flying SAFETY

MARCH 1995

HEADS-UP FLYING – THE ACC APPROACH

by General John M. Loh, USAF

■ The warfighting capability of Air Combat Command rests on the talents and abilities of every single member of the command. When we lose people or equipment to safety-related mishaps, it affects our ability to perform even routine day-to-day missions. Eventually, our overall combat capability suffers, because the loss of every asset is felt deeply and is very difficult to replace.

Because of safety's importance to our combat capability, improving the command's safety performance is an enduring goal, and so one of our key goals for 1995. Flight safety is a particularly visible and challenging area we continually strive to refine. We are committed to achieving a command-controlled flight mishap rate equal to or less than 1 mishap per 100,000 flying hours (Command-controlled mishaps are those which someone on the ACC team could have prevented through their actions). We promote our culture of safety as a recurring theme because our people live and operate in highly demanding, and potentially dangerous environments.

One of the most demanding environments our people face is flight operations. Whether it's an F-15 on an air superiority mission, an EC-130 en route to Southwest Asia, an F-16 LANTIRN mission, or a helicopter crew on a rescue mission, risk is an ever-present factor. How can we continue to lower our mishap rates? One way to do that is by the "heads-up" flying of all aircrews in the command. This is a common-sense approach to flight safety — one that will enable us to prevent mishaps, improve our safety performance, and enhance our combat capability.

Quite simply, heads-up flying demands complete knowledge of all the flight and training rules as well as your aircraft and its systems, an honest assessment of your capabilities, and total awareness and anticipation of what's going on around you. Heads-up flyers have to focus on the mission and concentrate on the task at hand while anticipating the unexpected.

Let me give you some examples of ACC crews' heads-up flying. A redeploying RC-135 crew had just passed the mid-point of their North Atlantic crossing when all three aircraft generators dropped off line and would not reset. Realizing they had limited battery power and instruments available with deteriorating weather at their divert bases, the crew decided to visually navigate to Goose Bay. En route, they calculated required fuel, discussed possible contingencies, and reviewed their procedures for crash landing or ditching. Despite further complications, the crew executed their plan flawlessly and landed safely at Goose Bay.

An F-15 pilot landing at his home base had just pulled his nose up for a full aerobrake when he noticed a civilian sedan enter the runway from the left, approximately 1000-1500 feet in front of him. The vehicle drove onto the left half of the runway and turned toward him. With only seconds to react, the pilot immediately selected full afterburner and steered to the opposite half of the runway, becoming airborne less than 100 feet from the car.

In order to rescue an injured fisherman, an HH-3 crew had to improvise an alternative method to recover their survivor when the helicopter's hoist system failed. Then, in the critical transition from a hover to forward flight, the crew experienced an engine compressor stall in one of their two engines which significantly reduced their ability to maintain level flight. Just to safely recover the aircraft, the crew had to perform a flawless single engine air refueling, then overcome an automatic flight control malfunction while landing.

There are some common threads running through these examples. Heads-up flying isn't a "cockpit only" event. It starts with mission preparation and planning. Likewise, it doesn't end when the wheels touch the ground. The concept of heads-up flying should permeate everything we do from academics to simulator training, mission planning, and debriefing.

These crews were mentally prepared for their missions. They had

continued on page 2

Our 51st Year
AIR FORCE SPECIAL PUBLICATION 91-1

UNITED STATES AIR FORCE

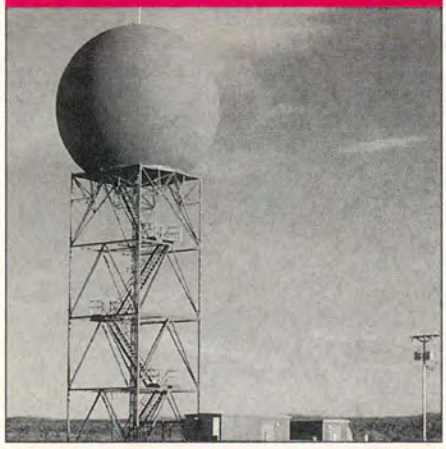
Flying SAFETY

MARCH 1995
VOLUME 51, NUMBER 3

SPECIAL FEATURES

Page 6

REGULAR FEATURES



Page 14

Cover photograph by SrA Andrew N. Dunaway, II

CONTRIBUTIONS

Contributions are welcome as are comments and criticism. No payments can be made for manuscripts submitted for publication. Call the Editor at DSN 246-0936 or send correspondence to Editor, *Flying Safety* magazine, HQ AFSA/SESP, 9700 Ave G, S.E., Ste 282, Kirtland Air Force Base, New Mexico 87117-5670. The Editor reserves the right to make any editorial changes in manuscripts which he believes will improve the material without altering the intended meaning.

HEADS-UP FLYING — THE ACC APPROACH
by General John M. Loh, USAF

continued

thought through possible complications and contingencies, and were prepared to respond quickly to save themselves and valuable combat resources. They prepared themselves as much as possible *before* the flight, leaving little to chance and even less to luck. If you're not mentally ready to fly — don't!

There is no such thing as a routine mission. Every flight has some risk associated with it and has the potential to become complicated and hazardous. Heads-up flying equates to continual vigilance, and does not allow for complacency.

Use all of the resources available to you. Whether it's other crew members on board, the AWACS controller, your wingman, or the SOF — use what you have available to help you safely recover your aircraft. Heads-up flying doesn't mean that you have to solve all the problems or find all the answers by yourself.

As leaders and supervisors, we must strive to develop heads-up aviators. Our training programs, evaluations, and exercises should all contribute to this development. Likewise, we must be careful that we don't push our crews too far, too fast. We must ensure that our flyers are not getting in over their heads. The best time to take a good hard look at the plan is during mission preparation; not after the mission's over.

I see or hear examples of smart, heads-up flying throughout Air Combat Command nearly every day. If we are to achieve this year's safety goals, everyone involved with ACC flight operations must be a heads-up flyer. Know your aircraft, know yourself, know your crew, and know what's going on around you — it's the common-sense, and *best* approach to flight safety. ■

Complacency "Gotcha"

ANONYMOUS NAVY PILOT

■ It was a typical hot August afternoon at NAS Whiting Field flying T-34s. Taxiing back to the line after a basic instrument hop with a solid student, the flight duty officer called me over the radio and asked if I had enough gas left to take the squadron flight surgeon up on a hop. I had about a half-a-bag of gas left, so I said, "Roger that." What an easy way to bag an extra hour of flight time!

I swapped out to the rear seat, stuffed the doc in front, and off we went. We headed for the nearest aux field where the doc showed off his stuff with some sweet bounces.

After a little landing competition, the doc said, "Let's go cruise Pensacola Beach and do some acro." At this point, I was fast becoming a sandbag instead of the aircraft commander, letting the doc do whatever he wanted. A quick glance at the gas gauge would have been a good idea. But I was treating the doc like another IP and assumed he had done an ops check.

The next mistake was flying right by Home Field to get to the beach, enjoying the view instead of checking my fuel state. The doc set up to do a loop as I finally did a scan of the fuel gauge. I saw 150 pounds remaining, which equates to just enough gas to RTB and land with min fuel by SOP.

We RTB'd and asked for the straight-in at 5 miles to get on deck expeditiously. I told the doc to stay at higher than normal in case we needed to dead stick it to the duty runway if we flamed out due to an inaccurate reading fuel gauge. Straight-ins are not normally done at Whiting, so the standard gear down in the break landing checklist was not done.

High and fast on short final, I did not see "Three Green" gear lights. GREAT! We didn't have the gas for a waveoff. The doc put the Turboweenie into a serious slip and lowered the gear.

Of course we landed long and fast with the doc standing on the brakes. Whiting Field normally does split runway ops which gives 3,000 feet to takeoff and 3,000 feet to land. As my luck was going, needless to say, another T-34 took the active before I could tell Tower I would need a full-length rollout. So both the doc and I stood on the brakes.

I finally awoke from my complacency slumber and took the controls. We zinged off the duty and got the aircraft under control on the taxiway. As my heart rate recovered, a quick glance at the fuel gauge showed I landed with 10 extra pounds of gas. I had that going for me! Not exactly the easiest extra hour of flight time I have bagged.

Aircraft commander responsibility cannot be delegated no matter how good the copilot is doing! Also, when doing something that takes you out of a normal habit pattern, use the checklists required. That is why they are in our pocket NATOPS. ■

CAT

CLEAR AIR TURBULENCE

CAPTAIN JAMES A. KRATZER
HQ Air Force Flight Standards Agency

■ Clear air turbulence (CAT), one of the most unexpected and potentially dangerous hazards to aviation, is also one of the most difficult to forecast. Severe CAT once tore the upper vertical stabilizer off a B-52, and numerous other cases have resulted in compressor stalls, flameouts, and injuries to aircrew and/or occupants.

From minor bumps to severe mountain wave turbulence, CAT comes in many forms and is usually most severe during the winter months. It's estimated CAT is responsible annually for over $30 million in aircraft damage.

While there are numerous definitions of CAT according to the FAA and National Committee for Clear Air Turbulence, perhaps the simplest comes from the Airman's Information Manual as "turbulence encountered in air where no clouds are present." Regardless of who is defining CAT, you certainly recognize it when your aircraft is suddenly and viciously jolted from encountering a pocket of CAT!! No more smooth, bright sunny day!

CAT is principally found in curved jetstream segments associated with troughs, ridges, closed upper-level lows, and rapidly developing surface lows. CAT is caused by small-scale wind variations in speed and direction with the resulting friction causing wind shear and turbulence.

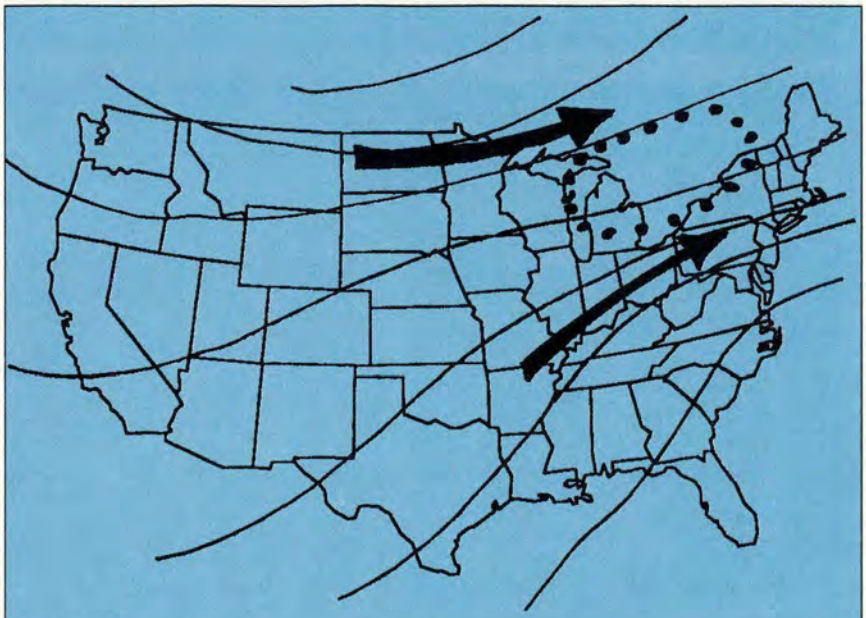


Figure 1: CAT occurring in the vicinity of merging jets.

During the colder months, there are often two or three predominant jetstreams — the polar, the subtropical, and the arctic. The best known of these is the polar jetstream. This mid-latitude jetstream is the one that frequently enhances major weather system development and movement. Unfortunately, many of the world's busiest air routes are concentrated in these same mid-latitudes, greatly increasing the opportunity for damage or injury due to CAT.

The perceptible effect of turbulence upon aircraft depends on factors such as the size, strength, and distribution of the turbulent waves or windspeed fluctuations, as well as an airplane's size, weight, speed, and design. While CAT tends to have lesser effects on slow, larger aircraft, the largest percentage of passengers is carried on these aircraft, creating a greater potential for injury. CAT occurs most frequently during the winter when the jetstream is normally flowing the fastest. The greater differences in windspeed between the jetstream and surrounding air cause the effects of friction to be greater, causing more ripping action and, therefore, more CAT.

continued

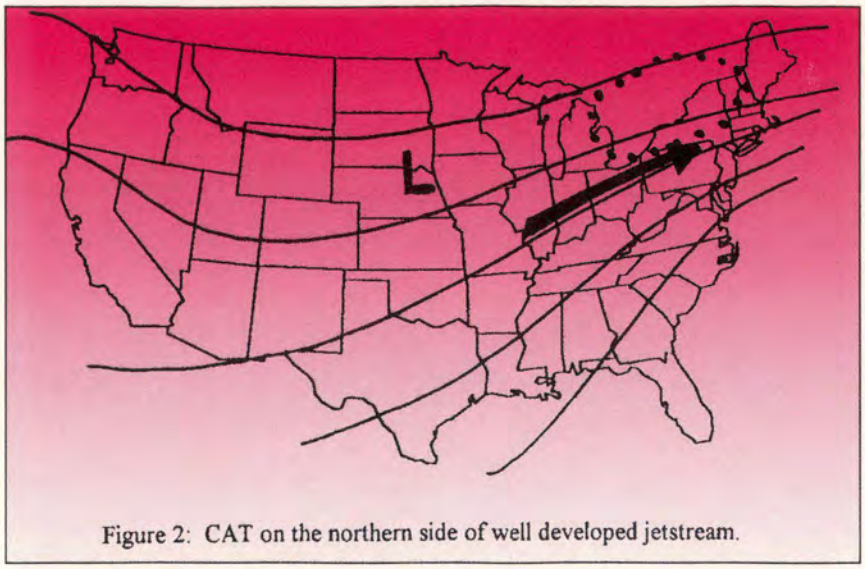


Figure 2: CAT on the northern side of well developed jetstream.

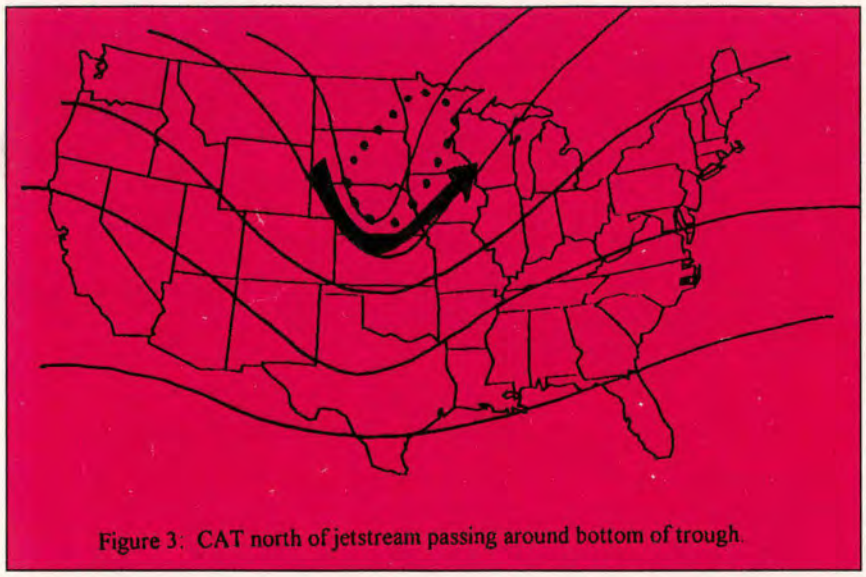


Figure 3: CAT north of jetstream passing around bottom of trough.

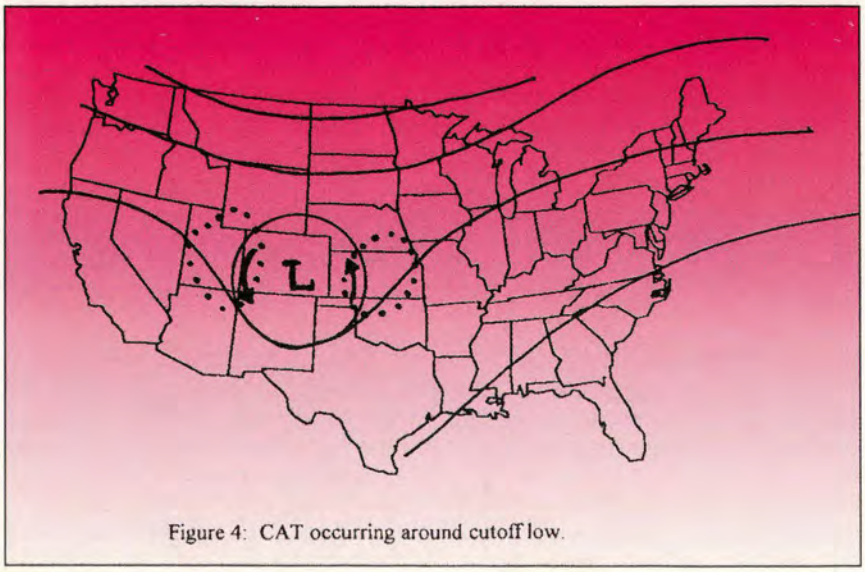


Figure 4: CAT occurring around cutoff low.

CAT CLEAR AIR TURBULENCE

continued

So much for definitions. Let's focus on what you can do as a pilot to avoid CAT — or at least minimize your exposure.

First, check all weather advisory data such as PIREPs, SIGMETs, AIRMETs, and other aviation hazard forecast products. Study the surface and upper-level weather maps, looking for the favored areas for CAT to occur, and learn to recognize the most common. When examining upper-level wind progs, key on areas where the upper-level winds rapidly change speed and/or direction in a short distance. If there is a 150-knot jet blowing towards a region of 80-knot winds, you can expect some turbulence.

A favored location for CAT is in the vicinity of merging jetstreams as shown in figure 1. The polar jet in the north merges with the subtropical jet from the south and forms vertical and horizontal wind shears, ingredients for CAT formation. While these discussions and diagrams cover operations in the northern hemisphere, they also apply to the southern hemisphere — just reverse the directions south of the equator.

Strong wind variations are usually found in the vicinity of a well-developed surface low-pressure system, or cold front. See figure 2. CAT tends to occur on the northern side of a jetstream's maximum wind, as the jetstream's wind decreases toward the low. Also, if the outside air temperature starts fluctuating, brace yourself for possible CAT. A temperature change is often accompanied by a corresponding wind direction/speed change — a sure sign of CAT.

Another common location CAT occurs is the polar side of a jetstream that bounds a sharp V-shaped upper trough. See figure 3. This upper-level pattern is frequently found during the winter and early spring. Strong jetstream winds on the sides of the sharply curved trough drop off quickly in the center of the trough.

CAT is also found in the neck (areas of convergence/divergence) of a cutoff low-pressure system. See figure 4. The air circulation around the low-pressure system perpendicular to the normal east/west flow causes the wind shear and eventual turbulence. This situation will normally occur only when there are winds of 70 knots or greater circulating around the cutoff low.

Figure 5 shows a rapidly developing surface low. Another frequent area of turbulence is the region between a surface low and the downstream upper-level ridge line. As the low quickly develops, the upper winds will change in response, causing the vertical and horizontal wind shears necessary for CAT.

In a general sense, CAT occurs with the greatest frequency and severity in the vicinity of and just below the tropopause where the jetstream is most frequent. Figure 6 shows where vertical wind shears within the jetstream are the greatest.

What can you do if you've forgotten all you read or just couldn't avoid clear air turbulence? First, either climb or descend (ATC and PIREPs are a good source for determining which way to go) to get out of the worst turbulence. A good rule of thumb from AFM 51-12, *Weather for Aircrews*, is "Either climb or descend after watching the temperature gauge for a minute or two. If the temperature is rising — climb; if it is falling — descend."

You can also fly your Dash One turbulence penetration airspeed to minimize damage, or, if possible, move southward to laterally escape the worst of the turbulence. Keep in mind that most CAT areas are less than 70nm in length and not very wide.

When you sufficiently recover from the severe and extreme turbulence situation, forward a PIREP to the controller and any Air Force weather service as soon as practical. This immeasurably aids your fellow fliers and alerts the weather community of the hazardous situation. National Weather Service often uses PIREPs to issue a turbulence advisory.

For more information on CAT, FAA Advisory Circular 00-30A, titled *"Rules of Thumb for Avoiding or Minimizing Encounters With Clear Air Turbulence,"* and AFM 51-12, Volume 1, Chapter 10, provide good general discussions of turbulence accompanied with excellent graphic aids. ■

CAT occurs with the greatest frequency and severity in the vicinity and just below the tropopause where the jetstream is most frequent.

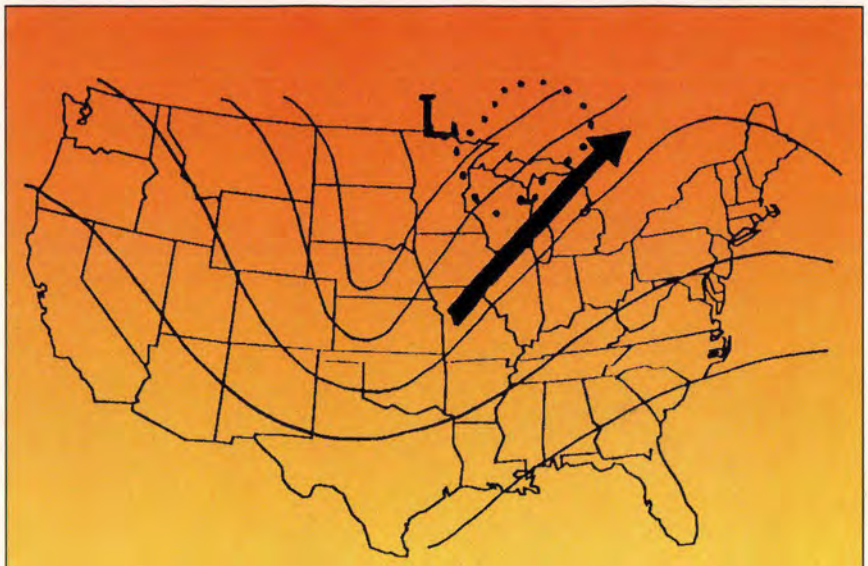


Figure 5: CAT downstream of a rapidly developing surface low.

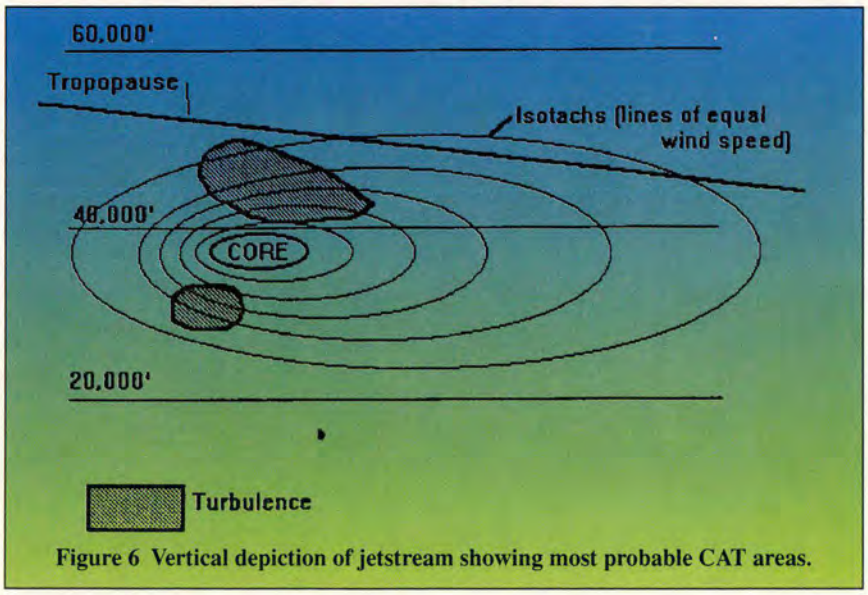


Figure 6 Vertical depiction of jetstream showing most probable CAT areas.

THE UNEXPECTED VISITOR

CAPTAIN SCOTTY SELMAN
Flight Safety Officer
398th Operations Group
Castle AFB CA

■ It all started one night when my phone rang. It was the Chief of Safety asking me if I'd been listening to the "commander's net" on the radio.

After a quick briefing on what was happening, I jumped into my car and drove to the base. It seems a civilian aircraft (PA-28 Warrior Archer) had accidentally mistaken Castle AFB for Turlock Airport (which is about 15 miles north of Castle) and landed here. I was called because the aircraft was not "squawking" or talking to anyone when it entered our Class C airspace, and because we had KC-135s in the pattern, the potential for a midair collision was very high.

Once I arrived at base operations, the airfield manager briefed me on what had happened. The aircraft was picked up on radar just prior to entering Castle's airspace. After numerous unanswered calls over all known radio frequencies (including VHF and UHF GUARD) from RAPCON, the supervisor of flying and the tower controllers (who also tried blinking the runway lights off and on), the aircraft landed.

The only lighting on the aircraft was the wing lights. The landing

light was burned out. After landing, the pilot turned off all his lighting.

Once the aircraft turned off the runway, the pilot realized he was in the wrong place and started to turn around on the taxiway. Within seconds, three security police vehicles blocked his path and had both occupants out "eating dirt." After a thorough search of their persons and with nothing significant found (in fact, neither had any identification except for the pilot who had a pilot's license and a pilot medical certification), they both were taken into base operations.

Official USAF Photo

When the airfield manager briefed the pilot that he would have to pay a landing fee, the pilot said he couldn't because he had no money and owed back pay for leasing the aircraft. His statement seemed odd because his passenger (who would give only his first name) had approximately $1,300 in a roll with a rubber band around it, a beeper, a cellular phone, and rolling papers. In fact, he was beeped a couple of times, and his cellular phone was ringing. When one of the security police answered the phone, the party on the other end hung up rather quickly.

This entire situation was getting stranger by the minute, a lot like something from one of those TV cop shows. That's when the security police took complete control of the situation.

After searching the aircraft, a small cardboard container with nearly 2.2 pounds of methamphetamines (street name — ice or speed) was found hidden inside the Piper. Needless to say, the duo was handed over to the local sheriff's department and booked on charges of possession, transportation of a controlled substance, and possession of a controlled substance for sale.

Although this incident really happened and has a humorous ring to it, there are many serious lessons to be learned. The first is **don't assume everyone follows the rules.** Before entering Class C airspace, everyone is required to have an operational transponder and two-way communication between the aircraft and the controlling agency. But, like in this situation, the "other guy" may be following his own set of rules, so beware.

Another lesson is to **"clear."** Not only should you clear your flightpath visually, but clear using the radios. When you hear someone transmitting on GUARD, listen closely to what is being said. It could direct a certain action on your part to get out of the way. If you're unsure about the situation, query the controller.

Probably the best lesson to learn is from the Piper pilot (apart from not dealing drugs): **Know your airport environment.** The Turlock Airport's runway is 2,985 feet by 50 feet. It has S-12 lighting, which has low intensity runway lights (LIRL) and runway end identifier lights (REIL). The rotating beacon at Turlock has a single green and a single white flash, a normal civilian airfield beacon.

By contrast, Castle's runway is 11,800 feet by 300 feet. It has ALSF-1 lighting (also know as A-1 standard lighting) approximately 2,400 to 3,000 feet long, high intensity runway lights (HIRL), and visual approach slope indicators (VASI). Its rotating beacon has a single green and a double white flash, a normal military installation beacon.

Right now you're asking, how could anyone mistake Castle for Turlock? We asked the same question. The pilot's explanation was that he gets disoriented when he flies at night (a bit strange since, after some investigation, we found the majority of his sorties were at night).

There are only a few possible answers **I** could come up with (besides the obvious). Both airfields are near a four-lane highway. Both runways have relatively the same runway headings. And the airport environment for both is on the same side of the runway. To a young, inexperienced, disoriented pilot (which the Piper pilot was), I could see, barely, how one could mistake Castle for Turlock.

The bottom line is this: There are a lot of aircraft flying today — legally and illegally. The "Big Sky" theory is flawed. Know the rules and **clear! FLY SAFE!** ■

Fliers and maintainers, we need your help!!

Our No. 1 Reader Request!

Another

THERE I WAS

issue to be published this summer.

Tell us about the story relating to flying safety you learned from most!

All entries remain confidential.

Air Traffic Controllers, Firefighters, Aircraft Munitions Specialists are welcome too!

If we print your story, we'll send you our Flying Safety coffee mug (confidentially, of course!)

Write, type, fax, call, E-Mail or send your cassette tape to:
The Editor, *Flying Safety* Magazine
HQ AFSA/SESP
9700 Avenue G, S.E., Suite 282A
Kirtland AFB NM 87117-5670

E-Mail:grigsbyj@smtps.saia.af.mil
Commercial: (505) 846-0950
FAX: (505) 846-0931

Don't let your story fade away!

There I Was...

FOLD

HQ AFSA/SESP
9700 Avenue G SE
Kirtland AFB NM
87117-5670

HQ AFSA/SESP

There I Was...

9700 AVE G SE
Kirtland AFB NM
87117-5670

"EYES ONLY" for the Editor

FOLD

■ It was dark, but it wasn't stormy, nor was it night. It was the usual O'dark-thirty. The squadron was humming with the quiet murmuring and last-minute preparations associated with the usual early-morning show. Navigators were comparing routes and times one last time, and copilots and gunners were guzzling steaming cups of java.

But this was not your usual show-up-3-hours-before-the-sun-comes-up early-morning mission. This was Global Shield — the largest of worldwide bomber exercises!

I wasn't quite a "boy nav," but I also hadn't earned the title of being "crusty" yet either. And seeing as this was my first Global Shield mission, and I was in the No. 2 plane, I was quadruple-checking everything as every good nav should. With briefings out of the way, a feeling of confidence and excitement began to overtake me. It was time to board the bus.

Suddenly, the lead radar nav (a crusty old f---) came up to me and pulled me aside. "Watch your pilot. Make sure he takes his fan heading." And then he was gone. Just like that.

I wondered what that was all about. Oh well. I made a mental note to cross-check the desired fan heading and to have it available if needed, and then I went on my way, a bit less confident and a bit less excited.

The bus ride was uneventful, as was the preflight and taxi. Things were going smoothly on this massive show of force. The throttles advanced. The aircraft shuddered and began rolling. My EVS and MFDs came alive as I stood ready for S1. I nailed it, and shortly thereafter, the plane lifted off into the now bright morning.

I heard the copilot call out the fan heading, and I mentally sighed in relief. Unfortunately, I was too early, and it was too late. We had flown straight up behind lead and got caught up in his jet wash. The aircraft rolled sharply to the left to what seemed like a 45-degree angle. Then it rolled sharply to the right and pitched way up. The airspeed began to bleed off. The IP was yelling into the interphone, "Kick the rudder in! Kick the rudder in! Push the nose over!"

Scenes from *Top Gun* flashed through my mind. Although we weren't in a flat spin and heading out to sea, this was definitely "not good."

I reached down for my trigger ring and gripped it tightly. I brought my knees together and prepared to punch out. I looked at my radar nav but can't remember if he was doing the same. I increased the upward tension on my trigger ring — and then I hesitated. I don't know why, and to this day, every time I replay this scene, I still kick myself for not leaving the plane. Spectators along the base perimeter painted a horrifying recollection of diving for cover as we flew overhead and praying they wouldn't get hurt by hatches, seats, or the fireball.

After dancing back and forth a couple more times, the pilots recovered the plane. For a moment, all was silent. With a fleet of bombers screaming up behind us, we couldn't afford to let up just yet. Luckily, the remainder of the mission panned out without a hitch.

This isn't a story about thorough mission planning or good crew coordination. We had all that. This is a lesson on surviving.

On that morning, I had gotten a little bit crustier, and I had also gotten a second chance at life that I probably didn't deserve. I had exceeded my personal ejection parameters. (I would remember these words later at CFIC* where the lesson was "Let the student exceed *his* parameters but never your own.")

The postmission debrief revealed that several other crewmembers were equally on the verge of exiting the aircraft, but for the same or similar reasons, they hesitated. I remember hearing about the Mather crash several years earlier involving a similar MITO where all crewmembers perished, and I wondered then why no one attempted to eject. I wondered if people would ask the same about our experience had we met a similar fate.

Was I within my ejection parameters for airspeed and altitude? I don't remember. If not, I'm sure I was close. But it doesn't matter, does it? No one ever rode it in and survived a B-52 crash landing. I exceeded my tolerances. Don't exceed yours. ·

*At that time, it was Central Flight Instructor Course. It has since been renamed as Combat Flight Instructor Course. ■

"Complacency Can Kill You"

CMSGT DON A. BENNETT
Technical Editor

A jet's liquid oxygen (LOX) converter exploded during ongoing maintenance actions. The explosion injured two maintainers and caused significant structural damage to the aircraft. The mishap was human caused, but easily preventable!

■ The jet's LOX converter had been removed earlier to facilitate other maintenance (FOM). It was placed in a box (with no lid) which was stored outside. During the storage period, there had been extremely heavy rains. Inside the box, there were several inches of water. The only protection the converter had from the weather was small cloth bags covering the pressure buildup and vent valve and supply port.

The maintainer assigned to re-install the converter took it from the box, removed the wet cloth bags, then wiped it down. No other special pre-installation preparation actions were taken. However, under conditions such as these, isn't it reasonable to assume there might be a chance the converter was "contaminated"? Of course, this would require further precautionary actions beyond just wiping the moisture off the converter!!

For instance, tech data calls for the fittings and valves to be blown with dry, oil-free air or gaseous nitrogen to remove moisture. And for possible contamination, the converter should have been purged in accordance with the applicable tech

data. Unfortunately, none of these steps were taken.

A couple of hours after the installation was completed, another maintainer arrived at the jet to service the empty converter with LOX. The servicing was uneventful.

Several hours after the servicing was completed, two other maintainers arrived at the jet to do a preflight.

Photos by TSgt Perry J. Helmer

One of the maintainers noticed the LOX converter access panel and surrounding airframe were sweating, and a hissing sound could be heard. The individual discussed the condition with the other maintainer, who was also the supervisor.

The worker also reported to the supervisor the cockpit oxygen regulator gauge was reading *below* the zero pounds per square inch (PSI) increment. In addition, frost was discovered on the pressure buildup and vent valve, a supply line, and the converter. The supervisor decided to continue looking for leaks in the system.

The worker was situated on the other side of the aircraft while the supervisor was conducting the search. When the supervisor found a potential leak, he called out to the worker to bring some tools. Before the worker could respond, the aircraft's LOX converter exploded.

The supervisor was injured as well as another nearby maintainer. The jet received extensive damage. Luckily, the other mishap worker was not injured.

An analysis conducted by depot engineers concluded the converter's overpressure relief valve failed to relieve excessive pressure because moisture had frozen in the valve. This allowed the converter to overpressurize and eventually explode. The converter's pressure gauge was damaged when the maximum allowable 500 psi was exceeded. The pressure buildup could have been in excess of 1,000 psi!

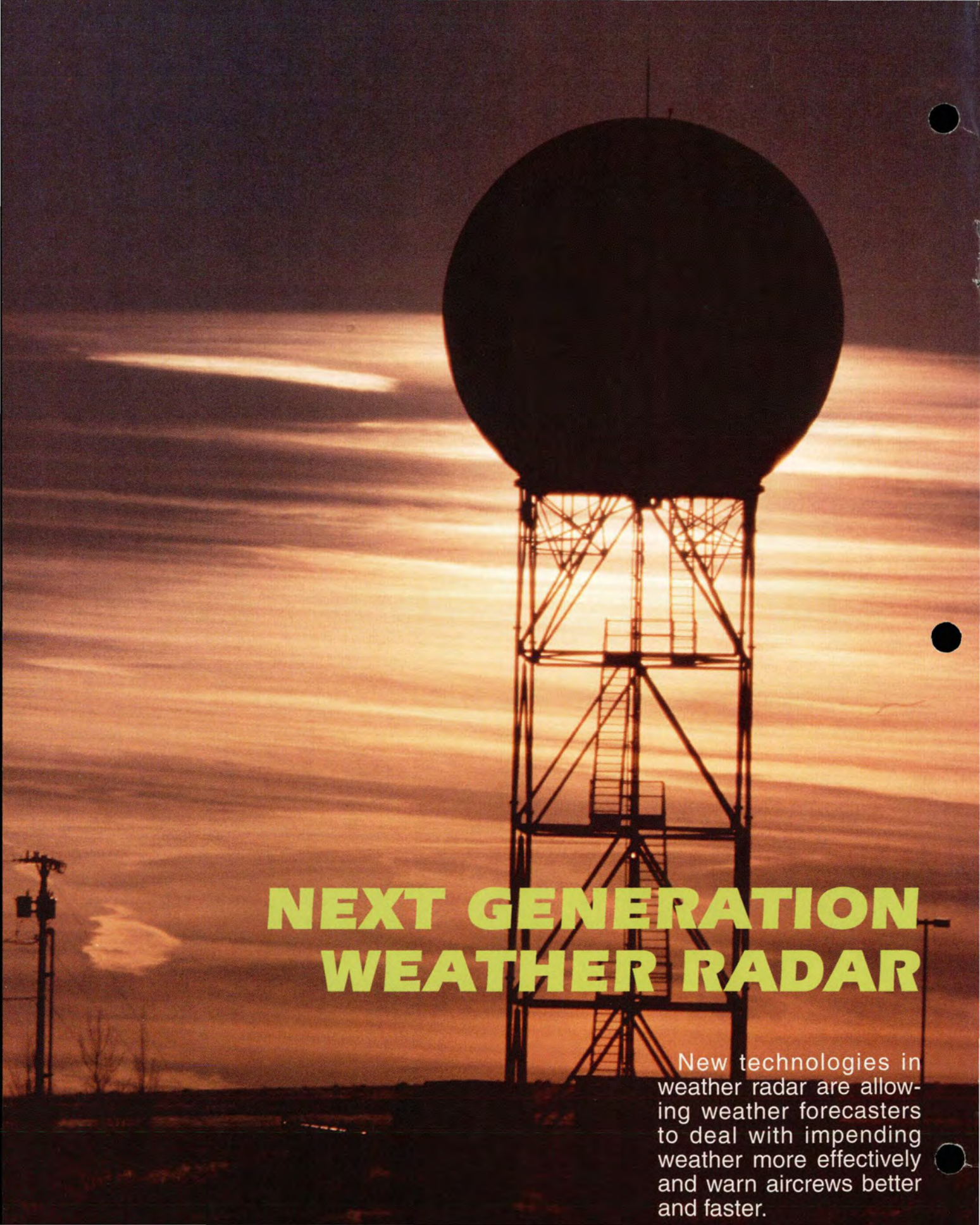
This flightline explosion mishap reminds us **again** that working around LOX (or gaseous oxygen (GOX)) is still a pretty serious and risky business. But the seriousness and risks can be sharply mitigated by proper training and strict adherence to aircraft and LOX/GOX equipment tech data. Good common sense can also help. Our pilots use and maintainers service and/or work on aircraft LOX or GOX systems successfully every day. Maybe our true formidable enemy is really complacency.

The Air Force has gone to great lengths over many, many years to ensure all aircraft and support equipment are "safety-engineered" to accommodate the safe, proper servicing or maintenance of all Air Force aircraft LOX/GOX subsystems and ground handling support equipment. The training programs of pilots, aircraft maintainers, and LOX/GOX ground handling personnel have been time-tested and have proven to be very effective. Certainly tech data and flight manuals have been fine-tuned over the past decades.

So if all this is true, then our biggest challenge in avoiding LOX/GOX-caused explosions is continually addressing and preventing complacency among those concerned. This is mainly the task of *all* logistics supervisors, managers, and commanders. Quality assurance and ground safety personnel can play a major part too. But the one most responsible is the immediate supervisor/trainer — YOU!

This mishap was preventable! It *never* should've happened, especially to the three unsuspecting maintainers. The converter installation mechanic was outwardly complacent and exercised some poor judgment, but others contributed by being equally complacent too. For example, who is responsible for the proper storage location and procedures of LOX parts in FOM status (or LOX/GOX support equipment)? Who trained the installing maintainer? Who was responsible for followup of the mishap mechanics? How many other maintainers and supervisors walked past the converter storage box and knew it was exposed to the elements or was filling with water during the heavy rains — **and didn't initiate actions to eliminate the potential hazard?** Who is responsible for establishing and maintaining a safe work environment or culture in *any* unit?

The message here is clear: **Complacency can kill you!!!** ■



NEXT GENERATION WEATHER RADAR

New technologies in weather radar are allowing weather forecasters to deal with impending weather more effectively and warn aircrews better and faster.

Lieutenant Jim Piel
416 SPTG/OSW
Griffiss AFB, New York

■ On a stormy night with gusty winds, snow-obscured ceilings, and weather approaching airfield minimums, the best sound a pilot can hear is the voice of Air Traffic Control saying, "You're number one for Runway ##, cleared to land," just before the airfield is closed for weather. Adverse weather conditions have always been, and will continue to be, a pilot's biggest challenge. But new technologies in weather radar are allowing forecasters to deal with impending weather more effectively and warn aircrews better and faster.

During the summer of 1992, a joint National Weather Service/Department of Defense weather radar program became reality when the first WSR-88D NEXT GENERATION WEATHER RADAR (NEXRAD) was commissioned. Since then, over 90 operational ground-based radars have been installed worldwide with an additional 63 radars planned for operation by the end of 1996. (See figure 1.)

The significance of the technology in the NEXRAD is that it does not just depict raw radar returns in real time as do other radars (such as its predecessor, the FPS-77). The NEXRAD interrogates the atmosphere using volume scans that are predefined by the radar operator. (See figure 2.)

The radar operator can alter the volume scan's size, sensitivity, and time to best monitor the weather situation. The data ingested from the volume scan is then used by the radar's computer system to generate images. The radar can generate and display over 60 different products.

The NEXRAD antenna was also designed to be located approximately 10 to 15 miles from an airport so the "zone of ambiguity" of the radar is not located over the airfield, thus giving a clear view of the weather

continued

Figure 1

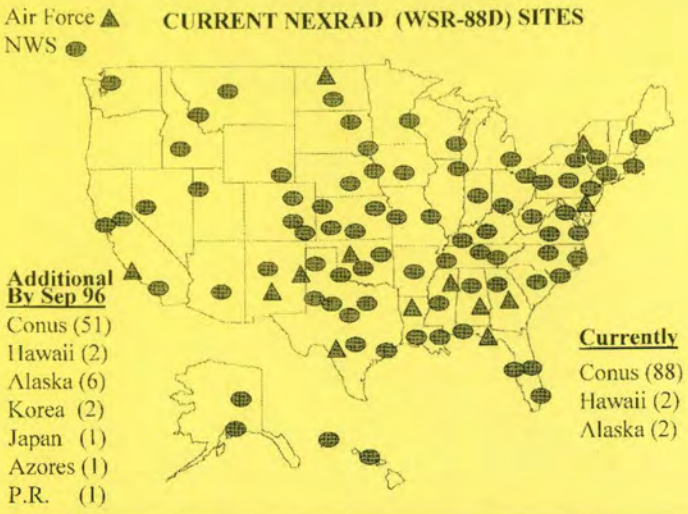
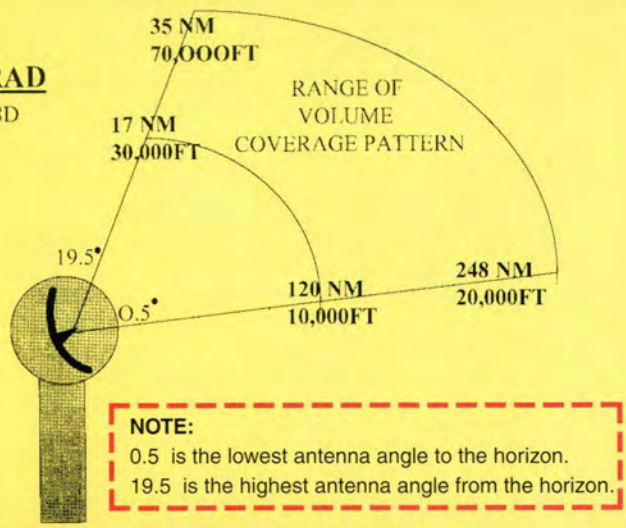
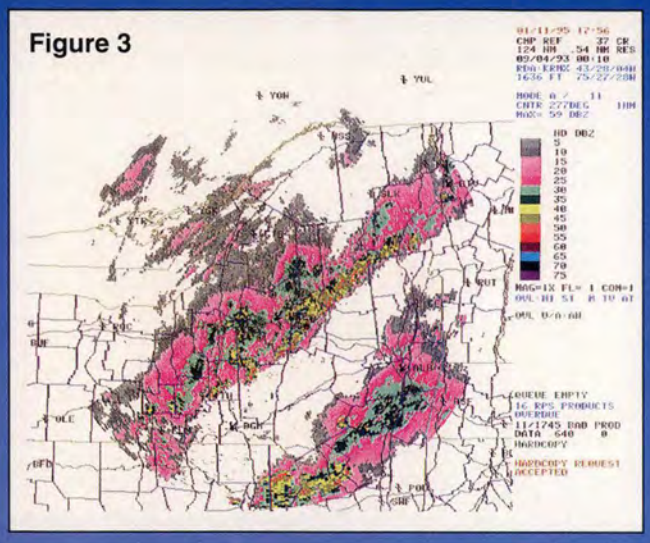


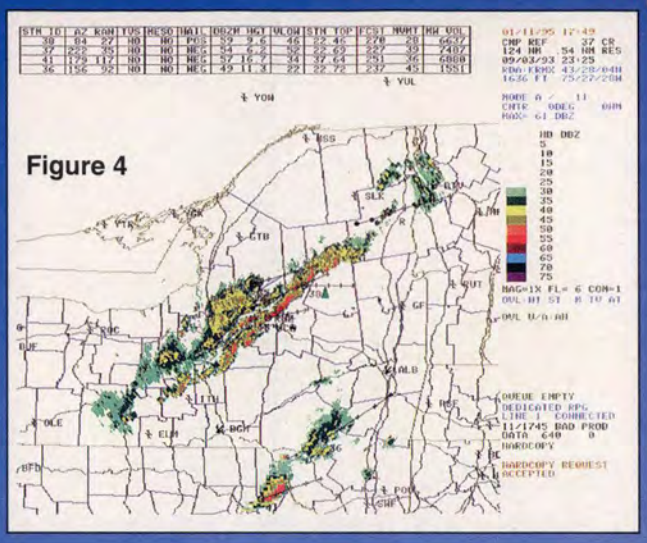
Figure 2



SSgt Durita Jackson, weather forecaster from the 377th Air Base Wing weather shop, Kirtland AFB NM, monitors Kirtland's NEXRAD downlink. The fully automated NEXRAD system is more user-friendly than the old analog system it replaces.

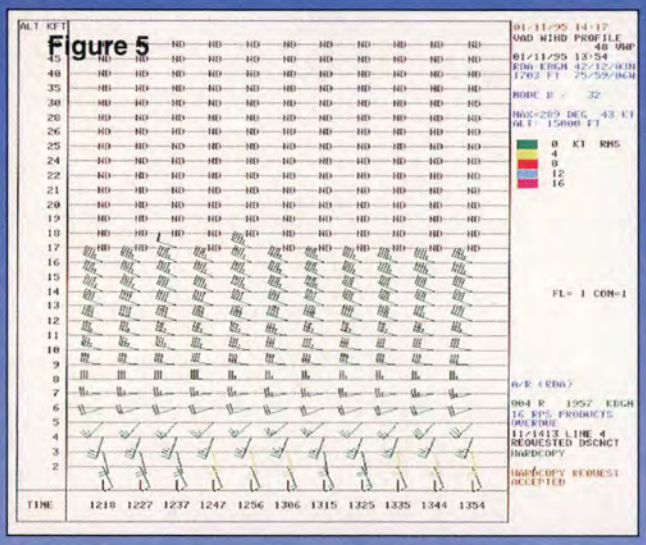
Photos by TSgt Perry J. Heimer





over and around the airfield.

The NEXRAD is used to interrogate the atmosphere in layers, either vertically or horizontally. While monitoring the atmosphere for precipitation, the NEXRAD gives detailed images of intensity, location, and movement of precipitation areas and individual storm cells. This information is critical in thunderstorm reporting and forecasting, not to mention determining rain/snow lines and even estimating rainfall totals to predict flash floods.



The term "atmosphere" is used because the NEXRAD not only allows forecasters to identify areas of precipitation, it is extremely sensitive and can virtually "see the air," thus depicting, or in some cases, inferring the presence of clouds, frontal boundaries, troughs, inversions, tornadoes, downbursts, microbursts, wind shear, turbulence, and even freezing layers.

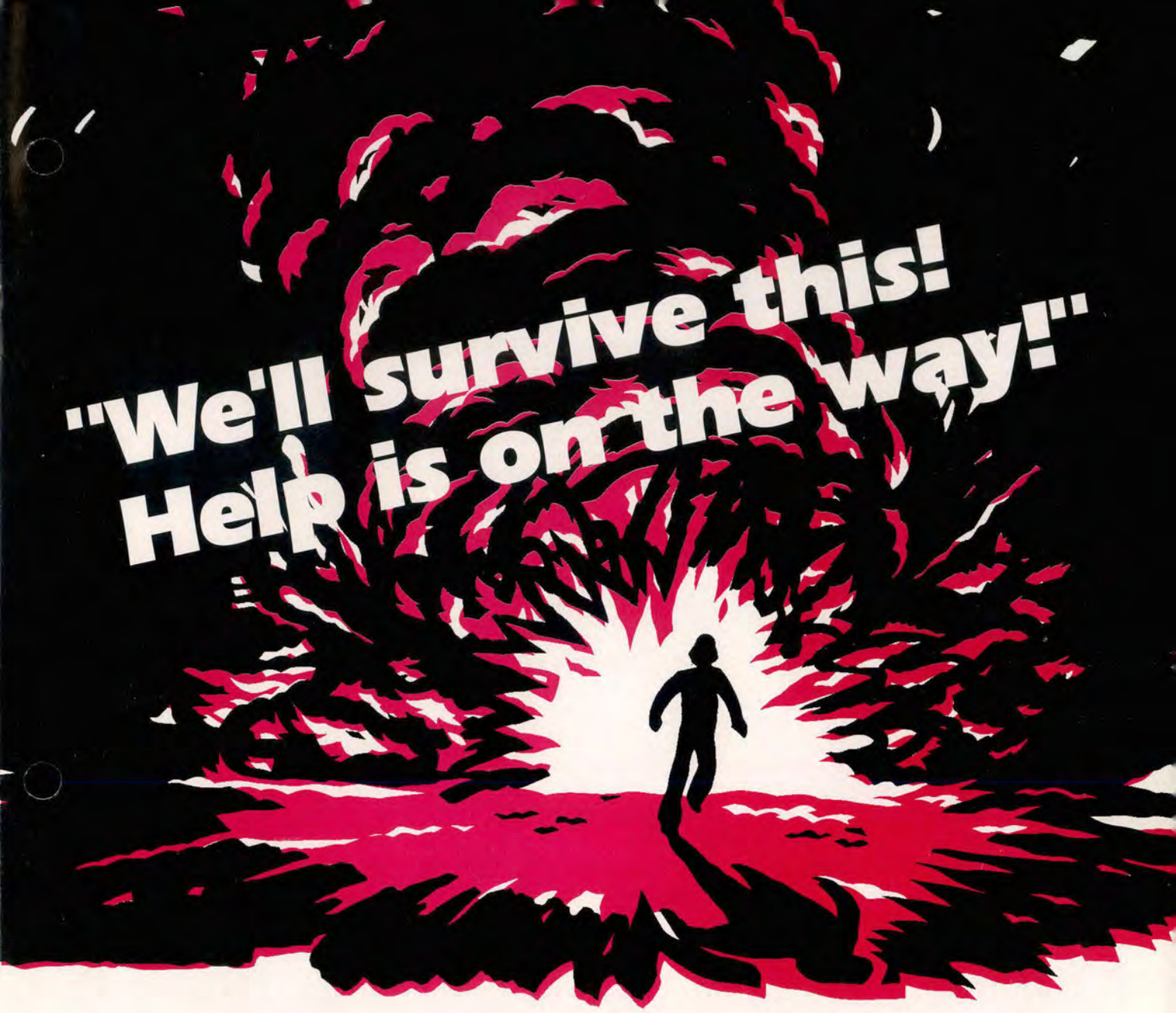
NEXRAD images are depicted on a principal user processor (PUP) which consists of two screens used to display and interrogate products. There can be several PUPs for each radar, allowing many users direct access to data from a single site.

There are 245 PUPs associated with all of the NEXRADs in the United States. Each PUP also has the capability to dial into other NEXRAD sites via modem and display products generated by the principle user. The PUP also allows the user to overlay many map features such as airways, VORs, airports, and working areas (to name a few) for precise location and tracking of weather in relation to air traffic.

Two of the most common images used in a weather station to brief aircrews are the Composite Reflectivity (CR) and the Vertical Azimuth Display (VAD). The CR depicts the highest reflectivity located at any elevation angle in the volume scan above each point. (See figure 3.) During severe weather, the CR can be combined with other products to identify individual intense cells (storms), mark them, and list characteristics including size, intensity, movement, and even the possibility of hail or a tornado. Figure 4 shows the same storm in figure 3 but filters out weak reflectivities, and overlays storm tracks to more closely monitor the system.

The VAD is ideal for analyzing vertical wind speed and direction to better see turbulence and wind shear. An analysis of the VAD in figure 5 reveals there is a consistent cloud deck between 2,000 feet and 16,000 feet, and also indicates light southeasterly winds near the surface shifting to a 35-knot southwesterly flow at 4,000 to 5,000 feet. These indications would definitely prompt the weather forecaster to warn aircrews to expect instrument meteorological conditions below 16,000 feet and the possibility of turbulence and low-level wind shear in the vicinity of the airport.

The WSR-88D NEXRAD still cannot fool Mother Nature, but the effective integration of this technology into day-to-day operations can help everyone stay one step ahead of **THE WEATHER.** ■



CMSGT DON A. BENNETT
Technical Editor

■ *"Can you hear me?" "SARGE, CAN YOU HEAR ME?"* shouted the aircraft commander.

After surviving the crash and explosion, the sergeant might still expire despite her best efforts. He was unconscious and mumbling something when she found him — she hoped rescue could get to them in time.

She couldn't help being mad. It was just that in a matter of a few terrifying minutes, she had lost the entire crew (with the exception of the crew chief), the passengers, and her aircraft. She didn't want to lose this man too. Despite her own serious injuries, the major was determined to fight off shock and maintain her composure as she tried to keep her crew chief awake — and both of them alive!

After pulling the sergeant out of the fiery inferno, she literally had to drag him from the crash site to escape further harm. She didn't have time to adequately assess his initial injuries before moving him, and she feared she might have aggravated them. He had been severely hurt when she found him — but there were minor explosions going off all around, and the fire was spreading rapidly. She was compelled to act fast.

After getting about 40 yards from the crash site, there was an enormous explosion. The blast threw her to the ground, disorienting her for a moment. The aircraft totally disintegrated. She knew the others in the wreckage didn't stand a chance of surviving.

Regaining her composure after slamming into the ground, she grabbed hold of the sergeant's collar and continued to drag him to safety. She realized there had been no choice, but the thought she might have aggravated her crew chief's injuries wouldn't leave her.

As she took her last few steps, the weight of the crew chief and her own pain were almost more than she could bear. As she stopped, gasping for air, she knelt beside the sergeant and gave him a gentle shake to wake

continued

him up. She knew help would come soon, but despite the heat from the crash, it was extremely cold out on the desert floor — they wouldn't last long in the cold night air.

As she sat with her crew chief and watched the fire, she tried to figure out what happened. There was a slight movement and murmur of agony beside her. In the smoke-shrouded glow of the wreckage, she could see the sergeant's eyes open. At least he was still alive, and now he was conscious. Without the professional medical care he needed, this was the best she could hope for. Her survival and buddy-care training were paying big dividends.

"I killed them! I killed all of them! Me! Mister Air Force! Master mechanic extraordinaire! I killed my two best friends and our crew! I can't believe..."

"Okay, crew chief, that's a lot better. Can you hear me now?" she said in a firm, confident voice, but her eyes were moist with joyful tears.

The sergeant slowly recognized the major as he also became aware of his painful injuries. Once he fully realized where he was and that his body was pretty well busted up, he was immediately overcome by fear.

The major reacted almost simultaneously. As she knelt at his side, she quietly assured him help was on the way. *"You'll be fine,"* she said.

He stared at the burning wreckage as she talked. *"But how did it happen?"* he cried out into the eerie night. *"And where's everybody else? Where's Tom and Eddie? And where is the crew? What happened to the..."* He tried to continue, but the major gently turned his face to hers.

"We're the only survivors," she whispered. *"Several minutes after takeoff, there was an explosion somewhere in the back of the aircraft. It felt like it originated at midframe, probably in the center wing box area. Then the aircraft just rolled over in a nose-down attitude. The lieutenant and I both fought the flight controls until impact. It all happened so fast. We were so low and slow, we just couldn't pull her out of it!"* She explained it all, except for the gory details.

After she finished, she noticed his cold, stony stare. He was there in the flesh, but his mind was not. She thought he might be in shock.

"Stay with me — talk to me!" she shouted, fearing he'd fall into a coma. Now she regretted telling him too much too soon. She might have chosen to be vague and evasive, but it wasn't her nature. Besides, she was the aircraft commander and responsible for the mission, the aircraft, and the crew. He deserved to know why he was lying there and possibly dying in the middle of the desert.

Without so much as a change in his facial expression, the sergeant started talking in a guilty, terse manner.

"I killed them! I killed all of them! Me! Mister Air Force! Master mechanic extraordinaire! I killed my two best friends and our crew! I can't believe..." He tried to continue, but again the major cut him off.

"Stop it! Stop that nonsense! You had nothing at all to do with it. How could you? There was an explosion, and the aircraft went down. You don't have a clue right now what caused the explosion.

"We've all watched you bust your butt trying to keep that jet looking sharp, mission ready, and 'in the air' every day of the year. You're the best mechanic we've got. Weren't you some kind of Air Force Maintainer of the Year several years ago?" asked the major.

"Yes, ma'am. I became a real golden boy back in '91. Got to meet some Air Force big shots — award banquets, interviews — you name it. Even got STEP promoted! And that was the same year my little girl was born. What a year! I couldn't do anything wrong! I was invincible then and have been pretty much ever since — at least, until tonight!" explained the mechanic.

"You don't understand! As soon as you mentioned the wing box area, I knew I was responsible. I did some unauthorized fuel system work in the box. No forms entry, unqualified, and no tech data. Incredible! ME, the wing's only master certified mechanic! Mister Can-Do-Anything — anything, unfortunately, except fuel systems work. I was really stupid! Shouldn't have tried it.

"I wanted this mission so bad I lied to the Prod Super and told him the jet was ready to fly when it wasn't. I'd been repairing a fuel system problem I discov-

ered early this morning and didn't want anybody to know. They would have wanted me to defuel the jet and take it to the fuel barn, but only after they got the other two jets with fuel problems fixed first. The jet would've been down for days and days!"

The sergeant stopped to make a feeble, unsuccessful attempt to wipe the tears welling up in his eyes. He was embarrassed, ashamed, and unable to hide it. He winced in pain with every little movement of his body, but he was still determined to complete his confession.

"Naturally, I had to do something," he continued. *"I'm not supposed to stumble or fall. Besides, THEY had to get this mission off, and there were no other aircraft available. Every jet we have is on a combat mission or broke. We've been flying our butts off every deployment I've been on, and the jets and people just can't keep up that pace forever. I've tried to..."* he spoke on, still staring at the sky above.

Despite his life-threatening injuries, he appeared to be doing better talking than he did earlier, so she let him go on. She was now more concerned about his emotional state than his health. Although she wasn't a doctor, deep down inside she felt sure he would live. But he was bitter, stone-cold bitter. She knew if he survived and fully recovered from his injuries, he probably would never heal emotionally. He was beginning a life-long guilt trip, for sure.

In the distance she could hear the sound of aircraft and helicopters, and she was relieved to see a small armada of rescuers heading their way. Flight time from the base was about 15 minutes, she estimated. She didn't bother looking for a way to signal. She knew her aircraft's bonfire was a significant beacon.

The major's thoughts were interrupted by an agitated question from the crew chief. *"Well, do ya...?"* he asked again to a major who wasn't listening to his other requests for answers. *"Wasn't listening, huh? Well, I see you're like the others who don't listen or pay attention to their troops. Why would you care about how many months I've seen my 3-year-old girl since her birth? What do you care about my failing marriage? Why should you be any different than my Chief or maintenance officer? Or my branch chief? You too! Thanks, Major!"* ended the crew chief.

"You'll be all right soon. Here comes rescue!" exclaimed the major. *"We'll get you to the hospital in..."*

The major froze in midsentence when she turned and noticed the lifeless expression on the crew chief's face. This time she could tell he was gone forever.

She slumped back onto the sandy ground with a sigh of agony. She had lost him too, her last crewmember. She ached all over. Grief overwhelmed her.

Like all professional Air Force aviators, she knew and accepted the risks associated with flying and war. What she couldn't accept were the risks taken by the many players influencing this tragedy, and she included herself. Wasn't she guilty of taking her crew chief for granted too? She thought he was invincible — never thought about him being tired, stressed out, undertrained, unknowledgeable about anything. Challenging his integrity was unthinkable.

Prior to the mission, didn't she consciously decide **not** to investigate further when he spent the first 20 minutes after their crew show working intensively up on top of the fuselage? Whatever he said or did was above reproach.

She recalled the general's remarks to her at her pin-on ceremony. He told her, "Major, with that new rank comes an even higher calling for dedication, trust, devotion to duty and, most importantly, personal integrity. Those attributes are only words unless you personally live by them through actions and deeds. Fix what's broke. Champion the issues and concerns of those around you, especially those who feel suppressed or less capable of solving their own problems. Never be afraid or ashamed to live up to the expectations of your rank or oath of office. And whatever you do — if you do nothing else — listen. If you truly listen to others, you will have gained a real valuable education obtained only by the few."

She knew something had to be done to prevent this kind of mishap from happening again. She made a solemn vow her crew's deaths, especially the crew chief's, would not be forsaken. Now she had something to say and do!

As the rescue choppers were settling nearby, the major looked at the body of her crew chief. Her heart sank, knowing that last frozen-in-time expression meant he departed this life with a ton of self-assessed guilt and disgrace.

He really didn't die of his injuries — she was certain his injuries were survivable. Instead, he finally faced what he had become and the ensuing grief it had caused. His honor and integrity were severely compromised. From the pinnacle of success to a rubble of ruins! He had become a broken man, but nobody wanted to know why.

The major wasn't looking at her oncoming, scrambling rescuers as she made a belated promise to her crew chief.

"We'll survive this. Help is on the way." ■

IT'S A PRIVILEGE

COLONEL CHARLES MATTHEWSON
Staff Judge Advocate
HQ Air Force Safety Agency

■ **QUESTION: I've heard AFSA is doing some investigations into irregularities in the way safety boards were conducted. Isn't that inconsistent with your mishap-prevention mission? What happened to the privilege protection given to the board's report?**

ANSWER: You're right about us investigating the investigators. The Air Force Chief of Safety, Brigadier General Orin L. Godsey, received a complaint from a mishap aircrew member who alleged a witness lied to a safety board and a board member kept certain facts out of the report.

While he could have passed the complaint over to the IG for investigation, he felt it was more appropriate to have the AFSA commander control it. Moreover, AFPD 91-2, *Safety Programs*, and AFI 91-204, *Investigating and Reporting USAF Mishaps*, require AFSA to ensure each mishap is **properly** investigated and reported and to provide quality oversight of the entire mishap investigation program. *Simply stated, it's AFSA's job to follow up on claims of investigation irregularity.*

This "oversight" of the process is really quite consistent with our mishap-prevention mission. The whole reason we do a privileged safety investigation of mishaps is to maximize our chances of getting honest testimony from witnesses and candid analyses from board members — in order to prevent similar mishaps. If we get false testimony and incomplete analyses, we're less likely to solve the problem.

The unusual part of this investigation is that the safety community will produce a report which could be used for disciplinary purposes. From this standpoint, you might perceive an apparent "inconsistency" with our normal limited-use rules. It's important to remember, though, that this "oversight" investigation is not a "safety investigation" in the normal sense. *We're not investigating the mishap — we're in-*

TELL THE TRUTH!

Editor's note: The original version of this article first appeared in Flying Safety magazine 43 years ago. We've made some minor editorial changes, but the message remains the same.

■ A few years ago, there was a very popular song entitled "Little White Lies" making the rounds on the jukeboxes, phonographs, radios, and bandstands. (Television was still a thing of the future.) In this ballad, the singer, evidently a masochist, bared his broken heart to an ex-lover and, in so doing, invited millions of listeners to join in his sorrow. The fractured heart, of course, was a result of those lies told by the object of the singer's affections--told with only the moon as a witness.

People are supposed to die of broken hearts, so we don't doubt that lies can be fatal, even if they are little. One wonders what happens when they're big, like some people tell.

What is a big lie? You might define it as a falsehood which will do serious harm of some sort to another person. The harm might be physical, financial, mental--or perhaps it would only hurt a reputation. Just so it hurts.

Sometimes aviators tell big lies. Usually, they think they're telling little ones without realizing just how large they really are. They think they're not hurting anyone, but actually they may be sending fellow airmen to their deaths, or at least driving a nail in their proverbial coffin.

You ask how that can be? It happens through "noncooperation" with safety mishap investigating boards. If an aviator who has had a mishap, or has witnessed a mishap, tells a little lie--hoping to cover for oneself or a

While the specific outcome of the investigation isn't something that should be discussed in this magazine, a hypothetical discussion will help us focus on the ultimate privilege issue potentially raised by the situation.

vestigating the mishap investigation process.

This investigation was done under the inherent authority of the AFSA commander, with sworn testimony, rights advisements as appropriate, and no promises of confidentiality. It was not focused on the "bottom line" of the safety report. It was focused on specific points along the lines leading to the board's findings and recommendations. The investigating officer inquired into two things, basically: Did the witness give a false statement? Did the board member conceal something important?

a friend--he or she may, in effect, be helping to cause another mishap. And there's really reason for it.

The purpose--the only purpose--of a safety mishap investigating board is to determine what caused the mishap so that appropriate action can be taken to prevent similar mishaps to others. Needless to say, if the true cause of the mishap is not discovered, then proper preventive action cannot be taken, and the efforts and actions of the investigators have been wasted.

Usually, the reason those involved in mishaps may tell a lie (and right here let's get it straight that only a very few fail to tell the truth) is fear of punishment or reflection on professional ability.

The first of these is completely groundless. The purpose of the investigating board is given above, and Air Force directives prohibit the use of the board's proceedings or findings for any other purpose than mishap prevention. No statement, testimony, or data obtained during a mishap investigation may be used in any action concerning discipline, pecuniary liability, line-of-duty status, revocation of commission, demotion, etc.

As for the possibility of a reflection on professional ability, there are two choices: Lie to cover up a failure, or disregard personal considerations and consciously try to help in the prevention of other mishaps. One can't do both. It does seem, though, that the lives of fellow fliers should be pretty important.

Remember, where mishap prevention is concerned, no lie (big or small) is harmless. much better to tell the truth. ■

Flying Safety, March 1952

Obviously, the investigating officer had to see the privileged safety report to answer these questions. The AFSA commander authorized this access in his appointment letter, but he also directed the investigator not to include any limited-use information in his report. This was a tough — but necessary — challenge for the investigator.

Any adverse action which might then be taken against the witness or board member would have to be based on the independently generated evidence from the oversight investigation. As implied in your question, the privilege protection given to the safety board's report had to be preserved.

While the specific outcome of the investigation isn't something that should be discussed in this magazine, a hypothetical discussion will help us focus on the ultimate privilege issue potentially raised by the situation. What would happen to the safety report if punitive action was taken against the witness (for a false official statement) or the board member (for dereliction of duty)?

In order to prove the false statement, a commander or prosecutor would have to know what the witness told the safety board. AFSA would probably authorize this access despite the limited-use restriction against usage for disciplinary reasons. This is because the Air Force should not be bound by its promise to the contrary when a witness has perpetrated a fraud upon the safety board by lying to it.

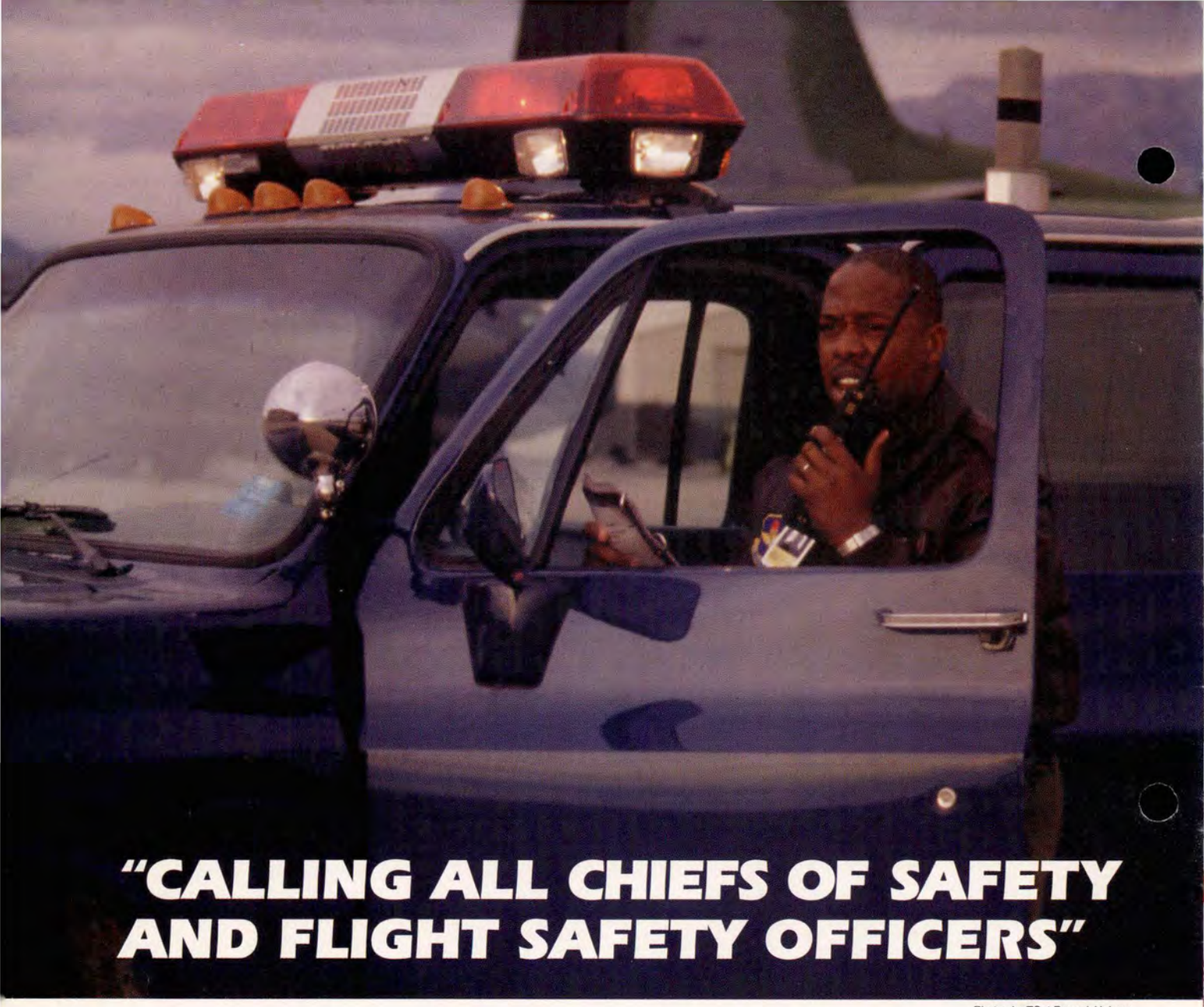
A case was recently announced where a murder suspect bribed the trial judge and was acquitted. Upon learning of the corruption, the DA brought the murder prosecution a second time, and the defendant claimed "double jeopardy." The court denied the defense because the first trial was tainted by the defendant's own fraud. It denied him the benefit of a basic constitutional right because his fraud voided such a claim.

The same logic would apply if a false-statement defendant claimed protection of the limited-use prohibition. His statement to the safety board should be available to the prosecution without damaging the Air Force's ability to retain privilege over the rest of the report.

As to the case of a board member's alleged dereliction, the situation would be quite a bit different. Chances are, there wouldn't be any direct evidence of his charged offense in the safety report. It would be something that parties to the safety board would have to testify about at trial.

The sensitive aspect of this is that those witnesses would have to talk about the deliberative process of the safety board — what they analyzed and why — and this is privileged information. The privilege, however, was not designed to keep evidence from those trying to enhance the mishap-investigation process. If the board's deliberative process was trying to be discovered for use to establish a mishap's cause, the prohibition would apply. If a prosecutor wanted to prove culpability for some factor contributing to a mishap, the prohibition would apply. Here, however, it's just going to be used to determine whether certain things did or didn't happen — during the board process, not during the mishap sequence. This sort of use would not violate the spirit of the privilege and, again, would be in support of vindicating the integrity of the mishap investigation process. Within these limited circumstances, AFSA would probably authorize the disclosure in court.

The important thing to remember here is that the safety privilege is a shield for an important governmental process. It is not a shield for individuals to use to prevent them from being held accountable for doing something which keeps that process — mishap investigation — from achieving its goal. ■



"CALLING ALL CHIEFS OF SAFETY AND FLIGHT SAFETY OFFICERS"

Photos by TSgt Perry J. Heimer

MIKE HANNAH
Investigation Instructor
Southern California Safety Institute

■ Most units experience a mishap only rarely. How prepared is your unit to deal with a mishap should one occur?

There are two things your commander will be at a loss to explain to the convening authority: Why wasn't perishable evidence preserved, and why were people injured during the investigation?

This article deals with the interim mishap (safety, if you wish) investigation effort. It addresses what you should do to prepare your local interim board members.

There are several methods of ensuring the interim board carries out its duties professionally and thoroughly.

- Your premishap planning and training must be sound.
- You must practice with a variety of scenarios and update your checklists as you complete and critique each exercise.
- You must be able to adapt to each mishap scenario.

Remember, each mishap may be different, but many of the procedures and methodologies will remain basically the same. Let's take a look at each of these areas in more detail.

Premishap Planning and Training

The foundation for your investigative effort is your premishap plan and your ability to adequately prepare your team. Your plan and checklists should be reviewed frequently for proper building/office locations and phone numbers to impound records of people, parts (aircraft, etc.), position (location in relation to the field, terrain, NAVAIDs, weather), and paper (OIs and local directives).

Just like tech data, checklists should be written in an easy-to-follow, step-by-step manner so inexperienced board members can adjust to specific mishap scenarios. If you're not satisfied with what you're currently using, pick up "the horn" and call other units, NAFs, or MAJCOMs for samples of good checklists and premishap plans you can use as a source for ideas.

Training Sessions

People invariably have "more urgent" matters to attend to than getting initial or refresher training. You can resolve this by having your interim board president call for the training session.

Use videos from your base audiovisual library (SAVPIN 50284DF, 5028DF, 50286DF, 50287DF, all on 1/2" VHS and covering the basic board). There are MAJCOM or NAF training programs available, and your locally developed techniques will fill in the gaps.

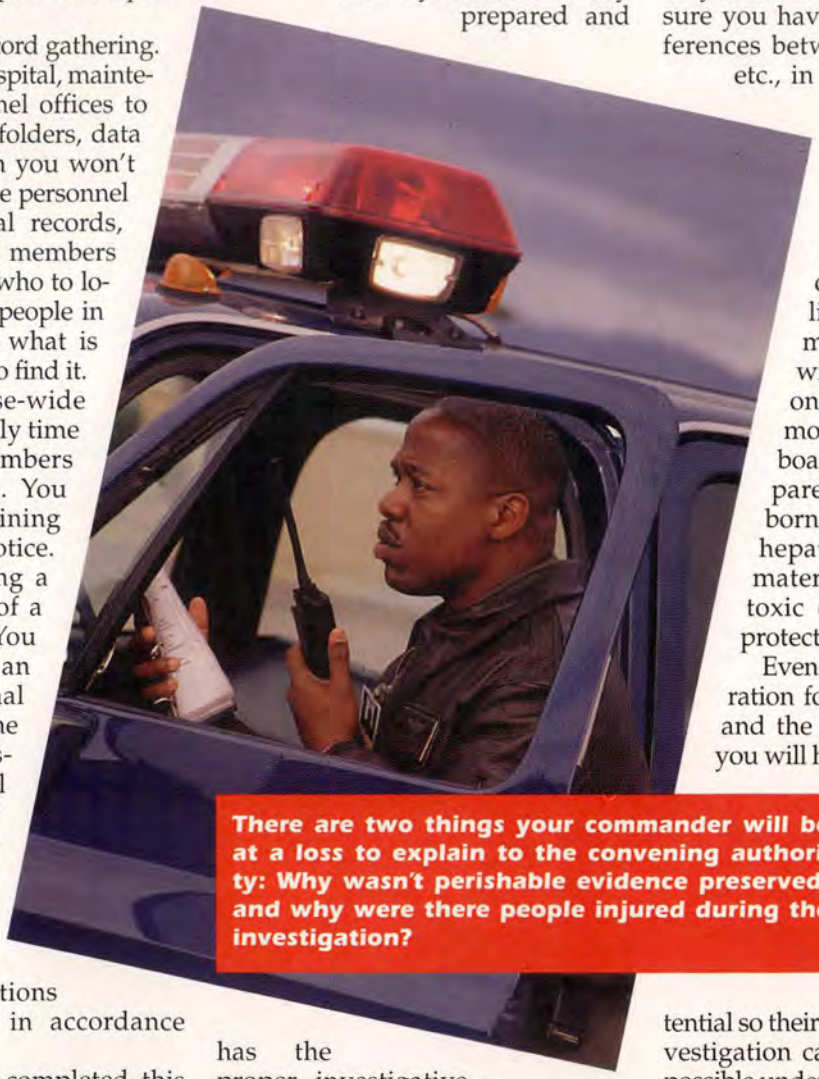
Don't *simulate* record gathering. Instead, go to the hospital, maintenance, and personnel offices to view actual record folders, data disks, etc. Although you won't be able to look inside personnel and medical/dental records, this ensures board members know where to go, who to locate, and alerts the people in those offices as to what is needed and where to find it.

A planned base-wide exercise isn't the only time interim board members should be trained. You can conduct training with little or no notice. How about running a full investigation of a Class C mishap? You can then produce an abbreviated formal report as well as the required final message for the actual Class C. For your "expanded" Class C investigation, be sure to use proper interviewing procedures and notifications of confidentiality in accordance with directives.

Once you have completed this realistic training session, don't be in a rush to release everyone until you have "in-briefed" the formal board, critiqued the premishap plan and checklists, and have the formal board properly set up with VOQs, vehicles, office space, phones, computers, equipment for the field investigation, and administrative support. In preparing for the formal board, just do for them what you'd *like* done for you if you were TDY for 30 days under adverse conditions. In short, the post-training/exercise critique is vital to making it work better next time.

Adapting

The key to adapting to each mishap lies in being fully prepared for the "canned" procedures and methodologies. Departing from "centerline" for mishap peculiarities seems easier if your board is fully prepared and has the proper investigative equipment available *before* the mishap occurs. If they aren't prepared, it's too late! You could see your career flash before your eyeballs as you remember the two things your commander can't explain to the convening authority.



There are two things your commander will be at a loss to explain to the convening authority: Why wasn't perishable evidence preserved, and why were there people injured during the investigation?

Finally, don't forget your public affairs office, local law enforcement, legal officer, mortuary affairs, and medical people in the safety board function. During your exercise, send out the most obnoxious person in the wing to hound the public affairs office, ask a million questions, take pictures of simulated classified, etc. This will help prepare your unit for the real event.

Know who is required to do autopsies. Be familiar with variables for on-base and off-base mishaps. If you have your medical folks work this well ahead of an actual mishap, you'll never regret it. In your area of responsibility, be sure you have "what if'd" the differences between counties, states, etc., in supporting a mishap investigation.

One Final Item

Mishap sites can be the grisly focal point of shattered dreams, lives, and human remains. Investigating will be extremely taxing on those involved, both mortuary affairs and the board. You **MUST** be prepared to avoid bloodborne pathogens (i.e., HIV, hepatitis) and hazardous materials (carbon fibers, toxic chemicals, etc.) with protective gear.

Even more difficult is preparation for the realism of death and the psychological trauma you will have to cope with when fatalities are involved. Be sure your flight surgeon and medical staff prepare the members of the mishap response team for this potential so their response and safety investigation can be as successful as possible under extremely difficult circumstances.

Be as prepared as possible. Stay current. Get equipped. Pass on knowledge to local board members in practical, thorough investigative methods, in quality training, and realistic exercises. ■

FSO's CORNER

INVESTIGATING & REPORTING

LT COL NEIL "BONE" KRAUSE
HQ Air Force Safety Agency

■ *The part broke. Removed and replaced the part. Airplane flew okay the next day.*

Anything wrong with this mishap report? Sure there is — it's obvious. It's not in the Aerospace Safety Automated Program (ASAP) format! Seriously, though, does this type of report add anything of value to the safety process? Or is it just square-filling?

Unfortunately, similar problems are starting to appear in some Class C or HAP reports (and even in a few Class A and B reports). Why? Maybe it's because some of the examples were taken out of AFI 91-204 when it was published, and AFP 127-1 has not been replaced since it was deleted years ago (although we're working on "Son of 127-1" now). Maybe it's because of all the changes in safety reporting in the last few years. Maybe it's because of problems in ASAP. Maybe it's all of the above.

What I would like to give you are a few general techniques to make your investigations and reports airtight, error-free, and usable. I will try to keep the ground and weapons troops in mind because the process works as well for them, too. And each level up the chain, from wing chief of safety to MAJCOM, can help out by checking the reports they get against these guidelines.

The mishap process consists of two very important parts, investigating and reporting. You can have the most complete investigation ever performed, but if you can't tell others about it, you've failed. And the shoddiest investigation will certainly be obvious when you try to BS your way through the report. So keep this magazine article in your bag o' tricks, especially those of you who haven't gone through the FSO course.

Investigating

Don't eliminate anything at first. Wait until the evidence starts to pour in, and eliminate avenues of investigation as they become irrelevant. To paraphrase Sherlock Holmes, "When you have eliminated the impossible, whatever is left, however improbable, is the truth."

Start with the final act: *Jet lands engine-out, near miss, POV runs off the road, etc.* Ask why. Ask what could have caused that to happen, and ask what could have prevented that from happening. Keep going until you sound like a first-grader (why is the sky blue?).

To give you an example, follow me through the process. *The jet lands single-engine.* (Assume it's not a Viper.) Why? Compressor stall. Why? FOD. What kind of FOD? Metal object, probably a screw. (How many of you would stop here?) Why? Screw missing from panel in front of intake. Why? Backing plate came off. Why? Not properly bonded to panel. (How many of you would stop here?) Why? Maybe that's not intuitively obvious. So ask, "What could cause the improper bond?" Several things come to mind; wrong adhesive/ weld, right adhesive/ weld but improperly installed, fatigue, corrosion, or even poor design.

Each of these questions opens an avenue you could investigate. Imagine the impact on the fleet if you are the one to find a problem with the adhesive used on these backing plates. Or the design is inadequate. Or the maintenance T.O. tells the wrench-benders to put it in wrong. (How would that look on your OPR?) The key is to keep going on all leads; the real problem may lie deeper than you think.

Also, keep the end product in sight — we're not here to punish, we're here to try to prevent the next mishap. Follow all leads that have mishap prevention value. For example, don't get hung up on the fact a pilot violated some rule, but WHY he violated it. (Maybe he missed the crew meeting where that was discussed. Why? No attendance taken, poor writeup in the FCIF book, no FCIF published, etc. — you get the idea).

You don't have to prove something beyond a shadow of doubt. Circumstantial evidence is okay. Make your best judgment, based on the facts. While you should take care to avoid hunches, you are also a smart professional — that's why you're in this job. If, in your professional judgment, something happened this way, we'll believe you. You're the closest to it. Just explain why you think so, and preface it with "probably," "possibly," or "most likely." Which brings us to...

Reporting

Your entire investigation is only half the story — now you have to tell others, so they can prevent mishaps, too. This requires communication skills. By skills, I mean the ability to put the narrative and findings into language others can understand. Not necessarily someone flying the same jet, but someone who is in a different type, different mission, or different service. To do this:

SOATFT (Spell out acronyms the first time). Okay, you can let USAF, CINC, and TDY stand, but if in doubt, spell it out.

Make sure you tell us what type aircraft somewhere in the message. Up front is best, in the subject line. It should always be included in paragraph 6.1 of the message.

Don't just tell us the F-16 guy was flying at 150 KIAS on final. Even an F-16 guy would have to look at configuration, fuel, etc., to tell if that was fast, slow, or on-speed. Don't just tell us the guy left the highway in his POV doing 50 mph. Tell us also that it was 15 mph above the posted speed.

Give us enough detail to tell if we have a problem or not. That means part numbers, NSNs, engine types, etc. That may tell a conscientious FSO somewhere in the world that, lo and behold, the F-16 has the same main fuel shutoff valve as the F-111.

Justify your conclusions. The causal finding should not be the first time new material is introduced!

Reread AFI 91-204. It will tell you findings should be in chronological order. It will also tell you to put one condition or event in each finding — no more, no less. There are no bonus points for only two findings.

Remember, the word "significant" is in front of "event" when describing findings. Most mishap finding sequences start with "On a 4-ship low-level training mission..." If that's not significant, start with, "During a low-level cross-turn at 500 ft AGL..." or "On postflight from a training mission..."

Here are two tests you can use to help you determine CAUSEs:

The NECESSARY test. Is this act necessary for the final result? If so, it's probably a cause. A maintainer not installing a cotter pin is necessary for the flight controls to become disconnected, but it may not be the only act necessary (see the next test). The supervisor may not have performed an adequate inspection prior to signing off the Red X, a separate, necessary act.

The SUFFICIENCY test. Is this act sufficient, in itself, for the final result? If not, keep looking for the real cause, or other causes. In the cotter pin case above, the first act was not sufficient; a supervisor had to inspect and sign off the work. Another example: A hydraulic system failure on an aircraft is not usually catastrophic — look at what the pilot did or didn't do, or what other systems failed.

Cause analysis were really a problem. Makes them agree with the finding. Notice it's hard to read the last two sentences because of subject/verb agreement? The same with cause analysis — make the category and responsible agent obvious in the finding, and ensure it agrees with the cause analysis terms. If you put a little effort into it, you will find that if you can't make the cause analysis fit the causal finding, you haven't finished your investigation yet, or you probably don't have a causal finding there. In fact, that was the original intent of the category-agent-reason methodology — to assist FSOs in determining root causes.

Inanimate objects don't have a functional area or command level in an organization. Faulty parts aren't on your org chart, and neither is the Dash One. NA/NA is appropriate for those cases. And be careful of "other" in the cause analysis — if you have to resort to that term, your logic may be faulty.

When making recommendations, document actions taken in your wing. Someone may want to do the same thing in theirs. And don't tell us "all crews were briefed." We know that. It's your job.

Think globally when making recommendations. You aren't the only ones in the world using forklifts, F-15s, or POVs. Your recommendation for F-15E LANTIRN procedures may also help someone doing PAVE TACK, night vision goggles, or even IR Maverick.

You also probably have an AIG (Address Information Group) for your aircraft. See the sidebar to get the appropriate numbers. Use these to distribute messages to the appropriate community. Realize also that certain equipment, such as terrain following radar, LANTIRN, and propellers are common to more than one aircraft, so you may use their AIG also. If you need to be included on an AIG (notice I said need, not want), call AFSA's AIG monitor, MSgt Gary Wolf, DSN 246-2372.

I hope I've given you a few hints to help investigate mishaps fully and report them more efficiently. It may not save you too much work, since your investigations will (hopefully) be more thorough, but I hope you can make up some of that time in more organized reports. Good luck, and let's hope you don't have to use these skills too often. ■

AIGs

AIG 9380 A-10
AIG 9381 C-17
AIG 9383 C-5
AIG 9384 F-111
AIG 9386 Helicopters
AIG 9387 C-130
AIG 9388 C-12
AIG 9389 F-4
AIG 9390 B-52
AIG 9392 KC-135
AIG 9394 T-1
AIG 9395 T-38/F-5
AIG 9397 T-37
AIG 9398 C-141
AIG 9399 F-16
AIG 9401 T-39/C-21
AIG 9405 Aero Clubs
AIG 9406 B-1
AIG 9407 F-15
AIG 9409 Safety Crosstell
AIG 9385/9396 Ground Safety
AIG 9404 Weapons

OPS TOPICS

Deer Hit on Takeoff!

■ An Air Force airlift support aircraft was transitting an Army airfield when it struck a deer — **on the runway — during takeoff!**

We have an extremely dead deer and Class C damage to the aircraft, and an opportunity to be educated by **another totally preventable mishap**.

Here are some of the main points for your consideration:

The airfield had a 6-foot-high fence around it, but in several areas the fence was down. This allowed man and beast easy access to the airfield, especially taxiways and the runway.

There were cornfields adjacent to the airfield — a great food source for area wildlife--thus creating a known animal and bird hazard to flight and ground operations.

The deer had been seen between the taxiway and runway, but **no one** notified either the ground controller or the tower of this potential hazard.

When the crew saw the deer on takeoff roll, abort actions failed to avoid hitting it.

The mishap post commander and airfield management learned a valuable lesson concerning keeping the airfield's perimeter fence serviceable. Perhaps additional emphasis will be placed on potential wildlife hazards during transient aircrew ops briefings and in updated flight information pubs.

But what can our Air Force aircrews take away from this "road kill" incident? Defensive taxiing? Defensive flying? Being especially alert at "non-Air Force" airfields? Expecting the "unexpected actions" of grazing animals (or bird activity) around the airfield?

Yes, this was an Army airfield, but isn't the Army one of the external customers the Air Force serves virtually every day? Can Air Force aircrews provide timely, effective feedback on this customer-supplier relationship, especially if the feedback enhances the operational safety of our Air Force aircraft and aircrew resources? ■

Costly Water Spill In Cockpit

■ A pilot was sitting in his seat while performing an aircraft preflight. A plastic drinking water bottle was lodged between his legs. It fell to the cockpit floor by his control column. The bottle broke open, but the spilled water **was not** cleaned up! Instead, the water was allowed to drain through the floor while the preflight was continued.

Once the engines were started, the fuel management panel failed. While trouble-shooting, maintenance removed the fuel management computer and found water inside it. The mission continued after replacing the costly computer.

Well, ladies and gentlemen, we are *all* reminded spilled water (or coffee!) in an electronics-loaded cockpit just doesn't mix well. You spill it — you clean it up — or your jet might not go up or down when you want it to!! ■

Flying Safety

DR. SHEILA E. WIDNALL
Secretary of the Air Force

GEN RONALD R. FOGLEMAN
Chief of Staff, USAF

BRIG GEN ORIN L. GODSEY
Chief of Safety, USAF

COL BERNARD B. BURKLUND, JR.
Commander, Air Force Safety Agency

MAJ JAMES H. GRIGSBY
Editor
DSN 246-0936

PEGGY E. HODGE
Managing Editor
DSN 246-0950

CMSGT DON A. BENNETT
Technical Editor
DSN 246-1984

DOROTHY SCHUL
Editorial Assistant
DSN 246-1983

DAVE RIDER
Art Director
DSN 246-0932

TSgt PERRY J. HEIMER
Photo Journalist
DSN 246-0986

Commercial Prefix (505) 846-XXXX
E-Mail--grigsbyj@smtps.saia.af.mil

DEPARTMENT OF THE AIR FORCE — THE CHIEF OF SAFETY, USAF
PURPOSE — Flying Safety is published monthly to promote aircraft mishap prevention. Facts, testimony, and conclusions of aircraft mishaps printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in mishap stories are fictitious. The contents of this magazine are not directive and should not be construed as instructions, technical orders, or directives unless so stated. SUBSCRIPTIONS — For sale by the Superintendent of Documents, U.S. Government Printing Office (USGPO), Washington D.C. 20401; send changes in subscription mailings to the USGPO. Back issues of the magazine are not available. REPRINTS--Air Force organizations may reprint articles from Flying Safety without further authorization. Non-Air Force organizations must advise the Editor of the intended use of the material prior to reprinting. Such action will ensure complete accuracy of material amended in light of most recent developments. DISTRIBUTION — One copy for each three aircrew members and one copy for each six direct aircrew support and maintenance personnel. Air Force units must contact their base PDO to establish or change requirements.

POSTAL INFORMATION — Flying Safety (ISSN 0279-9308) is published monthly by HQ AFSA/SESP, 9700 Avenue G, S.E., Kirtland AFB NM 87117-5670. Second-Class postage paid at Albuquerque NM, and additional mailing offices. POSTMASTER: Send address changes to Flying Safety, 9700 Avenue G, S.E., Kirtland AFB NM 87117-5670.

Oops! Missile Lost on Takeoff!!

■ Over the past decades, the Air Force has experienced some pretty interesting "dropped object" cases. Some were, in retrospect, kind of comical, while others were pretty scary. But in all seriousness, *every one* was counterproductive to the Air Force's mission. When the nomenclature of a dropped object is listed as a "missile," you can bet the cause will get the urgent attention of everybody concerned.

An AIM-120A LT/CCM (load trainer/captive carry missile) was unintentionally released from its jet during the takeoff roll. The inert training missile was totally destroyed. Luckily, no one was injured or killed. But what if it had been a "live" missile?

The mishap missile (and others) had been loaded several weeks earlier, but the training range was not available at that time. So the missiles were left configured on the hangared jet until the range was available.

During preflight, the mishap pilot found the missile's umbilical connector wasn't engaged. Maintenance had explained to the mishap pilot, in past similar circumstances, the connection didn't have to be engaged on an inert training missile. So it was understandable why the pilot took it as it was!

However, the bottom line is *both* the pilot's preflight checklist *and* the weapons loading crew's checklist required the umbilical connection to be engaged. Period!

Attempts to duplicate the mishap on the ground were successful — **with the umbilical connection disengaged!** The missile could be incorrectly positioned in such a way as to get all the necessary external "engaged" indications. But the missile could still be moved fully aft and depart the launcher. However, this **could not** be duplicated if the umbilical connection was engaged as required by checklists.

Miscommunication, misunderstandings, and, most disturbing, **nonadherence to flight directives and tech data** combined to cause a serious mishap — with untold consequences if repeated with a "live" missile!

Good ol' Murphy's Law!!! Do you suppose the manufacturer, Air Force engineers, system managers, and safety experts made sure the checklists required the connection to be engaged to prevent this kind of mishap — even on inert training missiles?!?

We "live and learn," but only as long as we "learn to live"! ■

Another Aircraft Fuel Tank Collapses

■ In October's issue, we printed an article titled "Fuels Cells Have to Breathe, Too!" It was about people who had properly stuffed rags, etc., in aircraft fuel system or support equipment fuel tank vents, but **did not** properly remove these obstructions when fuel system maintenance was completed! Their neglect led to collapsed fuel tanks or cells and, in one case, destroyed an aircraft.

By electing to use this authorized maintenance practice, a person can place the aircraft in a high risk category for a mishap, but **not** if the proper tech data procedures are carried out carefully and responsibly! The story was intended to reeducate readers about the extreme danger of blocking off fuel vents and give some tips for mishap prevention.

Well, here's another one to add to the growing "blocked fuel vent mishap" file!

An aircraft was on the flightline having touch-up paint *and* fuel system work accomplished at the same time. You guessed it! Two shops were working at the same time and **not** effectively communicating with each other. One taped over a fuel vent to do some painting. The other shop was transferring fuel out of the affected (blocked vent) fuel tank. Result: collapsed fuel tank.

Yes, both shops could have done a better job communicating, but why were both working at the same time? Where was the crew chief? Who was coordinating both shop's repair work?

Who was in charge? ■

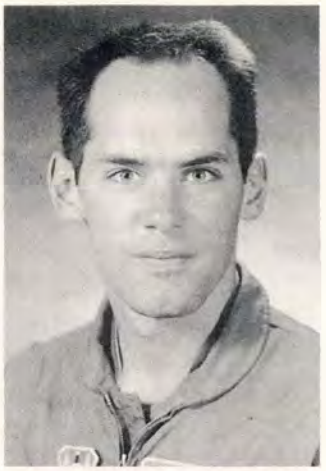
It would be great if we could talk (through the magazine) directly to the people who have the potential to do unsafe things like the above. But many maintainers don't get *Flying Safety* magazine in their office or squadron. Could you please pass on our safety messages for us? Thanks. --Tech Ed.

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 Mishap Prevention Program.

Captain Eddie Waters,
Standardization/Evaluation
Aircraft Commander



Captain Glenn Dubois,
Pilot

38th Reconnaissance Squadron, Offutt AFB, Nebraska

■ The first indication of trouble came when a crewmember in the mission compartment called the flight deck to report some flickering lights. Up to then, the flight had been a routine RC-135 redeployment with additional crew on board from the Middle East back to the United States. The crew had been airborne for just over 8 hours and had just passed the midpoint of our North Atlantic crossing.

Capt Waters, the crew commander, quickly rechecked the overhead panel for any signs of electrical difficulty. The No. 1 generator load jumped up to an abnormally high level, then dropped back to normal limits. Within 10 seconds, all three aircraft generators dropped off line. All AC electrical power was lost. Capt Waters placed the battery switch to emergency, providing DC power to critical systems.

Meanwhile, the pilot, Capt Dubois, confirmed his instruments had power from the backup hydraulic-powered generator. The aircraft commander's flight instruments, most engine instruments, and all fuel quantity gauges and navigation instruments were inoperative. With initial actions complete and the aircraft under safe control, the crew evaluated their options.

The nearest suitable emergency fields were on the Canadian coast, so there was no need for an immediate change of course. The navigators compared their manual track with the last known position from the computerized system. The tracks agreed closely. They were confident of the winds at the cruising flight level of 31,000 feet and noted agreement with the forecast winds.

Capt Peck referenced aircraft tech data and assisted in troubleshooting the malfunction. The pilot team ensured all nonessential equipment was off and unsuccessfully attempted to restore generator power. Within a few minutes, the No. 1 generator overheat light illuminated, and the generator constant speed drive had to be disconnected. A few minutes later, the overheat light again illuminated, indicating an unsuccessful disconnect and potential fire. The No. 1 engine was shut down according to the tech order.

At this point, the crew faced several problems. First, they had limited battery power. At the recommended level of equipment use, it would last for 1.5 hours. The pilots informed the crew to use strict discipline with all electrical equipment.

Second, they had limited navigation capabilities and no anti-ice protection or windshield heat. The crew had basic IFR instrumentation on the copilot's side of the cockpit but could fly only a ground radar directed approach.

Third, their fuel load and distribution were critical. They had plenty of total fuel, but no fuel pumps. The main wing tanks would feed the engines by gravity feed. The body tank fuel pumps use hydraulic power, but the automatic shutoff system uses DC power and will not allow the pumps to operate without it. Thus, use of body tank fuel would rapidly deplete battery power. So, they were limited to main wing fuel.

Finally, the nearest airfields were 3 hours away. At high altitude, fuel would be adequate but there was little margin for error. The crew could use a radio but needed to

*U.S. GOVERNMENT PRINTING OFFICE 1995-679-016/03009

Captain Brian Peck,
Aircraft Commander

Captain Gary Katz,
Standardization/Evaluation
Reconnaissance Navigator

Captain Rob Russell,
Lead Reconnaissance
Navigator

Captain Todd Phipps,
Reconnaissance
Navigator

conserve it for landing. The forecast for eastern Canada showed deteriorating conditions as a storm approached.

The nav team determined the best option for navigation was dead reckoning using forecast winds for estimating drift and latitude, while using instantaneous celestial "shots" to determine longitude. After landfall, they would navigate visually to find the airfield or get within range of radar controllers.

Considering the likely level of uncertainty in their position at landfall, they decided to use Goose Bay. If they chose Gander, they might pass on the seaward side of the field and never get within visual range. Goose Bay's geography was such they could expect to get landfall and then follow the coast until locating the inlet to the bay, minimizing the chance of missing the airfield.

En route to Goose Bay, the aircraft was off its cleared route, and the crew was not in radio or radar contact. They used VFR hemispheric altitudes, emphasized the importance of clearing, and had to descend to remain clear of the clouds. The closer they got to the coast, the lower they had to fly, eventually reaching 10,500 feet with 20-mile visibility.

Flying at low altitude compounded their fuel problem. Estimating fuel consumption, Capt Dubois calculated available fuel to be equal to required fuel with no margin. The crew worked together to review plans and possible contingencies. Everyone was informed, survival gear was passed out, and procedures for crash landing or ditching were reviewed.

At landfall, the crew turned south along the coast as planned, searching for the bay. The weather continued to worsen, and they descended further. Limited visibility, snow-covered land, and white sea ice blended to make piloting difficult. But, at 6,000 feet with 10-mile visibility, they came upon an inlet that seemed to match the chart. Capt Waters decided to turn inland following the bay.

At 60 miles from the airfield, a distress call was made. A Canadian Forces C-130 answered and relayed the aircrew's status to Goose Bay. The ground controller was able to get a directional bearing from the radio call, but the aircraft was still outside radar coverage. By now, the crew had to descend to 2,000 feet to stay clear of the weather, and the visibility dropped to 5 miles as snow began. Goose Bay reported snow with worsening visibility. The radio crackled with static as the battery charge became low.

Then, the No. 4 engine rpm began to unwind. The only possible explanation was fuel starvation in the No. 4 main tank. It was necessary to use body tank fuel which instantly restored the engine but increased the battery drain.

At 30 miles, Goose Bay obtained radar contact and began issuing vectors for the approach. At this point, visual flight became impossible. Capt Dubois assumed aircraft control.

Capt Waters began to configure the aircraft for landing, using speeds for the estimated weight. He set appropriate rudder trim for an engine-out approach. The remaining wing heaviness suggested a fuel imbalance, and the near flameout of the No. 4 engine supported this conclusion. Fuel was then gravity drained from the No. 1 tank to decrease the imbalance.

Capt Waters dumped body tank fuel overboard to lighten the aircraft and adjust the CG. With the airfield at 3 miles, Capt Waters took control for the landing. He stopped the aircraft without anti-skid brakes on the snow-covered runway without further incident.

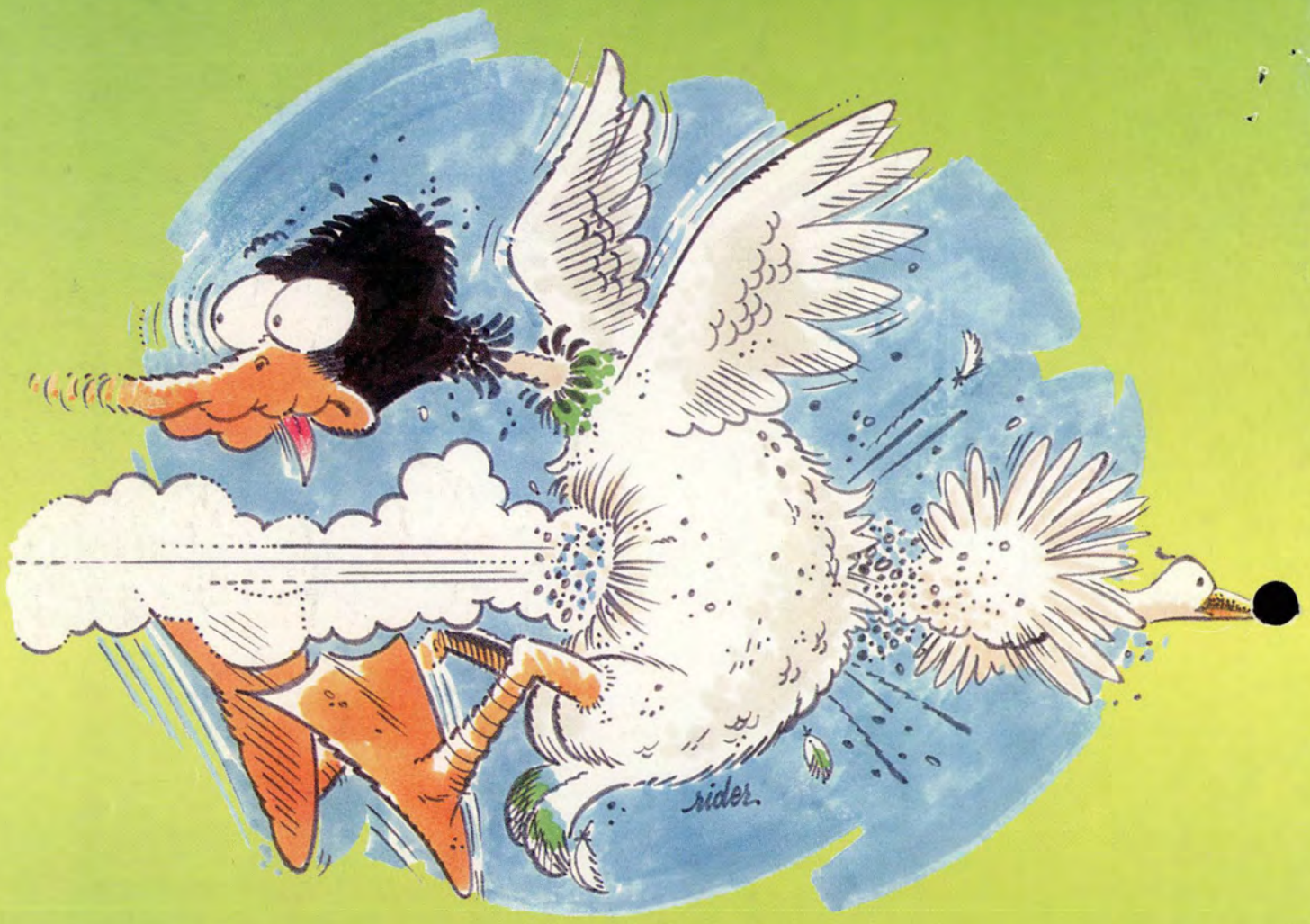
Preliminary examination showed evidence of independent mechanical deficiencies in all three drive units. It is only speculation at this point, but it appears that when generator one failed, the weakened remaining generators were unable to develop sufficient power and tripped off line. In the process, they damaged themselves to the point of complete failure.

The odds of such an occurrence are remote, but all of the elements may have come together on this flight. Solid crew resource management helped immeasurably in determining the best options and implementing a suitable plan under demanding, stressful conditions.

WELL DONE. ■

Spring Migration

Don't BASH a Bird



Update your Bird/Aircraft Strike Hazard Program

Don't miss an update on the BASH Program in the April issue of Flying SAFETY