maps. The hazards were also marked on a 1:100,000 map overlay maintained in operations during the field exercise. Both of the maps were incomplete. The wire struck by the OH-58 was not marked on either of the maps. In fact, when the mishap occurred, there were no hazards posted in the southern part of the exercise area. The unit had another wire strike accident seven days after this one, and the aviator involved still did not have the wire that was struck in the first accident marked on his map.

Crewmember Experience

The 22-year-old pilot had almost 300 hours rotary wing flight time, with more than 100 hours in the OH-58. The 30-year-old copilot had more than 350 rotary wing hours, with more than 200 hours in the OH-58.

Commentary

The absence of a wire strike protection system was a factor in this accident. Wire strikes have been a problem since the early days of Army aviation. They will continue to be a problem until aircraft are equipped with a wire protection system. An OH-58 wire strike system will be fielded in Canada in January 1980.

In addition to this factor, there were three specific errors which would have resulted in the crew not knowing the location of the wire hazards along their flight route. Any one of these errors could have caused the accident.

The first error was failure to provide required information to the flight crew. FM 1-51 requires units to maintain hazard maps of the areas of operation. It also states that this responsibility should be assigned to a specific individual. There was confusion in the unit as to who was responsible for the hazard map. Since it could not be substantiated that the operations officer delegated this responsibility, it was concluded that the responsibility and the tasks involved remained with the operations officer.

The hazard map constructed by the unit was inadequate. There were no hazards marked on the map in the area assigned for the mission. The area had not been reconned for hazards. The operations officer was unaware of this deficiency until after the accident. The unit SOP did not include instructions which would ensure aviators were provided hazards information in their area of operation before terrain flight missions.

The second error was inadequate flight planning. The pilot made no attempt to mark the hazards identified on the unit hazards map on his map. He understood this was a required task, but he omitted it. He thought he and the copilot could see the hazards.

The third error was a navigational error. The pilot thought he was on the eastern boundary of the assigned area instead of the western boundary. It is not known why this error was made. The pilot obviously had not been disoriented during the majority of the mission. He stated that he was keeping up with the navigational task and thought he knew where he was at the time of the accident.

The crew chief should not have been aboard the aircraft. Only mission-essential personnel are to be carried on tactical training flights. ■

■ In the past few years, I've noticed a trend in our airplane driving habits that has disturbed me to the point where I have doubts about our ability to fly in a proper military manner. For years, the bar talk about the flying game has invariably centered on the decline in our ability to do our job. We tend to sit around crying in our beer about every imaginable subject, from lack of leadership through the gamut to no flying time to square-filling to pencil whipping to the DRPCB's in MPC to additional duties to mobile control to overtasking, and so on, ad nauseam. I think the gripes are justified. I could come up with a few thousand choice words on any of the above subjects. But gripes aren't what this article is about. What I'm writing about here is airplane driving.

It seems like griping has taken the place of airplane talk – do you guys remember the stag bar of yesteryear? Some time ago, one couldn't walk into one of those places without getting clotheslined by an errant five-fingered MIG-21 which was closely followed by a poke in the eye with the 20mm cannon (Brrrrappp!) cleverly disguised as an index finger. The talk, the mood, the noise were all flying, flying, flying (with an occasional Bangkok "war" story thrown in for variety). A similar scene occurred in every squadron lounge in the Air Force every day. What's happened? Why has it changed?

I'll tell you what I think – I think that the average Joe Jetjock has given up on himself and the Air Force. I think that he has become overwhelmed with the size, the complexity, and impersonality of the US Air Force to the point that he has forgotten (or perhaps never learned) where he fits into the total scheme of things.

To explore this idea a little farther, let me talk a little bit about the F-15 Eagle jet. For you folks who don't know too much about it, let me digress a little to explain some things. There is no occupation in the whole world that is more demanding, challenging, or more good clean fun than strapping on an Eagle and jumping into the middle of a giant air-to-air dogfight with it. That doggone airplane is limited only by the guy in the cockpit. It has enough sustained G capability to make any pilot cry for mercy; it has "seventy eleven" different buttons and levers that perform about four hundred and "seventy eleven" different functions, and three different air-to-air weapons

WHO'S GOT THE STICK? or– bear's theory of fighter aviation

MAJOR GARY L. SHOLDERS • Directorate of Aerospace Safety

systems that can zap bad guys in the twinkling of an eye. The Eagle jet, in short, is the world's foremost (cold-blooded) pleasure machine. I and most of my peers in the fighter business would sell our souls to the devil and accept a demotion to permanent second lieutenant for a chance to fly that thing.

Yet, the plain facts are that guys are leaving the Air Force from the cockpit of an Eagle jet in droves. It's patently obvious to me that our young Eagle drivers either are unaware of, or unwilling to accept, the challenge that faces them in the Eagle driving business. I find it hard to believe that they are unwilling; second lieutenants, for example, are the most wonderful people in the whole Air Force. They are motivated, smart, and untainted by cynicism. Somehow, all along the line our Air Force fails to instill that vital sense of challenge and self-worth into those wonderful people. Our institution has been unable to convince our young jocks that *they have the stick*. For whatever reason, the young fighter pilot doesn't perceive a continuing challenge and/or job satisfaction in the US Air Force.

Let's try to turn that attitude around. Supervisors and line jocks alike can all do a heck of a lot to shake that stick and place it firmly in the hands of the guy who owns it; namely, good old Harvey Knucklefutz, the average tactical airplane driver. I don't think that we have to establish a whole new round of regulations, studies, or neat new training programs to do that either. Sure, they help – Operation Buck Stop of ATC is a well received formal program to put the stick where it belongs. TAC has recently increased the number of solo sorties in their F-4 training programs, and Air Force-wide adoption of the "Buck Stop" philosophy is now official.

The funny thing about this whole thing, though, is that there has *always* been an opportunity to grab that stick. For example, I don't feel that my authority to operate my air machine has been unduly hampered by the bureaucracy. Sure, every once in a while I've had to live with a delta sierra rule or situation, but I have *never* felt that someone else has been in charge of my airplane. In my experience in the fighter business I've seen, with few exceptions, that the aggressive, innovative and good fighter drivers rarely feel unchallenged. I think that's because they immediately got a tally ho on the stick, grabbed it, and never let go.

Let me share a few personal experiences that I've had over the years that have served to help me get a hold on the stick.

The first two stories are about folks who figured out how to start young jocks along the road to individual responsibility.

Story nr 1. *The Supervisor Who Knew How to Supervise.* Once, when I was one of the greenest of green buck IP's in the F-4, I was called to the DO's office for my prelaunch lecture into my IP career. The DO said something like this: "Around here we fly according to the book, etc. . . ." Standard lecture, I thought. He's gonna chew me out before I even go to work. The lecture, however, took an interesting turn a few minutes later when it went something like this: "I realize that every situation is not covered by the book. You are one of my IP's, *I trust you*, and you are getting paid for your superior judgment. Exercise it as you see fit – I will back you to the hilt." I walked out of that guy's office feeling about 12 feet tall – I would have committed hari-kari before I crossed that man. Although we rarely spoke after that day, I've always considered him to be the best

WHO'S GOT THE STICK? continued

DO I've ever worked for. He now has more stars than I have feet.

Story nr 2. *Noninstructional Instruction*. Once I developed a theory of aviation which stated that my students in the F-4 were too dependent upon my inputs and weren't thinking for themselves. So, I turned off the intercom after takeoff on the student's first ride in the airplane and didn't turn it on again until we arrived somewhere near homedrome at the completion of the mission. You should have seen those guys thrash around! My theory of aviation had been confirmed in spades. Of course, we accomplished absolutely nothing on that first ride. The pipe-smoking professional educators would have been aghast at my irresponsible behavior. After all, I did not respond to my student's psychosocial needs and did not use my JP-4 in an optimal manner. But you should have seen those guys fly on their second, third, and subsequent rides. Once they realized that they had the stick, it was smooth sailing— there was no doubt in their blue aerospace minds that they were in charge.

These next two stories are things that have happened to me which taught me to take charge of my airplane:

Story nr 3. *Air Traffic Controllers Who Don't Control*. Mind you, I have nothing against air traffic control. I'm the lousiest instrument pilot that ever walked the face of the earth. When the weather gets bad, I need those people. Like anyone else, though, they make mistakes once in a while, and they freely admit that they don't have total control in every flying situation. Once, I was driving along to fill one of those annual approach squares on a VFR day under GCA control. On a long GCA downwind, I was vectored between two hills. Presently, at left 9 o'clock high, one mile, there was a mountain peak. At right 3 o'clock high, one mile, there was a mountain peak. A quick glance at my radar altimeter showed 200 feet. Another time, under IFR control at 27,000 feet, I looked out the window and saw four F-4s heading directly at me, co-altitude. My student didn't know what to do. He said later that he was thinking about being violated by ATC if he took evasive action. He didn't think about the ultimate violation at all. The point is, as much as I love those ATC folks, I don't trust them as far as I can throw them. Their scopes are no where near as good as my 20/20 peepers on a VMC day. For that reason, I avoid weather flying like the plague whenever possible. I use my radar and my eyeballs and don't believe a word they tell me until I can verify it myself. I just can't afford to let someone on the ground take my stick away from me. It is not conducive to longevity.

Story nr 4. *The Guy Who Flew a Book Instead of His Airplane*. There was once an experienced fighter pilot on his first European tour, and he was taking his first theater instrument check. He studied the rules, but being a standard fighter jock, he didn't remember them well enough. He went on his checkride with a DRPCB SEFE who shall forever remain nameless and tried to remember all the rules while airborne. He failed miserably and flew the worst mission of his entire life. He flunked his checkride with about four million discrepancies. The irony is that if he had just used his common sense to fly his airplane instead of concentrating his entire attention to the nitpicking little rules, he would have done well. I won't tell you who that experienced fighter pilot was.

Here's one about a guy who wasn't afraid to speak out against an unacceptable situation:

Story nr 5. *The Horse Built By an Air Force Committee*. There was once a multi-mission, multi-aircraft type of base which formed a committee to develop operating procedures for the airfield. Everyone was there— fighter types, SAC types, FAC types, air traffic controllers, and members of the foreign host government. After about forty-eleven hours of intense deliberation, procedures were invented which considered every possible occurrence from nuclear attack to an invasion of crickets. Every procedure was locked in concrete— everyone knew exactly what to do for every conceivable situation.

About two months after the procedures were started, the wing had one of those massive safety meetings. The first item on the agenda was a giant diatribe from some high mucky muck in the wing about how the guys weren't following all the procedures and just screwing up the whole operation. Finally, one lone captain with a beak on his face stood up and said: "Sir, this whole big thing that you've got going here is fine and good I suppose, but my mission at this base is not to follow your operating procedures. My mission here is to drop bombs and to learn air-to-air warfare. I don't understand about half of your procedures; I can't remember any of them, and even if I could, they would cost me so much time and gas that they would unacceptably cut into my mission. How about giving me some credit for a little bit of common sense and let me do my job? Right now, your procedures are simply not hacking the program."

Amid stunned silence, the courageous and articulate captain took his seat. All of the procedures were subsequently scrapped, and the base lived happily ever after, with the committee-built-horse-that-was-really-a-nasty-old-camel never coming around again.

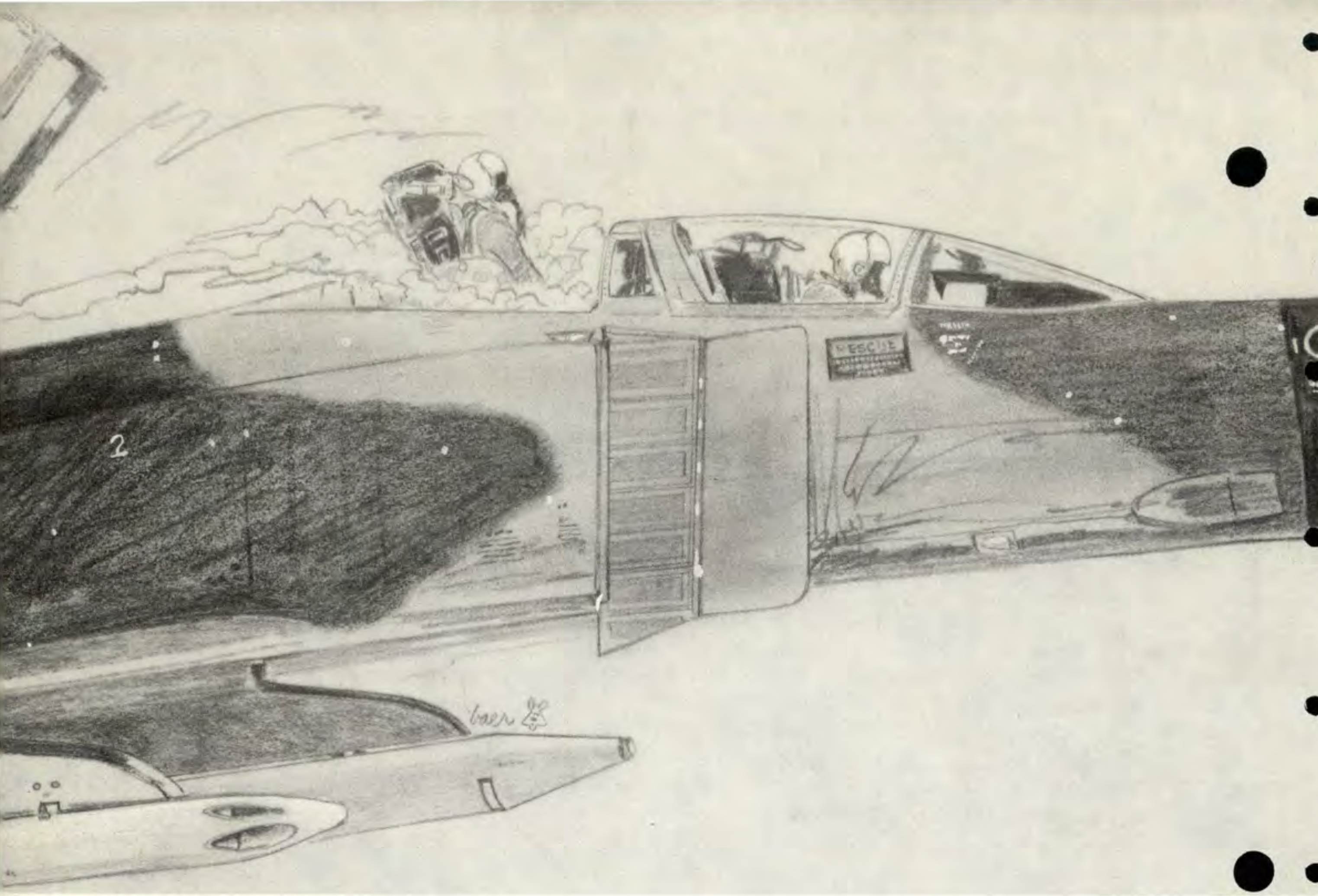
And, finally, here's a war story with a message:

Story nr 6. *The Flight Leader Who Led.* Once, when I was a new guy in combat, I was driving all over Southeast Asia one afternoon on the wing of a crusty old fighter pilot who had been my mentor for the first few missions. We were loaded up with snake and nape and nobody could seem to find any commies for us to kill. Afternoon turned to dusk, and then to dark. The leader took us over to squadron common and said: "Bear, you haven't had your night check yet, have you?"

"No, Sir," says I.

"Well, Bear, I guess you'll have to do without it— mind your p's and q's and don't bust your tail." We finally ended up in the middle of a giant firefight where the Army needed us pretty darn bad. I did OK. Afterwards, we were talking about the night checkout thing, and he said, "You've been flying on my wing now for a while; I think I know how well you fly. If I didn't think that you could have done the job, I would have sent you home. Those kind of decisions are exactly what I get my flight pay for." End of discussion. That was one of my first exposures to a guy who wasn't afraid to grab the stick.

The purpose behind all these little stories is simply to show one thing: It doesn't matter who you are, from a wing supervisor down to the lowliest brown bar, there are ample opportunities for you to take that stick. If we were to spend more time just latching on to that mother instead of worrying about who owns it, we would enjoy a better (and safer) Air Force. ■



MAJOR BRUCE N. COX · Directorate of Aerospace Safety

■ As a newly assigned project officer to AFISC, I haven't yet lost touch with the "real world" of squadron-level flying. My last flight was only a month ago, so I can hopefully still relate to the aviation community. But, my days are numbered, and I will soon be a higher headquarters weenie, unable to recognize the REAL Air Force. (Or so I'm told!) So I won't preach with high-level philosophy, just talk straight with you. My comments are directed primarily toward those aircrews who fly with escape systems in their aircraft, but don't stop reading just because you don't have an injection handle by your side. Next year you might.

There are few military aviators who have not personally grieved the loss of a friend in a flying accident. No one in our business is immune from this. When we are faced with this agonizing experience, our common profession compels us to second guess the mishap and the aircrew's role in it. I have done this on several occasions and probably you have too. To me, the most haunting memory of an accident is knowing that the crew could have saved their lives, but didn't. Tragic as this may sound, it happened more than once during 1979.

When an aircrew does not attempt ejection and is fatally injured, our aviation fraternalism inherently asks us to find a reason which removed the "aircrew error" stigma. There are times when personal injury or aircraft damage prevents ejection. Our fraternalism can accept that, because our hardware isn't perfect or failsafe. There are also those nebulous times when ejection is not attempted because the crew just doesn't recognize the need to eject. Such would be the case when unexpected ground collision occurs. We've done that with alarming regularity during 1979, too.

We agonize over that type of accident, but our gut feel is that some unknown distraction or malfunction diverted the crew's attention from their "stick and rudder" duties. But the one type of accident that we cannot accept is when an aircrew sticks with a crippled aircraft to their death in futile attempts to save the machine. This has never set right with me.

More than 30 years ago, we installed ejection systems in our aircraft to give the fliers the

The Will To Leave

Equals the will to live in an ejection decision

opportunity to smartly exit a doomed aircraft *before* it made its final landing. Now, it doesn't take a rocket scientist to know that the crew has to decide when to make their escape and jettison the aircraft. I, personally, have never bailed out of an aircraft, but I have talked to many who have. They agree on one point— the decision to pull the handle is quite obvious. Why then do some aircrews override this decision and stay with an aircraft until it is too late?

The answer to this question perhaps relates to the aircrew's ego and inability to admit to themselves that they have made an irreversible mistake. Aviators don't seem to hesitate when it comes to leaving an aircraft crippled by a material failure of some sort. But it's a different story if the aircrew themselves place the aircraft in the doomed category. This is where the crew is forced to make a critical choice. Our pride says, "If I put the aircraft there, I can get it out!" We've all experienced this to some degree, whether it be on the range or in the landing pattern. We've salvaged a mistake and come home to tell about it. But we continue to lose aircrews while they attempt to salvage their mistakes and, in the process, lose track of when it's time to junk the airplane and save themselves.

I've seen aircrews sit around a beer keg on Friday night and argue about when it's time to leave the aircraft. We need this kind of discussion among our crews. The point is, the time to think about ejection is before the fact. The cockpit gets awfully busy when something goes wrong, and that isn't the time to analyze your personal ejection parameters. The time to chose your personal ejection parameters of altitude and aircraft airworthiness is *before* you leave the squadron building. You must then have the discipline to leave the aircraft if it turns into a pumpkin and you reach those parameters.

It is far better to be alive and be briefly thought of as a "whiskey delta," than to kill yourself and remove all doubts. You owe it to yourself and your loved ones to think about that!! ■

With The Wheels Up or
(It Sure Takes A Lot Of Power To Taxi)

MAJOR DAVID V. FROEHLICH • Directorate of Aerospace Safety

■ THE SCENE: A large conference room somewhere in the Pentagon. All you can see are stars and blue suits (and frustrated smokers because it's a "conference room"). This is a gathering of high-ranking USAF officials to solve the problems dealing with the recent rash of unintentional gear-up landings. A hush (more-or-less) falls over the room as the last few dignitaries arrive so as to begin the briefing. We now turn to our live, on-the-spot reporter, Captain Cynic, for his totally unbiased report on the proceedings.

CAPTAIN CYNIC: "Viewers, the scene is set and Major Rough Briefer is about to begin his presentation. Let's listen."

MAJOR BRIEFER: "Ladies and gentlemen (and aircrews), I'm Major Briefer with a short presentation on unintentional gear-up landings in USAF operations. During 1979 the USAF recorded six unintentional gear-up landings resulting in a total damage cost of approximately $643,641. This may not seem like a large amount, but the loss of airframes and resources puts a dent in our capability which we cannot afford. Already in 1980 we have experienced one gear-up landing resulting in minor damage to the aircraft. Today we'd like to analyze some of the possible common denominators in the mishaps, attempt to pin down a common thread and discuss some alternatives to reduce or eliminate gear-up landings. But first, let's take a 15 minute break."

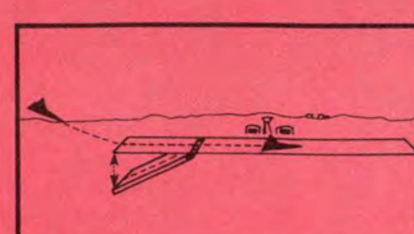
CAPTAIN CYNIC: "Wow, what a power-packed opening! We had expected this to be a biggee, but had no idea . . . wait, here's the major, ready to start again."

MAJOR BRIEFER: "Thanks for coming back, folks! We'd like to start with a discussion of some of the possible factors which the six 1979 gear-up mishaps did or did not have in common. How about aircraft type? No, we have to rule that out because the six in 1979 consisted of two transport types, two fighter types and two trainer types. Crew — no, can't lean on that either 'cause there were three crews and three individuals in the six mishaps. Two single-engine machines and four multi-engine aircraft, so no common thread there either! Maybe aircrew experience? We have to drop that also — they were highly qualified, high-time folks and brand newbees!"

GENERAL OVERALL: "Get on with it, major. Is there anything in common among all six mishaps?"

MAJOR BRIEFER: "Yes, sir! I had to dig into the reports and read the detailed narratives, but the common denominator is 'distraction'. In all cases there was an event or sequence of events which either broke or fixed the operator's concentration and allowed them to land gear-up. The distractions include other inflight traffic, ground aircraft movements, inflight emergencies or equipment problems, etc."

The above fictitious conference never happened but very well could have! The numbers are correct and the bottom line is the same: distraction is the culprit! But, how do we work the problem?



Nuclear Powered Runway Threshold Lowering Device?

"What's that, tower? I can't hear you 'cause the damn horn's blowing in my ear!"

Weld the Wheels Down. We have never had a T-41C land with the gear retracted! If we took the welded-down theory around for coordination, we would probably get "we concur" from the Arab oil companies (increased fuel consumption) and the Soviets (can you imagine the Eagles and Phantoms hassling with the rollers down?).

Drop Away Runway. We could build a nuclear powered, laser sensored, computer scheduled, ballistically activated, hydraulically operated runway lowering device! (See diagram) This contraption would look at the airplane on final, check for the wheels and rapidly lower the first 1,000 feet of runway to give the operator one last shot at lowering the landing gear.

Seriously, we can try to add systems and extra observers and ways to remind the pilot, but the only cure to scraped aircraft bottoms is operator awareness. Checklists have to be run, lights have to be rechecked, horns have to be noticed! That is over-simplistic, but operators have to begin to set for a mental warning whenever a distraction interrupts normal processes. For instance, try to condition to recheck for three green lights at minimums on every approach. If anything odd-ball happens in the instrument or visual pattern, try to get in the habit of saying "Where are my wheels?" If you are in a supervisory or instructor position, work on your students to get out of the "automatic gear-check" habit. Make sure they look at those little green lights as they check the gear.

Ours is not the only group with the problem! FAA Advisory Circular 20-34C discusses the same type of problems in the civilian retractables. In one recent year, almost one-third of the light aircraft human factor landing gear mishaps were chalked up to "neglected to lower landing gear." The circular advises pilots on completing the landing gear checklist and knowing the gear system thoroughly. Sounds like pretty good advice, but again – our problem does not appear to be lack of checklists or knowledge. The weak link is distraction!! Something interrupts the sequence, checklist or routine and the belly gets scraped! Get it together so they don't write one of these about you!

OPERATIONS FACTOR, Pilot Error. A non-standard downwind was established from a crosswind turn. Preoccupation with non-standard pattern and traffic precluded accomplishment of normal configuration procedures (CAUSE). Pilot punched off the gear warning horn on downwind (CAUSE). Gear was not confirmed down by either FP or IP during turn to final as required by radio transmission or crew checklist procedures (CAUSE)."

"OPERATIONS FACTOR, Aircrew error. The crewmembers, pre-occupied with an imagined emergency allowed their attention to be diverted from basic flying tasks. The crew failed to insure the landing gear was down IAW T.O. . . ."

"OPERATIONS FACTOR, Crew Error. The crew was distracted and failed to insure . . ."

MAJOR BRIEFER: "Gentlemen, this concludes my briefing."

"What's that, tower? I can't hear you 'cause the damn horn's blowing in my ear!" ■

MOUNTAIN WAVES

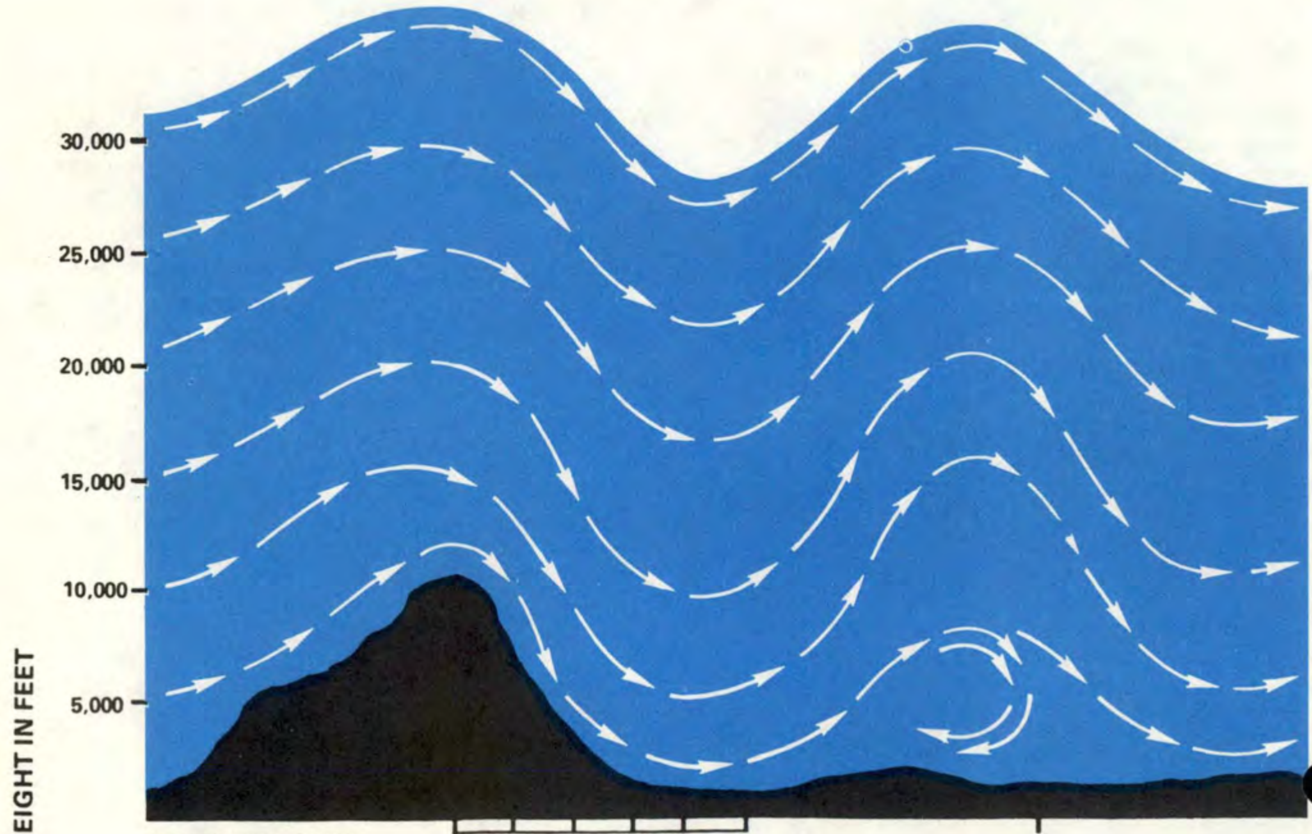
A Force Second Only

■ The meteorological phenomenon referred to as orographic mountain turbulence, lee or gravity waves—but better known as mountain waves—is as old as meteorology itself. It is the phenomenon which occurs under certain conditions when air flow is directed toward a mountain range or rough terrain, producing a stationary area for 10 or more miles to the lee side of the range, possessing extreme turbulence and very high velocity updrafts and downdrafts.[1]

Characteristics of a typical mountain wave are illustrated in figure 1, pictorially describing the sequence of development. As depicted, the air flows smoothly with a lifting component as it moves along the windward side of the mountain. The wind increases in velocity, producing a venturi effect, and upon passing the crest the flow breaks down similar to the airflow over a stalled airfoil.[2] As the breakdown occurs, a much more complicated pattern develops with downdrafts predominating accompanied by associated updrafts and turbulence. Proceeding downwind for perhaps 5 to 10 miles from the summit, the airflow begins to ascend as part of a definite wave pattern.

Additional waves, generally less intense than the primary wave, also may be downwind. "In some areas, as many as six and even more have been reported, resembling the series of ripples which form downstream from a rock submerged in a fast mov-

Figure 1. Typical Mountain Wave Pattern



To Tornados

LTC JAMES D. SIMPSON • U.S. Marine Corps (Retired)

ing stream."[3]

The first wave, because of its more intense action and closer proximity to the mountain, is of primary concern. "The horizontal distance between successive waves usually ranges from 2 to 10 miles depending upon the existing wind speed and atmospheric stability, but wave lengths up to 20 miles have been reported."[3]

While there is still much to be learned, we know that "the turbulence hazard in mountain waves is of a magnitude compared with, and maybe greater than, that involved in penetrating a thunderstorm. Estimates are that accelerations of as much as 8 G or more could be experienced."[4]

Sailplane pilots long have been taking advantage of the rising air currents on the windward side of a mountain and have greatly contributed toward a better understanding of the mountain wave. During the 1930s, these sailplane pilots observed that strong currents which rose to great heights occasionally were encountered on the lee side of a mountain. In the wake of this discovery, record flights of more than 30,000 feet were recorded by using these strong currents on the lee side of the Alps. In 1952, near Bishop, CA, a new record of 44,500 feet was established using the mountain wave on the lee side of the Sierra Nevada Mountains during a period of strong wave activity.[3] Mojave, CA, was the site of the current record which is 46,266 feet recorded in February 1961.[5]

The strong currents that rise from the lee side of mountains continue to produce record breaking flights, horizontally as well as vertically. As of May 1977 the distance record was established at 1,015.8 statute miles requiring an elapsed time of 14 hours and 3 minutes along the Appalachian and Clinch Mountain ranges.[6]

When mountain waves are discussed, mountains of great heights such as the Sierra Nevadas, the Great Divide and the Alps come to mind. However, it has been established that any mountain range or ridge line with a crest of 300 feet or higher is capable of producing wave phenomena. These phenomena have occurred at altitudes up to 75,000 feet over a roll of hills only several hundred feet high.

A wave condition arises with a component of the wind at a speed of 25 knots or more at the mountaintop level flowing perpendicular to the mountain range. "The actual wind direction can vary somewhat (with 50 degrees being the maximum deviation from the perpendicular) and still cause a wave, but the strongest waves occur with a strong perpendicular flow. The stronger the flow, the more severe the effects to be expected on the leeward side."[4]

In the western United States where these waves have been observed most frequently, it has been noticed that the strongest waves develop when there is a cold front approaching the mountains from the northwest and/or a trough aloft approaching from the west. This produces a strong westerly flow over the mountain ranges which have a north-south orientation.

There is generally a stable layer or inversion present on the windward side of the range up to an altitude slightly above the peaks, with a strong wave. A prefrontal area usually includes this condition. The top of this stable layer is just above the cap cloud and dips to its lowest level at a point directly over the foot of the roll cloud. Without this stable layer, convective instability tends to break up the wave pattern.

The most favorable wind profile for the existence of a high wave has winds exceeding 25 knots at the mountaintop level. There should be a rapid increase in the wind speed with altitude in the level of the mountain range and for several thousand feet above, with a steady strong flow up to the tropopause. The character of the wave varies with different wind profiles. A very strong increase of wind with height can eliminate the wave leaving only stagnant air in the valley.[4]

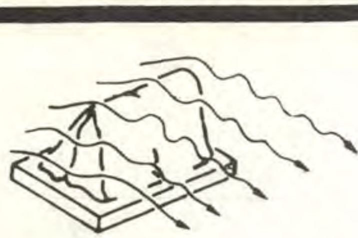
As would be expected, the mountain profile has a pronounced effect on the character of a mountain wave. Several topographical variations and their effects on the airstream are depicted in figure 2.

The most notable variations are:

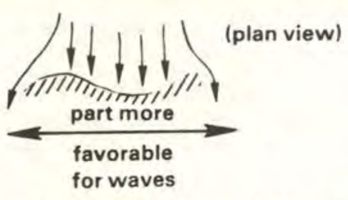
- Waves will be stronger to the lee of the ridges than to the lee of isolated peaks. They will extend higher and will carry a greater distance downwind (figure 2a).
- A concave shape toward the oncoming airstream is more favorable for waves than a convex shape (figure 2b).
- Ridges with gentle windward slopes leading to steep lee escarp-

Mountain Waves continued

Figure 2. Effects of Topography



a. INFLUENCE OF LENGTH OF MOUNTAIN.



b. INFLUENCE OF CURVATURE AT CREST LINE.

c. INFLUENCE OF GENTLE WINDWARD SLOPE AND STEEP LEE ESCARPMENT.

d. INFLUENCE OF A MOUNTAIN PASS.

ments are particularly favorable for strong wave activity (figure 2c).

- The lee of a pass between two prominent peaks is a favorable area for wave activity (Figure 2d).[7]

The telltale signs. The possibility exists for wave phenomena to develop when the air is too dry to produce any telltale signs. However, this condition is relatively rare and cloud formations remain the best means for identifying the presence of a wave before encountering it. Some typical cloud formations normally associated with the wave which will be discussed in detail are the cap cloud, rotor cloud, lenticular cloud, and in some regions the mother-of-pearl cloud. The clouds and their associated position in the mountain wave airflow pattern are depicted in figure 3.

A cap cloud, as the name implies, is a low hanging cloud with its base near or below the mountain's summit and a relatively smooth top only a few thousand feet above the summit. The major portion of this cloud is found on the windward slope where it usually releases light rain or snow. The leeward edge remains stationary, as an apparent wall when viewed from downwind, with fibrous fingers reaching part way down the lee slope before dissipating. At times, the cap cloud will appear to roll over the ridge line and then down the lee slope very much like a waterfall. From downwind, it often resembles a stationary bank of stringy cirrus.

The rotor cloud, which looks like a line of cumulus or fracto-cumulus clouds parallel to the ridge line, forms on the lee side with its base at times below the mountain peaks and its top extending considerably above the peaks, sometimes to twice the height of the highest peak. "The rotor cloud may extend to a height where it merges with the lenticulars above, extending solidly to the tropopause."[4] Like the funnel of a tornado, this cloud gives visible evidence of violent turbulence.

The most dangerous features of mountain waves are the turbulence in and below the rotor clouds and the downdrafts just to the lee of the mountain ridges, and to the lee of the rotor clouds.

During investigations of the Bishop Wave, horizontal as well as vertical gusts of 2 G to 4 G were recorded and 7 G was exceeded on one occasion. Downdrafts and updrafts on the order of 2,000 feet per minute were observed, with other instances estimated as high as 3,000 feet per minute.[7]

The rotor, a standing cloud, is continually forming on the windward side and dissipating on the lee side. Although its rotation is seldom visible from the air, this cloud is actually rotating forward toward the mountain in its upper portion and backward in its lower portion.

The lenticular or lens-shaped clouds, which appear in layers between 20,000 to 40,000 feet are relatively smooth and the most spectacular of all the forms identifying the presence of the wave. The layers or tiered appearance of these clouds is consistent with the smooth laminar flow in this section of the wave. "The tiered type structure is due to the stratified characteristic of humidity in the atmosphere and the lifting effect of the wave on the whole depth of the atmosphere."[7] These lenticular clouds, like the rotor, are stationary, constantly forming in bands parallel to the mountain at fairly regular spaced intervals on the windward side and dissipating to the lee.

As many as 10 bands have been observed at one time, extending out 40 or more miles to the lee of the mountain ridge. At other times, only one lenticular might be visible in the lee of the most prominent mountain obstruction.[3]

At times, severe turbulence may

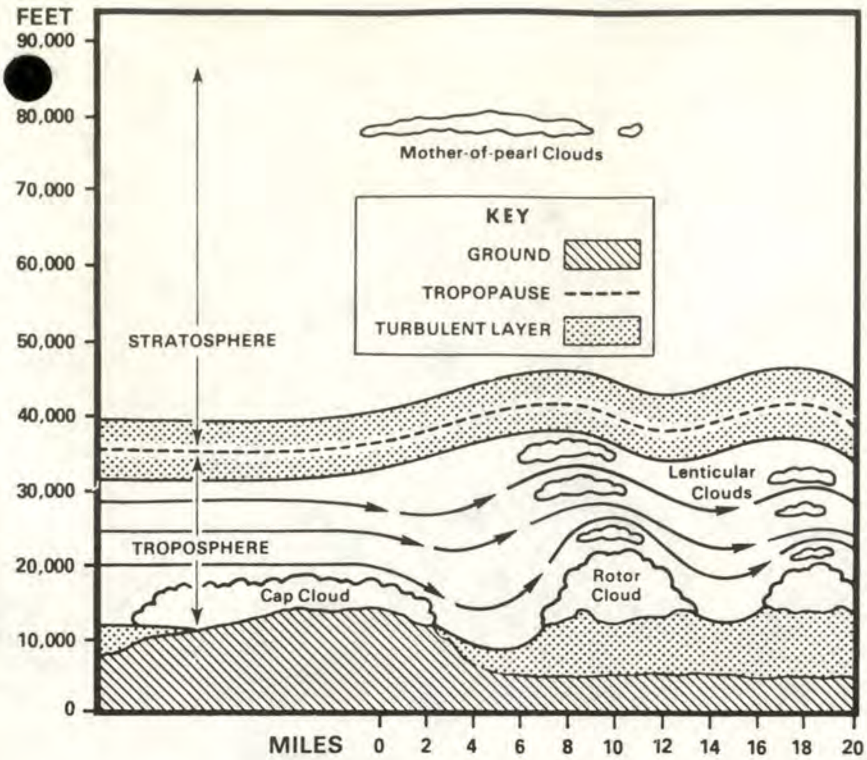


Figure 3. Typical Mountain Wave and Associated Clouds

occur above the extremely smooth lenticulars. "The turbulence layers above and below the lenticular level are comparable to ball bearings, allowing the atmosphere between to flow through at very high speeds."[4] For reasons not well understood, at times there is a sudden breakdown from smooth wave flow into vigorous turbulence which occurs throughout the vertical extent of the wave system. When this happens, the highest lenticular clouds reveal very jagged, irregular edges rather than the normal, smooth edges. In most cases, the clouds tilt toward the mountain range as ascent is made through the layers from the rotor cloud to the highest lenticular layers. As a consequence of this tilting, the streamlines are packed closer together in the downdraft side of the rotor. Thus, the wind speed is considerably increased in this area and local jets form, introducing additional hazards.

"Mother-of-pearl clouds are high level, about 80,000 feet, lenticular clouds and have been observed only in the Polar regions."[7]

While the overall context of the cloud formation is stationary over a considerable period of time, the clouds can change position, shape and structure in an extremely short time, and there is continuously a considerable amount of motion in and around the clouds. Extensive clouds can form or dissipate in a matter of seconds.

There are times when the wind is favorable for a wave condition, but there is not enough moisture present for the clouds to form. This cloudless or "dry wave" generates just as much turbulence as when clouds are present, but none of the warning features that the clouds provide are present. The conditions that are favorable for this type of wave phenomena and accepted as an indication of such a development are:

- Wind flow at mountaintop level of 25 or more knots perpendicular to the ridge.
- An increase in wind speed with altitude up to and above the mountaintop, in some cases on up to the tropopause. Within limits, wave action becomes more intense and stronger winds (more than 100 knots in the free air above the ridge) may eliminate smooth wave flow patterns entirely. When this happens, severe and chaotic turbulence may be expected.
- An inversion or stable layer (increase in temperature with altitude somewhere below 14,000 feet).[3]

The Wave. The amplitude or dimensions of the lee wave can be tremendous depending in a complex way on both the topography and the airstream characteristics. "In the Sierra Nevadas, for example, the wave clouds can extend several hundred miles parallel to the ridge lines of a well defined leading edge of clouds."[4]

There may be several wave crests or there may be only one. The amplitude and intensity of the waves decrease as they progress downwind. The distance of the first wave crest from the mountain peaks varies with wind speed, the type of wind profile, and the lapsed rate. "The crest of the first lee wave downstream of the ridge line is commonly observed to be less than one wavelength away."[7] With regard to wavelengths, observational evidence indicates that they range from 3 to 15 nautical miles, with the average about 6 nautical miles.

Although amplitude of lee waves is of importance, the larger the amplitude the greater the vertical currents, no operational techniques are available to assist a forecaster in predicting amplitude. Generally speaking, maximum amplitude is associated with the layer of greatest stability. The length of the wave has nothing to do with the turbulence associated with the rotor cloud.

With regard to persistence of mountain waves, W. B. Beckwith points out that "once established, wave activity may last for periods ranging from a few hours to 1 or 2 days with the essential characteristics of the waves remaining fixed in space."[8]

One mountain wave project was to investigate the altimeter error associated with the low pressure caused

continued on page 26

10% STARK TERROR

CAPTAIN ROBERT C. COPENHAFER, JR. • Davis-Monthan AFB, AZ

■ You've heard flying described as 90 percent boredom followed by 10 percent stark terror. To me, it was more like a 99 to 1 ratio with my one missing. You see, in my seven years of flying, I had not had anything really dangerous happen like what I am about to tell you. Everybody else had a good old heart pounding war story to tell except me. I had even felt cheated; but, no more.

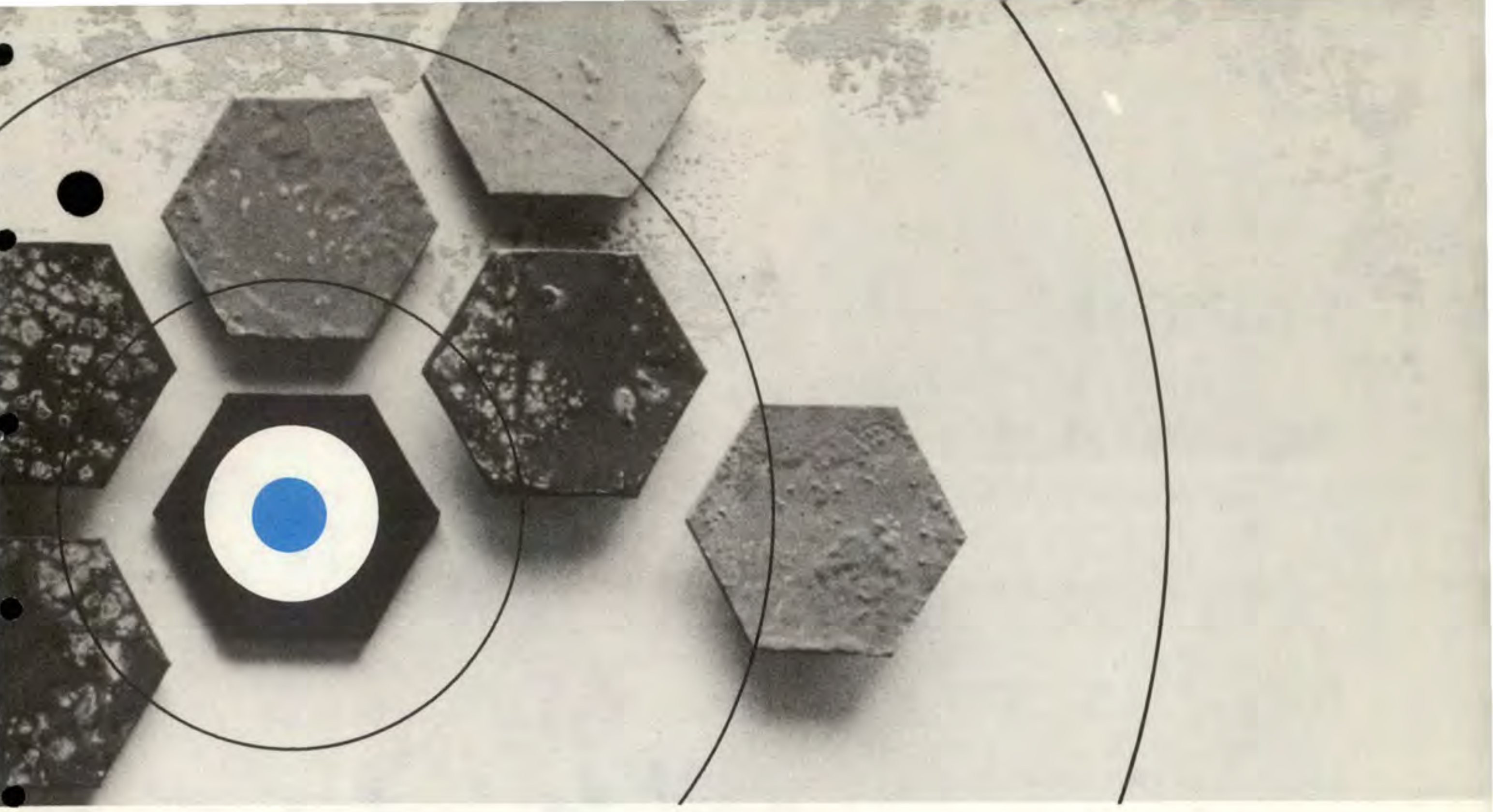
I was on a crosscountry flight in my *Duck* (0-2A) going from northern California to a base in southern California on a beautiful autumn afternoon. I decided to follow the California coastline while maintaining 1,500 to 2,000 ft AGL. The weather was as beautiful as the scenery. And, if I thought the scenery was beautiful, only God knows how many others thought the same, so the eyeballs were alert and searching the skies. Finally I reached the Los Angeles TCA. Having studied the approach plates and maps for the area, I noticed that VFR flight was restricted to 7,000 ft and above over the TCA. Complying with regulation, I climbed to 7,500 ft as I headed east over the city. I happened to see the LA Coliseum while tuning the ADF to the football game being played inside. Having never seen it from the air before, I decided to fly overhead for a few minutes while constantly searching the skies for *the blimp*. As the crowd filtered out, I decided that it was time for me to continue on to my destination. Up to this time, I was strictly VFR with no problems encountered and eyeballs tirelessly scanning the crowded California skies.

Contacting approach, I requested an ILS to a nearby airport for a low approach followed by radar vectors to my final destination. Approach cleared me out of 7,500 ft for 3,500 ft, gave me a heading to intercept the ILS final approach course, and told me the weather was VFR with five miles visibility. Five miles visibility in the Los Angeles Basin at 1600 local? Right! That dark, milky haze must have been measured with a mileage marker uncalibrated on the high side! However, this alerted me all the more to constantly clear and, believe me, I did clear as I had never seen so many different aircraft in one area in my life.

On the vector to the ILS final, my ILS receiver did the expected by going inoperative. I notified approach control who instructed me to maintain VFR at 3,500 ft, proceed direct to a nearby VOR, and fly a 100° heading upon reaching the VOR. I said to myself, "they really can't be serious thinking this visibility is actually VFR, but by the strict definition of VFR, they're right." It certainly wasn't the VFR I was used to in Arizona.

Pressing on to the VOR and clearing like a bandit, I had the erie feeling that something was amiss, but I couldn't put my finger on it. I do know that I was never more vigilant of others than then. After roughly three to five minutes and some communication problems with approach, I arrived at the VOR and began turning to my assigned heading when I heard another aircraft calling his position at the same VOR. I looked left and then glanced right to see a green and yellow tandem seater joining on my right and then doing an "alley-oop" over the top and in front.

By now I was getting just a bit concerned. For three hours I had



flown, clearing for myself with no help from radar, and now with their help, I was getting into what I felt was an uneasy situation. Winding the clock after my encounter at the VOR, I continued on the 100° heading for another five minutes or so when approach called out parachute activity at my 12 o'clock for two miles and simultaneously gave me a vector to 110 degrees. Looking through the darkening haze, I made contact on four to five jumpers at my 11 o'clock low descending over a small airport. I slipped the aircraft to search for other jumpers in that direction WHEN . . .

What happened next is the most frightening experience I've ever had in my life. Rolling wings level, I had a parachutist at my 12 o'clock actually climbing his risers with his knees above his chin desperately trying to get out of the way of my mixmaster which was about ready to mix him! How close? Well, let's say he had a yellow helmet on, a reddish brown mustache drooping around the corners of his mouth, which was wide open displaying the horror of the situation, and two of the widest eyes I've ever seen on a human being. Immediately, I dumped the nose and pulled left checking my 3 o'clock only to see a horde of jumpers with their rears to me climbing their risers as well. I could not believe what had almost happened as I notified PAR final control.

Walking into Base Ops, I was amazed how such an enjoyable flight could turn into such a horror show in a matter of minutes. Had I done anything wrong to deserve such fate? I had seen the notice of parachute activity near my final destination in the IFR Supplement. But, tell me, who really pays close attention to the IFR Supplement after confirming that the field is not PPR or that it has the proper gas and oxygen and sufficient runway? Complacency? Not a chance! Like I said before, I was prone to the clear position. Controller at fault maybe? Well, parachutists don't give radar returns as far as I know. Parachutists's fault? Check your right of way rules.

It dawned upon me that I nearly killed someone with me being at fault even though I did things by the book. Or did I? Maybe I should have asked approach if there was any parachute activity in the area mentioned in the IFR Supplement. But, on the other side of the coin, why wasn't I told sooner or, for that matter, what are people doing parachuting in an approach corridor to a major airport?

I've rehashed this nightmare over and over again for the past week looking for ways to avoid such an occurrence again. I can tell you that from now on, this pilot is going to continue to clear like my life depended on it (I know it does), pay close attention to all the remarks in the IFR Supplement, and if any doubt exists as to unusual activity enroute or at my destination, I will initiate the inquiry and not wait to be called. Those few minutes of a three hour and thirty minute flight are all I can really remember. Stark terror makes a lasting impression while yielding unwanted war stories. Hopefully, you won't be able to use the same story. ■

PART II

I Learnt About

■ Last month I told you about our flight outbound from the United States to the Azores. Well after a two week "swan" around the Med we found ourselves back at Lajes preparing for the flight home. We had lost one aircraft due to a heavy landing at Naples – the wheels went through the wings and it blew up on touchdown, but that's another story – so we were down to 15 aircraft for the return journey. Because of the prevailing winds an extra stop was planned at Bermuda, which was fine by us as we had missed a stop there on the way out!

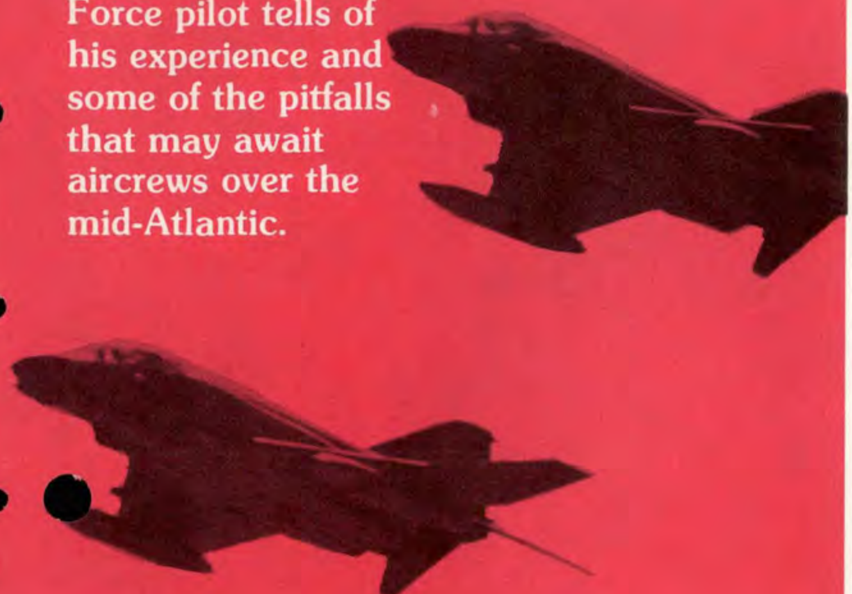
We planned to fly back as a five aircraft formation, meeting the tankers 400 miles west of the Azores, and to complete the remaining 1,300 miles unaccompanied. Once again navigation was to be by DR.

On the morning we were due to leave the satellite picture showed an extensive bank of cloud around the refueling area, and the pilot of a C-141 who had just come through it advised us not to bother. We didn't! The next day the cloud had cleared from the refueling area and we decided to have a go.

We joined up with our tankers as planned and plugged in. There were five of them – one each – in a stepped down echelon. As we approached the end of the refueling bracket, I looked down at nr 5, my wingman, who was at the bottom of the stack and saw him being engulfed slowly but surely by a thick layer of cloud creeping up from below. Very soon I could see his tanker but I could no longer see him on the end of the hose. Rather than go IMC, we disengaged early and tried to join up. In a Phantom with three full jugs at 220 knots at 20,000 ft you're on the wrong side of the drag curve, and until you get climbing speed, there's no place to go but down. Initially we used reheat to try to stay on top of the worst of it and get joined up. However, we were not that flush with fuel, and the cloud tops got higher. Numbers 1, 2 and 3 managed to get joined up with the aid of the only serviceable AI in the formation, but I (nr 4) and my wingman (nr 5) were eventually forced to dive to achieve climbing speed. Then we had to continue as

Flying From That

This is the second of two articles in which a Royal Air Force pilot tells of his experience and some of the pitfalls that may await aircrews over the mid-Atlantic.



singletons. We maintained heading and leveled at different heights – thank goodness our radios were working well for a change! We tried to climb out of the cloud but eventually had to give up as by this time the tops were well above 45,000 ft and we were still heavy with fuel.

A short time later my wingman calmly informed me that his compass was suspect and that he had lost all attitude information. However, he said he could see a contrail through the cloud above him, which he thought was mine, and that he would follow it. That sounded like a reasonable idea and he followed it for 300 miles!

Suddenly, and much to our relief, we broke into the clear, and my wingman joined up with me. Although we had all been flying the same heading, an Air-to-Air TACAN check showed that the other three aircraft were 64 miles to the south of us. At that point we noticed a large contrail close by and eventually found a friendly C-141 on the end of it going roughly in our direction. It seemed like a good opportunity to find out where we were – apart from knowing that we were approximately in the middle of the "pond" – so we gave him a call. Out there 243.0 was all ours, and the captain seemed to find nothing unusual in having five Phantoms asking for directions to Bermuda. He wasn't actually going there himself, but I was inclined to take the heading he gave us as a reasonably good steer. After all, in that situation how selective can you afford to be? An hour-and-a half later Bermuda TACAN indicated on the nose and we arrived in the kind of sunshine one expects out there.

On arrival we heard that the next wave of five aircraft had failed to join up with their tankers and had returned to the Azores. One pilot had had a fuel transfer problem and flamed-out ½ mile off the approach end of Lajes runway!

We all learnt a lot about flying and air-to-air refueling planning on that detachment.

– Courtesy *Air Clues,* November 1979. ■

Anatomy of an Accident

CAPTAIN GLENN SUTHERLAND
80 FTW
Sheppard AFB, TX

■ Student: "Solo 10, initial."

RSU: "Winds calm."

This was to be this student's third pattern in an otherwise routine second solo mission in a T-38.

The student pitches-out, configures with gear, and is displaced for a normal overhead pattern.

The student now commits the final and fatal error. He rolls into 45-50° of bank and starts the nose up as he moves the throttle forward.

"Solo 10, gear down."

This was the student's first chance to prevent the coming accident, but the gear down call had become just another radio call – he does not check, and does not realize that the flaps are not down.

To himself: *My airspeed is high and I seem to be losing a lot of altitude–pull off some more power and pull the nose up.*

The student has now missed his second chance at preventing this accident. Once again he is mechanically flying the aircraft and fails to analyze the reason for his high airspeed and descent rate. The corrections he made are both totally wrong.

Looks like I am going to overshoot. I sure hope the center runway is clear.

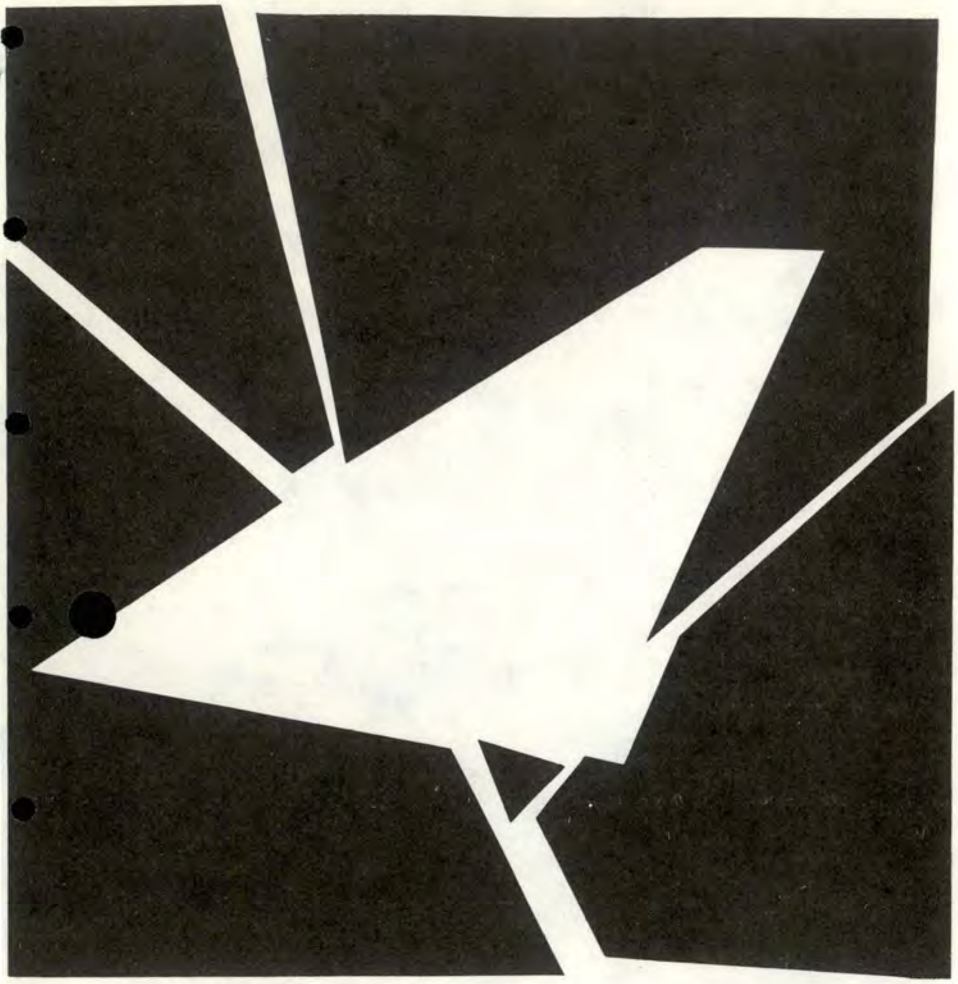
RSU: "Center's clear."

Student: "Thank you, on the go."

The student now commits the final and fatal error. He rolls into 45-50° of bank and starts the nose up as he moves the throttles forward. At that altitude and with that configuration the aircraft simply does not have enough power to overcome the drag and stop the sink rate in time.

RSU: "And let's get that thing flying. Burners, please."

The student did not acknowledge the call and approximately three seconds later the aircraft crashed. The configuration at the moment of



impact was gear down, speed brakes up and flaps up. The aircraft impacted the ground in 40-50° of bank, 8-10° nose up pitch, throttles in the afterburner range and full aft stick. The student made no attempt to eject and was killed upon impact.

All systems were operating normally prior to impact, so the reasons for this accident had to be that (1) The student failed to lower flaps and (2) maintained bank and allowed a high descent rate to develop. In short: pilot error.

Many pilots will argue that knowledge of aerodynamics is not necessary to adequately fly the machine, and this is partially true. However, without knowing why we do the things we do in an airplane, we are just over-paid assembly line fliers. We are simply pulling and pushing knobs and controls, just mechanically performing our given task, all the while attributing the performance of our aircraft to wires, mirrors and magic.

This student might be alive today if he had not made the fatal mistake during the go-around of increasing bank and back pressure *before* increasing power. At this point, he was trying to accelerate with the brakes on. At the time of impact it was estimated that the aircraft was in a descent rate of 10,000 fpm or 166.7 fps.

There are many questions that remain to be answered: Why did he fail to lower the flaps?

Why did he fail to properly check his configuration during the turn?

Why did he not recognize the bad pattern earlier and go around?

And, most of all, why did he increase bank and back pressure at that fatal moment during the go-around?

The answer to most, if not all, of these may lie in his training. Bad habit patterns may have been ingrained and when he reacted under stress, he unconsciously reverted to these patterns, which, in this case, proved to be fatal.

Instructors, this is why it is so vitally important that your students understand *why* they are taught to fly the way they are. A better understanding of the effects of power, bank, induced drag and angle of attack may prevent this type of accident from happening in the future. ■

MOUNTAIN WAVES continued

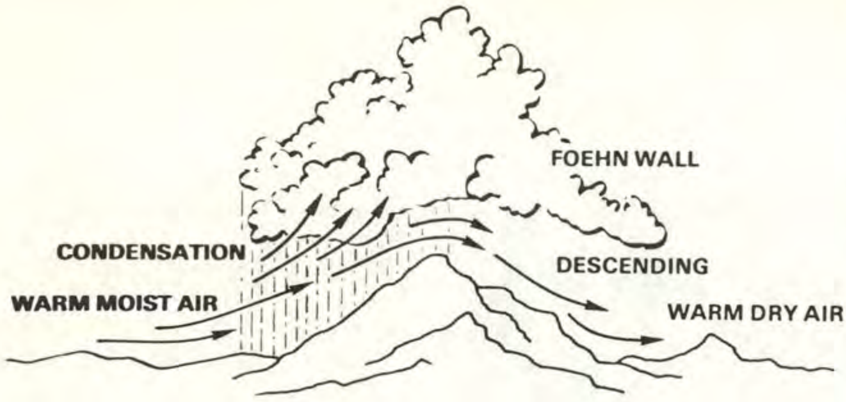


Figure 4. The Foehn or Chinook Wind

by the venturi effect of high wind over an obstruction. The pilot involved in the project who had occasion to make ski landings on the eastern side of the Sierras reports, "Near the tops of these mountains, after landing at points of known elevation, the altimeter has read as much as 2,500 feet high if a strong wave is in progress."[2]

Another type of mountain wave phenomenon worthy of discussion is the Foehn or Chinook winds. This same type of wave possesses numerous aliases in respect to its worldwide origin.

Snow eaters. One of the most interesting of local winds is the Foehn which was first observed and studied in the Alps. It is a warm, dry wind which descends the slopes and valleys of the mountains. Foehns which occur on the Great Plains of North America as well as those which occur in the interior valleys are given the name Chinook, an Indian term, which translates as "snow-eater." The cause of their warmth and dryness is shown in figure 4, but the essential features are:

A considerable elevation of land lying between an area of high pressure and an area of low pressure and sufficient water vapor in the air moving up the slope to cause precipitation on the windward side.[9]

Through adiabatic compression this wind is able to obtain increased temperatures and as this occurs, the relative humidity is lowered. The descending wind arrives at the bottom of the lee side of the mountain containing temperature rises as much as 50 degrees Fahrenheit. Blowing across a snowfield, they can evaporate snow at the rate of 2 feet a day.

During the descent, a great deal of turbulence and mixing of air masses occurs as well as the increased temperatures making this phenomenon a hazard comparable to the previously discussed mountain wave. Because there are fewer telltale signs, it is possibly more hazardous.

The knowledge gap. It is alarmingly obvious that there is not enough awareness about mountain waves and what their destructive forces are capable of doing. These forces, according to knowledge gained through extensive study, are said to be second only to tornados. Aircraft known to have the structural strength to withstand 14 G have been torn apart attempting to penetrate a fully developed mountain wave rotor cloud.

Contrary to many novices who claim to possess knowledge on the subject of mountain waves, these waves are not found only in those areas where towering mountain ranges occur. They also are found near mountains and ridge lines whose elevations are much less impressive. This phenomenon is capable of occurring in any region of the United States, or any other country for that matter, where the topography has ridges with elevations of 300 feet or more. Ridges of this elevation have produced wave action up to 75,000 feet with as many as 6 waves and a wave length of 20 miles.

The destructive force of mountain waves can be averted if one is familiar with the associated tell-tale signs. The majority of times, this phenomenon says to those who are knowledgeable, "Hey, here I am." With a good weather briefing and a little smarts there is no need to fear, or to get caught in, a mountain wave. – Adapted from *U.S. Army Aviation Digest*, September 1979. ■

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OPS topics

On The Gages

■ We hope there is not a trend beginning, but it seems as if there has been some less-than-good instrument flying. One of our action officers pointed that out recently as follows: "We don't know what the problem is, but if you haven't been under the hood recently, the next time your turn comes, work hard, whether it be in a simulator or in an aircraft. If we have learned anything from our mishap reports—and we have learned this many times in the past—use all of the instruments all of the time, use a normal cross-check, and believe what you're seeing unless something doesn't add up. Only if you use all of them can you tell if you've got a bad one. And falling off a wing in weather is a terrible time to learn that you have gotten a little rusty on your basic instrument flying."

Low Level Routes

When the crew of a T-37, flying a VFR low level route, saw an F-111 below them they rocked their wings to make the T-37 more conspicuous. They had to do it again a few moments later when they spotted another F-111 at or slightly above their altitude. The aircraft were never close enough to each other for a near midair collision, but the potential was there because VFR and IFR low level routes nearly coincided in one area. The VFR route has since been deactivated and the base indicated it would review all of its low level routes and redesign where necessary. How about your area?

A Soggy Day

Runway wet. The F-4E pilot planned accordingly and made a firm touchdown 700 feet down the runway. At 1,600 feet the left tire started sliding like soap, then the right tire—reverted rubber hydroplaning. Both tires blew, one at 2,400 feet from the end, the other at 3,100 feet. This crew was as slick as the runway and managed to bring the Phantom to a stop on the centerline. Everyone was a little puzzled when maintenance could find no reason for brake problems. The pilot probably felt a bit chagrined until on the fourth sortie following the blown tires, the left wheel locked up on touchdown on a dry runway. Six layers of cord later the tire started rotating again. Last we heard they were still looking for the culprit.

Everybody out!

During an alert response exercise on an B-52H, the flight crew noticed electrical sparks and smoke in the area of the pilot's sliding window. They shut down the engines and evacuated the aircraft. Investigation revealed that the flight crew had moved the metal "alert cocked" sign from the pilot's forward window to the side window. The sign subsequently slipped and fell against the pilot's sliding window heat switch. This caused an electrical short resulting in the sparks and smoke noticed by the flight crew. The unit now uses non-conductive plexiglass for their "alert cocked" signs.

Near Midair

A midair collision was averted when an alert controller called "traffic at one o'clock" and two pilots took immediate evasive action. The pilot of a T-38 said the other aircraft, a light plane, was behind the canopy bow and not visible to him. At the correct speed and angle, another aircraft may have no relative motion and thus could remain behind an obstacle such as a canopy bow. That has happened with fatal results. *See and avoid* requires more than just moving one's eyes. Move your head and body to be sure you see what's out there. ■

Mail & Miscellaneous

Send your ideas, comments and questions to: Editor, *Aerospace Safety* Magazine, Norton AFB, CA 92409

■ Colonel William F. Belk, MC
c/o Aerospace Safety Magazine

Colonel Belk

Your article on tonic water ("Gin and . . . Soda," Dec 79) and the recent attention devoted to tonic water has aroused a great deal of attention within the Air Force flying community. It has been a good example of essential information being rapidly disseminated through safety channels to all flying personnel.

The possibility of the quinine in tonic water causing undesirable side effects is now well known.

Conspicuous by its absence, however, is the relative lack of emphasis on the other ingredient of a gin and tonic. Namely—the alcohol in the gin.

While it is an immensely difficult problem to approach, someday, someone is going to have to address the problem of alcohol and military aviation.

How hypothetical it is of us to devote such a widespread effort about tonic water and the *very* minimal potential it has for safety; and at the same time ignore the gin which has a long standing and proven history of safety related mishaps.

I can't know of a single person in the Air Force who isn't aware of the problem alcohol presents to all types of safety including flying safety. The problem is that it involves virtually everyone, at one time or another, and we have grown to accept it.

Is there a single pilot anywhere within the military that has not seen, or indeed for that matter, personally participated in a mission while still under the effects, or aftereffects, of alcohol?

Isn't it about time that something be done about this problem; not only with flying personnel, but all personnel (driving, etc.). Your opening of the article highlights our own stupidity and apathy.

The effect of tonic water is minimal as compared to alcohol. Yet she served you the gin!

It is, of course, a matter of great individual and social significance. It involves qualities many Americans appear to have abandoned; self-restraint, personal responsibility and responsibility for our actions towards others.

Can we afford to continue to ignore the problem of alcohol? *It won't go away.*

Major Ernest J. LeClair, Jr., RI ANG
Hull, MA

Dear Major LeClair

Thanks for your letter. It may surprise you but the problem of alcohol in military aviation has been addressed–repeatedly so. This is not to say that it is no longer with us, but simply that the potential adverse effects of alcohol are well known. I doubt that there is a single responsible manager in the USAF who would condone flying while intoxicated. Yet, I'm equally sure that some individuals have and will fly in that condition.

I do not believe that we can simply expect Americans to exercise self-restraint and personal responsibility. If this was a realistic expectation of mankind, there would be no need for police or, for that matter, military forces. These are virtues to be sought in ourselves and honored in others, but not expected of all.

As part of society, it is the duty of each of us to take those actions we are capable of, which will help ensure the public safety and health. The police and the courts can neither stop drinking nor drunk driving, but if each individual assists those acquaintances who have drunk too much and who are in need of transportation, we could drastically reduce the mayhem on the highway. Similarly, if anyone with knowledge of an inebriated pilot, who is preparing to fly, advised management of this fact, the public consequences could be prevented in virtually every case. Unfortunately, this expectation is no more realistic than the other.

What can we do? We can continue to publicize the hazards. We can continue to develop rules and advise our crewmembers that we expect them to utilize the necessary restraint and responsibility to live within the rules. We can try to deglamorize alcohol and its niche in the fighter pilot mystique. We can report truthfully on alcohol-involved mishaps. And, we can ask everyone to execute their responsibility for the public safety when all of the above fail. We are doing this.

Colonel William F. Belk, MC
Chief, Life Sciences Division
Directorate of Aerospace Safety

OPS TOPIC—TANGO IN TRAFFIC

1. Your August 1979 issue has just arrived, hence the delay. It's all good reading but I must take issue with the last sentence of "Tango in Traffic" on p. 24.

2. I'm an engineer but I don't think your jocks should relax only when they've "put the fire out." What about those ejection seat pins; the FOD hazards; the snags you've almost forgotten about because you didn't write them down in flight? No, sir, the time to relax is when you've handed the aircraft back to the line chief and you're in the crew room again.

Flight Lieutenant L.E. Abbott
Royal Air Force

Amen!–Ed. ■

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UNITED STATES AIR FORCE

Well Done Award

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

MASTER SERGEANT

John B. Patterson

71st Aerospace Rescue and Recovery Squadron
Elmendorf Air Force Base, Alaska

■ On 9 July 1979, Sergeant Patterson was the flight mechanic aboard an HH-3E helicopter during a routine water hoist training mission. The initial smoke deployment had been completed when a rumble was heard and vibration was felt in the aircraft. The training maneuver was terminated, and the helicopter was vectored toward land. The nearest airfield was four miles away. While Sergeant Patterson was checking the rear cabin area, the aircraft was cleared for a straight-in approach. On final, strong electrical fumes were entering the cabin and cockpit. The number one generator failed, and an inflight emergency was declared with the tower. The smoke and flames were entering the cabin area from the rear of the main rotor gear box. Sergeant Patterson started fighting the fire with a small hand-held fire extinguisher. After landing and the engines were shut down, he climbed to the top of the aircraft and began to fight the fire from the maintenance platform while awaiting assistance from the base fire trucks. The fire department soon arrived, but, unfortunately, the fire truck's foam spray system failed; the truck was useless. Sergeant Patterson stayed atop the burning aircraft and fought the fire until it was extinguished. His quick airborne action possibly saved the crew from a disastrous inflight fire, and his efforts and disregard for his own safety were responsible for extinguishing the fire on the ground. WELL DONE! ■

The PRECISE Word Must Be HEARD