UNITED STATES AIR FORCE

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OCT 2004

FLYING SAFETY MAGAZINE

Maj Gen Lee McFann,
AF Chief of Safety (see page 4)

FSM

FLYING SAFETY MAGAZINE

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SAFETY SAGE

HAZARDOUS AIR TRAFFIC REPORTS

The fiscal year is almost at an end and as we looked at possible Sage topics, we found there were 261 HATRs submitted in AFSAS as of 8/24/04. That is a lot of reporting, and thanks to the field for passing along a lot of great information. The sad part is that the 261 reports break out like this:

106	Near Midair Collisions	45	Air Traffic Services
37	Runway Intrusions	31	Pilot Procedures
19	Other Reports	14	Movement Area Violations
7	Communications	2	Publications

That represents a lot of potential danger to Air Force personnel and equipment. Everyone who works in the airfield environment needs to be aware of where they are at all times. We must prevent mishaps, not react to them. When you are in the air, aircrews must continually practice "see and avoid," which along with TCAS helped make them *near* midair collisions instead of midair collisions. Vehicle operators must ensure their airfield operations training is adequate, and if unsure of where to go or where they are, ask someone before they cross the runway. Too many times, the root cause of the HATRs was failure to communicate, or the people involved heard the wrong information, both in the tower and the aircraft/vehicle.

How do we prevent more HATRs? Practice "see-and-avoid," use proper communication and follow all the required procedures. We can reduce the number of close calls we have next year. Keep up the good work in reporting the HATRs so we can identify problem areas and prevent mishaps. If you need more information, visit us on the web or give us a call.

Editors Note: In the Aug 04 issue, on page 13, Chart 3 had two boxes labeled "Physical Environment." The right box should have been labeled "Personnel Factors."

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. 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, PO Box 371954, Pittsburgh PA 15250-7954. REPRINTS — Air Force organizations may reprint articles from *Flying Safety* without further authorization. Non-Air Force organizations must advise the Managing 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.

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SAFETY Q&A
WITH SENIOR LEADERSHIP

MAJ GEN LEE MCFANN
Chief of Safety, USAF, and Commander, AFSC

FSM: What is your safety-related background?

When I found out I was coming here, I thought, "I've never been in safety." Then after I thought about it, I've spent my whole career in safety. I think we all have. I don't think there's anyone in our Air Force who's not involved in safety. For me, it's just more visible now. I've flown big airplanes, I've flown little airplanes, I've had staff jobs, I've been a commander several times, and I think of all the responsibilities and exposure to safety I've had. It's not unique to me. Anybody's who's been in the Air Force as long as I have has been exposed to safety, whether on the flight line or in a missile silo. Safety's safety. Now I have a different viewpoint because of my formal association with safety.

FSM: As you serve as Air Force Chief of Safety, what are your priorities as far as improving our safety efforts?

My priority is our people. If we can save one life, what a great thing to do for our Air Force. I think our job in Air Force safety is prevention of fatalities, serious injuries for our people, or damage to our equipment. I think the goal of zero, while it may be very difficult to achieve, is the only goal to have. Accepting a goal of anything less than zero, is saying, "I agree, we're probably going to hurt or maim some people this year." I could not look at somebody and say, "We're going to lose 17 people this year—that is our goal." That's unacceptable.

HQ AFSC Photos by TSgt Michael Featherston

FSM: What do you believe we as AF members can do to improve our safety record in flight safety?

We have a tremendous flight safety record. It's something we all can be very proud of. Is it perfect? No. Can it be improved on? Yes. I think in order to improve our flight safety we're going to have to change a couple of things. We're down to such a low threshold, to see any significant improvement we will have to change some things. One option is better use of technology. For example, Military Flight Operations Quality Assurance (MFOQA). This is the military version of what the airlines have used to reduce their accident rate. This is a program where aircraft flight data is reviewed by Operators and Maintainers and it enables us to see things we have not been able to review in the past—this system has the potential to predict potential problem areas. As opposed to being great historians and saying what happened, we want to look at the future and try to predict. That's what this MFOQA will help us do. We had a case with a C-17 in AMC, where a very bright captain took some data, analyzed it and charted it out, and realized there was a problem in the way we trained our C-17 pilots landing while using night vision goggles. The current method was causing extra stress on the landing gear. Just a few weeks after this, there was an incident with the C-17 that if we'd had this data, we could have prevented damage to the landing gear. Another example is in AETC, with the T-6. They were having a high rate of engine oil problems. After reviewing the flight data, AETC IPs reviewed this particular maneuver and AETC altered the way it was performing this maneuver. The result was engine oil problems decreased five-fold. Therefore, less exposure to dangerous situations, less chance of incidents arising.

FSM: What do you believe we can do to improve our safety record in POV mishaps?

First is personal responsibility, then leadership responsibility. The Army has instituted a program that is showing great promise. It is a program of increased senior involvement. For example, if you're going to take a long, three-day weekend, you need to brief your supervisor in detail on what you're going to do. The results from that program have been pretty astonishing. Nearly 40,000 individuals have participated in this, and they've had one fatality. And that person was a passenger. I do not think this is super rocket scientist stuff—it is just more personal involvement at all levels. If I came and briefed you, as my supervisor, that I was going to drive from New Mexico to San Francisco and back on a three-day pass, you'd probably say, "Hey, you need to add a few days onto this or change your target location—you're driving too far." So, by making people lay out their plans, you're having them do a personal risk management when they brief their supervisor. Anytime we brief our supervisors, we pay attention to it. Leadership involvement will help us a great deal. We lose more people to traffic accidents in our Air Force than in any other cause.

FSM: What special safety concerns are posed by our war efforts?

There are a few. One of them is the fatigue of the force. We have a pretty high ops tempo. When we come back from Iraq, where there are people trying to kill us, we drop our guard a little bit. We think, "Oh, I'm safe, I'm back in America." So, complacency is one. The second one is when people try to make up for lost time. "I was in Iraq for six months—I didn't get to go downtown and have some fun. I'm going to go accomplish all those fun things and make up for the time I was deployed." Complacency—"I'm out of the high-risk zone." What a terrible thing, to come back from a war zone and get killed while driving home. To get killed anywhere is a tragedy, but to survive a war and come back and get yourself killed because you tried to drive too far and fast when you were tired, just because you wanted to get to Florida for the weekend...

FSM: Speaking of our war efforts, do you see any special concerns with the support side of aviation—our maintainers, weapons, security, supply, transportation and the rest of the Air Force?

Our effort in the war, on the support side, is fabulous. They're in a high-risk zone, people are lobbing grenades at them, and they accomplish their mission better and safer than anybody else in the world. The reason is our training, our education, and the commitment of our people. When we come home, I hope we can maintain that same razor's edge and attitude. It's difficult to do—you can't be in an intense environment in Iraq and come back and maintain that forever, so I worry about keeping people at that high level of alertness when they come back home, wherever they're stationed. That's a leader's job—you need to keep your people motivated and be attuned to their needs.

FSM: What role do you believe supervisors and/or co-workers play in ensuring our Air Force works and plays safely?

It's fundamental. That's what we're supposed to do. Leaders should know their people, and work and play safely. If you see somebody about to do something that makes the hair on the back of your neck stand up, they probably should not do it. If it's your co-worker or one of your troops, don't let them do it. Would you want to talk with this person's spouse and say, "I thought jumping off that bridge wasn't a very good idea, but I let him do it—sorry"?

FSM: What role do you see ORM playing in our on- and off-duty safety efforts?

I think it's very important; in fact, it's critical. We cannot take all the risk out of anything, but we need to know it's a risk worth taking. If the risk factors come out too high, then you have to step back and ask, "Why am I doing this?" Whether it's flying an airplane or driving a POV. If why you're doing it doesn't make sense, you need to change the factors you can control. Get more sleep before you go, take more time, is there another way to accomplish the same thing? Find some way to mitigate the risks. You can't take them all out. For example, airplanes. Before we go fly, we know our mission. We prepare for it. We've obviously been trained in whatever events we're going to do in the airplane, so we mitigate all those risks. There are still risks; we can't eliminate all of them. To get it down to zero is pretty difficult, but we can really reduce the risks.

FSM: What do you see as the greatest safety problem with reference to off-duty activities?

I don't know that there is a single greatest problem. It's personal responsibility and leadership responsibility. Both parties have to accept the responsibility. We have to realize we're Airmen 24/7, 365. I can't finish a day's work and go home at 7 o'clock tonight and say, "I'm hanging up my Air Force blue uniform." We're all too valuable to be wasted, splattered on the highway somewhere because we did something stupid. For example, not wearing a helmet on a motorcycle—I don't get it. I understand riding motorcycles—I don't get not wearing a helmet. I don't get not wearing seatbelts. It's personal responsibility—you have to take some on your own, and your boss has to take some, too. It's always easy in hindsight to say, "I've seen him drive home on a Friday night like that before—it wasn't the first time he drove that way." Where was the supervisor? If the co-workers knew, why didn't they say something? Why didn't the supervisor say, "I understand that you live in the mountains and you're trying to start your three-day weekend, and you're in a rush to get home, but…."

FSM: When you have completed your tour as Chief of Safety, what would you like to have accomplished?

I'd like to think that all our safety records—from individuals, to aircraft, to munitions, to space, to ground—have all improved. It'll take a little bit of a culture change, but I think what we need to do in Air Force safety is more involvement from our supervisors, accepting responsibilities on a personal level, and I think we can build on an already great safety record. We can't afford to lose one precious Airman. That's our best resource, and if we say it's our most important resource, we need to protect it.

FSM: Secretary of Defense Rumsfeld has given DoD a goal of reducing mishaps by 50 percent. How will the Air Force work to reach that goal?

I think that's a great effort by the Secretary, recognizing that we're losing some of our precious people and equipment, and that's unacceptable. I think the goal is achievable. It's going to be difficult in some areas; it's going to take a cultural change in some parts, because we're going to have to accept more responsibility. Do I think we'll make the 50 percent reduction in all categories? Maybe not, but we're going to try. We're well on the way in some areas, and some areas need some more emphasis. It's a good effort, and it's good for our Air Force.

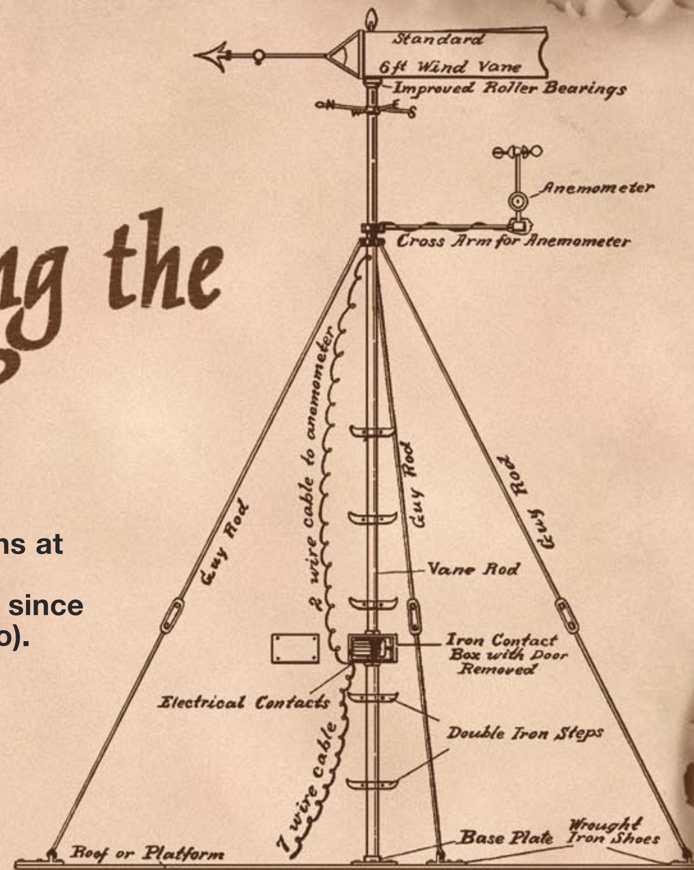
FSM: The Air Force Chief of Staff, Gen John Jumper, has initiated a program of motorcycle mentorship. What's your view of that, and how do you see it affecting Air Force riders?

I think it's great. As we speak, Gen Jumper is at Bolling AFB, taking the motorcycle safety course. He's a rider; he believes in leadership by example, and that's what he's doing. He's the Chief; would it be OK if he skipped the course? Maybe. He has a very busy schedule. Nobody would probably say anything. However, he's leading by example—he's attending the course. He'll probably have some golden nuggets for us on ways to improve the course. We have a couple of our people there, watching him go through the course. He'll probably have some safety points from the safety course that we can incorporate in all our clubs. We have some 900 mentorship club members across the Air Force, and I'd like to see that number grow to a larger percentage of our riders. Our largest club is in South Carolina, with 450 members.

FSM: Is there anything else you'd like to add?

I'm thrilled to have the job. Looking forward to working with the great people at the Air Force Safety Center. We'll be working hard together to reduce mishaps. Many people focus on aircraft mishaps, and that's important, but it's not the whole story. Our greatest tragedy is in motor vehicles. That's where we lose most of our people.★★

Who's Watching the Weather?



Source: Smithsonian Institution
Photo Illustration by Dan Harman

Automated Aviation Weather Observations at Civilian Airports
(But military aviators should still pay heed since automation is on the way for them also).

COL TIMOTHY MINER, USAFR
Reserve Assistant to the Director of Weather, HQ USAF

On December 17, 1903, the nation's first successful heavier-than-air aviators launched with a weather observation made at Weather Station No. 6 located at Kitty Hawk, N.C. The station observer made his hourly report of "Winds NE at 21 knots" on that morning, based on the readings from a state-of-the-art weather instrument—the Belfort/Friez U.S. Weather Bureau Station. With the minimum wind speed threshold met, the Wright Brothers launched. The rest, of course, is history. The aircraft has improved much during the 100 years since that launch. Aviation weather capabilities have also made outstanding advances. From the very beginning, weather observers and their instruments have been part of the aviation team.

Almost a decade ago, those of us who fly regularly in the civilian world saw a change in the way weather observations are collected and distributed. The relationship between man and machine changed. At that time, the paradigm shifted away from man reading values on instruments and applying his or her visual perspective and "judgment skills" before sending the values off to the collection point. What replaced it were instruments automatically sending off values collected at a specific point on the airport over time, sometimes without a human to view and supervise. Because there are many different weather observation techniques now available on civilian airports, it is important for every aviator and decision-maker to understand where their weather observation comes from and how it is collected. Military aviators should still pay heed since automation is on the way for them also. But that is another story.

According to the Federal Meteorological Handbook Number 1 (FMH No. 1), there are three different ways to take a weather observation. The first is the "manual" observation, where a certified weather observer is responsible for collecting all information. This was the only way to do it from 1903 until about 10 years ago. The second method is the "automated" one. Here, a machine takes all the values from a specific point on the airport and prepares the meteorological report for transmission without a certified weather observer. The third method is the "augmented" observation. An automated observing system prepares the meteorological report for transmission, but a certified observer is also signed on to add additional information as necessary and to act as a quality control. All three observations are now used today around the United States, and you need to know their strengths and weaknesses.

The Measure of Man

Since the 1700s, humans have been official weather observers and they have made manual observations. The trained human with accurate instruments and a clear view of the entire sky dome around an airport is usually very good at creating a word picture of what is going on, weather wise, around the terminal. That language is the METAR or routine aviation weather report. The human adds judgment that helps select the best prevailing visibility, ceiling and cloud descriptions both near and far from the airport. When conditions are variable, the human can provide the "full sky view" or the "big picture." What the human lacks is speed. From start to finish the whole process of creating, coding and transmitting weather observations takes about 20 minutes. During rapidly changing conditions, humans sometimes can't keep up. (See sidebar on page 11 for a reminder of when weather conditions require a new observation.)

There is also one other important weakness to the human weather observer: cost. During tight government budgets and manpower shortages, human weather observers went under the proverbial microscope. Aviation was also going places where a weather observer was impractical. As aviation expanded, aviators needed other ways to get weather information at locations where there were no human observers.

The Measure of Machine

The answer to the expanding need for weather information was the weather observing system. Weather observing systems have evolved from a six-foot wind vane and anemometer to very complex systems of weather observation instruments connected to computers, radios and telephones which can create their own observations and transmit them without human intervention.

Systems add their own strengths to the ability to watch the weather. Most importantly, systems have persistence. Assuming they are well-engineered, they are on the job around the clock. Not only does this increase the safety and efficiency of the aviation weather system, but it also lowers costs. They sample the atmosphere every few seconds, if necessary, so they can literally watch weather conditions change and are available to amend the current weather observation with a SPECI (see sidebar). Finally, they are subjective in their measurement, which can create more exacting standards. Because of these strengths, weather systems are a real benefit to aviation weather.

However, these same systems have weaknesses that could deny an aviator the complete picture of the atmosphere. Not every weather system can sense every element of the weather that many expect from a complete observation. Some of the sensing "strategies" are also different than we expect. For example, from a central location on the airfield, a weather system senses the airport's prevailing visibility over a matter of a few feet rather than looking out to a distant object.

Another case of paradigm shift is the measurement of cloud cover. Rather than get a big picture view of the atmosphere by scanning from horizon to horizon once an hour, the weather system only senses clouds that are straight up and then averages the many values collected between official observations. A weighted average looking straight up also produces the official ceiling. I saw this weakness firsthand when I flew into a major airport reporting clear skies. A quick look down showed that a large fog bank was almost halfway across the airport. Every active runway was totally IFR for landing. Since the fog hadn't reached the weather system in the middle of the field, all it knew was that the airport had clear skies and unrestricted visibilities. I got to make my first "unrepresentative" call on the observation as a pilot, and it was quickly changed to reflect the actual conditions.

There is one other weakness that can create real confusion. The automated systems lack judgment. For example, there I was in base operations when another pilot brought over an observation from an airfield in Arizona. The report said the temperature was 32 degrees Celsius and "snow." It turns out that a spider's web produced the false report of snow. The computer could not see the error and correct it.

Augmented weather observations are a mixture of the best of both man and machine. They contain the judgment and "big picture" of human vision plus the persistence of machines that can quickly detect changes. With humans in the loop, there are far fewer errors in reporting from the automated systems.

How We Got Here

In 1996, I had the privilege to meet with many other representatives of the aviation industry at a meeting to discuss the use of the newest weather observation system, the Automated Surface Observation System or ASOS (figure 1). Actually, this was the answer to many budget concerns in the National Weather Service, which was pulling many of its field offices (forecasting centers) away from airports. The question on the table was whether automated observations would be enough to meet the needs of commercial aviation.

For a number of years, the Automated Weather Observing System (AWOS) was in use at various small airfields, rooftops, and hospitals where only basic weather information was required. With four different FAA versions, all

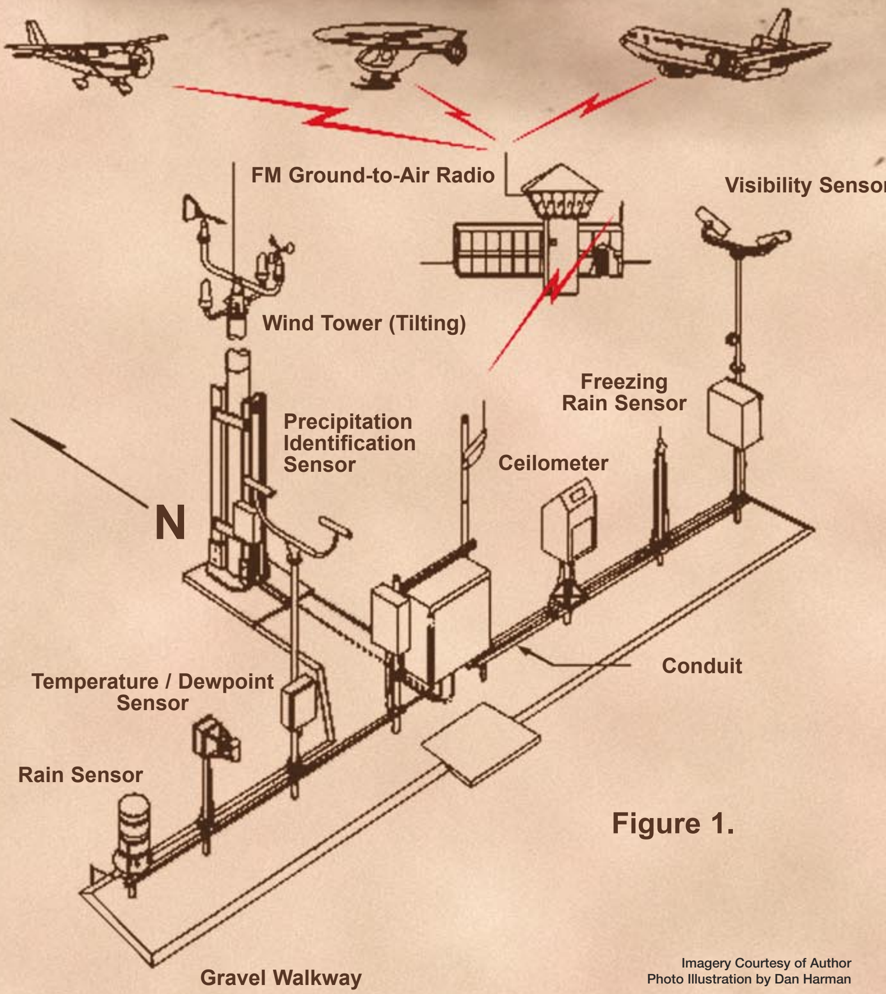


Figure 1.

Imagery Courtesy of Author
Photo Illustration by Dan Harman

with different capabilities, the private sector was certainly getting more weather information than it ever had at these locations. ASOS was even better and sensed even more. Table 1 shows the different levels of capability of the AWOS and ASOS.

It took almost three years to resolve the issue. At that time, thunderstorms and freezing precipitation were not sensed by the ASOS. The pilots in the group wanted augmentation for those significant hazards. Airlines had their own weather forecasting capabilities at Operations Centers around the country. They needed more information than just the basic observation to forecast weather at the busiest hubs of commercial aviation. The answer was to create four different levels of service based on the probability of hazardous weather and the amount of activity at the hundreds of airports around the country, the distance to an alternate airport, and special concerns of certain airports (like terrain). Every year, the airport list is validated based on these concerns.

The four increasing levels of service are identified as Levels D, C, B, and A. They are described below in the FAA's own words.

•Service Level D

This level of service consists of an ASOS continually measuring the atmosphere at a point near the runway. The ASOS senses and measures the following weather parameters: Wind, Visibility, Precipitation/Obstructions to Vision, Cloud Height, Sky Cover, Temperature, Dew Point and Altimeter. A site ranked as service level D has a stand-alone ASOS.

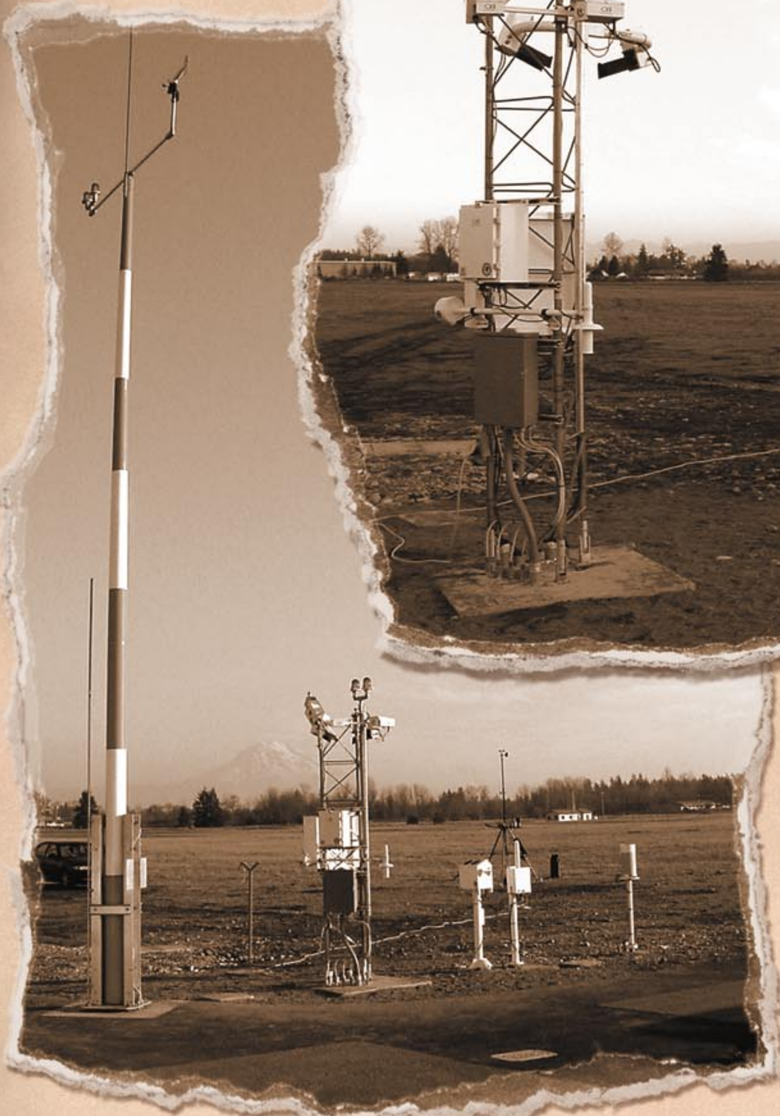
•Service Level C

This level consists of all the elements of Service Level D, plus augmentation and backup by a human observer on location nearby. Backup consists of inserting the correct value if the system malfunctions or is unrepresentative. Augmentation consists of adding the following elements, if they are observed: Thunderstorms, Tornadoes, Hail, Virga, Volcanic Ash, Tower Visibility and any operationally significant remarks as deemed appropriate by the observer. During the hours that the observing facility is closed, the site reverts to Service Level D, stand-alone status. Generally speaking, air traffic control tower specialists provide Service Level C.

Table 1.

Weather Observing Programs

Element Reported	AWOS-A	AWOS-1	AWOS-2	AWOS-3	ASOS	Manual
Altimeter	X	X	X	X	X	X
Wind		X	X	X	X	X
Temperature/ Dew Point		X	X	X	X	X
Density Altitude		X	X	X	X	
Visibility			X	X	X	X
Clouds/Ceiling				X	X	X
Precipitation					X	X
Remarks					X	X



Imagery Courtesy of Author
Photo Illustration by Dan Harman

FMQ-19
Weather Observing System

• Service Level B

This level consists of all of the elements of service levels C and D plus the augmentation of the following elements: Longline RVR (Runway Visual Range) at precedented sites (may be an instantaneous readout), Freezing Drizzle versus Freezing Rain, Ice Pellets, Snow Depth and Snow Increasing Rapidly remarks, Thunderstorm and Lightning Location remarks, Observed Significant Weather Not at the Station remarks. During the hours that the air traffic control tower is closed, the site may revert to Service Level D. Generally speaking, contract weather observers provide Service Level B.

• Service Level A

This level consists of all of the elements of service levels B, C and D plus the augmentation of the following elements: 10-minute longline RVR at precedented sites or additional visibility increments of 1/8, 1/16 and 0; Sector Visibility; Variable Sky Condition; Cloud layers above 12,000 feet; and Cloud Types, Widespread Dust, Sand and other Obscurations and Volcanic Eruptions.

Conclusion

The bottom line to this entire effort is that weather at one airport is not necessarily the same as that at another. When flying into and out of civilian airports, aviators need to know that every weather element they expect to be sensed is available either by automation or by human augmentation or manual observation. You don't want to be surprised by unreported weather at your destination.

Now, let me introduce you to the FMQ-19 Weather Observing System (see photos above). It is coming to an Air Force Base or Army Airfield near you soon. We'll talk more about this system in a future issue of *Flying Safety Magazine*.

Weather Observations Elements and Change at Civilian Airports

A SPECI is an unscheduled report taken when any of the criteria given in the Federal Meteorological Handbook No.1 are observed. It is important for every aviator to be familiar with the values that force a change to the weather observation, since they show the variability that could exist in the current conditions.

According to the FMH, "SPECI shall contain all data elements found in a METAR plus additional plain language information which elaborates on data in the body of the report. All SPECIs shall be made as soon as possible after the relevant criteria are observed.

(1) **Wind Shift**. Wind direction changes by 45 degrees or more in less than 15 minutes and the wind speed is 10 knots or more throughout the wind shift.

(2) **Visibility**. Surface visibility as reported in the body of the report decreases to less than, or if below, increases to equal or exceed:

(a) 3 miles.

(b) 2 miles.

(c) 1 mile.

(d) The lowest standard instrument approach procedure minimum as published. If none published, use 1/2 mile.

(3) **Runway Visual Range (RVR)**. The highest value from the designated RVR runway decreases to less than, or if below, increases to equal or exceed 2400 feet during the preceding 10 minutes. U.S. military stations may not report a SPECI based on RVR.

(4) **Tornado, Funnel Cloud, or Waterspout**

(a) is observed.

(b) disappears from sight, or ends.

(5) **Thunderstorm**

(a) begins (a SPECI is not required to report the beginning of a new thunderstorm if one is currently reported).

(b) ends.

(6) **Precipitation**

(a) hail begins or ends.

(b) freezing precipitation begins, ends, or changes intensity.

(c) ice pellets begin, end, or change intensity.

(7) **Squalls**. When squalls occur.

(8) **Ceiling**. The ceiling (rounded off to reportable values) forms or dissipates below, decreases to less than, or if below, increases to equal or exceeds:

(a) 3000 feet.

(b) 1500 feet.

(c) 1000 feet.

(d) 500 feet.

(e) The lowest standard instrument approach procedure minimum as published in the National Ocean Service (NOS) *U.S. Terminal Procedures*. If none published, use 200 feet.

(9) **Sky Condition**. A layer of clouds or obscurations aloft is present below 1000 feet and no layer aloft was reported below 1000 feet in the preceding METAR or SPECI.

(10) **Volanic Eruption**. When an eruption is first noted.

(11) **Aircraft Mishap**. Upon notification of an Aircraft Mishap unless there has been an intervening observation.

(12) **Miscellaneous**. Any other meteorological situation designated by the responsible agency, or which, in the opinion of the observer, is critical.

Space Weather: An Operational Impact in Real-Time or How Sunspots Create Spotty Operations for the Air Force

COLONEL TIM "URSA" MINER, USAFR
Reserve Assistant to the Director of Weather, HQ USAF
DR. CELIA MINER (LT COL, USAF, Ret.)
Former Commander, Learmonth Solar Observatory

Imagery Courtesy of Authors
Photo Illustration by Dan Harman

It was another dark night filled with writer's block as I tried to compose the next installment of Colonel Beak for *Flying Safety* Magazine. Suddenly my able-bodied partner—my spouse—rushed in telling me that Sunspot Cluster 652 had erupted like a pimple on the surface of the sun. (It's amazing how the mental analogies change when you have a teenage daughter!)

Immediately, I went to the Internet to connect to the Joint Air Force and Army Weather Information Network (JAAWIN) where I knew I'd find the scoop. *(Editor's Note: JAAWIN is available to all registered military personnel at https://weather.afwa.af.mil)* Sure enough, the men and women of the Air Force Weather Agency (AFWA) and its Space Weather Operations Center (WOC) at Offutt AFB OK, were already on the job.

My first stop was the Space Weather Home Page. Here, the Michelson Doppler Image (MDI) photograph of the sun (see figure 1) showed an orange orb with an ugly black patch. It reminded me of the overripe fruit on the kitchen counter. The size of the black spots was well above average. In fact, my spouse reported the group had been visible to the (properly protected) naked eye that morning near dawn. This was going to be a very significant space weather event. Beside the MDI was the black and green photograph from the Solar X-ray Imager. The large white spots on the surface correlated to where there were sunspots on the MDI. They reminded me of the toothpaste on the bathroom mirror. The sun was truly active, and radiation from intense solar flares burst forth from the sun like soda spewing from a shaken can.

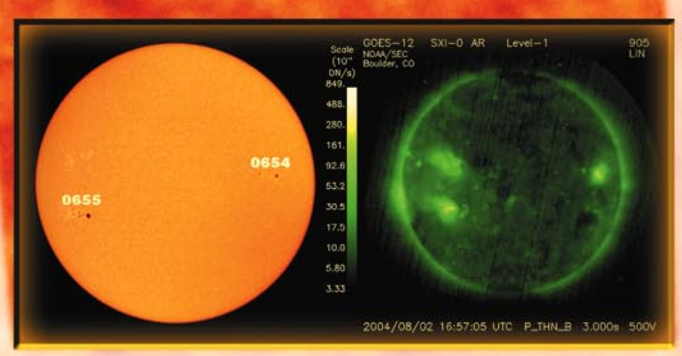
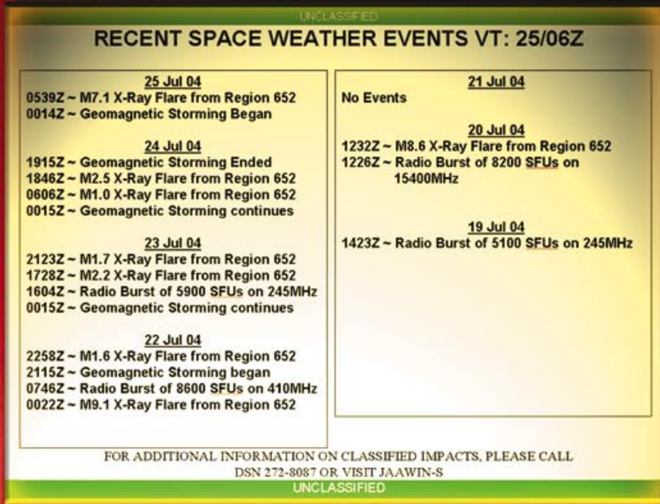


Figure 1.

These observations of the sun, supplemented by data from other satellite-borne sensors, provided data necessary for forecasting solar effects on Earth, or "space weather." In addition to data from these sensors, from sunup to sundown at five different locations around the world, the men and women of AFW almost literally have their "eyes on the sun." (Ouch, that must hurt!) The locations are Learmonth Solar Observatory in Western Australia; Holloman AFB, New Mexico; Palehua, Hawaii; San Vito, Italy; and Sagamore Hill in Massachusetts. There, using light in visible wavelengths plus radio sensors covering a wide range of frequencies, the sun is continuously monitored for "storms" and "activity" that can send radiation and cosmic particles towards Earth. An example is the image above, collected using visible light in the red-orange part of the electromagnetic spectrum.


UNCLASSIFIED

RECENT SPACE WEATHER EVENTS VT: 25/06Z

25 Jul 04
0539Z ~ M7.1 X-Ray Flare from Region 652
0014Z ~ Geomagnetic Storming Began

24 Jul 04
1915Z ~ Geomagnetic Storming Ended
1846Z ~ M2.5 X-Ray Flare from Region 652
0606Z ~ M1.0 X-Ray Flare from Region 652
0015Z ~ Geomagnetic Storming continues

23 Jul 04
2123Z ~ M1.7 X-Ray Flare from Region 652
1728Z ~ M2.2 X-Ray Flare from Region 652
1604Z ~ Radio Burst of 5900 SFUs on 245MHz
0015Z ~ Geomagnetic Storming continues

22 Jul 04
2258Z ~ M1.6 X-Ray Flare from Region 652
2115Z ~ Geomagnetic Storming began
0746Z ~ Radio Burst of 8600 SFUs on 410MHz
0022Z ~ M9.1 X-Ray Flare from Region 652

21 Jul 04
No Events

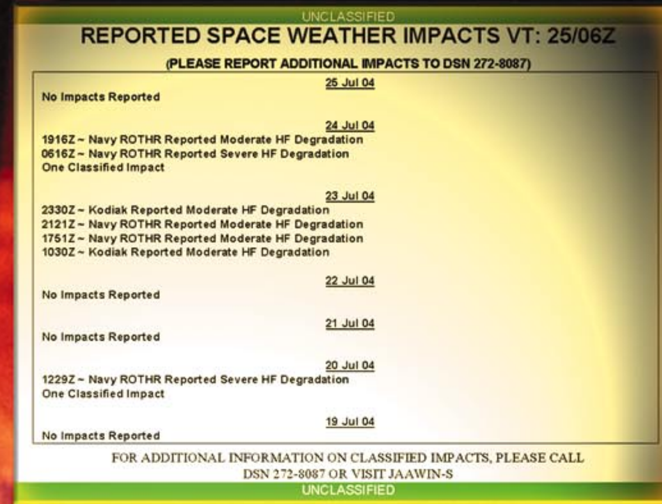
20 Jul 04
1232Z ~ M8.6 X-Ray Flare from Region 652
1226Z ~ Radio Burst of 8200 SFUs on 15400MHz

19 Jul 04
1423Z ~ Radio Burst of 5100 SFUs on 245MHz

FOR ADDITIONAL INFORMATION ON CLASSIFIED IMPACTS, PLEASE CALL DSN 272-8087 OR VISIT JAAWIN-S

UNCLASSIFIED

Chart 1.


UNCLASSIFIED

REPORTED SPACE WEATHER IMPACTS VT: 25/06Z

(PLEASE REPORT ADDITIONAL IMPACTS TO DSN 272-8087)

25 Jul 04
No Impacts Reported

24 Jul 04
1916Z ~ Navy ROTHR Reported Moderate HF Degradation
0616Z ~ Navy ROTHR Reported Severe HF Degradation
One Classified Impact

23 Jul 04
2330Z ~ Kodiak Reported Moderate HF Degradation
2121Z ~ Navy ROTHR Reported Moderate HF Degradation
1751Z ~ Navy ROTHR Reported Moderate HF Degradation
1030Z ~ Kodiak Reported Moderate HF Degradation

22 Jul 04
No Impacts Reported

21 Jul 04
No Impacts Reported

20 Jul 04
1229Z ~ Navy ROTHR Reported Severe HF Degradation
One Classified Impact

19 Jul 04
No Impacts Reported

FOR ADDITIONAL INFORMATION ON CLASSIFIED IMPACTS, PLEASE CALL DSN 272-8087 OR VISIT JAAWIN-S

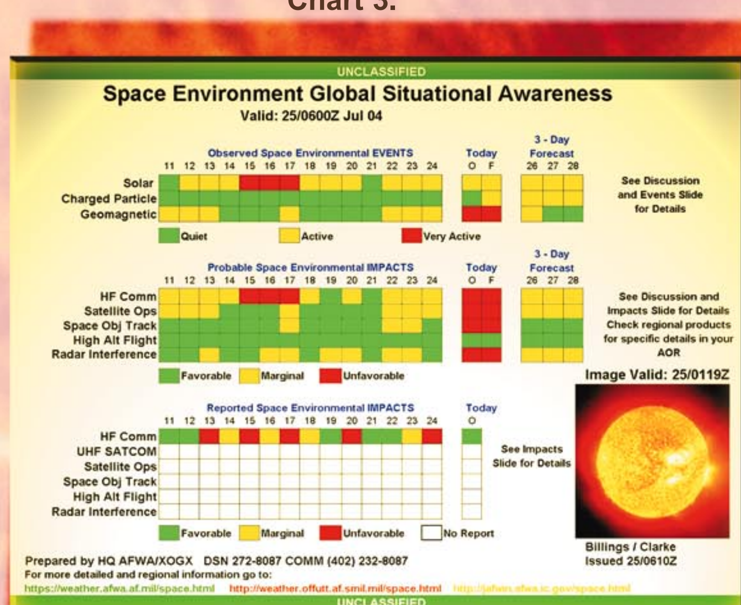
UNCLASSIFIED

Chart 2.

My next stop was the "Recent Space Weather" Page, where I could see that AFWA had analyzed the data and concluded that major activity was taking place. The Web site page listed that a major flare had already erupted from Region 652 and that "geomagnetic storming" was in progress (see Chart 1).

I then selected the "Space Weather Events and Impacts Stop Lights Chart" Page from the main Space Weather Page menu (see Chart 2). This chart is titled "Space Environment and Global Situation" (see Chart 3) and shows the Space WOC forecast of solar activity impacts on operations today and for the next three days. The unclassified forecasts give probable solar impacts to HF communications, satellite operations, space tracking capability, human hazards to high altitude flight, and radar interference. The red-colored stoplight for that day showed high probabilities throughout the day in most of these operations.

Chart 3.



Text bulletins are also available on the main website. These "word pictures" give more details of the analysis and forecasts. There are many to choose from if an operator wants more information. However, most of the detailed information is used by the weather briefer to tailor specific forecasts for the unique missions of individual Air Force and Army units. From the extent and significance of the activity, I was sure that today operational weather briefers would spend extra time ensuring that warfighters all over the world received the information on this event and its impact to their specific mission.

JAAWIN provided the effective means to disseminate the information on the space weather affecting operations that day. It is available every day, anywhere there is connectivity—including our house, at least when the daughter isn't "instant messaging."

Region 652 has recently rotated off the portion of the sun facing our planet. However, its presence only underscores how space weather continues to grow in importance to the Air Force and Army as they perform their missions. A quick look at the "Recent Space Weather Impacts" page showed me that. Whenever the sun is highly active, operational communications and operations can be directly impacted (see Chart 2).

Your weather briefer is your source for detailed and tailored information on space weather taking place now and during future missions. If you aviate, you know the significant role you play through the PIREP process. Space weather is no different. The JAAWIN Space Weather page asks every operator to report significant mission impacts caused by these events to help AFWA to accomplish its mission of giving you the weather information you need anytime and anywhere "from the mud to the sun."

CIRCLING REVISITED

Aircraft Category	Obstruction Clearance Radius
A	1.3 NM
B	1.5 NM
C	1.7 NM
D	2.3 NM
E	4.5 NM

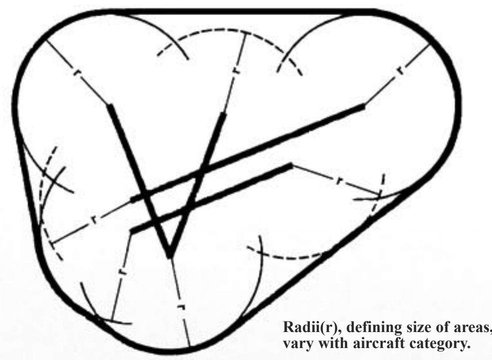


Figure 1.

LT COL DAVID TUBB
Commandant, USAF Advanced Instrument School
Randolph AFB TX

The mishap crew, flying an Air China Boeing 767, planned and briefed the ILS 36L approach to Kimhae International Airport in Busan, South Korea. However, due to surface winds exceeding their 10-knot tailwind limitation, they changed their plan to circle to runway 18R. The weather was 500 scattered, 1000 broken, 4000 meters visibility with rain and mist. The captain flew the ILS down to the Cat C circling MDA of 700 feet, displaced the aircraft on a one-mile-wide downwind and commenced the base turn at 1.75 NM past the end of the runway. While on base leg, with the captain looking cross-cockpit, the copilot stated he had lost sight of the field. This was immediately followed by, "Pull up! Pull up!" from the ground proximity warning system. Unfortunately, it was too late. The aircraft impacted approximately 100 feet below a ridgeline, killing 139 passengers and crewmembers. Ironically, the captain survived.

Most of us have been taught that a circle is simply a maneuver at the end of an approach which, for one reason or another, cannot be completed as a straight-in. Most of us also probably view circling as a somewhat benign, relatively straightforward and "safe" maneuver. In a pure training environment, on a beautiful VMC day, I could agree with that (although I'd still prefer my straight-in ILS). But what about when you're no kidding just below that ragged cloud deck, the visibility is at minimums, and you're at an unfamiliar airfield (at night!)? Now, how do you feel about circling?

The International Civil Aviation Organization (ICAO) published a report several years back that concluded straight-in approaches are 25 times safer than circling approaches. The airline industry agrees. Many major carriers prohibit their pilots from flying circling approaches, opting instead to limit them to performing VFR patterns, with minimums of 1000-3 (VFR for civilians). Granted, part of their decision is fiscally based (FAR Part 121 requires carriers to train and certify pilots who circle below 1000-3). But, a large part is also based on their recognition of the inherent risk in circling (not to mention passengers' fears as they look out the window of a 747 in 30 degrees of bank at 500 feet AGL). Although, with the proliferation of GPS approaches, circling is becoming less common, there is still a host of places around the world where it's the only way to get the aircraft on the ground.

Before we go any further, let's review some circling fundamentals and design criteria. Figure 1, from AFMAN 11-217, Vol. 1, *Instrument Flight Procedures*, shows how the circling protected airspace is constructed. For those of you who are up on your TERPs knowledge, you'll notice there is no "secondary" airspace. What does that mean? It means if you take your aircraft just one foot outside of the circling radii, there could be a tower, some terrain, or any other obstacle just waiting to reach up and grab you.

In order to fully appreciate the scope of this simple figure, though, we need to delve a little deeper into the whole approach category issue. FLIP General Planning Chapter 2 and FAR Part 97 define aircraft approach categories based on a speed of 1.3 V_{SO} (stall speed in the landing configuration) at the maximum certified landing weight. These speeds are listed below:

continued on page 20

USAF Photo
Photo Illustration by Dan Harman

CMSGT JEFF MOENING
HQ AFSC/SEFF
MSGT CHARLES WHEATLEY
HQ AFSC/SEFM

A mighty C-5 was on its takeoff roll. Five knots before go-speed (110 knots), the pilots saw a vehicle crossing 600 feet in front of them, left to right. They elected to continue the takeoff, since an abort would result in almost certain collision. The C-5 passed abeam the pickup at 20 feet AGL with the vehicle just getting off the runway. Have you seen yourself in this position? With the number of runway intrusions we have seen in the Air Force, you may have. We had 36 runway intrusions in CY03 that endangered aircraft. Luckily, we did not have a collision between an aircraft taking off and a vehicle.

The sad part is that the above story is true. It actually happened, and we dodged a Class A mishap with fatalities. The guidelines for control of access to the runway and other parts of the airfield are rather specific, and everyone who uses them is "supposed to know" the rules. The rules not only affect the people driving a vehicle, but also the aircraft operators who, way too often, cross or enter runways without clearance, and the air traffic controllers who clear aircraft to land and take off with vehicles, personnel or other aircraft on the runway. What are the rules, why do we have problems, and what do we do about it? Let's try to answer the questions starting with vehicle operations.

Vehicles

The rule book associated with driving a vehicle on the airfield is AFI 13-213, *Airfield Management*, which explains The Flightline Drivers Familiarization Program. Every wing and unit that drives on the flightline must have a documented program to ensure they train their people on the requirements as outlined in AFI 13-213. This training program must contain:

- Airfield Diagrams
- Operating Procedures and Standards
- Reporting, Enforcement and Violation Consequences
- Training Criteria
- Testing Requirements
- TDY and Contractor personnel
- Privately-Owned Vehicle Passes

If your program covers all these requirements, great; but if not, you had better get it updated. The key question is: If we train our people on vehicle operations, both here and deployed, what happens? We can have all the instructions and programs in the world, but if people don't follow them or get so wrapped up in what they are doing they forget, or fail to properly communicate, we have mishaps. If you took a look at the HATRs that involved vehicles, you would find the most common errors to be that the operator:

—Was trained, but failed to get permission to cross the runway

—Was confused about their location or unfamiliar with the airfield

—Thought they had permission to cross, but didn't hear the tower communication properly

—Was never trained, or improperly trained, on runway crossing procedures

—Didn't think they had to ask for permission from the tower

How do we prevent an unauthorized vehicle from entering the runway without an outright ban on vehicles?

The first step is training. The unit flightline driving program must be first-rate. Leadership must ensure that the people responsible for the program have the support and resources needed to make the program work. If supervisors at all levels actively support the program and ensure that only qualified operators use the runway, we can cut down on our close calls.

Secondly, we must have stronger enforcement by everyone. The folks in the tower cannot always see every square inch of real estate on the airfield every second of every day, so they rely on you to let them know you are there. If you see a vehicle in the wrong spot, stop it or call the tower or airfield manager (base ops) immediately. People who violate the rules must pay the price as outlined in the AFI and local directives, depending upon circumstances.

continued on page 18

RUNWAY/CONTROLLED MOVEMENT AREA MARKINGS

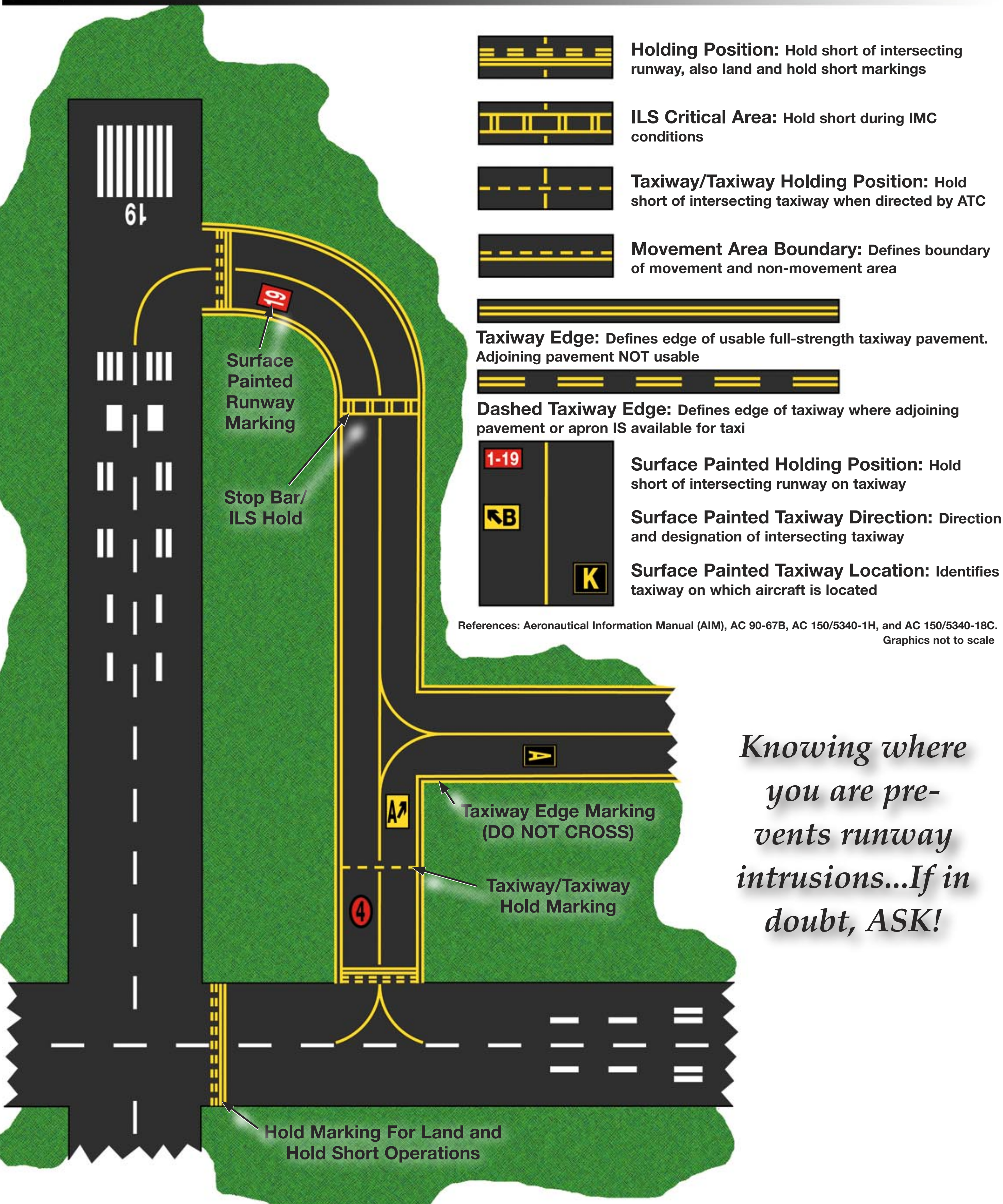
Tower Light Gun Signals

Color and Type of Signal	Aircraft on the Ground	Movement of Vehicles, Equipment and Personnel
Steady Green	Cleared for Takeoff	Cleared to Cross, Proceed or Go
Flashing Green	Cleared to Taxi	Not Applicable
Steady Red	Stop	Stop
Flashing Red	Taxi Clear of the Runway in Use	Clear the Taxiway/ Runway
Flashing White	Return to Starting Point on Airport	Return to Starting Point on Airport
Alternating Red/Green	Exercise Extreme Caution	Exercise Extreme Caution

Airport Signs

- 4-22 — **Taxiway/Runway Hold Position:** Hold short of runway on taxiway
- Also... **Runway/Runway Hold Postion:** Hold short of intersecting runway
- 8-APCH — **Runway Approach Hold Postion:** Hold short for aircraft on approach
- ILS — **ILS Hold Postion:** Hold short of ILS critical area
- **No Entry:** Identifies paved areas where aircraft entry is prohibited
- B — **Taxiway Location:** Identifies taxiway on which aircraft is located
- 22 — **Runway Location:** Identifies runway on which aircraft is located
- 4 — **Runway Distance Remaining:** Identifies runway length remaining
- 4 — **Position Marking**
- **Runway Boundary:** Exit boundary of runway protected areas
- **ILS Critical Area Boundary:** Exit boundary of ILS critical area
- L→ — **Runway Exit:** Defines direction and designation of exit taxiway from runway
- Also... **Taxiway Direction:** Defines direction and designation of intersecting taxiway(s)
- 22↑ — **Outbound Destination:** Defines directions to takeoff runways
- ↖MIL — **Inbound Destination:** Defines directions for arriving aircraft
- **Taxiway Ending Marker:** Indicates taxiway does not continue
- ↙A G L→ — **Direction Sign Array:** Identifies location in conjunction with multiple intersecting taxiways

Airport Markings



Thirdly, we must communicate more effectively. Like we said earlier, the tower can't always see everything and they rely on you, so in order for them to control the airfield, they must know you are there. If you aren't sure about something, call first. This is one case where it is better to get permission than to ask for forgiveness, because you may be dead. Communicate with the tower ground controller or other controlling agency and listen for the proper clearance, and we will be in great shape.

Aircrew

How about aircraft and runway intrusions? If you look at the incident numbers, they are right up there with vehicle intrusions in certain years. How can a trained and professional aircrew enter a runway without permission and even take off? If you would poll the folks here at the Safety Center, you would get two words—communication and task saturation. Maybe that's three words.

Looking at the HATRs, you would find communication as the number one cause. Task saturation isn't there in writing, but if you read the reports you might find that if an aircrew was behind in the checklists and/or late for their takeoff, it might have led to their communication problem. Also, anticipating your clearance and thinking you were granted clearance led to a number of the incidents. What do we do about it?

Can we slow the pace of flying down? Not likely to happen, but we need to slow down and ensure that what the aircrew asked for and what they heard are the same thing. The aircrew needs to ensure the tower heard their transmission and acknowledged what they heard. The few seconds you take to verify your clearance may be the ones that save your life and those of your fellow Airmen.

Communication is the key. We have already said that in a roundabout way. Bottom line for all aviators is: The rules are there, and you know what they are. Take the time to properly communicate with the tower; if you aren't sure it was your clearance, ask again. If you see something that doesn't look right, wait until it does.

Air Traffic Control (ATC)

The last area we want to look at is ATC. What can the people in the tower do about an unauthorized vehicle, personnel, or aircraft on the runway, or an aircraft that takes off without clearance? If they had the right weaponry, a lot! Luckily for us, they can't shoot us. However, they are charged with the responsibility to ensure that aircraft arriving and leaving an Air Force base do so in a safe and timely manner. Most of the time it's right on the money, but they have their share of the responsibility for many a close call.

Most of the incidents involve ATC clearing an aircraft to land or take off with a vehicle or another aircraft on the runway. The tower didn't know the vehicle was there, or thought the vehicle or aircraft had already cleared the runway. Like we said earlier, they can't always see every square inch of our airfields, so they rely on us. The tower is only as good as the information they receive. If you don't call the tower to say you are going to cross the runway, you are setting up an accident. If you don't call the tower to say you are off the runway or say you are off when you aren't, then you are the problem. Sometimes the tower may get task-saturated dealing with multiple takeoffs and landings. This is no excuse for clearing an aircraft to take off or land with an obstacle on the runway. Here we have the old time-worn phrase of, "see and avoid," but this time it's on the ground.

Communication is once again the key to prevention. Everyone must ensure we communicate with the tower so they can have a complete picture of the airfield. ATC must, in turn, take the time needed to ensure the runway is clear and their directions are the correct ones to prevent a mishap. Task saturation is common in today's high-paced environment, but think how high-paced it will be if you had an accident on the runway because you put two pieces of Air Force property in the same place at the same time. Take the time to listen and communicate effectively and clearly. If you don't hear the right response, ask again and again, if necessary. If things don't look right, respond accordingly. Take the extra effort to ensure the safety of the lives the Air Force has entrusted to you.

Reporting

We want to touch on the process of reporting runway intrusions and controlled movement area violations. The Air Force tracks both via a quarterly Airfield Operations Board (AOB) held at each base. Any runway intrusions or controlled movement area violations, regardless of impact to safety, must be documented in the AOB minutes. The AOB minutes are then sent to the respective MAJCOM, FAA and to the Air Force Flight Standards Agency for review. This is a mandatory procedure IAW AFI 13-204, *Functional Management of Airfield Operations*. AFMAN 91-223, *Aviation Safety Investigations and Reports*, instructs that any runway intrusion "that endangers the safety of an aircraft or UAV" is considered a Class E HATR and appropriate actions should be taken. Runway intrusions and controlled movement operation violations "that did not endanger aircraft" shall be reported to the base safety office as Class E CMA Violations. Everyone who uses the airfield has the responsibility to report violations, and to work to correct the issues that endanger our lives.

Summary

What is the bottom line for all of this? The Air Force has had way too many close calls on our busy runways and taxiways. The law of averages is going to catch up to us one day, and it will be catastrophic. No one wants an aircraft accident, especially one with fatalities. It is bad enough that we have to deal with birds and wildlife, but they were put there by Mother Nature and nobody controls her. However, we can control the vehicle drivers, aircraft operators and air traffic controllers. You can have the best written plan in the world, but if you don't implement it and follow the established rules, you have missed a chance to prevent a mishap. The overall key to mishap prevention is communication and risk management.

With an effective training program and effective communication between vehicles, aircraft operators and the tower, we could eliminate almost every near-miss we have had. Maybe this is a topic for your next safety day, or a safety team to look at your base's record of runway intrusions. Use your ORM tools and the vast amount of knowledge at your location to see if you have a problem, and if so, take the steps to mitigate the risk.

Runway Intrusions Constituting Hazardous Air Traffic Reports (HATRs) Involving USAF Aircraft

CY 96	CY 97	CY 98	CY 99	CY 00	CY 01	CY 02	CY 03	2004 to date
7	2	10	22	23	14	20	36	10

Controlled Movement Area (CMA) Violations Constituting HATR Involving USAF Aircraft

CY 96	CY 97	CY 98	CY 99	CY 00	CY 01	CY 02	CY 03	2004 to date
0	0	0	0	0	3	4	7	6

Semi-Annual Totals For Runway Intrusions Constituting HATRs Involving USAF Aircraft

Jan-Jun 2001	Jul-Dec 2001	Jan-Jun 2002	Jul-Dec 2002	Jan-Jun 2003	Jul-Dec 2003	2004 to date
7	7	12	8	17	19	10

Semi-Annual Totals For CMA Violations Constituting HATRs Involving USAF Aircraft

Jan-Jun 2001	Jul-Dec 2001	Jan-Jun 2002	Jul-Dec 2002	Jan-Jun 2003	Jul-Dec 2003	2004 to date
2	1	0	4	2	5	6

Note: The totals in the above charts are from the AFSAS data program instituted in 2002. Data may not be accurate before that date.

continued from page 14

- Category A: speed less than 91 knots
- Category B: speed 91 knots or more but less than 121 knots
- Category C: speed 121 knots or more but less than 141 knots
- Category D: speed 141 knots or more but less than 166 knots
- Category E: speed 166 knots or more

The question always comes up, though, as to what type of speeds these are—indicated, true, ground? From a circling perspective, it would make the most sense if they were true air speeds, since the protected airspace is based on radii extending from the runways' ends. That's not the case, though. Since the categories are based on stall speeds, they are determined by aircraft *indicated* airspeeds.

So, why do I care? Well, let's say you're in your Cat C aircraft circling at Patrick AFB. The circling MDA is 480 feet MSL and you're flying 140 KIAS. Now go to Colorado Springs, where your MDA is 6820 feet MSL. Finally, fly down to La Paz, Bolivia (Figure 2). Your MDA here is 14,200 feet MSL. In all three locations, you're flying 140 KIAS for your circle. What has changed with your altitude, though?

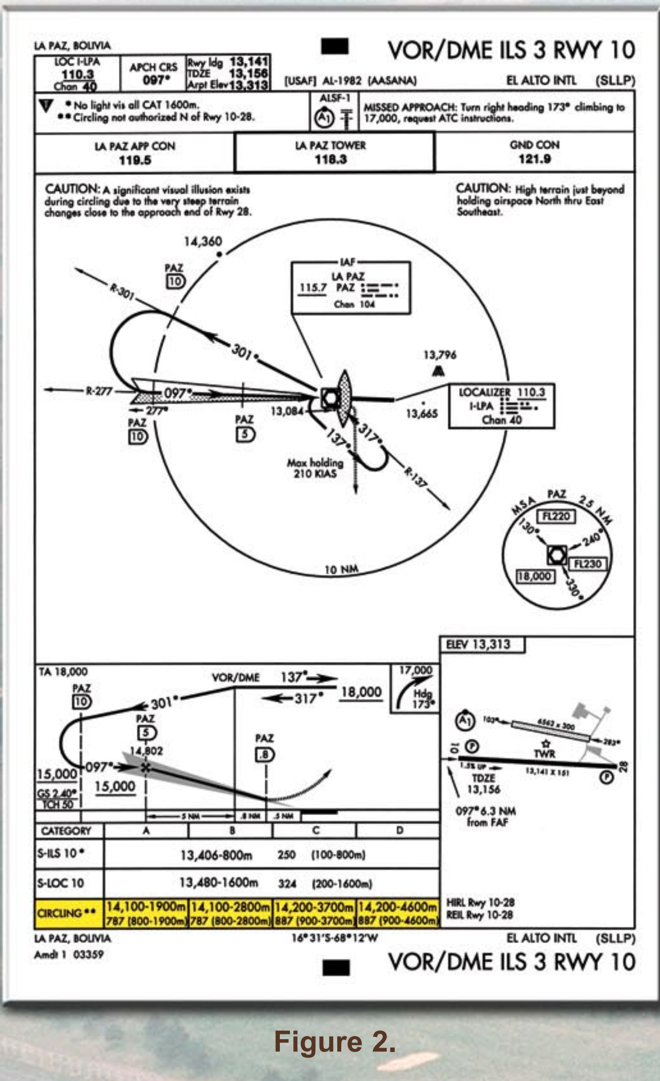


Figure 2.

True airspeed. A general rule of thumb is that *TAS = IAS + (2% per 1000 feet)(IAS)*). So, how does that translate to our three locations? For Patrick, your TAS is 141 knots; for Colorado Springs, it's 159 knots; for La Paz, it's 180 knots! Comparatively, your turn radius has gone from approximately 3000 feet to 4000 feet to 5000 feet (assuming 30 degrees of bank). So, the aircraft turn radius has increased dramatically, but the Cat C circling airspace remains constant at 1.7 NM. In reality, even if we assume no wind (so that TAS = ground speed), you've gone from a Cat C aircraft to Cat D to Cat E by simply changing your circling MDA. So here's the moment of truth…when was the last time you bumped up your category mins because of a higher TAS?

Although the FAA and USAF don't take TAS into their circling TERPs calculations, interestingly enough, the ICAO does. When an ICAO-approach designer sits down to construct a circling approach, he or she uses what's called PANS-OPS (Procedures for Air Navigation Services-Aircraft Operations) criteria vice TERPs criteria. In doing so, they consider not only the effect of TAS, but also factor in a "worst case" 25-knot tailwind, higher category indicated airspeeds, and a final roll-out point (so you're not rolling out of the base turn in the overrun).

Table III-4-2. Example of determining radii for visual manoeuvring (circling) area for aerodromes at 2 000 ft MSL (non-SI units)

Category of aircraft/IAS (kt)	*A/100*	*B/135*	*C/180*	*D/205*	*E/240*
TAS at 2 000 ft MSL + 25 kt wind factor (kt)	131	168	215	242	279
Radius (r) of turn (NM)	0.69	1.13	1.85	2.34	3.12
Straight segment (NM) (this is a constant value)	0.30	0.40	0.50	0.60	0.70
Radius ($\bar{R}$) from threshold (NM)	1.68	2.66	4.20	5.28	6.94

Note.— Radius from threshold ($\bar{R}$) = 2r + straight segment.

Figure 3.

Take a look at Figure 3. This table is extracted directly from the PANS-OPS Doc 8168 manual. Notice, in this case, the numbers are all derived based on a 2000-foot MSL airfield elevation. If the designer were working with an airfield at some other elevation, he or she would simply use a different table. For our Cat C aircraft scenario, it's easy to see that the ICAO protected airspace is much larger—4.2 NM versus 1.7 NM. In going back to the Air China accident at the beginning of this article, we begin to see how this difference in protected airspace plays into the chain of events. The crew had been trained on ICAO/PANS-OPS procedures; they were flying a foreign carrier, into a foreign, commercial airport, and were flying off a Jeppesen approach plate. In their minds, they assumed they had plenty of protected airspace. What they missed in their approach review was that the circle was actually designed with TERPs criteria—not PANS-OPS! They only had the Cat C 1.7 NM of protected airspace. And, as I said before, if you go outside that airspace, there just might be something there that'll reach up and grab you.

There are a few other areas worthy of discussion. One goes back to circling design criteria and deals with the issue of visibility. Remember, for circling, we must have both ceiling and visibility in order to shoot the approach. Remember also, that the visibility is "prevailing visibility." Prevailing visibility is the greatest visibility over 180 degrees of the horizon—not necessarily a continuous 180 degrees and not necessarily in that sector of the airfield you're circling in. So, just because the ATIS or the tower controller calls visibility above the mins, you may still lose sight of the runway. Additionally, visibility is measured in statute miles (5280 feet) while circling radii are measured in nautical miles (approx. 6000 feet). This problem is magnified when comparing required visibilities to circling radii.

Approach Categories	**A**	**B**	**C**	**D**	**E**
Required HAA	350	450	450	550	550
Required Visibility (statute miles)	1	1	1.5	2	2
Required Visibility (nautical miles)	**.88**	**.88**	**1.32**	**1.76**	**1.76**
Circling Area Radii (nautical miles)	1.3	1.5	1.7	2.3	4.5

Figure 4.

Refer to Figure 4. Notice how in every category the required visibility is less than the circling radius. So, in theory, you would be "legal" to shoot a Cat E approach with only three miles vis while flying your circle out to four miles. Legal, yes…good technique, no (unless you like going missed approach).

Another point of interest is when to descend on a circling approach. The books will tell you to start down when you're in a position to place the aircraft on a normal glidepath. But what is a "normal glidepath"? Most folks would answer, and I'd agree, that three degrees is a normal glidepath. The gotcha, though, is that once you leave your MDA, the TERPster takes a walk—you have to "see and avoid." The required obstacle clearance on a circling approach is 300 feet. Once you're 300 feet below the MDA, there could be anything sticking up, even to the runway threshold. Additionally, what about the approach that is classified as a circle because it exceeds the 400-feet-per-nautical-mile rule? The reason it's a circle is because some obstacle on final prevents a traditional straight-in approach from being developed. So, if I could start down on a "normal" three-degree glidepath, wouldn't they have just made it a straight-in approach to begin with? In the case of the Air China crew, had they flown Cat D mins, they would've been in protected airspace the whole time. But, if they had flown these mins and started down on a three-degree glidepath, they would've descended early on the base leg and still hit the same hill. Bottom line: if you're shooting one of these types of circling approaches, make absolutely sure you can see and avoid any obstacles between you and the runway once you depart the MDA.

Finally, two questions we repeatedly get at AIS are: What do I need to keep in sight during a circle, and, can I circle at a lower category if I can comply with the category airspeeds; e.g., I'm a Cat E guy, but there aren't any Cat E mins published. Can I just fly Cat D as long as I stay below 166 KIAS? For the former question, are you in the U.S. or overseas? AFMAN 11-217, Vol. 1, and the FAR state you only have to keep the *airport environment* (defined as "the runway, its lights and markings, taxiways, hangars, and other buildings associated with the airport") in sight while circling in the U.S.; for ICAO, you're required to maintain sight of the *runway environment* (defined as "the approach light system, the threshold, threshold markings or threshold lights, runway end identifier lights, the runway or runway markings, etc."). The answer to the latter question also comes out of AFMAN 11-217, Vol. 1. Paragraph 8.5.1.1. states: "*An aircraft can fly an IAP (instrument approach procedure) only for its own category or higher, unless otherwise authorized by AF Instruction or MAJCOM directives. NOTE: If MAJCOMs allow aircraft to fly an IAP using a lower category the MAJCOM must publish procedures to ensure that aircraft do not exceed TERPs airspace for the IAP being flown to include circling and missed approach.*" Remember, a circle is part of the IAP; so, unless your MAJCOM (or some other instruction) has given you specific guidance on flying a lower category, you're out of luck.

I've reviewed a few circling fundamentals and, perhaps, introduced some new information here. There are other issues that deserve your attention as well, but I don't have room to address them (e.g., missed approach procedures, circling techniques/restrictions, base turn considerations and controller instructions, to name a few). Hopefully, what I have provided will help one of you in the future when you find yourself flying that unplanned circuit around an unfamiliar airport (at night, with minimum weather).

More than anything I could tell you, though, is practice these things. Most of us only perform circling approaches as part of our semi-annual or annual requirements. In these cases, we're normally flying them in ideal circumstances—i.e., at home or our aux field, in VMC. Try flying them at unfamiliar locations; train at the actual MDA (but fly no-kidding circles as high as your VFR pattern altitude); be precise and don't accept sloppy techniques or aircraft control from a wingman or crewmember; and, lastly, take TAS and winds into account and bump up your aircraft category if appropriate. Fly safe!

WINGTIP TAXI

CAPT WILLIAM ENGBERG
53 AS
Little Rock AFB AR

I was the IP for an LRAFB C-130 crew that was sent to an unnamed AFB for a Static Display/Air Show for a UPT graduating class. We were one of the first planes in, followed by an Altus KC-135. I was ground training a student under the shady wing of *Herc University* when the 135 taxied in. I was comfortable under the shade of the wing of the Herc and didn't want to get up and stand in the sun just to give the "thumbs up" as they uneventfully taxied in, like a thousand planes have done in the past.

I couldn't have been more wrong, and I will never complain again. Here is why the setup was so insidious. We've always heard of the taxi strike: (1) at night, (2) not at home field, and (3) with no taxi lines, where the marshaller is: (1) young, and (2) not qualified. What you *never* expect is a wing strike during the day (blue sky, high noon) by a qualified, salty, 45-year-old, "professional-looking" marshaller.

His goal was to taxi all the planes together so the nose of each aircraft would be pointing at the same spot and we would all be angled into each other like spokes on a wheel. However, the marshaller was used to T-38s with a 25-foot wingspan, and not a C-130 or KC-135, which both have 130-foot wingspans.

I was standing under the left wingtip of my Herc as the KC-135 taxied in with the right wingtip fast approaching. My "thumbs up" began transforming into "two hands raised, palms parallel" to each other, as though I was standing behind my buddy's car helping him back up to another car. They weren't actually that close, but I had never been in this position before and didn't know how to express *"You are stinkin' close!"* After about two seconds, I actually heard myself say, "This is stupid," and that is when I got scared. My arms formed a giant "X" as I looked at the Ray-Bans of the CP. Thankfully, they were a highly professional crew and were watching the hand signals from many safety observers, not just the single guy in front.

Here is where it gets *dumb*. The marshaller, who is off the nose of the KC-135 at least 100 feet away from me, and obviously sees my wingtip better than I do (even though I AM STANDING RIGHT UNDER IT), sees my arms forming an "X," looks

STRIKE AVERTED

Photos Courtesy of Author

me in the eye, blows me off, signals to the crew "OK," followed by raising his paddles in the air, continuing them in a sharp left turn, presumably turning them away from our wingtip. He also adds attitude and starts aggressively nodding his head like a cowboy signaling, "Come on, boys; we haven't got all day." I was in shocked disbelief.

The plane slowly edged forward about a foot (wingtips still about 25 feet away, but at an angled collision course from *behind* our wingtip) when I pointed my left index finger *directly* at the Copilot and simultaneously made the international "You are cutting your throat" motion across my neck with my right index finger. The KC-135 came to a halt and the now-pissed-off marshaller looks at me again. He stops motioning, looks at the wingtip clearance (not seeing the God's Eye View) and *blows me off again*, trying to turn the KC-135 and get them to rip their right wingtip 10 feet into our left wingtip.

I could see the frustration building in the cockpit. The final, *non-standard* hand motion I gave was forming my right hand into the shape of a gun and putting it to my head while pointing at the Copilot. Thank the Lord the international, "You are a dead man," signal was received and they deplaned a crew chief. The crew chief was visibly disturbed when he rounded the corner and saw what the marshaller was trying to do to his plane. He headed back inside and the engines shut down.

The next issue was that the marshaller had wedged the KC-135 so tight into us that they couldn't move until we left the next day. KC-135s have no capability for reverse, there was no "push back" capability at the air show, and we could not start up and taxi because our other crewmembers had departed.

Moral of the story:

- *Always* protect yourself and others by standing near taxi ops with the "thumbs up."
- *Never* assume the marshaller *sees* what you see.
- *Never* blindly trust anyone with *your* plane's movement.
- *Always* stop the show when you hear yourself or someone else saying, *"This is stupid"* or "I've *never done this before."*
- *Always* look at multiple observers when marshalling (each has *part* of the perspective).
- *Never* assume "It can't happen to me."

Air Force Weather
Focused on Operations

Photos Courtesy of NASA
Photo Illustration by Dan Harman

BRIG GEN THOMAS STICKFORD
Director of Weather, USAF

In June 2004, Air Force Weather's (AFW) integral role in US Air Force operations was reaffirmed. As part of a Deputy Chief of Staff for Air and Space Operations reorganization within Headquarters Air Force, AFW and its Field Operating Agency, the Air Force Weather Agency (AFWA), were realigned under the Directorate of Operations and Training led by Maj Gen Marne Peterson. This move underscores AFW's mission: to maximize warfighting and homeland defense capabilities, enhance flight safety, optimize training effectiveness, and safeguard weather-sensitive resources for the Air Force, Army, and a variety of US government departments and agencies.

For the last year, I've had the unique opportunity to be your Director of Weather, and as a career aviator, it's been a real eye-opener to "sit" on the other side of the weather counter. In fact, I can't say enough about the dedication and competence of the over 4400 men and women of AFW making the process happen for our nation. It's a process worthy of every aviator's attention, and knowing this process will make you a better decision-maker, whether that decision is for one aircraft or for the entire Air Force.

Forecasting Starts With Collecting Information

The first and most important step in the process is the *Collection* of terrestrial and space weather data. The basic facts of current wind speed and direction, temperature, atmospheric pressure, cloud types, sun spot intensity, etc., are the "atoms" upon which a weather forecast is built. This is not new. Benjamin Franklin and Thomas Jefferson were ardent collectors of daily weather observations. When all is said and done, weather people are managers of data—lots of data. The interpretation of all this data is what makes weather forecasting a science.

Data collection is literally a worldwide effort. Right now, AFW folks embedded in Air Force and Army units are collecting weather observations in every theater of operations. Sixty years ago, military weather observers took part in the D-Day landings; today, AFW battlefield Airmen have earned Purple Hearts in SWA. We also have AFW forecasters located on a mountain in Hawaii and in the desert of Australia collecting information from beyond the atmosphere to the core of the sun. Most importantly, at nearly every airfield, our "eyes forward" are watching and collecting information on the state of the atmosphere around the base. Not surprisingly, with observations being taken across the globe, communications play a big role. All observations get routed to AFWA, AFW's strategic weather center at Offutt AFB. Consequently, AFW absolutely depends on the skill of its communications technicians to keep data moving.

Up until the last decade, the business of weather observing was done solely by human eyes. With the advent of automated weather observing systems, there has been an explosion of data available. Commercial aircraft now collect up to 30,000 daily observations of the upper atmosphere around the United States, as well as in other locations around the globe. In addition, an expanding aviation presence in the world means more pilot reports (PIREPs). Here's where you can add value to the process. PIREPs help forecasters assess how well a computer model is performing, and impact the resultant accuracy of the man-in-the-loop forecast. So, please take a few minutes to call in a PIREP whenever you can.

In addition to these atmospheric observations, solar observatories and satellites provide continuous streams of data. Moreover, the newest sensors being deployed at our Air Force bases and Army posts are so capable that our dependence on human observations is declining, allowing our folks to focus on weather for all aspects of the mission, including takeoff, ingress, time over target, egress, and landing. With more and more data available to work with, AFW can better assess the current state of the atmosphere, leading to a better forecast.

Analysis Tells Us Where We Are

The second step in the forecasting process is the *Analysis* phase. Here, automated processes at AFWA help "connect the dots" between the various data elements, creating a picture of the current state-of-the-atmosphere and state-of-the-sun. Analysis also takes place at the Air Force Combat Climatology Center (AFCCC) in North Carolina. AFCCC accumulates data for thousands of locations in countries throughout the world, expertly assessing it to determine each location's averages and extremes over a long period of time. The resulting climatology is a vital, yet often overlooked planning tool. For instance, climatology should be consulted when deciding on personnel or equipment bed-down locations (e.g., should troops bring cold weather gear? Will we need additional water due to extreme heat?).

Climatology can also be exploited to establish the best time of year to conduct a particular aspect of flight training or to determine when to launch an operation with expected weather conditions that favor US forces over an adversary. Since climatology can be misinterpreted, be sure to consult your local weather experts whenever you use it. Just be sure you do use it!

Once the historic and current states of the atmosphere are known, it's time to move to the next phase of the process.

Looking Into The Future

The third step of the process, *Forecast Development*, is where the science becomes critical. In fact, this is where AFW really stakes its reputation. After the formation of the current database, AFWA uses its capability as one of the world's largest computing facilities to run global models of the atmosphere and models of potential solar activity. It constantly amazes me that, considering the size of the Earth, we are creating future world-views of the weather with a resolution on the order of only about 40 kilometers. More impressively, many important areas of the world are forecast with a resolution as small as one kilometer.

Next, eight Operational Weather Squadrons (OWS), each with a geographic area of responsibility, impart much-needed regional expertise. Using the strategic center output as a starting point, OWS forecasters employ a blend of experience, known model strengths and weaknesses, and knowledge of regional terrain features to tweak the model output appropriately. With OWSs in the CONUS and overseas, AFW provides regional centers of expertise to every theater, as well as every base and post. But AFW doesn't stop there.

Personalizing The Forecast

Tailoring, the fourth step in the process, makes the weather personal to every Air Force and Army decision-maker. The tactical-level Combat Weather Team (CWT) is the lead organization for this effort. The CWT's job is to know your weather information needs, forewarning you when weather will negatively impact your mission capability or degrade the enemy's effectiveness more than that of friendly forces. The base or post CWT is your local AFW point of contact and your best resource to exploit the terrestrial and space environments to accomplish your mission efficiently, effectively, and safely. Each CWT works hand-in-hand with supporting OWSs to provide you with an accurate and relevant mission execution forecast when you need it.

Delivering The Product To Warfighters

The final step is delivering that tailored product to you anytime, anywhere, based on your needs. Again, AFW owes a lot to the many communicators that are part of our organization. "Bandwidth," "protocols," and satellite communications are as important to AFW as cold fronts and modeling. Bottom line: If you don't get the information when you need it, it doesn't matter how good it is.

So, this five-step process is the heart and soul of AFW. It's what drives the men and women of AFW to bring you the capability to own and exploit the weather for any military need. As I said before, it is an honor to work with this "Band of Brothers" that is AFW. Together, it is our privilege to work for you as part of our nation's warfighting team.

OPS TOPICS

Editor's Note: The following accounts are from actual mishaps. They have been screened to prevent the release of privileged information.

Since this issue is about weather, here are a few cases where our aircraft went head-to-head with Mother Nature and she, as usual, won. Watch out, as these incidents are only Class Cs or Es, but some could easily have been Class As.

Sparkly F-15s

The flight was briefed as a two-ship, basic qualification course, basic fighter maneuver sortie. Brief, takeoff and departure were uneventful. While navigating in visual meteorological conditions (VMC) at 17,000 feet AGL en route to the training area, the instructor pilot (IP) noted numerous areas of thunderstorm activity along the route of flight. The IP asked the radar approach control (RAPCON) about the weather's location, and RAPCON confirmed multiple level 1 through level 4 thunderstorm radar returns. The IP requested and received a vector to clear the weather, and about a minute later RAPCON gave the flight a second vector to clear weather. RAPCON then informed them of thunderstorm activity in and around their location and in the working airspace. The IP turned to the vector heading and noted that it appeared their path would take the mishap flight between a gap in cumulus clouds. The IP placed the student into close formation, and as the mishap flight approached the gap they entered instrument meteorological conditions. The IP, flying Aircraft 1 (A1), noted a lightning strike to his aircraft's radome. The strike then exited his left horizontal stabilator and entered the student's aircraft (A2). The flight regained VMC moments later and completed a battle damage check, noting no system or aircraft abnormalities. The flight declared an emergency and returned to base uneventfully.

Post-flight inspection of both aircraft revealed that the bolt of lightning entered the left side of the aircraft radome and exited the left horizontal stabilator. Both pilots reported seeing the lightning bolt cross from A1 to A2 and post flight inspection of A2 found that the lightning bolt entered the radome on the right side.

A review of the weather available to the IP prior to the flight revealed isolated thunderstorms in the forecast with maximum tops of 45,000 feet. The mission execution forecast listed the freezing level at 15,500 feet. The IP was aware of numerous areas of thunderstorm activity and was attempting to avoid thunderstorms, both visually and with the aid of RAPCON. According to AFH 11-203, Vol. 1, *Weather for Aircrews*, aircrew should avoid the area of susceptibility for lightning strikes defined as plus/minus 8 degrees Celsius of the freezing level and/or plus/minus 5000 feet of the freezing level. The IP did not avoid this area of susceptibility. Further, AFH 11-203, Vol. 1, warns aircrews not to fly in *close formation* within the vicinity of thunderstorm activity. The IP flew the mishap flight in close proximity to thunderstorm activity, and both aircraft were damaged due to a lightning strike. Keep your wingman close, but not during a lightning storm.

Seeker Head Takes A Hit

The F-16 training mission was planned and briefed as a four-ship suppression of enemy air defenses (SEAD) mission with four F-15E strikers. Mission planning, brief, ground ops, takeoff, and departure were uneventful. While manning the counter-rotating cap at 12-14,000 feet, No. 3 of a detached two-ship encountered *large rain* for 1-2 seconds, which broke the seeker head of his AIM-9 missile. The aircraft departed the conditions as quickly as it entered and did not enter any other weather conditions. The No. 2 aircraft of the SEAD formation experienced the same weather at 10-12,000 feet within five minutes of No. 3.

The aircraft departed the conditions as quickly as they entered and did not enter any other weather conditions. The two aircraft were operating as separate two-ships at the times of occurrence. Both aircraft accomplished battle damage checks prior to recovery, and no damage was noted on airborne checks due to the location and size of the AIM-9 seeker heads. Recovery, landing and taxi back were uneventful. Maintenance recovered the aircraft and noticed the AIM-9 seeker head damage. It is amazing the amount of damage water can do when we fly through a rainstorm.

Charged KC-135

The aircraft was a KC-135E scheduled for an hour of transition prior to an air refueling mission. The AR track was changed during mission planning to accommodate the receivers. Isolated thunderstorms and showers had been moving across the base and the area all day, with lightning reported within three miles of the field at various times. During the crew weather brief, the three-mile lightning warning was canceled and the weather forecaster briefed that the planned route had isolated thunderstorms with tops up to FL450. Weather was not a factor for the initial transition and the aircraft weather radar showed only green prior to and during the time of the strike. Conditions at the time of the strike were: 6000 feet MSL, rain, light turbulence, minus 10 degrees Celsius OAT.

At this time, the aircrew heard a loud bang, observed that the aircraft radar was no longer operative, but did not find any other indications of damage. The crew returned to base and landed without incident. After landing, maintenance found a dime-size hole in the radome and damage to the antenna control sub-assembly. It is amazing how fast Mother Nature will change her path into ours.

Heavy Rain = Damaged F-16s

The mishap sortie was planned, briefed, and flown as a four-ship SEAD sortie. All aircraft were configured with three AIM-120s, one AIM-9, two AGM-88s, two wing tanks, one ALQ-184 ECM pod, and one HTS pod. Ground ops, takeoff, departure, and first air refueling were uneventful. Following the first air refueling, the flight contacted command and control (C2), but C2 was unable to pass a weather update, status of package and position/status of next tanker. The flight proceeded to the next air refueling track for the second refueling. The flight attempted to deviate for weather by climbing and flying north. Due to IMC conditions, the flight's formation was radar trail. In an attempt to locate the next tanker, flight lead (FL) switched the radar to air-air mode, providing the MF with no capability to detect severe weather. The flight then flew through heavy rain, damaging two ECM pods and two AIM-9 missiles. After entering the heavy rain, FL directed a 180-degree turn to get out of the weather. After determining the mission could not be completed due to the weather, the FL informed C2 he was returning to base. Upon return, maintenance discovered damage to the pods and missiles after flight. Another case of a little bit of water causing some expensive aircraft damage.

Ice Beats JDAM

The F-16 mission was planned and briefed as a two-ship of attack/SEAD. Mission planning, brief, ground ops, takeoff, and departure were uneventful. En route to the range, pilot 1 (P1) noticed weather in the direction of travel from FL220 to FL300. P1 directed pilot 2 (P2) into a close formation and initiated a descent from FL280. Passing FL260, both aircraft entered the weather. Weather conditions rapidly intensified. Due to this and significant turbulence, P2 lost sight of P1 and went lost wingman. P1 established deconfliction between the two aircraft and directed P2 to take a radar lock and establish radar trail formation. Shortly thereafter, while level at FL210, the formation encountered 22 seconds of rain and then broke out of the weather.

Once in VMC conditions and rejoining on their first tanker, P1 directed P2 to a fighting wing formation. P2 noticed icing on his JDAM, damage to the seeker head of the AIM-9, icing on his CBU-103 and damage to the proximity sensor of the CBU-103 once the icing cleared. He informed P1 of his condition. Both aircraft refueled successfully and accomplished a battle damage check. The check revealed that the ECM radome of P2 was also damaged. Upon entering their mission destination, both pilots were tasked to drop their CBU-103. Both pilots assessed the bomb to be functional and employed it as tasked. The release was successful and they appeared to function normally. Return to base and landing were uneventful. Luckily, we were able to complete the mission, but some high-priced damage and loss of mission capability was the result of this encounter with the weather.

Maintenance Matters

Editor's Note: The following accounts are from actual mishaps. They have been screened to prevent the release of privileged information.

This edition is about the very old and trustworthy KC-135 Stratotanker. Here are some tales from the world of the oldest, and one of the busiest, airframes in our inventory.

A Rolling We Will Go

A maintainer was preparing to jack the nose of the aircraft on the wash rack for an after-wash bearing change. IAW the tech data, he removed the wheel chocks clear of the main landing gear wheels and then released the parking brakes. As he put the nose jack in place and started jacking, the aircraft started to roll backward. At this time, the person helping him attempted to put the main gear chocks behind the left main landing gear to stop the aircraft from rolling. The aircraft then proceeded to roll over the chock. They attempted to put another chock behind the landing gear as one of them ran to the crew entry ladder, went up the stairs, and set the parking brakes. With the brakes set, the aircraft stopped rolling. Unfortunately for the maintainers, the trailing edge of the right wing impacted a maintenance stand, which damaged the right aileron and the trailing edge of the wing outboard from the aileron.

On the day of the mishap the weather was overcast with winds at 12 knots, and based on the position of the aircraft, this produced a left quartering headwind. In addition to the headwind, the wash rack has a slight incline in the direction the aircraft rolled. The wash rack is an approved location for the jacking procedure to be accomplished. Prior to and after this event, this procedure has been accomplished at this location without incident. The wind direction, the incline, and the process of raising the nose may all have contributed to starting the aircraft moving.

The T.O. was being followed and compliance was not a factor. The procedures in the T.O. states: "Move wheel chocks clear of main landing gear wheels." This step is in place to prevent the wheels from binding on the chocks when the nose of the aircraft is jacked. Two different techniques were noted for the removal and placement of the wheel chocks. The first method, and the one employed this time, was to remove the chocks out to the side away from the wheels. The second and *preferred* method is to move the chocks back away from the wheels four to six inches. This prevents the binding of the wheels against the chocks and prevents the aircraft from building momentum if it does start rolling.

In this mishap the aircraft started rolling backward during the jacking process, and had the chocks been placed directly behind the wheels, the aircraft most likely would not have rolled over them. With the chocks out away from the wheel the aircraft built up enough momentum to roll over the chocks. To prevent this mishap in the future, Quality Assurance issued a maintenance group directive instructing all maintainers not to remove the chocks completely, but only move the chocks back 4 to 6 inches while performing this procedure on spots with an incline. What are your procedures for jacking and removing chocks?

What, No Chin-Ups?

Ground operations were normal through engine start. While attempting to close the crew entry chute, the crew chief indicated to the pilot that the pressure plate on the crew entry door was not closed. At that time, the pilot asked the boom operator to reattempt closing the door. The boom operator then held the door winch with his left hand, while placing his right foot on the door latch handle and right hand on the pivot point of the escape spoiler chinning bar. While the boom operator attempted to close the pressure plate with the added strength of his foot, the locking assembly on the chinning bar flexed due to the installation of *improper hardware*, allowing the chinning bar to drop without the pin being pulled. The improper hardware consisted of a rivet being replaced by a screw and self-locking nut which became loose. When the chinning bar dropped, the escape spoiler released causing the crew entry door to *fall* to the flightline, damaging the door but resulting in no injuries. It is amazing how improper hardware can crop up when you least expect. The main question is: When did some maintainer install the bad hardware? We don't know for sure.

What Tow Mark Do We Use?

A KC-135R was being towed from the flightline to a C-141 fuel cell hangar for some needed fuel cell maintenance. A six-person tow team was performing the tow using an MB-2 tow vehicle. As the tow team members assembled at the aircraft, the brake operator (BO) went into the aircraft and closed the crew entry door behind him. Other tow crew members helped hook the tow bar to the tow vehicle, and then the wing walkers (WW) and tail walker (TW) proceeded over to the fuel cell hangar to await the aircraft. The tow team supervisor (TTS) discussed the towing route with the tow vehicle operator (TVO), and the towing operation began. The TTS failed to give the technical order-directed safety briefing to the other team members outlining the route, communication and signaling methods, and emergency stopping procedures prior to initiating the towing operation. Is this a human factors error?

As the aircraft began entering the fuel cell, the WW and TW took their assigned positions and the TTS identified the floor marking where he intended to stop the nose wheels. The aircraft proceeded to about two feet short of the floor marking for the purpose of accomplishing a tire FOD check. The aircraft was stopped and aircraft brakes were set. The WW and TW approached the stopped tow vehicle to retrieve the aircraft chocks and positioned them on the floor forward of the main landing gear in preparation of the final stop on the parking spot. At this point, the TTS realized the floor marking he initially identified was for C-17 aircraft, *not* the KC-135. The next floor marking was labeled "C-141B" and the third marking was unlabeled. The assumption was made that the third marking must be the KC-135 marking. What's that old saying about assuming?

The TTS then directed the BO to release brakes and motioned for the TVO to continue pulling the aircraft into the hangar. As the aircraft began to roll forward, the right WW signaled for the tow vehicle to stop. He needed to remove an aircraft chock from in front of the right main gear since the aircraft was being pulled farther into the hangar. The TVO thought this second stop was the termination point of the aircraft towing, and assumed the tow vehicle was being disconnected from the aircraft at this time. Is this another human factor getting ready to cause a mishap? Yep!

On a standard towing operation, there are two stops made when positioning nose gear on the final parking spot. The first stop is short of the mark to check for FOD, and the next stop is the final positioning. It was determined that the TVO acted on habit pattern, believing the second stop was the final position, and the tow vehicle was being disconnected. In this case, after the chock was removed the TTS motioned for the TVO to pull forward. The TVO believed he was disconnected from the aircraft, and interpreted this signal as his clearance to pull away and exit the hangar.

As the nose wheels approached the third marking, the tow vehicle began to slow down, leaving the nose short of the marking, so the TTS used hand signals for the TVO to keep moving forward to position the wheels on the third mark. The TVO's attention was now focused forward, and he was unaware of the situation developing behind him. He slowed the tow vehicle as he exited the hangar through the roll-up garage door, and seeing an opening in traffic he began to accelerate the tow vehicle. The aircraft, still attached to the tow vehicle, began to roll past the third floor marking. The tow team began yelling for the tow vehicle to stop, but the aircraft proceeded forward until the vertical stabilizer made contact with the overhead crane structure. The BO immediately tried to stop the aircraft using the aircraft brakes. The tow team and other personnel were finally able to get the TVO's attention just as the nose radome began to make contact with the roll-up door. The tow vehicle was stopped, and aircraft brakes set.

The failure of the tow team supervisor to conduct a technical order-directed safety briefing prior to initiating towing operations indicated *poor judgment and complacency*. The failure of the other tow team members to intervene at this point indicated their *acceptance* of this negative norm. The failure of maintenance supervision to publish guidance and mandate training on safe hangaring and obstruction avoidance showed a *lack of awareness* of the risks associated with this particular operation. All of these factors contributed to the mishap, but they were not considered causal because it could not be clearly determined that eliminating any one of these factors would have prevented this mishap.

The single causal factor for this mishap was determined to be the tow vehicle operator's *inability to maintain an adequate level of situational awareness* during the final stages of the towing operation. His misinterpretation of events caused him to take individual action that directly resulted in this mishap. This mishap is a classic example of maintenance human factor errors. Supervision, habit pattern, failure to follow tech data, loss of situational awareness and many other human factors came into play for this mishap. Make sure you look at the human factors that can cause your mishaps and intervene to stop them.

USAF CLASS A FLIGHT MISHAPS

FY04 Flight Mishaps (Oct 03-Aug 04)	FY03 Flight Mishaps (Oct 02-Aug 03)
23 Class A Mishaps	26 Class A Mishaps
9 Fatalities	10 Fatalities
10 Aircraft Destroyed	19 Aircraft Destroyed

05 Oct		A C-17 had an engine failure (upgraded to Class A).
09 Oct		A KC-135E experienced a No. 3 engine fire.
14 Oct	✈	A T-38 crashed during takeoff.
20 Oct	✶	An F-22 engine suffered FOD damage during a test cell run.
17 Nov		A KC-10 experienced a destroyed engine.
18 Nov	✈	An A-10 crashed during a training mission.
23 Nov	✈	An MH-53 crashed during a mission. Four AF crewmembers were killed.
11 Dec	✶	An RQ-1 crashed after it experienced a software anomaly.
30 Dec	✶	A C-5 engine had damage from a compressor stall during a test cell run.
31 Jan		A KC-10 experienced an engine failure.
03 Feb		An E-4B had an engine failure inflight.
04 Feb		A C-5B had a right main landing gear failure.
25 Feb	✈	An A-10 crashed after takeoff. The pilot did not survive.
27 Feb		A B-1B departed the runway during landing .
02 Mar	✶	An F-15 engine was damaged by FOD during a maintenance run.
03 Apr	✈	A T-6 crashed on takeoff. Both pilots were killed.
29 Apr		A C-130 landing gear collapsed during landing.
05 May		An MH-53 experienced a lightning strike (upgraded from Class B).
06 May	✈	An F-15 was destroyed after it suffered a bird strike.
08 May		A C-5B had an engine failure inflight.
17 May	✈✈	Two F-16s had a midair collision, one pilot was killed.
21 May	✈	An F-15 crashed during a sortie; pilot ejected safely.
06 Jun		A C-17 suffered engine damage inflight.
12 Jun		An A-10 suffered an engine fire.
14 Jun	✈✶	An MQ-1 crashed on landing.
18 Jun	✈	An F-15 suffered a double engine failure; pilot ejected safely.
10 Jul		An F-16C departed prepared surface during landing.
11 Jul		An MC-130P experienced multiple bird strikes.
18 Jul	✶	A C-17 maintainer was fatally injured during flight control maintenance.
17 Aug	✈✶	An MQ-1 had an engine fire and crashed.
24 Aug	✶	A C-17 experienced engine-confined FOD damage.

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- A Class A mishap is defined as one where there is loss of life, injury resulting in permanent total disability, destruction of an AF aircraft, and/or property damage/loss exceeding $1 million.
- These Class A mishap descriptions have been sanitized to protect privilege.
- Unless otherwise stated, all crewmembers successfully ejected/egressed from their aircraft.
- Reflects only USAF military fatalities.
- "✈" Denotes a destroyed aircraft.
- "✶" Denotes a Class A mishap that is of the "non-rate producer" variety. Per AFI 91-204 criteria, only those mishaps categorized as "Flight Mishaps" are used in determining overall Flight Mishap Rates. Non-rate producers include the Class A "Flight-Related," "Flight-Unmanned Vehicle," and "Ground" mishaps that are shown here for information purposes.
- Flight and ground safety statistics are updated frequently and may be viewed at the following web address: http://afsafety.af.mil/AFSC/RDBMS/Flight/stats/statspage.html.
- **Current as of 08 Sep 04**.

WonderWords

By 1Lt Tony Wickman
Alaskan Command Public Affairs

How to play: All words listed below appear in the puzzle—horizontally, vertically, diagonally, and backwards. Find them and **Circle the individual letters only; Do not circle the word.** The leftover letters spell a word or words that make up the WonderWords.

Words:

Advisory	Haze
Air	Highs
Alarm	Ice
Argon	Knots
Arid	Lava
Atmosphere	Low
Aura	Mass
Barometer	Melt
Blizzard	Mist
Clear	Nets
Clouds	Pilot
Cold	Polar
Cyclone	Pressure
Dawn	Rain
Degree	Rime
Dew	Safety
Drift	Shear
Drizzle	Sleet
Dusk	Snow
Dusty	Stack
Dye	Storm
Echo	Thaw
Eye	Tide
Flood	Tilt
Fog	Tips
Front	Temperature
Gust	Towers

T	E	M	P	E	R	A	T	U	R	E	N	D	W	P
S	S	D	W	A	F	D	E	Y	D	I	E	L	A	R
A	P	E	U	O	U	V	I	E	A	Z	F	O	H	E
F	D	I	G	S	N	I	C	R	A	E	L	C	T	S
E	A	T	T	G	K	S	E	H	A	A	T	F	L	S
T	W	Y	U	T	Y	O	S	F	V	O	I	E	E	U
Y	N	S	S	A	M	R	I	A	L	R	E	L	D	R
D	T	I	I	H	E	Y	E	I	D	T	Z	E	R	E
R	M	N	L	W	E	M	P	O	A	Z	G	S	R	O
A	S	S	O	T	I	A	O	U	I	R	H	A	H	S
Z	N	T	W	R	E	L	R	R	E	G	L	C	D	S
Z	O	I	O	D	F	A	D	E	I	O	E	U	S	T
I	G	L	I	R	E	R	E	H	P	S	O	M	T	A
L	R	T	L	E	M	M	C	Y	C	L	O	N	E	C
B	A	R	O	M	E	T	E	R	C	S	T	O	N	K

_ _ _ _ _ _ _ _ _ _ _ **Solution: 11 letters**


"Collecting weather information from beyond the atmosphere..."
see page 12