FAA Aviation News

JULY/AUGUST 1996

FEDERAL AVIATION ADMINISTRATION

AVIATION SAFETY FROM COVER TO COVER

Summer Operations

Stories Begin on Page 1

U.S. Department of Transportation
Federal Aviation Administration

Federico F. Peña, *Secretary of Transportation*
David R. Hinson, *FAA Administrator*
Anthony J. Broderick, *Associate Administrator for Regulation and Certification*
Thomas C. Accardi, *Director, Flight Standards Service*
Louis C. Cusimano, *Manager, General Aviation and Commercial Division*
Roger M. Baker, Jr., *Manager, Aviation Safety Program Branch*
Phyllis Anne Duncan, *Editor*
Louise C. Oertly, *Senior Associate Editor*
H. Dean Chamberlain, *Assoc. Editor/Forum*
A. Mario Toscano, *Designer/Assistant Editor*

The FAA's Flight Standards Service, General Aviation and Commercial Division, Aviation Safety Program Branch, AFS–810, Washington, DC 20591; telephone (202) 267–8017, FAX (202) 267–9463; publishes FAA AVIATION NEWS in the interest of flight safety. The magazine promotes aviation safety by calling the attention of airmen to current technical, regulatory, and procedural matters affecting the safe operation of aircraft. Although based on current FAA policy and rule interpretations, all printed material herein is advisory or informational in nature and should not be construed to have regulatory effect. The FAA does not officially endorse any goods, services, materials, or products of manufacturers that may be mentioned. **Certain details of accidents described herein have been altered to protect the privacy of those involved.**

The Office of Management and Budget has approved the use of funds for the printing of FAA AVIATION NEWS.

SUBSCRIPTION SERVICES
The Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402–9371, sells FAA AVIATION NEWS on subscription. Use the self-mailer form in the center of this magazine to subscribe. Cost: $16.00 ($20.00 foreign) for one year; $32.00 ($40.00 foreign) for two years. Prices are subject to change by the Government Printing Office without prior notice.

CHANGE OF ADDRESS OR SUBSCRIPTION PROBLEMS: Send your label with correspondence to Sup Doc, Attn: Chief, Mail List Branch, Mail Stop: SSOM, Washington, DC 20402–9373. Or call GPO Customer Service at (202) 512–1800/6; FAX: (202) 512–2168.

To keep subscription prices down, the Government Printing Office mails subscribers only one renewal notice. You can tell when your subscription ends by checking date on the second line of your mailing label. To be sure that your service continues without interruption, please return your renewal notice promptly.

***************3–DIGIT 342
FAN SMITH212J JUN95 R 1 423*
JOHN SMITH
212 MAIN ST
FORESTVILLE MD 20747

FAA Aviation news
JULY/AUGUST 1996
VOLUME 35 · NUMBER 5

FEATURES

SUMMER OPERATIONS

DEPARTMENTS

COVER PHOTO: "The Lightning Stalker" by David O. Stillings, courtesy of Thor Guard, Century Rain Aid.

http://www.faa.gov/avr/news/newshome.htm

Aviation Safety Program:

http://www.faa.gov/avr/news/asphome.htm

Feather Canyons?

Summertime means thunderstorms and their associated hazards

by Phyllis-Anne Duncan

Joni Mitchell sang of looking at clouds as "ice cream castles in the air, feather canyons everywhere." The song, "Both Sides Now," goes on to remind us there is another side of clouds— "but now they only block the sun; they rain and snow on everyone..."

A billowing mass of cumulonimbus clouds is a beautiful thing to watch—from the ground—and it is a summer pastime I enjoy. In fact, thunderstorms—harbingered by those "feather canyons"—are one of nature's most awesomely beautiful displays. As an aviator, though, I also "look at clouds from both sides," and I know that within their darkness and physical displays of power they contain about every aviation hazard known to humanity: wind, rain, icing, turbulence, wind shear, microbursts, tornadoes, hail, lightning—the list goes on.

Space-age radar allows us to "see" into thunderstorms more than ever before, and forecasters can predict their intensity, track, location, and duration better than ever. Like some macabre home movie on cable TV weather channels, we can watch storms progress through their life cycle, but all the technology aside, it remains true that a storm's outward appearance—which is what is most often presented to our pilots' eyes—can in no way correlate the amount of rain, turbulence, etc., within the storm. Prediction, as always, is still an inexact science. Consequently, penetrating a thunderstorm is at best a craps shoot; at worst it symbolizes some-

FIGURE 1
AVERAGE NUMBER OF STORMS PER YEAR

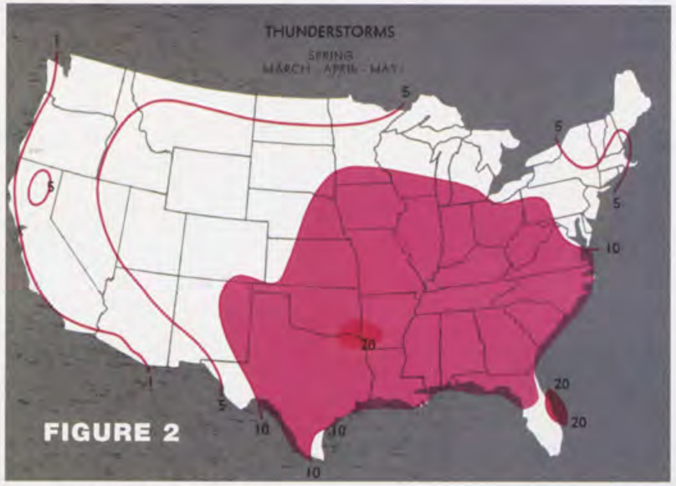


FIGURE 2

one bent on self-destruction.

Where? When?

If you have the means to live in a tropical area of the world, you also have the possibility of year-round thunderstorms. Spring, summer, and fall are the seasons of thunderstorm discontent in mid-latitudes. And if you want to avoid thunderstorms for most of the year, try the Arctic.

Figure 1 (page 1) shows the average number of thunderstorms per year in the 48 conterminous states. As you can see, central Florida, in addition to its various amenities, has the dubious distinction of having the most thunderstorms per year.

Seasonally, spring time (March, April, May) means an increase in thunderstorm activity in nearly half of the country. (Figure 2). Only the far western U.S. averages fewer than 10 days of thunderstorms in the summer (Figure 3). The number of days with thunderstorms then precipitously drops off with the coming of autumn (Figure 4), and winter means few thunderstorms or none (except for the Gulf Coast of Louisiana), as seen in Figure 5.

Again, another one of those truths is that a thunderstorm can arise anytime the required conditions exist—moist, unstable air that gets lifted.

On the Inside

FAA Advisory Circular (AC) 00-6A, *Aviation Weather*, says, "For a thunderstorm to form, the air must have (1) sufficient water vapor, (2) an unstable lapse rate, and (3) an initial upward boost (lifting)." The "upward boost" is the key; without it, no storm. Air can be lifted by surface heating (why thunderstorm frequency is so high in the summer months), sloping terrain (some pretty intense storms can occur near mountainous terrain), converging winds (all that energy has to go somewhere), frontal surfaces, or any combination of the above.

When the moist, unstable air is forced upward in an initial updraft, the air becomes cooled, resulting in condensation. This is the beginning of the cumulus cloud. The condensation releases latent heat, which increases buoyancy in the cloud and fuels the upward movement which, in turn, draws more water vapor into the cloud. The updraft is now said to be "self-sustaining" as this cycle of cooling, condensation, uplifting continues. This is the billowing effect we can see as we watch cumulus clouds grow before our eyes.

A thunderstorm is said to have a "life cycle" of three, progressive stages:

1. Cumulus Stage
2. Mature Stage
3. Dissipating Stage

The Cumulus Stage

Not all cumulus clouds become thunderstorms, but every thunderstorm begins as a cumulus cloud. The cumulus stage is characterized by the uplifting of the moist, unstable air (Figure 6A, next page). This updraft extends from near the surface to the top of the cloud and varies in strength. Clouds may grow at the phenomenal rate of 3,000 feet per minute, which means they can easily outclimb your aircraft. The time-honored rule of thumb is never to climb to avoid a thunderstorm because you can be overtaken by the updraft.

The size of water droplets is very small in the early part of the cumulus stage, but the size of the droplets grows with the size of the cloud, and they quickly become raindrop size. When the rising air carries the water droplets above the freezing level, the potential for icing conditions is created. Eventually, the cold raindrops grow so heavy they cannot be sustained aloft by the uplifting air, and they fall, dragging air down with them. When the downdraft coexists with the updrafts, the thunderstorm is said to be mature.

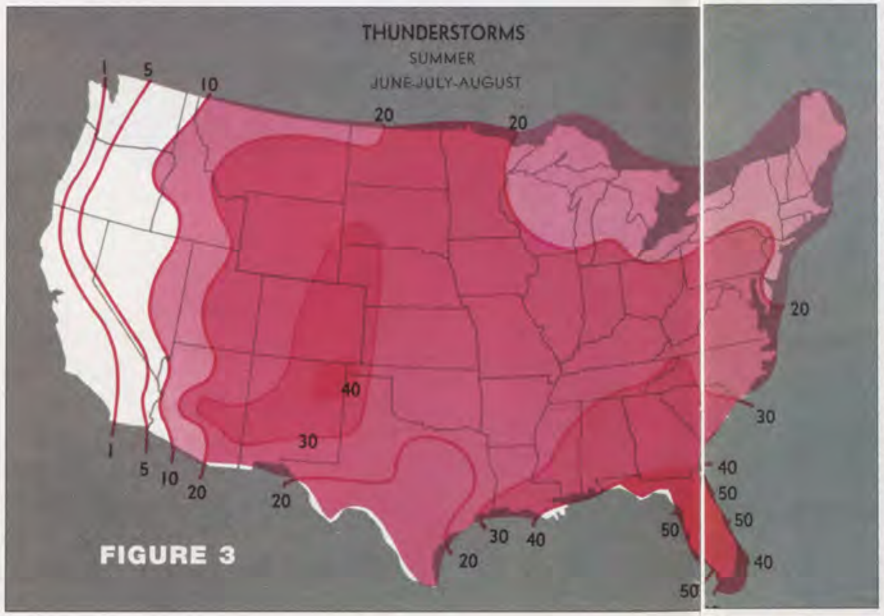


FIGURE 3

The Mature Stage

When the rain begins to fall, it signals the creation of a downdraft and the maturity of the storm. The cold rain now lessens the latent heat created by condensation, making the downdraft cooler than the air surrounding it (Figure 6B, next page). Pilots on the ground shiver and jokingly comment on the "air from 50,000 feet" when they feel that first rush of cool air before the rain arrives. Because the air in the downdraft is cooler than the air surrounding it, it accelerates downward—up to 2,500 feet per minute—then spreads outward at the surface. This is characterized by strong and gusty surface winds, a temperature drop that is sometimes sharp, and a quick rise in pressure (cold air is more dense). This surface wind surge is sometimes referred to as a "plow wind" or gust front because it pushes air (and other things) in front of it aside.

Even with all this down-rushing air, updrafts in the mature stage have reached their maximum—possibly now 6,000 feet per minute. When you have updrafts and downdrafts so close to each other, they create strong, vertical shears and extreme turbulence. The mature stage is the time of the thunderstorm's greatest intensity. Yet, the downdrafts are also the beginning of the end.

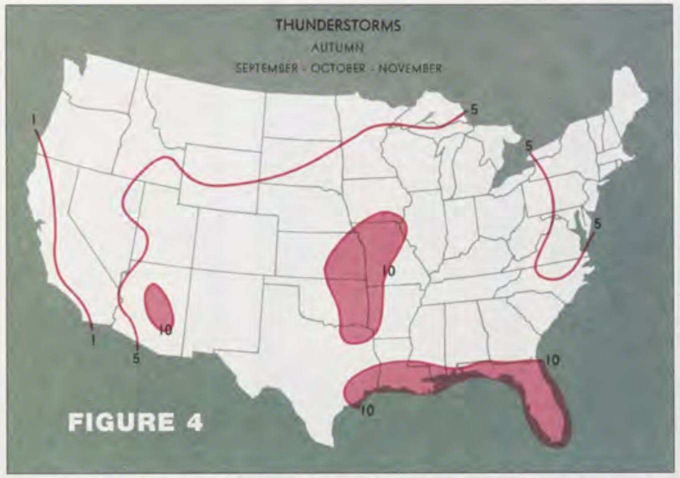


FIGURE 4

The Dissipating Stage

Figure 6C (next page) shows the dissipating stage of a thunderstorm. The rain ends, downdrafts cease, and the thunderstorm is over. The cloud forms its characteristic anvil, pointing to where the air mass is headed. The clouds remaining are harmless now, unless they take in more moisture, become unstable again, and encounter another lifting force. The life cycle starts again.

How Big is Big?

Most of what we've talked about here is a single, thunderstorm cell. Yet, a single cell diameter can range

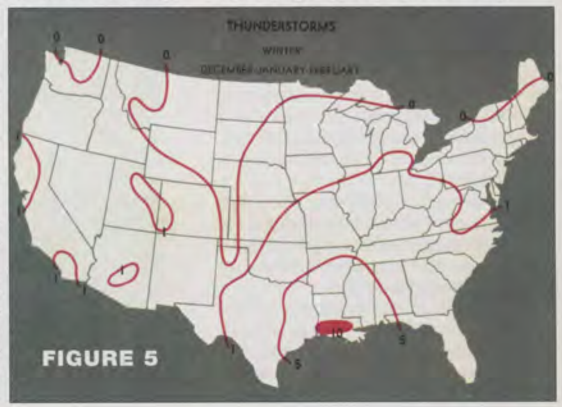
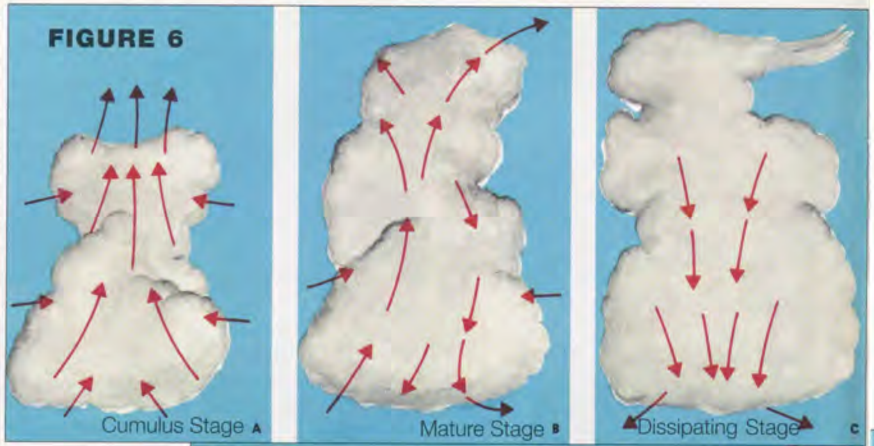


FIGURE 5

from five miles to as much as 30 miles! In moist climates cloud bases are near the surface, but can range up to 10,000-foot bases over dry areas. Thunderstorm tops average between 25,000 and 45,000 feet but have been known to grow beyond 65,000 feet.



How Long?

The duration of a thunderstorm is linked to its severity—the more severe, the longer they endure.

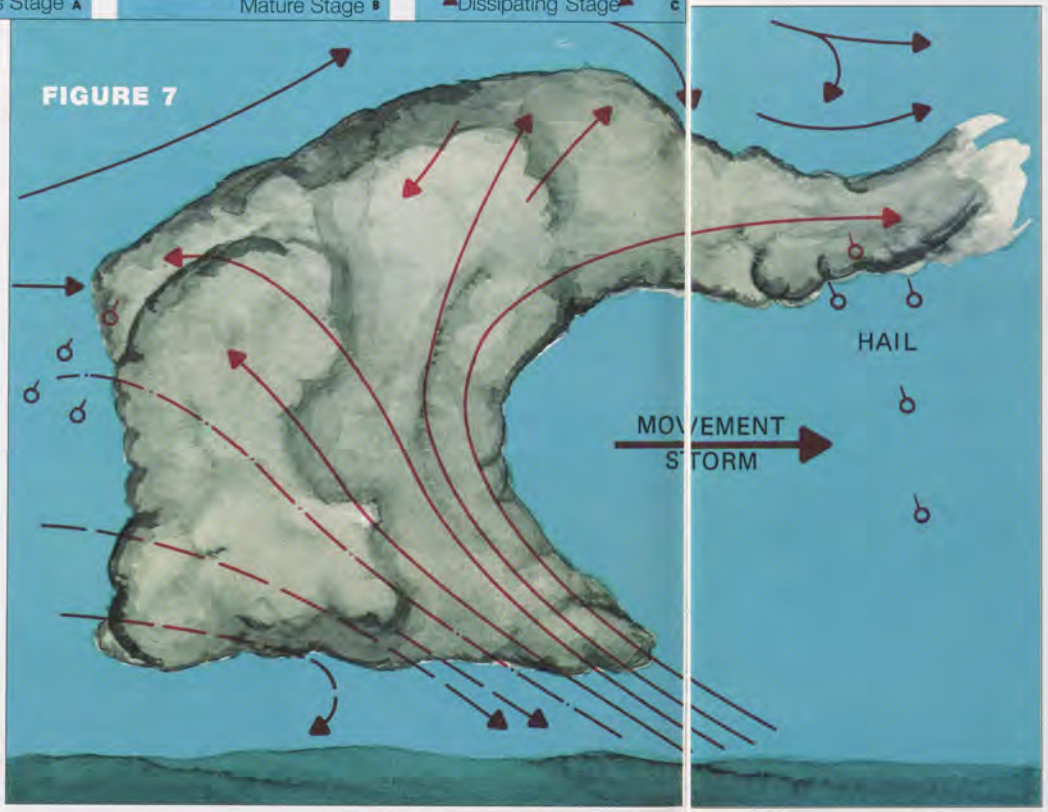
Air mass thunderstorms occur randomly and most often from surface heating. They usually last only for an hour or two with moderate wind gusts and rainfall, but they are still "rough," too rough to fly through. When air mass storms reach their mature stage, rain falls next to the updraft and friction slows the updraft and can actually reverse it to a downdraft. The storm is said to be "self-destructive" since the cold, down-rushing air cools the surface and cuts off the heating element, as it were. Twenty minutes to an hour and a half are usually the duration of an air mass storm.

Middle and late afternoons in the summer are when the surface is the warmest, and these are the peak times for air mass storms. These are ones that spring up on a summer afternoon and cancel your plans for a quick flight. But they're just as quickly gone, and flying conditions can prevail again.

Air mass storms also occur offshore, but the best time for this is late hours of darkness when cool air flows from the land over warm water, picks up moisture, and is lifted.

Steady-state thunderstorms are associated with weather systems—fronts, converging winds, and troughs which force air upward along long distances. The *squall line* of thunderstorms is truly to be feared since they can last for hours. A squall line is a narrow band of active thunderstorms, often ahead of a cold front. AC 00-24B, *Thunderstorms*, says that a squall line "presents the single most intense weather hazard to aircraft." Squall lines may be too long and too wide to detour around. Needless to say, it is not safe to fly under a squall line or even an isolated cell.

Steady state storms in a squall line last longer because rain falls outside the updraft, so there is no friction drag to slow the updraft down. It continues, and rain and hail are sometimes "thrown out" of the cell miles away from the main cell itself. (Figure 7)



What's So Dangerous?

Just about everything in a thunderstorm is dangerous. Let's talk about the "worst" first.

Tornadoes

In May Hollywood regaled us with the movie, *Twister*, which showed some spectacular, special effect renderings of tornadoes. Tornadoes are a case where reality is probably worse than anything special effects wizards can come up with. Yet, tornadoes are, like their progenitors, intensely and deadly beautiful. Tornado chasers drive rapidly from area to area in the summer, trying to "catch" these monstrous dervishes on video, radar, infrared, so that they can later "dissect" them and, hopefully, come up with better ways to detect them.

Other meteorologists sit safely inside their labs and watch on a Doppler radar display the characteristic hook form, denoting a possible tornado. Just a few years ago, this technology didn't exist, and forecasters had to wait for someone to sight a tornado's touchdown before issuing a warning. The drawbacks of this are obvious, and as forecasting technologies have improved, the loss of life, at least, from tornadoes has diminished dramatically. (They do still seem to find those trailer parks, though.)

Violent thunderstorms draw air strongly and rapidly in at their bases. If the air coming in to the cell has any rotation to it, it can form a vortex that extends from the surface well up into the cloud. Wind in such a "concentrated vortex" can exceed 200 knots, and the pressure inside the vortex is quite low. (Remember: "As the velocity of a fluid increases, its pressure decreases.") The winds pick up dust and debris, which make the funnel cloud that extends downward from the base of the cumulonimbus cloud visible. Until it touches the surface, it is still "merely" a funnel cloud; once it contacts the earth, it's a tornado or a "waterspout" over water.

Isolated thunderstorms will occasionally spawn a tornado, but they are more likely to be associated with steady state storms along cold fronts or in squall lines. Extreme turbulence can be present miles away from "tornado-ripe" storms.

AC 00-6A understates it: "An aircraft entering a tornado is almost certain to suffer structural damage." An event that can pick up cars, buses, tractors, not to mention houses can easily render an aircraft into its component parts. And remember, the funnel cloud extends up into the cumulonimbus cloud and "hides" there, especially if you have your head in the cockpit on instruments.

Cumulonimbus mammatus clouds—those with pendulant, rounded bases—appear in connection with tornadoes, and mammatus clouds mentioned in a weather report or forecast indicate an extreme hazard.

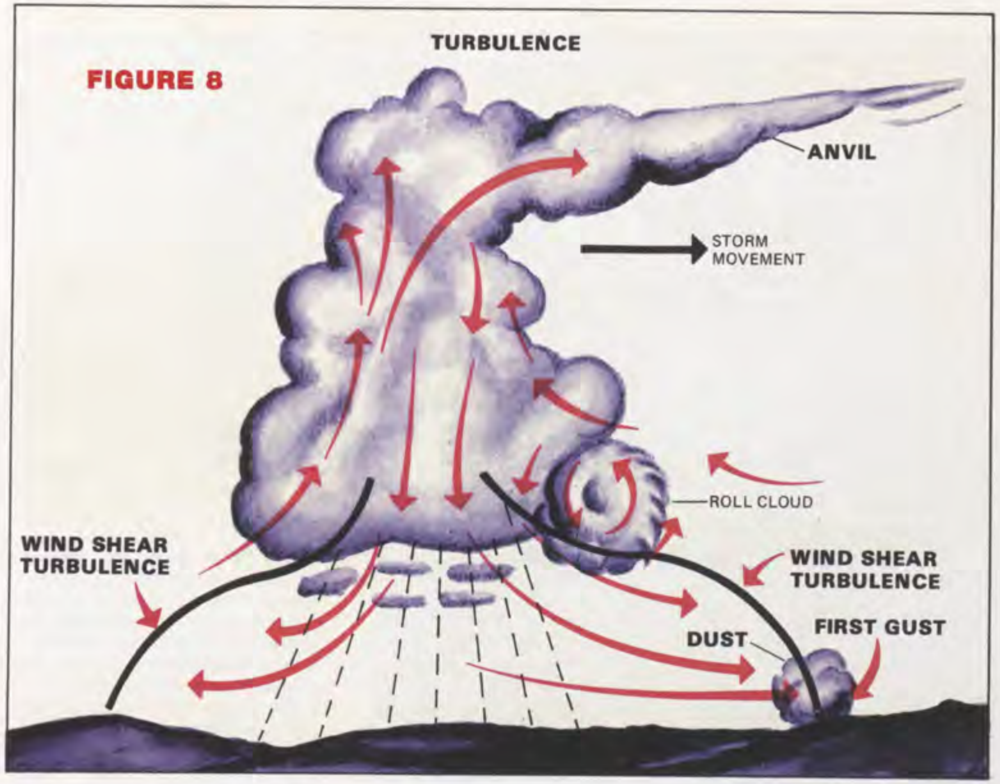
At some point in our history, every state in the U.S. has experienced a tornado. (Why, in the little town of Culpeper, VA where I grew up, they still talk about The Tornado—the one that happened over 40 years ago and which wrecked a bunch of barns.) However, the Great Plains east of the Rockies are "home" to most of the serious tornadoes in the country. In the vast expanses of Tornado Alley, communities have warning sirens for approaching tornadoes that send people rushing to their storm cellars.

Turbulence

Turbulence within even an isolated thunderstorm can be severe enough to exceed the structural integrity of an aircraft. Another aviation rule of thumb is that hazardous turbulence can be found in all thunderstorms. The strongest turbulence occurs with the shear between updrafts and downdrafts, but turbulence has been encountered thousands of feet above a storm and up to 20 miles laterally from a storm.

The plow wind or gust front before a storm means turbulence close to the surface, and this is sometimes marked by a "roll cloud" on the leading edge of storms associated with squall lines or fronts. Figure 8 (next page) diagrams where turbulence can be expected.

This turbulence means that if you inadvertently penetrate a thunder-



storm, holding altitude may not only be impossible but also your attempts to hold a constant altitude could overstress the aircraft. As we noted earlier, updrafts can travel up to 6,000 feet per minute. You cannot hope to counter that kind of force and keep the aircraft intact. The best thing to do is keep your attitude constant and ride out the storm.

Airborne weather radar has generally not yet progressed to the point where it can "see" turbulence, but it can see the severity of the thunderstorm that will inevitably mean turbulence. Expect one with the other. (New airborne Doppler weather radars advertise a "turbulence/windshear mode.")

Icing

When updrafts carry the moist air above the freezing level, the water becomes supercooled. Supercooled water can freeze on impact with an aircraft, adding to its thunderstorm woes. Icing in a thunderstorm can be rime, clear, or mixed, and icing encounters can be frequent in a series of cells. You don't need the increased weight, decreased lift, increased stall speed, etc., from icing adding to the danger of a thunderstorm encounter.

Hail

Some consider hail to be second in hazard to turbulence in a thunderstorm. If the supercooled drops in a thunderstorm are propelled above the freezing level and freeze, they "crash" into each other, creating a growing iceball we call a hailstone. Every year on the national news we see home video of golfball-sized hail, baseball-sized hail, even the occasional softball-sized hail. Severe thunderstorms that have built to great height produce the biggest hailstones. Eventually, they become so large, the updrafts can't support them, and they fall—maybe some distance from the storm's center. Aircraft have encountered hail in clear air miles from the nearest thunderstorm.

Most of the time as the hailstones fall through warmer air, they melt and fall as rain. So, you can imagine how large they must start out at altitude if they hit the ground the size of a softball. Yet, even if there is only rain, it doesn't mean the absence of hail. Hail can be associated with any thunderstorm and especially beneath the anvil cloud of a large storm. In addition to the disconcerting noise of hail hitting an aluminum-skin aircraft, hail as small as 1/4-inch in diameter can cause aircraft damage.

Low Ceilings and Visibility

Within the thunderstorm itself, visibility is nearly zero. Precipitation and dust at the surface beneath a storm can restrict visibility and lower ceilings. The problems are the same as any phenomenon that diminishes ceilings and visibility, but with a thunderstorm the hazard is a cumulative one—lowered visibility can keep you from heeding the signs of the other hazards associated with the storm, such as a funnel cloud embedded in the main cloud. So, you say, you go on the instruments. Right. Bone-jarring turbulence, stress-inducing noise from rain or hail drumming on the fuselage, not to mention flashes of nearby lightning that bring black spots to your vision. It's spatial disorientation waiting to happen.

All in all, the combination of hazards make precision instrument flying in a thunderstorm virtually impossible.

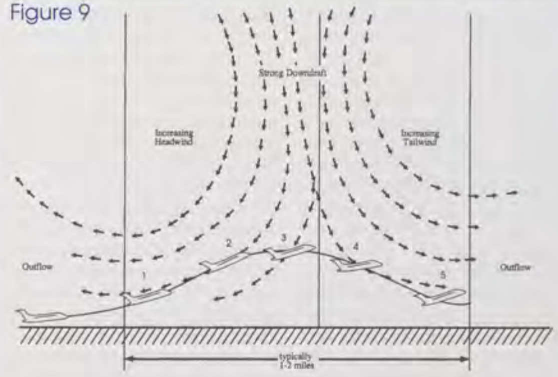
Is There Electricity in the Air?

You betcha. Again, AC 00-6A understates the obvious somewhat when it says that electricity generated by thunderstorms is "annoying to flight crews." Lightning (the most visibly spectacular manifestation of electricity

M I C R O B U R S T S

Microbursts are small but highly intense downdrafts which spread outward in all directions upon contact with the surface. Until recent years their existence was only hypothesized, and it wasn't until advanced radar and computer modeling arrived on the scene that their existence was proven. The danger of microbursts lies in the existence of vertical and horizontal wind shears; microbursts are considered extremely dangerous to all aircraft, especially those at low altitude, i.e., takeoff and landing. Because they are small, short-lived, and can occur in areas where there is no precipitation, microbursts are difficult to detect using conventional weather radar or wind shear alert systems.

Figure 9



A microburst encounter during takeoff. The airplane first encounters a headwind and experiences increasing performance (1), this is followed in short succession by a decreasing headwind component (2), a downdraft (3), and finally a strong tailwind (4), where 2 through 5 all result in decreasing performance of the airplane. Position (5) represents an extreme situation just prior to impact. Figure courtesy of Walter Frost, FWG Associates, Inc., Tullahoma, Tennessee.

Characteristics of a Microburst

• **Size:** A microburst is usually less than a mile across as it descends from the cloud base. When it reaches 1,000 to 3,000 feet of the surface—the transition zone—the downdraft becomes horizontal and can extend approximately 2 1/2 miles across.

• **Intensity:** Downdrafts can be as strong as 6,000 feet per minute, and the horizontal shear near the surface can be as much as 45 knots—meaning a 90-knot shear (headwind to tailwind change) occurring within a few hundred feet of the ground.

• **Visual Signs:** Microbursts can occur anywhere there is convective activity. They can be embedded in heavy rain associated with a thunderstorm or in light rain beneath virga. A ring of blowing dust at the surface may be the only visual cue for a microburst when there is no precipitation.

• **Duration:** An individual microburst may last no longer than 15 minutes after striking the ground until it dissipates. The horizontal winds will increase during the first five minutes, with maximum winds lasting two to four minutes. Microbursts can be concentrated in a line, and activity in such configurations has been known to last an hour or more. Where there is one microburst in an area, there are likely to be multiple events in the same area.

Microbursts are a severe hazard to aircraft within 1,000 feet of the ground, especially in the approach to landing phase of flight. Aircraft can encounter performance-increasing headwinds and performance-decreasing tailwinds in a brief interval. See Figure 9, above.

in thunderstorms) has been known to puncture the aircraft's skin, damage the communications radios or disrupt reception on low and medium frequencies, and play havoc with navigational equipment.

The greatest probability of lightning strikes to aircraft occurs when the aircraft operates at altitudes where temperatures are between -5°C and +5°C. Lightning strikes have also occurred in clear air, outside of a thunderstorm.

Lightning has even been the suspect in explosions of aircraft, possibly by the ignition of fuel vapors; however, serious accidents as a result of lightning are rare.

One of the major hazards is temporary pilot blindness. It's not particularly bright inside a thunderstorm, so your eyes become adapted to reduced light. Then, a flash of lighting "fries" your eyeballs. It can take critical seconds for your vision to readjust, and seconds is all it takes to become disoriented and find yourself in an unusual attitude or in an stall/spin, possibly too close to the surface for recovery. Lightning can also cause permanent errors in magnetic compasses. You can "use" lightning somewhat to judge the intensity of a storm: Generally the more frequent the lightning, the more intense the storm.

Effects on Altimeters

As a thunderstorm approaches, the pressure falls then rises again with the plow wind. As the storms moves away, pressure returns to normal. These changes in pressure can occur rapidly—over as little as 15 minutes. Consequently, the altimeter reading could be off by as much as 100 feet. It is imperative to obtain a corrected altimeter setting.

Water Ingestion

Pilots of aircraft with turbine engines have yet another thunderstorm hazard—the possibility of engine flame-out from water ingestion. Turbine engines have a water ingestion limit, and severe thunderstorms can produce enough water for an engine flying through the storm's rain to exceed its ingestion limit. Ingestion of hail can, of course, cause structural damage to the engine.

The only operational procedure to avoid engine flame-out from water ingestion is total thunderstorm avoidance. If you inadvertently encounter a thunderstorm and experience water ingestion, the best recommendation is to follow severe turbulence penetration procedures established for the aircraft and avoid thrust changes except to deal with excessive airspeed variations.

I Have Weather Radar; What do I Have to Worry About?

Plenty. Airborne weather radar detects precipitation droplet size, so the strength of the radar echo depends on the drop size and number. More drops, stronger echo; larger drops, stronger echo. Size, however, determines echo intensity to a much greater degree than the number of drops. Because hailstones are covered with a film of water, they give the strongest echoes of all. Drop size is also proportional to rainfall rate, and the greatest rate of rainfall is in a thunderstorm.

Strong echoes identify thunderstorms and by implication, then, the areas of greatest hazard to aircraft. Ground based weather radar is a valuable tool in preflight planning; airborne radar should only ever be considered a thunderstorm avoidance tool.

As we've seen thunderstorms can build and dissipate in one area very rapidly, then "move" rapidly, unseen by radar until sufficient sized droplets occur, to another area. Consequently, under no circumstances should airborne weather radar be used for thunderstorm penetration. Also, airborne radar detects only rain droplets not water droplets within clouds. Your radar scope can show "clear" areas between echoes, but fly into them and you may find lowered ceilings and visibility.

Nor can the airborne radar assure you can avoid turbulence. Yes, we said that an echo can indicate the presence of all the hazards associated with a thunderstorm, but we also said that turbulence can and does occur outside the cell. So, another rule of thumb: Avoid the most intense echoes by at least 20 miles; i.e., don't attempt to fly between echoes unless they are 40 miles or more apart.

What Do I Do or Don't Do If...?

The *Aeronautical Information Manual*, paragraph 7-1-26a reminds us not to take any thunderstorm lightly even when radar echoes show light intensity. Avoidance is the best policy.

Avoidance

- DO avail yourself of all possible knowledge about the possibility of thunderstorms along your route of flight. Get a weather briefing, contact DUATS, watch the weather radar channel, and contact an FSS or Flight Watch en route for the latest weather reports and forecasts, SIGMET's, Convective SIGMET's, AIRMET's, and for PIREP's. ARTCC's also have Center Weather Service Units which have access to weather radar displays and provide information to controllers. Controllers will pass along severe weather avoidance information when it doesn't interfere with their primary duty of separating traffic. In other words, the person responsible for thunderstorm avoidance is you.
- DO NOT land or takeoff in the face of an approaching storm. That plow wind or gust front before the storm can bring a sudden wind shift or low level turbulence and possible loss of control.
- DO NOT try to circumnavigate thunderstorms that cover six-tenths or more of an area—as seen visually or on airborne radar.
- DO NOT fly without airborne radar into a cloud mass that contains scattered, embedded thunderstorms. (Convective or cumuliform clouds can under certain conditions be engulfed by thick stratiform clouds, thus rendering the thunderstorm undetectable visually.) Scattered thunderstorms that are not embedded are easily visible and can usually be circumnavigated.
- DO avoid by at least 20 miles any storm forecast to be severe or which gives an intense radar echo. Remember the anvil of a large thunderstorm can extend miles beyond the cell, so the 20-mile distance should be from the anvil, not the main cell.
- DO remember that vivid and frequent lightning indicates a severe thunderstorm.
- DO regard as severe any storms with tops exceeding 35,000 feet, as sighted visually or by radar.

Unavoidable Penetration

Good preflight planning and good knowledge of what your airborne radar shows you should preclude penetration, but if you find yourself surrounded by intense cells and penetration is inevitable, heed the following:

- Tighten your seat belt and shoulder harness and warn your passengers to do the same. Secure all loose objects in the cockpit and cabin. (Actually, if you have concerned passengers on board, this may give them something to do while you concentrate on flying the airplane.)
- Plan your course to take you through the storm in the least amount of time, and hold that course.
- To avoid icing, select a penetration altitude that will either keep you below the freezing level or above the level of -15°C.
- If you have them, turn on pitot heat, carburetor heat, or jet inlet heat. (Icing can rapidly accumulate at altitude, and loss of airspeed indication or power reduction can occur instantaneously.)
- Memorize or look up the recommended power setting or airspeed (V_a) for turbulence penetration and establish it. It will be slower than cruise speed because reduced speed puts less stress on the aircraft in turbulence.
- Turn up the cockpit lighting to its brightest. This will lessen the likelihood of temporary blindness from lightning.
- If on automatic pilot, disengage the altitude hold mode and speed hold mode. Leaving them on can place the aircraft's structure under stress as the autopilot maneuvers the aircraft to try and "catch up" with turbulence-induced changes in altitude, attitude, and airspeed.
- Tilt the antenna of your weather radar up and down occasionally. Tilting it up helps to detect hail that might be in front of your course. Tilting it down may detect a cell growing under you. (Remember, with a 3,000 to 6,000-foot per minute upward growth rate, a cell can easily engulf you from below.)
- DO keep your eyes on your instruments. Looking outside exposes your eyes to temporary blindness from lightning flashes. Why look out anyway, because you won't like what you see.
- DO NOT change power settings; maintain the setting for reduced airspeed.
- DO maintain a constant attitude and let the aircraft "ride out" the storm. This may mean a precipitous climb only to head earthward in a downdraft, but there is no way you can predict where the updrafts and downdrafts are to avoid them. Trying to do so will only stress the structure of the aircraft.
- DO NOT turn back once you've penetrated the thunderstorm. The time for the 180 was before penetration to avoid the storm altogether. A straight course through the storm will get you, hopefully, out of the hazards more quickly. Turning maneuvers also increase stresses on the aircraft.

Conclusion

The inexorable march of a thunderstorm with its primeval claps of thunder and supernovae of lightning is nature at its most awe-inspiring. A few months ago I spent some time in the Boston Science Museum in its "lightning" room, where a scientist "creates" lightning under controlled circumstances. As I watched I recalled some significant memories about thunderstorms and their aftermath: A barn back home struck by lightning, its hold of hay smoldering until, hours later, it burst into a fireball seen for miles and a trip as a fairly new private pilot ferrying an aircraft to Texas and flying along the Gulf Coast on a summer afternoon.

I shuddered at the memories, inhaled the ozone from the scientist's repeated bolts of artificial lightning, and decided that a thunderstorm's beauty is best appreciated and its hazards best avoided on the ground.

There are numerous commercial publications about thunderstorm avoidance. Consult Chapter 7, Section 1 of the AIM for additional information on radar weather services. To purchase a copy of AC 00-6A, Aviation Weather, *fax your order with credit card number and expiration date to the Superintendent of Documents at (202) 512-2250 or call (202) 512-1800. AC 00-24B,* Thunderstorms, *is free from the U.S. Department of Transportation, General Services Section, M-45.3, Washington, DC 20590, or fax your request to (202) 366-2795.*

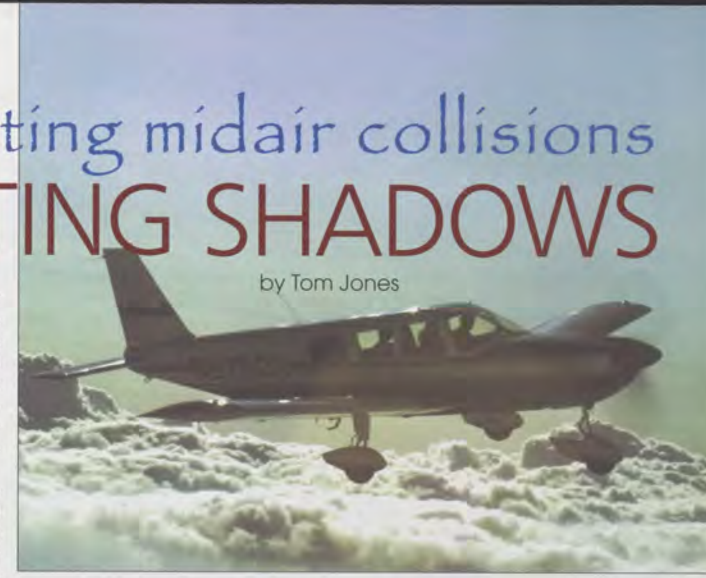
TURBULENCE CRITERIA

Intensity	Aircraft Reaction	Reaction Inside Aircraft
Light	Momentarily causes slight, erratic changes in attitude or altitude or slight, rapid, and somewhat rhythmic bumpiness (chop) without changes in altitude or attitude	Occupants may feel a slight strain against seat belts or shoulder harnesses. Unsecured objects may be slightly displaced. Food service may be conducted; no difficulty walking.
Moderate	Similar to light but of greater intensity. Changes in altitude or attitude occur, but the aircraft remains in positive control. Variations in airspeed.	Occupants feel definite strains against seat belts or shoulder harnesses. Unsecured objects are dislodged. Food service and walking are difficult.
Severe	Large, abrupt changes in altitude and/or attitude. Large variations in indicated airspeed. Aircraft may be momentarily out of control.	Occupants are forced violently against seat belts or shoulder harnesses. Unsecured objects are tossed about. Food service and walking are impossible.
Extreme	Aircraft is violently tossed about and is nearly impossible to control. Structural damage possible.	We don't even want to guess.

Turbulence is classified as light, moderate, severe, or extreme, and the AIM denotes the aircraft's reaction and "reaction inside the aircraft." One description is notable for its absence; there is no description of the reaction inside the aircraft for extreme turbulence. I think our imaginations are enough. The next time you think you may be safe taking a thunderstorm lightly, read below. And remember, turbulence is only one of the many hazards associated with a thunderstorm. Note that the following table is for large, transport category aircraft; so what is moderate for them may be severe for smaller, general aviation aircraft.

...preventing midair collisions

COUNTING SHADOWS



by Tom Jones

As summer approaches, longer daylight hours give us more hours of sunshine for getting the winter rust off our flying. Going out to different airports, getting proficient with takeoffs and landings, and becoming proficient in basic aircraft control is a great reason for going into the family budget for flying money.

Much flying time is spent in the traffic pattern, doing takeoffs and landings. One of the most prevalent hazards is the possibility of a mid-air collision. A basic law of physics states that "no two objects can occupy the same space at the same time." Aircraft have tried to disprove that law on various occasions. Don't let your aircraft be one of them.

Most mid-air collision occur in the traffic pattern, in daylight, under VFR, while on final approach, and on a weekend. Why? That's when most recreational flying is done. Not only are you out there flying but so are several thousand others. How do we stay apart?

For several years I was a professional flight instructor. I have spent many eight-hour days in the traffic pattern with student pilots. One of the survival tactics I developed was counting shadows. While flying at low altitude I still look below my aircraft at the shadows on the ground. If I can see only one shadow, more than likely there is only one aircraft. If there are two shadows, someone else is getting too close to me! Extra caution is recommended, and evasive action may be in order.

Nothing—even counting shadows—beats scanning thoroughly for other traffic. Always be alert and on the lookout. Have your passengers assist in looking out for traffic. Remember to look out for the pilot making the long, straight-in, killer final approach. (Is that one of the reasons why we call it "final" approach?)

The technique of looking for shadows (as well as aircraft) is appropriate while entering a traffic pattern. If we enter the traffic pattern at the proper altitude, there is usually no problem seeing our shadow on a sunny day. If we are flying a C-5A on a sunny day and can't see our shadow, it probably means that our traffic pattern is little too high.

While flying in the traffic pattern with a student, I have had other aircraft enter the pattern just below me, fly the pattern, and even land without seeing me. That is an experience! On one of these occasions a pilot was flying an *Ercoupe*. As he flew under me, I could look down into his cockpit and watch him reading the checklist and adjusting his controls. Too close for comfort!

All FAA literature advocates entering the traffic pattern at an altitude from 800 to 1,000 feet AGL if you don't know the established or published traffic pattern altitude (TPA) for the airport, but isn't that part of what UNICOM is for? Of course, if I'm flying a large or turbine engined aircraft, the recommended TPA is 1,500 feet AGL. If we all enter at the same altitude, there will be a better opportunity to see each other.

When administering flight tests to CFI applicants, I have noticed many of them want to fly the traffic pattern with a bank not to exceed 15 degrees. This seem to be a hazard to me. If we use a medium bank (approximately 25 degrees)—and coordinated, of course—in the pattern, we spend less time turning, and, thus, we are able to make more precise turns in order to fly a "square" pattern. I am concerned about spending too much time in a turn. While a wing is up, someone else may be approaching behind that wing.

An excellent way to practice flying a good traffic pattern is to go back to basics. Try flying rectangular patterns at traffic pattern altitude around a field away from the airport. Watch for shadows and attempt to make good, coordinated turns, using medium banks. Remember perfect practice promotes perfect performance. Impress yourself, your passengers, and your fellow aviators.

Use these techniques and you'll be a better pilot—beyond a shadow of a doubt.

Mr. Jones is an Aviation Safety Inspector with the Richmond, VA Flight Standards District Office.

...preventing midair collisions

PATTERN CHATTER

by Bruce Edsten

"Well, all we gotta do now is find Bevis, 'cuz we already know where Butthead is!!!"

"Yeah, thanks a bunch, Big Shot!"

The invective was overhead in the traffic pattern of a fairly busy, general aviation airport and was directed at the pilot of a *King Air* who had just landed. Only thing is, the turbine driver came straight in and, more importantly, totally unannounced.

Well, we oughta write this guy a ticket, right? Put him in the penalty box for a while and let him contemplate his indiscretion while everybody else gets to keep on flying, right?

Maybe skin him alive and dry his hide on the hangar wall for all to see, RIGHT!?

No, no, I've calmed down now.

Trouble is, he's almost certainly completely legal in making a long, straight in approach with the radios off, but *being legal ain't necessarily being smart!*

The two pattern denizens who fired the shots at our wayward business cruiser really do have a point. They most likely would not have said a thing had they not been cut off in the pattern, had the diddley scared out of their about-to-solo students, or some such. Unfortunately, it's a picture we still see all too often, and one for which there is simply no excuse.

A Mid-Air Can Ruin Your Whole Day

The very real concern here is the mid-air and its close cousin, the near mid-air (NMAC). In the former, there will be some wrinkled metal, and in the latter, it may be a simple, ahem, laundry problem. Most NMAC's go unreported, but we still hear about some 200 to 300 of them a year. The actual contact occurrences are the really important ones, and we definitely hear about those.

Although the number is slowly declining, we still average about one midair per week, with a lot more in the summer, of course. And where do they occur? At uncontrolled fields, also of course. Actually, I don't care for the term, uncontrolled, because that implies that the situation is out of control altogether. Now, in fact, that truly does describe some airports, and certain pilots feel that it applies to their home field all the time, but I prefer to use "non-towered" instead.

In any case, operations at these fields are a lot less formal than at their tower-controlled counterparts. This sets the stage for the uneducated and/or the hot rod to go and commit, largely unobserved, all manner of mayhem. Throw in some really nice weather, with winds at two knots gusting to three, and it gets worse. Far too many folks simply go and do their own thing, and not infrequently someone else's thing is in direct conflict.

However, even diametrically opposed things do not necessarily pose a serious hazard if everybody knows what everybody else is doing. Take our King Air, for instance. Do you suppose his radios were all broken? Not bloody likely! The average turbine aircraft's instrument panel is usually crammed with RNAV, VOR-nav, every-body-else-nav, LORAN, GPS, UPS, FedEx, and at least a pair of 720-channel VHF Nav-Comms. Nope, our King Air operator simply decided to do what he pleased. Most likely, he did have the radios on and knew about the other folks in the pattern. He simply felt that he, seasoned veteran that he is, didn't need to lower himself to the level of those "amateur" pilots and make some mickey-mouse traffic report. By the way, the bumper sticker on the back of his truck reads: "Why, yes, as a matter of fact I DO own the @#$%@ road!" Figures. Sure hope I don't have to scrape him off the bottom of a smoking hole some day.

[Editor's Note: Bruce and I are not trying to compare expensive airplane drivers with expensive car drivers, but.... A few years ago I had a student where I literally had just gotten out of the airplane for the kid's first solo. His takeoff was fine, but on the turn to downwind a Mooney came whizzing in, not on the 45, but across the takeoff path, behind and to the left of my student, flew under him and popped up in front of my student at TPA. I watched the wings of the 152 bobble in surprise, but the kid did a great job of calming himself down and coming in for a great first solo landing. In fact, he thought he had done something wrong. I met the Mooney pilot at the fuel pump, putting on my FAA "hat" and pointed out to him what just happened and the danger of it. By the way, he had made no radio announcements either, and his instrument panel was crammed with expensive nav-comms and a hand-held peeked out of his flight bag. He told me in no uncertain terms what to do with my student, the 152, and the fuel nozzle he was holding in his hand then parked his airplane, jumped into his Beemer, and drove away, laying rubber and giving me a middle-finger wave. Again, nothing illegal about the operation and certainly nothing to initiate a non-compliance investigation, just utter stupidity.]

Poor judgement in making a long straight-in notwithstanding, he could have improved the situation dramatically by simple announcing his intentions. The other folks in the pattern may have grumbled a bit, but it would have been a simple and far less hair-raising procedure for everybody to simply extend the downwind a tad and fall in behind. There are a couple of fields nearby that are very popular places for practicing instrument approaches. This means that there are relatively frequent, long, straight-in operations entering the pattern. In spite of the fact that these are already otherwise busy patterns, it all works fairly well because the folks on the practice approaches are keeping everybody else abreast of what's going on.

Use Them Ray-dee-os

The whole point is that most of the wrinkled tin, the inflight coronaries, the adrenaline overdoses, and the soiled laundry could be prevented. And, of course, the route to the site of this miracle is very simple: communication!

Okay, okay, there are a few truly, no-radio aircraft, and I suppose there are a few cases of truly incurable "mike fright," but by and large everybody and everything that flies CAN get on the radio. It's almost entirely a case of won't do it, not a case of can't.

And then, there's always the occasional case of over-doing it. We have all heard it, and in our early flying days, many of us (me included) have been guilty of it. The "overdone" transmission usually begins with the obligatory 10-second, "Uuuhhhhhhhh..." followed by the pilot's entire family history, a detailed description of the aircraft—including time since last major—current power settings and airspeed, and finally a position report that only the pilot understands, like "passing over Lukey Smedlap's barn." Usually missing from all this is the name of the airport!

Doing It Right!

What we need to strive for in our communications at non-towered airports is brevity and clarity. The brevity part is pretty easy. It really bugs the English teachers, but, hey, what are teachers for if you can't bug 'em a bit? (I'm gonna hear about this for sure!) What bugs them is the elimination of the grammatically correct use of "The King's English," but that's okay in radio communications, as long as the meaning gets through and the airwaves are tied up no longer than necessary.

Clarity is just as important as being brief and for the same reason. That reason is the widespread use of only a few Common Traffic Advisory Frequencies (CTAF). CTAF have been shown on sectional charts by the symbol Ⓒ following the frequency for some time now. Most of the time, it's 122.8, the usual UNICOM frequency, and when it's not, it's usually 122.7 or 122.9. The point is, anytime you transmit, you will be potentially fouling things up at a dozen other airports within the range of your radio. Therefore, keeping your transmission time to a minimum also keeps the confusion to a minimum.

Don't make your transmissions short by leaving out the airport name, however. Ever have this happen? Just as your turn final to runway 24, somebody says, "Cessna three six x-ray, turning final for runway 24." Ohmigod! Where is that guy? Don't want to hit him! Better go-around. Full power, flaps up, break right, climb to traffic pattern altitude, etc. A complete search of the area reveals nothing, so you continue and rejoin the downwind. Then, a couple of minutes later, "Cessna three six x-ray turning final for runway 24, Southport." Well, no wonder you couldn't find him. You're at Northport!

Differentiating between UNICOM and TRAFFIC is important, too. When you pick up the mike and say, "North Hockey Puck UNICOM..." what follows is supposed to be a request for information. You should use UNICOM in your transmission ONLY when asking for an airport advisory, checking on your rental car, ordering extra pickles on your special from the airport restaurant, and like that. Do NOT use the term UNICOM when making a traffic report.

Many moons ago, I earned my private ticket and a good chunk of my commercial as a line boy at a small general aviation airport. Being of the conscientious sort and attempting to give the best service possible, I always sprinted for the microphone hanging on the wall as soon as I heard the phrase "UNICOM" in a transmission. Can't tell you the number of times I got there just in time to hear the pilot saying, "...entering downwind." Well, at least the pilot was making some kind of a traffic report.

So, How Should it be Done?

Let's take it step by step.

1. **The Address.** Name the airport and say, "Traffic." The formal name of the airport is fine for official correspondence, but cut it short for traffic reports. For example, it's "Georgetown-Scott County Marshal Field" in the Airport/Facility Directory but "Georgetown Traffic" is all you need on the radio.
2. **Your Identification.** Once again, short and sweet. "Cessna" or "Piper" is good enough, or maybe "Twin Beech." Model designations such as 150, 152, 28, 36A, etc., are not necessary or even very useful, so leave them out. If you have an unusual homebuilt or a biplane, the name may not mean much, so you could say, "Low wing" or "Biplane" or some such. And you can abbreviate the n-number, too. "Three four x-ray" works just as well as "One two three four x-ray." (On initial call-up to an ATC facility you do want to use the entire call sign, however.)
3. **Your Position.** "Five miles east," "Entering left downwind runway 24," etc. Good stuff! "Coming up over the gas station" or "Passing over Lukey's barn" ain't gonna make it, though. Local pinpoint landmarks might be cute and colorful, but they are of no use to the pilot from the next county, never mind the next state. This is a good place to mention the runway number, too. If the wind is not strong enough to make the active runway obvious and/or absolutely necessary, there may well be somebody lining up for the other end of the airpatch. In the case of multiple runways, the problem can be multiplied, too; e.g., an instructor may be using another runway on purpose to teach crosswind landings.
4. **Your Intentions.** Obviously a wide variety of things might be

appropriate here. Usual pattern chatter would most likely include things like "Full stop," "Touch and go," "Low approach," and such like. "Departing eastbound," "Going around," "Executing the missed approach," or "Taking the active" might come up, too. (Also, you take the chance of a wiseacre response to the latter along the lines of, "Well, bring the active back when you're done with it, 'cuz I need it next.") Again, short and sweet is the name of the game here.

5. **Airport Name Again.** In case the listeners didn't hear you when you started your transmission with the airport name, say it again so they will know whether to look for you or not.

So, we have address, ident, position, intentions, and airport. A typical transmission might then go like this:

"Hockey Puck traffic, Piper two five sierra, entering left downwind for runway 24, touch and go, Hockey Puck."

Really tough, right? So why does it seem beyond the capabilities of a lot of pilots? The trouble is, some of these clowns think they're being cool when they are really only displaying their ignorance and lack of consideration. It is not beyond the realm of possibility that they could pay the ultimate price for their failure to communicate.

You will notice, too, that the typical transmission has no "This is" or "I am" or anything else in it that doesn't actually convey some element of meaning. Here's where the English teacher cringes. The public school system has spent years trying to get little Johnnie and Susie to use proper grammar, and now we tell them to forget it. Like, radical, dude!

As you may have surmised from the tone of this article, this failure to communicate properly is a sore point with me. Non-towered airport operations are a challenge to everyone using them, and I can only throw in an occasional article, so I want people to remember it! I could write a book, but that's already been done. Now, there is the movie...

The bottom line? Communication! It is the information age, so they say.

✈

You can get more information from the Aeronautical Information Manual (AIM) *and Advisory Circulars 90-42F, "Traffic Advisory Practices at Airports Without Operating Control Towers," and 90-66A, "Recommended Standard Traffic Patterns for Aeronautical Operations at Airports Without Operating Control Towers," which are available free from U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785; fax to (301) 386-5394. Mr. Edsten is the Safety Program Manager at the Louisville, KY Flight Standards District Office.*

Calendar of Events

It's that time of year again when aviation enthusiasts start gathering at local airports. Following is a list of some events.

July 20 • Solano, CA - Nut Tree Airport. Solano Air Fair. For information call Bud Field (510) 443-2399 or Nancy Auld (415) 726-4825.

August 24-25 • Hayward Airport, CA. Hayward Air Fair. For information call Bud Field (510) 443-2399 or Nancy Auld (415) 726-4825.

Sept. 7-8 • Hagerstown, MD - Washington County Regional Airport (HGR). EAA Chapter 36 Fourth Hagerstown's Aviation Heritage Weekend Fly-In/Drive-In. For information call the Greens, (301) 739-0074 or Abe (after 9 p.m.) (717) 762-8715.

Sept. 21-22 • Rock Falls, IL - Whiteside County Airport (SQI). North Central EAA "Old Fashioned" Fly-In. For information call Gregg Erikson (708) 513-06441 or Dave Christianson (815) 625-6556.

Sept. 28-29 • Half Moon Bay Airport, CA. California Coast Airfair 96. For information call (415)726-7655.

Oct. 10-13 • The 10th Reunion of the Second Emergency Rescue Squadron, 5th and 13th Air Force, will be held in Galveston, TX at the Inn at San Luis. For further information, contact L. R. Nelson at 13515 Butterfly Lane, Houston, TX 77079; (713) 464-0655.

Oct. 12-13 • Sonoma Valley Airport, CA. Schellville Fly-In. For information call Bud Field (510) 443-2399 or Nancy Auld (415) 726-4825.

Oct. 29-30 • Rosemont, IL. FAA's Great Lakes Region Airports Division's 12th Annual Airport Conference at the Holiday Inn-O'Hare. This year's conference will include presentations by over 30 speakers in three break-out sessions covering topics on planning, engineering, funding, construction quality, operations, safety, capacity, and the environment. For registration and general conference information contact Carol Koenes (847) 294-7013.

PLACE STAMP HERE

Superintendent of Documents
Government Printing Office
Washington, DC 20402–9371

Superintendent of Documents Subscriptions Order Form

Order Processing Code:
***6654**

Charge your order. It's easy! MasterCard VISA

Please enter my sbscription for FAA AVIATION NEWS (FAN). One year $16.00 ($20.00 foreign). Two years $32.00 ($40.00 foreign)

The total cost of my order is $___________ . Prices include regular domestic postage and handling and are subject to change.

____
(Company or personal name) (Please type or print)

____
(Additional address/attention line)

____
(Street address)

____
(City, State, ZIP Code)

____
(Daytime phone including area code)

Please Choose Method of Payment:

- ☐ Check Payable to the Superintendent of Documents
- ☐ GPO Deposit Account ☐☐☐☐☐☐☐ – ☐
- ☐ VISA or MasterCard Account

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

____
(Credit card expiration date)

Thank you for your order!

____
(Signature)

11/93

Mail To: Superintendent of Documents, Government Printing Office, Washington, DC 20402–9371

DETACH ENVELOPE HERE ↑ ENCLOSE FORM WITH CHECK OR MONEY ORDER (Do not send cash)

TINY BUBBLES, BIG TROUBLES

Altitude-Induced Decompression Sickness

by J. R. Brown and Melchor J. Antuñano, M.D.

Decompression sickness (DCS) describes a condition characterized by a variety of symptoms resulting from exposure to low barometric pressures that cause inert gasses (mainly nitrogen)—normally dissolved in body fluids and tissues—to come out of physical solution and form bubbles. DCS can occur during exposure to altitude (altitude DCS) or during ascent from depth (mining or diving).

The first documented cases of DCS (Caisson Disease) were reported in 1841 by a mining engineer who observed the occurrence of pain and muscle cramps among coal miners exposed to air-pressurized mine shafts designed to keep water out. The first description of a case resulting from diving activities while wearing a pressurized hard hat was reported in 1869.

Altitude-Induced Decompression Sickness

Altitude DCS became a commonly observed problem associated with high-altitude balloon and aircraft flights in the 1930's. In present-day aviation, technology allows civilian aircraft (commercial and private) to fly higher and faster than ever before. Though modern aircraft are safer and more reliable, occupants are still subject to the stresses of high altitude flight—and the unique problems that go with these lofty heights. A century and a half after the first DCS case was described, our understanding of DCS has improved, and a body of knowledge has accumulated; however, this problem is far from being solved. Altitude DCS still represents a risk to the occupants of modern aircraft.

Tiny Bubbles

According to Henry's Law, when the pressure of a gas over a liquid is decreased, the amount of gas dissolved in that liquid will also decrease. One of the best practical demonstrations of this law is offered by opening a soft drink. When the cap is removed from the bottle, gas is heard escaping, and bubbles can be seen forming in the soda. This is carbon dioxide gas coming out of solution as a result of sudden exposure to lower barometric pressure.

Similarly, nitrogen is an inert gas normally stored throughout the human body (tissues and fluids) in physical solution. When the body is exposed to decreased barometric pressures as in flying an unpressurized aircraft to altitude or during a rapid decompression), the nitrogen dissolved in the body comes out of solution. If the nitrogen is forced to leave the solution too rapidly, bubbles form in different areas of the body, causing a variety of signs and symptoms. The most common symptom is joint pain, which is known as "the bends."

Trouble Sites

Although bubbles can form anywhere in the body, the most frequently targeted anatomic locations are the shoulders, elbows, knees, and ankles. Table 1 lists the different DCS types with their corresponding bubble formation sites and their most common symptoms. "The bends" (joint pain) account for about 60 to 70% of all altitude DCS cases with the shoulder being the most common site. Neurologic manifestations are present in about 10 to 15% of all DCS cases with headache and visual disturbances being the most common symptoms. "The chokes" are very infrequent and occur in less than two percent of all DCS cases. Skin manifestations are present in 10 to 15% of all DCS cases.

Medical Treatment

Mild cases of "the bends" and skin bends (excluding mottled or marbled skin appearance) may disappear during descent from high altitude but still require medical evaluation. If the signs and symptoms persist during descent or reappear at ground level, it is necessary to provide hyperbaric oxygen treatment immediately (100% oxygen delivered in a high-pressure chamber). Neurological DCS, "the chokes," and skin bends with mottled or marbled skin lesions (Table 1) should always be treated with hyperbaric oxygenation. These conditions are very serious and potentially fatal if untreated.

Facts About Breathing 100% Oxygen

One of the most significant breakthroughs in altitude DCS research was the discovery that breathing 100% oxygen before exposure to a low barometric pressure (oxygen prebreathing) decreases the risk of developing altitude DCS. Oxygen prebreathing promotes the elimination (washout) of nitrogen from body tissues. Prebreathing 100% oxygen for 30 minutes before initiating ascent to altitude reduces the risk of altitude DCS for short exposures (10 to 30 minutes only) to altitudes between 18,000 and 43,000 feet. However, oxygen prebreathing

has to be continued, without interruption, with inflight 100% oxygen breathing to provide effective protection against altitude DCS. Furthermore, it is very important to understand that breathing 100% oxygen only during flight (ascent, enroute, descent) does not decrease the risk of altitude DCS and should not be used in lieu of oxygen prebreathing. Although 100% oxygen prebreathing is an effective method to provide individual protection against altitude DCS, it is not a logistically simple nor an inexpensive approach for the protection of civil aviation flyers—commercial or private. Therefore, at the present time it is only used by military flight crew and astronauts for their protection during high altitude and space operations.

Predisposing Factors

Altitude

There is no specific altitude that can be considered an absolute altitude exposure threshold, below which it can be assured that no one will develop altitude DCS. However there is very little evidence of altitude DCS occurring among healthy individuals at altitudes below 18,000 feet who have not been SCUBA diving. (SCUBA: Self Contained Underwater Breathing Apparatus)

Individual exposures to altitudes between 18,000 feet and 25,000 feet have shown a low occurrence of altitude DCS. Most cases of altitude DCS occur among individuals exposed to altitudes of 25,000 feet or higher. A U.S. Air Force study of altitude DCS cases reported that only 13% occurred below 25,000 feet. The higher the altitude of exposure, the greater the risk of developing altitude DCS. It is important to clarify that although exposures to incremental altitudes above 18,000 feet show an incremental risk of altitude DCS, they do not show a direct relationship with the severity of the various types of DCS. (Table 1 shown on Page 18)

Repetitive Exposures

Repetitive exposure to altitudes above 18,000 feet within a short period of time (a few hours) also increase the risk of developing altitude DCS.

Rate of Ascent

The faster the rate of ascent to altitude, the greater the risk of developing altitude DCS. An individual exposed to a rapid decompression (high rate of ascent) above 18,000 feet has a greater risk of altitude DCS than being exposed to the same altitude but at a lower rate of ascent.

Time at Altitude

The longer the duration of the exposure to altitudes of 18,000 feet and above, the greater the risk of altitude DCS.

Age

There are some reports indicating a higher risk of altitude DCS with increasing age.

Previous Injury

There is some indication that recent joint or limb injuries may predispose individuals to developing "the bends."

Ambient Temperature

There is some evidence suggesting that individual exposure to very cold ambient temperatures may increase the risk of altitude DCS.

Body Type

Typically, a person who has a high body fat content is at greater risk of altitude DCS. Because of poor blood supply, nitrogen is stored in greater amounts in fat tissues. Although fat represents only 15% of an adult normal body, it stores over half of the total amount of nitrogen (about one liter) normally dissolved in the body.

Exercise

When a person is physically active while flying at altitudes above 18,000 feet, there is greater risk of altitude DCS.

Alcohol Consumption

The after-effects of alcohol consumption increase the susceptibility to DCS.

SCUBA Diving Before Flying

SCUBA diving requires breathing air under high pressure. Under these conditions, there is a significant increase in the amount of nitrogen dissolved in the body (body nitrogen saturation). The deeper the SCUBA dive, the greater the rate of body nitrogen saturation. Furthermore, SCUBA diving in high elevations (mountain lakes), at any given depth, results in greater body nitrogen saturation when compared to SCUBA diving at sea level at the same depth. Following SCUBA diving, if not enough time is allowed to eliminate the excess nitrogen stored in the body, altitude DCS can occur during exposure to altitudes as low as 5,000 feet or less.

What To Do When DCS Occurs

- Put on your oxygen mask immediately and switch the regulator to 100% oxygen.
- Begin an emergency descent and land as soon as possible. Even if the symptoms disappear during descent, you should still land and seek medical evaluation while continuing to breathe oxygen.
- If one of your symptoms is joint pain, keep the affected area still; do not try to work pain out by moving the joint around.
- Upon landing seek medical assistance from an FAA medical officer, aviation medical examiner, military flight surgeon, or a hyperbaric medicine specialist. Be aware that a physician not specialized in aviation or hyperbaric medicine may not be familiar with this type of medical problem. Therefore, be your own advocate.
- Definitive medical treatment may involve the use of a hyperbaric chamber operated by specially trained personnel.
- Delayed signs and symptoms of altitude DCS can occur after return to ground level whether or not they were present during flight.

Things to Remember

- Altitude DCS is a potential risk every time you fly in an unpressurized aircraft above 18,000 feet (or at lower altitudes if you SCUBA dive before the flight).
- Be familiar with the signs and symptoms of altitude DCS (Table 1) and monitor all aircraft occupants, including yourself, any time you fly an unpressurized aircraft above 18,000 feet.
- Avoid unnecessary strenuous physical activity before flying an unpressurized aircraft above 18,000 feet and for 24 hours after the flight.
- Even if you are flying a pressurized aircraft, altitude DCS can occur as a result of sudden loss of cabin pressure (inflight rapid decompression).
- Following exposure to an inflight rapid decompression, do not fly for at least 24 hours. In the meantime, remain vigilant for the possible onset of delayed symptoms or signs of altitude DCS. If you present delayed symptoms or signs of altitude DCS, seek medical attention immediately.
- Keep in mind that breathing 100% oxygen during flight (ascent, en route, descent) without oxygen prebreathing before take-off does not prevent the occurrence of altitude DCS.
- Do not ignore any symptoms or signs that go away during the descent. In fact this could confirm that you are actually suffering altitude DCS. You should be evaluated as soon as possible.
- If there is any indication that you may have experienced altitude DCS, do not fly again until you are cleared to do so by an FAA medical officer, an aviation medical examiner, a military flight surgeon, or a hyperbaric medicine specialist.
- Allow yourself at least 24 hours to elapse between SCUBA diving and flying.
- Be prepared for a future emergency by familiarizing yourself with the availability of hyperbaric chambers in your area of operations. However, keep in mind that not all of the available hyperbaric treatment facilities have personnel qualified to handle altitude DCS emergencies. To obtain information on locations of hyperbaric treatment facilities capable of handling altitude DCS emergencies, call the Diver's Alert Network at (919) 684-8111.

If you are interested in learning more about altitude DCS, as well as the other stressors that may affect your performance and/or your health during flight, we encourage you to enroll in the Physiological Training Course offered by the Aeromedical Education Division, Airman Education Program, at the FAA Civil Aeromedical Institute in Oklahoma City. A similar course is also available to you at U.S. military physiological training facilities around the country through an FAA/DOD Training Agreement. For more information about any of these courses, call (405) 954-4837.

For multiple copies of a brochure entitled, Altitude Decompression Sickness, *contact FAA at (405) 954-4837 and ask for publication AM-400-95/2.*

NOTICE TO READERS

We know that those of you who are subscribers cannot have failed to notice that the April 1996 and May/June 1996 issues of *FAA Aviation News* arrived very late. You may have come to expect that of a government publication, but let us assure you that we try very hard to overcome that stereotype. The problem is the magazine is printed by a contract printer, and that contract is overseen by the U.S. Government Printing Office. Once the material for the next issue leaves our office, we have no control over the printing schedule of the contract printer. In fact, this was the reason why we did not include the usual story on the NOTAM for flying to Oshkosh 1996—we could not be assured that this issue you're reading would be printed and distributed on time.

Because of that we have made some changes to the new printing contract, which will be shortly out for competitive bid, that we hope will tighten the printing schedule and not allow printing and delivery times to slip as they are now.

We sincerely apologize to anyone who was inconvenienced and assure you that we are working hard to correct these problems.


Signs and Symptoms of Altitude Decompression Sickness

DCS Type	Bubble Location	Signs and Symptoms (Clinical Manifestations)
Bends	Large joints of the body (elbows, hip shoulder, wrist, knees, ankles)	Localized deep pain, ranging from mild to excruciating. Sometimes a dull ache, but rarely a sharp pain. Active and passive motion of the joint aggravates the pain. Pain can occur at altitude, during the descent, or many hours later.
Neurologic	Brain	Confusion or memory loss Headache Spots in visual field, tunnel vision, double vision, or blurry vision Unexplained extreme fatigue or behavior changes Seizures, dizziness, vertigo, nausea, vomiting, and unconsciousness can occur
	Spinal Cord	Abnormal sensations such as burning, stinging, and tingling around the lower chest and back Symptoms may spread from the feet up and may be accompanied by ascending weakness or paralysis Girdling abdominal or chest pain
	Peripheral Nerves	Urinary and rectal incontinence Abnormal sensations, such as numbness, burning, stinging, and tingling Muscle weakness or twitching
Chokes	Lungs	Burning, deep chest pain under the sternum Pain is aggravated by breathing Shortness of breath Dry, constant cough
Skin Bends	Skin	Itching, usually around the ears, face, neck, arms, and upper torso Sensation of tiny insects crawling over the skin Mottled or marbled skin usually around the shoulders, upper chest and abdomen, accompanied by itching Swelling of the skin, accompanied by tiny, scar-like skin depressions

Table 1

The Wright Brothers' First Flight at...College Park, MD?

by Catherine Wallace Allen

Interestingly enough, there are few historical facts that are as well known to us even as children growing up as the first flight of Orville and Wilbur Wright. Every child knows who the Wright brothers are and that Kitty Hawk was the site of their most significant achievement. However, beyond that, the other achievements of the Wrights and sites associated with them are lesser known. These places, in fact, have made immense contributions to the direction that aviation and the aeroplane have taken—places like Huffman Prairie in Dayton, OH, where the Wrights continued perfecting and flying their early aeroplanes; Ft. Myer in Arlington, VA, where the trials for the first government aeroplane took place; and finally the College Park Airfield (now known as the College Park Airport) in Maryland, site of a fascinating list of achievements and activities associated with Wilbur and Orville and later with aviation in general.

The spectacular history of this small airfield began in 1909 with its selection as the site for the training of the first military officers to fly the newly accepted government plane. "Wright Machine Reaches College Park by Mule Power" proclaimed an October 6, 1909 article in *The Washington Evening Star,* which went on to say that lessons to both Lieutenants Frederick Humphreys and Frank Lahm would begin as soon as the plane was assembled. Wilbur was to be their instructor, and he proclaimed to the Associated Press on his arrival that College Park was "a fine field." A man of few words and simple means, Wilbur was not one to make a big deal of his efforts at the field. He roomed across the railroad tracks at a friendly neighbor's house and took his meals along with his hosts and his two aviation students who roomed directly next door.

Operations at the airfield, previously a farm, were also simple. There was a small shed that was constructed to house the Wright "aeroplane", and this ultimately became the quarters of the corporal and ten privates who were to assist with the activities at the field. There was a cooking tent behind the shed where they took their meals.

Fortunately, the romance of an airplane flying through the clouds was not lost on the general public. Interested spectators, as well as reporters from all the local papers, waited each day, taking in every movement, sentence, and gesture of both Wilbur and the two young lieutenants who were undergoing flight instruction. Fortunate may not be how Wilbur would have described it, after his recent departure from Ft. Myer where thousands of spectators and other crowded conditions required him to seek out this more remote field. Reports of his activities at College Park were both humorous and serious as he tried to fulfill his contract to the government:

Wilbur Wright made one long and one short flight at College Park this morning. Two spectators who got in the way of his machine just as the landing was made narrowly escaped death!

In avoiding a catastrophe, he displayed great skill as an operator. As an orator, he distinguished himself for forceful language in calling down the offending spectators. (From The Washington Evening Star, *October 20, 1909*)

It is evident that Wilbur was just as much a focus of the media as was his machine and its flights. In fact, the world was extremely curious about both him and his brother Orville, who was promoting the aeroplane in Europe at the time.

Both Wright brothers were labeled by the press as being extremely quiet and intense. However, their reluctance to spend large amounts of time talking to the media was actually more a result of their dedication to the task at hand, the seriousness with which they took their work, and Orville's extreme shyness, all of which may have given the public that impression. Their personalities were not quite so staid as history would have us believe.

Another activity that seemed to elicit smiles from both spectators and the aviators themselves was the recurring races with the Baltimore and Ohio (B&O) trains that traversed one edge of the airfield. The papers made much ado of these spectacular "races between two means of transportation" with Wilbur delighting in the fact that he came out ahead each time.

These episodes were, of course, fueled by the media, but they also

Continued on Page 24

METAR TAF

The Weather is Changing - Are You Ready?

by William Benhoff

KEY to AERODROME FORECAST (TAF) and AVIATION ROUTINE WEATHER REPORT (METAR)

TAF KPIT 091730Z 091818 15005KT 5SM HZ FEW020 WS010/31022KT
FM1930 30015G25KT 3SM SHRA OVC015 TEMPO 2022 1/2SM +TSRA OVC008CB
FM0100 27008KT 5SM SHRA BKN020 OVC040 PROB40 0407 1SM -RA BR
FM1015 18005KT 6SM -SHRA OVC020 BECMG 1315 P6SM NSW SKC

METAR KPIT 091955Z COR 22015G25KT 3/4SM R28L/2600FT TSRA OVC010CB 18/16 A2992 RMK SLP045 T01820159

Forecast	Explanation	Report
TAF	Message type: TAF-routine or TAF AMD-amended forecast, METAR-hourly, SPECI-special or TESTM-non-commissioned ASOS report	METAR
KPIT	ICAO location indicator	KPIT
091730Z	Issuance time: ALL times in UTC "Z", 2-digit date, 4-digit time	091955Z
091818	Valid period: 2-digit date, 2-digit beginning, 2-digit ending times	
	In U.S. **METAR**: CORrected ob; or AUTOmated ob for automated report with no human intervention; omitted when observer logs on	COR
15005KT	Wind: 3 digit true-north direction, nearest 10 degrees (or VaRiaBle); next 2-3 digits for speed and unit, KT (KMH or MPS); as needed, Gust and maximum speed; 00000KT for calm; for **METAR**, if direction varies 60 degrees or more, Variability appended, e.g. 180V260	22015G25KT
5SM	Prevailing visibility: in U.S., Statute Miles & fractions; above 6 miles in **TAF** Plus6SM. (Or, 4-digit minimum visibility in meters and as required, lowest value with direction)	3/4SM
	Runway Visual Range: R; 2-digit runway designator Left, Center, or Right as needed; "/"; Minus or Plus in U.S., 4-digit value, FeeT in U.S., (usually meters elsewhere); 4-digit value Variability 4-digit value (and tendency Down, Up or No change)	R28L/2600FT
HZ	Significant present, forecast and recent weather: see table (on back)	TSRA
FEW020	Cloud amount, height and type: SKy Clear 0/8, FEW >0/8-2/8, SCaTtered 3/8-4/8, BroKeN 5/8-7/8, OVerCast 8/8; 3-digit height in hundreds of ft; Towering CUmulus or CumulonimBus in **METAR**; in **TAF**, only CB. Vertical Visibility for obscured sky and height "VV004". More than 1 layer may be reported or forecast. In automated **METAR** reports only, CLeaR for "clear below 12,000 feet"	OVC010CB
	Temperature: degrees Celsius; first 2 digits, temperature "/" last 2 digits, dew-point temperature; Minus for below zero, e.g., M06	18/16
	Altimeter setting: indicator and 4 digits; in U.S., A-inches and hundredths; (Q-hectoPascals, e.g., Q1013)	A2992

In 1989 at a meeting in Geneva, Switzerland of the International Civil Aviation Organization (ICAO) the worldwide standardization of aviation was discussed. Out of this meeting came two significant changes for airspace users here in the U.S., which is a signatory to ICAO. First, in 1993 U.S. airspace was reclassified from Positive Control Zone, Terminal Control Zones, and Airport Radar Service Area to Class "A," "B," and "C" and so on. This was done in an effort to standardize the airspace classification within the U.S. with that of the rest of the world. The need for standardization is apparent when you consider the increasing number of pilots who are flying internationally and the development of aircraft capable of flying vast distances.

The second significant change went into effect July 1, 1996, and that was a major change in the format for presenting weather information.

The U.S., Canada, and Mexico have always used Surface Aviation Observation and Terminal Forecast formats to report weather, but the rest of the world used a different format. During the Geneva meeting, the member countries reached an agreement to blend the two formats into one. Consequently, the METAR/TAF format was developed and subsequently approved by the World Meteorological Organization, of which the U.S. National Weather Service is a member.

Are you ready to read and understand METAR/TAF?

METAR are the aviation routine weather reports. They replace the report we now know as SA or hourly surface analysis. METAR are issued once an hour, with the observation taken by a human weather observer, AWOS, or ASOS. If a special observation is required it will be called a SPECI.

TAF will replace the FT or terminal forecasts. TAF are issued four times each day at 00:00 UTC, 06:00 UTC, 12:00 UTC, and 18:00 UTC, the same as the terminal forecasts were. TAF also cover a 24 hour-time period just like the FT did. However, there are many changes in these reports from the SA and FT. Let's take a look at METAR and TAF in some detail.

Meteorological Aviation Routine Weather Report (METAR)

In both METAR and TAF you will notice a change in the order of the weather information. The order will now be:

1. WIND
2. VISIBILITY
3. WEATHER PHENOMENA
4. SKY CONDITION

In METAR only:

5. TEMPERATURE
6. ALTIMETER SETTING

Also, the current codes for weather phenomena will be replaced with all new two-letter contractions (like RA for Rain, SN for Snow, etc.).

Wind

The wind will be reported with five digits, three for direction and two for the wind speed. For example, 35015KT translates as "winds from 350 degrees at 15 knots."

Calm winds will be reported as 00000KT. Wind gusts will continue to be indicated with a "G"—for example, 35015G25KT. If the wind is variable it will be shown as either VRB, if it is six knots or less (VBR05KT), or with the directions separated by a V if over six knots: 35015KT 330V030. It is very important to remember that only vari-

KEY to AERODROME FORECAST (TAF) and AVIATION ROUTINE WEATHER REPORT (METAR)

Forecast	Explanation	Report
WS010/31022KT	In U.S. **TAF**, non-convective low-level (≤2,000 ft) Wind Shear; 3-digit height (hundreds of ft); "/"; 3-digit wind direction and 2-3 digit wind speed above the indicated height, and unit, KT	
	In **METAR**, ReMarK indicator & remarks. For example: Sea-Level Pressure in hectoPascals & tenths, as shown: 1004.5 hPa; Temp/dew-point in tenths °C, as shown: temp. 18.2°C, dew-point 15.9°C	RMK SLP045 T01820159
FM1930	FroM and 2-digit hour and 2-digit minute **beginning** time: indicates significant change. Each FM starts on new line, indented 5 spaces.	
TEMPO 2022	TEMPOrary: changes expected for < 1 hour and in total, < half of 2-digit hour **beginning** and 2-digit hour **ending** time period	
PROB40 0407	PROBability and 2-digit percent (30 or 40): probable condition during 2-digit hour **beginning** and 2-digit hour **ending** time period	
BECMG 1315	BECoMinG: change expected during 2-digit hour **beginning** and 2-digit hour **ending** time period	

Table of Significant Present, Forecast and Recent Weather - Grouped in categories and used in the order listed below; or as needed in TAF, No Significant Weather.

QUALIFIER

Intensity or Proximity

- Light "no sign" Moderate + Heavy

VC Vicinity: but not at aerodrome; in U.S. **METAR**, between 5 and 10SM of the point(s) of observation; in U.S. **TAF**, 5 to 10SM from center of runway complex (elsewhere within 8000m)

Descriptor

MI Shallow	BC Patches	PR Partial	TS Thunderstorm
BL Blowing	SH Showers	DR Drifting	FZ Freezing

WEATHER PHENOMENA

Precipitation

DZ Drizzle	RA Rain	SN Snow	SG Snow grains
IC Ice crystals	PE Ice pellets	GR Hail	GS Small hail/snow pellets
UP Unknown precipitation in automated observations			

Obscuration

BR Mist (≥5/8SM)	FG Fog (<5/8SM)	FU Smoke	VA Volcanic ash
SA Sand	HZ Haze	PY Spray	DU Widespread dust

Other

SQ Squall	SS Sandstorm	DS Duststorm	PO Well developed dust/sand whirls
FC Funnel cloud	+FC tornado/waterspout		

- Explanations in parentheses "( )" indicate different worldwide practices.
- Ceiling is not specified; defined as the lowest broken or overcast layer, or the vertical visibility.
- NWS **TAFs** exclude turbulence, icing & temperature forecasts; NWS **METARs** exclude trend fcsts
- Although not used in US, Ceiling And Visibility OK replaces visibility, weather and clouds if: visibility ≥10 km; no cloud below 5000 ft (1500 m) or below the highest minimum sector altitude, whichever is greater and no CB; and no precipitation, TS, DS, SS, MIFG, DRDU, DRSA or DRSN.

March 1996 **UNITED STATES DEPARTMENT OF COMMERCE**
NOAA/PA 96052 **National Oceanic and Atmospheric Administration**—National Weather Service

able winds will be reported in the main body of a METAR. All other variable weather conditions will be reported in the remarks section of the METAR report.

Visibility

The visibility will still be reported in statute miles but will be followed by the notation "SM." So, 2SM will read "two statute miles visibility." Both miles and fractions of miles will be reported; i.e., 2 3/4SM translate to "two and three-quarters statute miles visibility."

The RVR values, when available, will now be included as an integral part of the body of the report following the visibility. RVR will continue to be reported in feet, i.e., RVR34/2800FT. This is translated as "The RVR for runway 34 is 2,800 feet." Sometimes you may see a "M" preceding the actual value, i.e., R34/M600FT means "The RVR reading is less than 600 feet," or R34/P6000FT means "The RVR reading for runway 34 is more than 6,000 feet."

The METAR will also report what the restricting phenomena is if the visibility is less than seven miles. The contraction FG (fog) will be used only if the visibility is less than five-eighths of a mile. If the visibility is greater than five-eighths of a mile, the contraction BR (mist) will be used. However, if they have to add a description to the these phenomena they will use the contraction FG for visibility beyond five-eighths of a mile. Some examples would be: 1/2SM FG, which would read "one-half mile visibility in fog;" 3SM BR would read "three miles visibility in mist;" and 2SM BCFG would read "two miles visibility with patches (BC) of fog. As I stated there are many changes, and subtle nuances, in METAR/TAF!!

Weather Phenomena

Next in sequence will be significant weather phenomena. All the current codes will be replaced with new, two-letter codes. The sequence within the weather phenomena string will be:

- INTENSITY/PROXIMITY
- DESCRIPTOR
- PRECIPITATION
- OBSCURATION
- OTHER

The *intensity* will still be a "-" for light, a "+" for heavy, and no sign to indicate moderate. The proximity will be "DSNT" for distant (more than 10 miles from station), "VC" for vicinity (five to 10 miles from the station), and if there is no indication, it means the phenomena is within five miles of the station.

If it is required, a two-letter descriptor of the precipitation or obscuration will be used such as "SH" for showers, "BL" for blowing, "TS" for thunderstorms. This will be followed by a two-letter code for the precipitation: "RA" for rain, "SN" for snow, "DZ" for drizzle, and/or a two-letter code for an obscuration phenomena, "FU" for smoke, "HZ" for haze, "SA" for sand. Examples would be:

+SHSN = heavy showers of snow

TSRA = thunderstorms with moderate rain

VCFC +TSRAGR = a funnel cloud five to 10 miles from the reporting station and at the station there is a thunderstorm with heavy rain and hail.

You see it can be quite complicated but very comprehensive, with a lot more information for you, the pilot, to make a decision.

Sky Condition

The next item in these reports is the sky condition. This is what we used to see as the first item in the SA report. Under the SA system, the weather observer divided the sky into 10 segments and reported the cloud cover based upon coverage of these segments; e.g., 10 tenths of the sky covered with clouds is overcast, etc.

With the new format the sky is divided into eight segments. As pilots this should be transparent to us, eight-eighths of the sky covered will still be overcast. However, there will be some new terms here also:

"SKC" will indicate the sky is clear of clouds

"FEW" will be up to two-eighths of sky coverage

"SCT" will be three- to four-eighths of sky coverage

"BKN" will be five- to seven-eighths coverage.

For example: FEW050 SCT070 BKN100 would read "Up to two-eighths coverage at 5,000 feet; three- to four-eighths coverage at 7,000 feet; and a ceiling of five- to seven-eighths coverage at 10,000 feet.

Another subtle but very important change is the use of the contraction "CLR." This contraction for clear skies is not what it seems. CLR will only be used in conjunction with ASOS/AWOS observations, and really means "No clouds observed below 12,000 feet." Don't be fooled into thinking "CLR" means clear skies with no clouds. Remember, "CLR" is only associated with automated observations, has a specific meaning, and IS NOT used in TAF.

The National Weather Service will report the cloud types in the METAR reports using the codes "CB" for cumulonimbus clouds, and "TCU" for towering cumulus.

There are two major changes in sky coverage reporting:

A cloud layer will no longer be reported as thin or partial. In an SA, if you have a report of 5,000 feet thin broken with 7,000 foot overcast, the ceiling is 7,000 feet. But in METAR the same conditions will be reported as BKN050 OVC070. The ceiling now is 5,000 feet. This will impact VFR pilots in their flight planning.

Ceilings will no longer be annotated as "E" for estimated or "M" for measured. It is assumed that every pilot knows that the first layer of clouds that is broken or overcast constitutes the ceiling, and therefore it is not necessary to indicate that, thus the new METAR format no longer annotates the ceiling.

Temperature

Temperature will only be in a METAR report and not included in a TAF. In METAR the temperatures will be reported in degrees Celsius (C). If a temperature is below zero it will be preceded with an "M". For example 05/M03 indicates that the temperature is 5°C and the dewpoint is -3°C.

Altimeter

The altimeter setting will still be in inches of mercury, but it will be in four digits and will be preceded with an "A". For example A2992 indicates the altimeter setting is 29.92 inches of mercury.

A METAR is Remark-able

After the altimeter setting portion of the METAR is the remarks section, and it will be preceded with the code, "RMK." Most all METAR will contain some remarks information, and it is very important that pilots read these remarks. As I stated before, the only variable meteorological condition reported in the main body of the METAR is winds. This means if the ceiling or visibility is variable it will only be reported in the remarks section. Let me show you how this could effect a your flight decisions. The METAR you get looks like this:

20010KT 3SM BR BKN012 10/08 A2992 RMK VIS 2V4 CIG 007V1500

This would indicate the winds are from 200 degrees at 10 knots; the visibility is three statute miles with mist; the ceiling is 1,200 feet; the temperature is 10°C and the dewpoint is 8°C; and the altimeter is 29.92 inches of mercury.

With a report like this you might be tempted to go VFR, but the remarks indicate the visibility is two miles variable to four miles and the ceiling is 700 feet variable to 1,500 feet. If you didn't read the remarks and tried to fly, VFR would be very hard to maintain.

The remarks will appear as needed in an order of priority that follows the same sequence as the body of the METAR; i.e., wind remarks, visibility remarks, weather phenomena remarks, and sky condition remarks.

Terminal Aerodrome Forecast (TAF)

TAF will follow the same sequence as the METAR (wind, visibility, weather phenomena, sky condition), but you must know some terms that will help you break the TAF down into time frames. Two terms indicate a permanent change in the weather.

- FM (from) indicates a rapid change in the weather and is followed by a time in hours and minutes. For example, FM1400, means from 1400Z the weather will rapidly change to what is forecast.

- BECMG (becoming) indicates that a gradual, permanent change in the weather will occur, and is followed by two "hour indicators". For example, BECMG 1417, means the weather is gradually changing between 1400Z and 1700Z to what is forecast.

The next two terms are a way for the weather service to refine the weather forecast or say "BUT."

- TEMPO (temporary) indicates that occasionally these conditions will occur, and TEMPO will be followed by two "hour indicators" which define the times when this weather will happen. For example, TEMPO 1216 means that temporarily between 1200Z and 1600Z the forecast conditions will occur.

- PROB40 (probability) indicates that there is a chance of these conditions happening. PROB40 will also be followed by two "hour indicators" for when these conditions might occur. For example PROB40 1015 means that there is a chance of these conditions between 1000Z and 1500Z. But you notice it says PRBO40; this means that there is greater than a 30% chance of this happening and less than a 50% chance. This term will only be used for some form of precipitation. If the chance is greater than 50%, the conditions will be forecast using one of the other terms; that is, you will not see PROB60, PROB70, etc.

There is one other rule for reading TAF that I must tell you about. In the main body of the forecast (the first group of weather) and in a FM group you will always get the wind, visibility, and sky condition, but if no weather phenomena is mentioned it means it is not happening, even if it was forecast in an earlier weather group. BUT, in a BECMG or TEMPO group if one of the weather sequence items are not mentioned, it means **it did not change.** This means for example, if the visibility is not mentioned in a BECMG group for the time you expect to arrive, you must read back in the TAF to find the last place visibility was mentioned. It has not changed. If a weather phenomena was forecast earlier and it will not continue in a BECMG or TEMPO group, they will use the term "NSW" to indicate no significant weather is forecast for this time period. Confused? Look at the TAF example and you will see how these rules apply.

Conclusion

As you can see the weather is definitely changing, and it will require us all to learn a new system for reading the weather, there will be confusion and no doubt frustration on the part of many pilots. But, take comfort in remembering how often you called the Class B airspace by its old name, TCA, and how you now so easily you use Class B today. We have all climbed that learning hill and survived. Now it is time for another.

Good luck!

Mr. Benhoff is the Safety Program Manager at FAA Cleveland, Ohio Flight Standards District Office (FSDO). If you are not up on METAR/TAF, we urge you to attend an Aviation Safety Program seminar in your area that deals with this subject, read section 7-1-29 of the Aeronautical Information Manual (AIM), *or contact the Air Traffic Aviation Weather Division, ATR-200, (202) 366-4956. One of the keys to understanding and translating a METAR/TAF is the item we are colloquially calling the METAR/TAF "Secret Decoder Card," except it's no secret. A reproduction of it is at the beginning of this article; your Safety Program Manager will have limited copies; and a copy along with a METAR/TAF training presentation and lesson plan are available and downloadable from the Aviation Safety Program Home Page at:* http://www.faa.gov/avr/news/metar.htm


The Wright Brothers' First Flight at...College Park, MD?

Continue from Page 19

served to lighten the methodical pace of the instruction and the seriousness with which the aviators undertook their remarkable flights.

Wilbur had installed an additional set of levers on the aeroplane next to the seat that was occupied by one of his two students. The levers did not interfere with Wright having control of the machine at all times. In teaching Lahm and Humphreys, he allowed them to take control of the airship at favorable times during the flights. The flights were of relatively short duration, although by October 21, the newspapers reported that Wright had taken up Lieut. Humphreys for 27 minutes during which the student handled the machine throughout most of the flight and made his first landing.

Landing and taking off at that time was quite different than it is now. The 1909 Signal Corps plane did not have wheels. Its chassis design was almost sled-like in appearance, with its skids allowing the aircraft to slide along the ground upon landing, much like a sled. For takeoff and even for transporting the airship to and from the shed, the enlisted men brought out two large-wheeled devices that snugly fit under each of the two lower wings. This enabled the enlisted men to pull the aircraft to wherever the plane was going to be set up to take off and then to return it safely to the shed at the end of the day.

Wright's instruction of the two young lieutenants progressed smoothly throughout October. He was complimentary of Humphreys' early abilities, as reported by *The Evening Star* (October 18, 1909):

...he was progressing finely and was one of the most satisfactory pupils that he has had thus far. "Lieut. Humphreys is a very daring automobilist and is accustomed to handling a gasoline engine and steering wheel, so that his chaperoning an aeroplane through the unobstructed air is not such a trick, seeing that he is used to dodging all sorts of wheeled vehicles on bad Maryland roads."

Around this time, another officer, Lieut. Benjamin Foulois, who was to initially have been one of the two students to receive instruction, returned from France where he had been representing the U.S. Army at an aeronautical congress. Though it was not in his contract to do so, Wilbur agreed to give flight instruction to Foulois as well, commencing on October 23. This was not the young lieutenant's first flight in the Wright machine, however. He had previously made several flights at Ft. Myer with Orville Wright as part of the government trials for the aeroplane's acceptance, most notably the speed test to and from Alexandria, VA.

By the 26th of the month, Lahm and Humphreys were ready to solo, and several hundred people were in attendance at the College Park field for that event. Lieut. Humphreys was the first pupil to take the biplane in the air, starting off from the monorail at 8:15 a.m. He circled the field for two minutes and, while making a landing, hurdled over the stump of a tree with the aeroplane, bringing forth a commendation from both the large group of spectators and Wilbur.

After the flight, he said to his student:

I suppose I ought to congratulate you, but it is such a matter of course. You handled the machine very well. (The Washington Post, *October 27, 1909)*

The Evening Star later said that "it was very difficult to get Wright to say anything about the progress of his pupils, but he admitted that Humphreys was handling the machine alone rather sooner than anybody else he had taught."

Immediately after Humphreys, Lahm made a similar solo flight of seven minutes with another beautiful landing.

Wilbur must have been buoyed up by the success of these flights, because the following day he made front page headlines by offering to take a friend of his sister Katherine and of Lieut. Lahm for a flight. What made this flight so unique was that the friend was a woman, Mrs. Van Deman, and it seemed unlike the extremely cautious Wilbur to make such a flight.

Wilbur Wright and Lt. Humphreys preparing for take off.

Mrs. Van Deman was an aviation enthusiast, having attended the trials at Ft. Myer and having been present at the College Park field on a number of occasions. It was only after Ms. Van Deman obtained permission (keep in mind this was 1909) from her husband Capt. Ralph Van Deman of the 21st Infantry, that Wilbur consented to take her for a flight.

She was a model passenger and the papers further reported that her husband was mighty glad that Wilbur took her up, for this would insure peace in his family! Wilbur was evidently as uncommunicative as usual after the flight, and had no comment for reporters.

During the next few days, Wilbur continued to observe his students in flight with Lieut. Foulois continuing to get personal instruction from Wilbur. On October 31, while Humphreys was piloting the aeroplane, a tooth from one of the cog wheels on the magneto broke and the motor came to a stop. The new pilot was able to control the aeroplane with splendid skill and glide it to the ground. Wilbur made some temporary repairs but sent to the Wright factory in Dayton for a new part. In the meantime, Wilbur decided to leave the field for a short time to go up to New York to take care of some legal business. It was also announced that Orville would be returning home to meet up with Wilbur at either Dayton or College Park and that his flight exhibitions throughout Europe had been quite a success.

Lieut. Humphreys, who had been detailed to the aeronautical unit from the Engineer Corps, had reached the end of his term and had to return to the Corps. A few days later, Lieut. Lahm also received orders detaching him from the Signal Corps, forcing him to rejoin his original cavalry unit. Both men were reluctant to go back to their original units, but the regulations at that time prescribed a time limit during which officers of line organizations might serve on special details (Manchu Law), so there was no way around it.

Lahm and Humphreys were trying to get in as much flight time as possible before the end of their stay, and they had made several flights over the past week together, or accompanied by Lieut. Foulois, who had not yet soloed. On November 5, the wind was low and it was a perfect day for flying. They had only been in the air five short minutes when, during a sharp turn, the left-hand wing dipped just enough to touch the ground and resulted in a violent turn of the machine to the right. The right wing was broken, as was the right skid. The material covering of the lower left wing was also badly torn, but, fortunately, both new aviators were fine.

Wilbur was still in New York at the time, so he could not comment on the damage to the plane, but the news of the accident was treated with relative calm by both the War Department and the press, who could usually be counted on to capture the high drama of what was going on at the College Park field and turn it into headlines. However, this time it was not to be so. Wilbur had garnered the respect of not just these reporters and the hundreds who had witnessed these early instructional flights, but the entire city of Washington D.C. as well.

Though it was not in the Wright brothers contract to do so, Wilbur and Orville offered to fix the aeroplane for the government. At this point, Signal Corp No. 1, the new government aeroplane, was moved from the airfield and stored temporarily in the balloon shed at Ft. Myer. Both Lieuts. Lahm and Humphreys were immediately detailed to their regiments at Ft. Riley and the Washington Barracks, respectively. The enlisted men at the airfield were sent to either Ft. Myer or to accompany Lieut. Foulois to Sandy Hook, NJ to assist him with the proposed tests of firing on captive balloons.

This ended government aeronautical activities at the College Park Airfield for 1909. The Aeronautical Unit of the Signal Corps was left with one damaged aeroplane, one un-soloed pilot, and a detachment of enlisted men. Fortunately, Lieut. Foulois, who was the only officer left with the Signal Corps who had received some training at College Park, was eventually sent to Ft. Sam Houston with the aeroplane and nine of the enlisted men, which permitted him to get considerable more practice to earn his "wings" during the winter.

Although the government had discontinued its use of the College Park field, it was to forever be associated with aeronautical activities of one form or another. Civilian aviators immediately received permission to lease the grounds, and of course the Signal Corps returned the following year to open the government's first military aviation school. Significant firsts in aviation—the first machine gun shot from an aeroplane, the testing of the first bomb-dropping device, the first Postal Service Airmail flights, experiments with vertical flight, and radio navigational aids for blind flying—are all part of the history of this wonderful field. The most significant names in aviation history from the Wright brothers and Glenn Curtiss to "Hap" Arnold, Thomas DeWitt Milling, Charles Chandler, Al Welch, Tony Janus, and even Paul Garber, among many others, live on there. It started with the Wrights and continued on from there...Oh, if this field could only talk!

Ms. Allen is the Director of the College Park Aviation Museum (part of the Maryland-National Capital Park and Planning Commission's Natural and Historical Resources Division). A new 26,000 square-foot museum is currently under construction and scheduled to open in June of 1997. If anyone is interested in more information on the museum or has early aviation and/or College Park Airport artifacts they would like to loan or donate, the museum can be contacted at 1909 Corporal Frank S. Scott Drive, College Park, MD 20740.

• Current Charts

As president of the American Bonanza Society, an organization with over 9,000 members, I have been asked which FAR specifically require, or what is the regulatory basis for the requirement that a pilot, operating a piston-powered aircraft weighing less than 12,000 pounds, under FAR Part 91, have with them on board current charts for VFR or IFR operations.

I understand that violations have been filed against pilots for not having current charts with them, and as a matter of fact, for not having a current database in their Loran or GPS, although operating under VFR.

I am familiar with FAR § 91.503; however, that applies to large or turbine-powered aircraft.

Barrie C. Hiern, Sr.
Rome, GA

The basis for your question, in numerical order, is FAR § 91.7 Civil aircraft airworthiness; § 91.9 Civil aircraft flight manual, marking, and placard requirement; § 91.13 Careless or reckless operation; and § 91.103 Preflight action. FAR § 91.103 requires a pilot to become familiar with all available information concerning a flight. Much of this information is contained in FAA-approved charts. Approved charts then list the date they become obsolete for use in navigation. Use of obsolete charts after that date then violates the "all available information" requirement for a given flight.

The use of database equipment without a current database not only violates the "all available information" concept, it could make that device unairworthy in accordance with its and probably the aircraft's approved flight manual. This situation could then make the aircraft unairworthy. The use of an unairworthy piece of equipment and possible unairworthy aircraft and the use of obsolete charts then could become a matter of enforcement action based upon the above FAR that could include the question of careless or reckless operation under FAR § 91.13.

The easy answer for this question is for all pilots to use current charts and databases. This also means pilots should update their VFR and IFR charts in accordance with the latest electronic and published NOTAMS.

• More on Soviet Women Pilots

Re: "Nachthexen" in *FAA Aviation News*, March 1996. If you haven't read it, I suggest you read *A Dance With Death* by Anne Noggle, Texas A & M University Press, published in 1994.

Hibouathe@aol.com

I ordered this book as soon as I received this e-mail from our FAA Aviation News *home page. (It is not on the shelves of most bookstores, but any bookstore can special order it from the Texas A & M University Press.) Ms. Noggle is herself a Women's Air Service Pilot, and she collected dozens of first person interviews with and photos of many surviving Soviet women pilots in 1990 and 1992. The book is a collection of these narratives along with lots of then-and-now photos of the women. It is a fascinating read, and I wish I'd had it before writing the article. The first-person accounts come across as surprisingly modest though their patriotism is easy to discern.*

The title comes from a quote from Serafima Amosova-Taranenko, a pilot and deputy commander of the 46th Guards Bomber Regiment:

"To fly a combat mission is not a trip under the moon. Every attack, every bombing is a dance with death."

—The Editor

• Gray Matters Photo ID

I really enjoyed your article "Gray Matters," in the March 1995 issue of *FAA Aviation News*. As usual, it was very informative. I am a general aviation pilot and CFII in addition to being a military pilot and have experienced both sides of the airspace issue. It's good to see that many of the prominent aviation publications have had similar articles lately, as this area needs more discussion and understanding as the military tries to maintain readiness levels with more limited resources, including training airspace.

I do have on question for you. Do you know the source of the F-16 photo that begins your article? This specific aircraft used to be assigned to my unit and I am curious how it ended up in your magazine. Judging by the travel pod under the left wing and the Sidewinder missile on the left wing tip launcher, this jet appears to be arriving at another base for dissimilar air combat training deployment. If I am not mistaken, the runway at the bottom center of the photo is the F-106 drone launch runway at Tyndall AFB, FL, a location we deployed to often for this training. I know that you are busy, so if you do not have the time to find out, that's okay. In any case, keep up the good work.

David J. Stephan
Wichita, KS

The photograph was provided as part of a collection sent to us by the U.S. Air Force. We don't know where it was taken.

• Awesome as Alaska

Your April issue is as awesome as Alaska itself. Exciting, page after page. Congratulations!

David A. Moffitt
Greenville, DE

Thanks; we thought it was pretty spiffy, too.

Our many thanks to the contributors of the wonderful photos, but all the credit goes to our resident Leonardo da Vinci, Designer/Assistant Editor A. Mario Toscano.

PREVENTING RUNWAY INCURSIONS VIA THE WWW

Three highly informative FAA brochures designed to prevent runway incursion are now available for downloading on the Aviation Safety Program's home page on the World Wide Web. The three brochures can be downloaded as .pdf files, using Adobe Acrobat.

The brochures are "Land and Hold Short Operations," "Reducing Runway Incursions," and "Surface Movement Guidance and Control System." Please take a look and download this important safety information.

The official Aviation Safety Program home page is located at:
http://www.faa.gov/avr/news/asphome.htm

If you have any trouble downloading these files, please e-mail the Webmaster indicated on the home page for help.

ALASKA INFO UPDATE

We've had many, many excellent comments about our special Visiting Alaska issue (April 1996) but as inevitably happens, by the time something gets into print, there's a change. So, here is an update and some clarification on some items.

The phone numbers for the Richmond and Edmonton offices of Transport Canada are (604) 666-9517 and (403) 495-2258 respectively.

Anchorage is not the Automated Flight Service Station (AFSS); Kenai is.

The photo on page 22 which we identified as Shishmaref (which is what was written on the color slide provided us) is actually Ulim.

We've had one person write in and say the photo of Kodiak on page 24 was flopped, but the photographer says it wasn't. Ditto for the picture of Juneau on the back cover.

The address and phone number of the FAA's Aircraft Registration Branch is now AFS-750, Mike Monroney Aeronautical Center, P. O. Box 25504, Oklahoma City, OK 73125; (405) 954-3116.

On page 12 we indicated that Canadian firearms law prohibited carrying a firearm into Canada, but Alaska requires a firearm as part of the mandatory survival gear. Actually, Canada forbids handguns, shotguns, and automatic weapons. You can bring a rifle into Canada with appropriate safety precautions, such as the bolt removed, unloaded with ammunition carried separately, and a lock installed on the trigger guard. Also, in Canada the weapon must be carried in the aircraft "out of sight." If you have any questions about this, contact Chris Clark of the Royal Canadian Mounted Police, Firearms Registry and Administration Office, (403) 993-6218.

The beautiful photographs of Petersburg and Sitka on page 2 and two others on page 5 should have been credited to Ms. Patricia Mattison, FAA Safety Program Manager in the Juneau, Alaska Flight Standards District Office.

STRICKEN FROM THE LIST

A reader asked if his name could be removed from the FAA's mailing list because he didn't want any more aviation "junk" mail. In checking with the FAA Airmen Certification Branch in Oklahoma City, we discovered the answer is a qualified yes. Yes, a name can be removed, but any certificate action such as a new medical or airman certificate may put your name back on the list. If that happens, you must resubmit your request to have your name removed from the list.

Anyone whose name is removed should be aware that they will no longer receive any FAA Aviation Safety Program information or other such information that is distributed from the FAA's mailing list. If you remove your name from the FAA's mailing list, that does not mean that it is removed from every aviation organization or business that already has it and who maintains their own mailing lists.

Airmen wanting to have their name removed from the FAA's mailing list should write to FAA, Airmen Certification Branch AFS-760, P.O. Box 25082, Oklahoma City, OK 73125. Please include your full name, address, airman certificate number/s, Social Security (if used), and telephone number. Please make sure you sign your request.

NEW ORGANIZATION TO FOCUS ON PARACHUTE RESEARCH

A new, non-profit organization promoting research and development of parachute technology has recently been formed. Called the National Parachute Technology Council (NPTC), it is composed of researchers and technologists from government, industry, and academia.

NPTC's primary goal is to identify key parachute research needs connected with the use of parachutes on 21st century aerospace systems. NPTC is also interested in promoting collaboration among parachute researchers to reduce development costs. Finally, NPTC will act as an advocate for funding of parachute R&D projects deemed important for maintaining the U.S. leadership in parachute technology.

Members of NPTC are currently working on a document that will identify the most important aerodynamic, structural, and operational problems facing present and future use of deployable gliding systems, such as ram-air parachutes, folding wings, and any other high-glide systems that unfold for deployment.

Any individuals or organizations interested in discussing parachute R&D issues with NPTC should contact Dr. J. Potvin at the Department of Science and Mathematics, Parks College of Saint Louis University, Cahokia, IL 62206; (618) 337-7500, ext. 424; potvin@sluaxa.slu.edu .

KINGS EXTEND AVIATION RECORD

On December 15, 1995 with new free balloon ratings added to their pilot certificates, aviation video instructors John and Martha King became the first husband-and-wife team to each hold all of the possible pilot category and class ratings.

Earlier the Kings had each claimed all seven possible flight instructor ratings, but lacked the airship and free balloon ratings required to complete their set of pilot ratings which include airplane multi-engine land and sea, single engine land and sea, instrument airplane and helicopter, helicopter, gyroplane, airship, free balloon, and glider.

We are really hooked on anything that flies," says Martha, "and each class of aircraft has brought its own special pleasures."

"Doing all of this learning and taking all of these checkrides," says John, "has reminded us of the effort every pilot makes in learning to fly and in staying proficient."

Flying some of the unusual aircraft has been especially fun for the Kings. "It's fun to call an airport for advisories in a gyroplane and have them call back and say, 'You're a what?'," comments Martha.

NEW RULES ON AIRCRAFT ICING

In May the FAA issued a series of new regulations instructing pilots how to recognize specific hazardous icing conditions and requiring them to quickly and safely exit these conditions when encountered.

Eighteen new airworthiness directives (AD) affect 29 different aircraft models with unpowered controls and pneumatic deicing boots. A total of 4,430 aircraft are affected.

The AD require aircraft flight manuals to provide pilots with instructions for identifying severe icing conditions that exceed the icing envelope and to offer instructions on how to exit such conditions safely.

Pilots of the aircraft cited in the AD are required to look for certain visual cues when flying in icing conditions, such as icing on side windows or abnormal icing buildup on the upper and lower surfaces of the wing, behind deicing boots, or on the propeller spinner further back than is normally observed. If these visual cues exist, the pilot must report these conditions to air traffic control and request priority handling to exit the area by changing altitude or course. Pilots are required to follow the "exit" procedures outlined in the AD for their aircraft.

AD 96-09-23 affects the following aircraft:

- Aerospatiale ATR 42/ATR-72 series
- Beech 99/200/1900 series
- British Aerospace HS 748
- CASA C-212/CN-235 series
- Cessna 208/208B
- deHavilland DHC-6 series
- deHavilland DHC-7/DHC-8 series
- Dornier 228 series
- Dornier Model 328-100 series
- EMBRAER EMB-110P1/EMB-110P2
- EMBRAER EMB-120 series
- Fairchild Aircraft SA226/SA227 series
- Fokker F27 Mark 100/200/300/400/500/600/700/050 series
- Jetstream 3101/3201
- Jetstream BAe ATP
- Jetstream 4101
- Saab SF340A/SAAB 340B/SAAB 2000 series
- Short Brothers SD3-30/SD3-60/SD3-SHERPA series

For any additional information, contact Kathi Ishimaru concerning transport aircraft, (206) 227-2674, or John Dow on small airplanes, (816)426-6932.

BATTERY CORROSION

There are many companies who now manufacture battery packs for use in aircraft emergency locator transmitters (ELT). Many instances have come up where ELT batteries were found to be leaking. Some with as little as fifteen hours of aircraft operation and, in most cases, before the battery expiration date. Many of these were serious enough that the ELT was corroded beyond repair.

Statistics have shown that too often ELT's do not activate during actual aircraft accidents. The FAA and NTSB both say that this may be due to poor ELT maintenance. An inspection of the ELT should not be accomplished only when the battery expiration date has passed. A thorough inspection should be done every 100 hour and annual inspection.

One of the ways for the FAA to get a handle on the problem is through the malfunction or defect report program. This does two things: first it lets other operators know a problem may exist through the airworthiness alerts. And secondly, it helps build a data base upon which the FAA can base its recommendations. If you see any problems with ELT's, please send in a malfunction or defect report to your local FAA FSDO.

ANSWER TO MAY/JUNE 1996 AVIATION TRIVIA QUESTION:

Question: Who was Gen. Chuck Yeager's Army Air Corps back-up had he not been able to make the flight of the Bell X-1?

Answer: Bob Hoover

Thanks to everyone who participated, and look for future aviation trivia contests. Anyone who has interesting aviation trivia questions can fax them to (202) 267-9463 or e-mail them to Phyllis_Duncan@mail.hq.faa.gov . Remember, please include the answer.

The Washington Post

James K. Glassman

False Fear Of Flying

In one minute of unimaginable horror, a ValuJet DC-9 nosedived into the Everglades shortly after it took off from Miami on May 11. All 110 people aboard were killed.

Assuming May 11 was a typical day on America's highways, more people were killed in motor-vehicle crashes that Saturday than in the crash of ValuJet Flight 592.

Air crashes are so terrible, gruesome and mysterious, and so many innocents are killed so quickly, that we lose sight of the actual risks involved in flying. Those risks are tiny—and getting tinier all the time.

Over the past 15 years, 93 people on average, were killed annually in U.S. commercial airline crashes. By a remarkable coincidence, that's the same number killed by lightning. Meanwhile, 12,000 die annually in accidental falls, 4,000 by drowning, 6,000 by poisoning, 40,000 in motor vehicles, 30,000 by suicide, 25,000 by homicide.

Over the past 10 years, there has been just one fatality for every three million people boarding a U.S. aircraft in scheduled service, including commuter planes. Your chances of dying in a car or taxi are 37 times greater, per mile, than on an airplane.

Of course, air safety can always improve. And a crash such as the one in the Everglades usually brings changes for the better. Accidents involving wind shear led to better radar. On-board fires led to smoke detectors. And after several crashes, training for commuter pilots has been upgraded.

But crashes also induce hysteria. For example, since ValuJet charges as little as $39 a flight, one immediate reaction among journalists and politicians to the May 11 tragedy was to conclude that low-cost airlines skimp on safety. An internal Federal Aviation Administration (FAA) report surfaced in the Chicago Tribune that showed that ValuJet had an accident rate 10 times higher than that of established carriers.

True, but we're talking about high standards and small numbers. For the period studied (March 1990 to March 1996), ValuJet had five accidents, none fatal, in 164,000 departures. By comparison, Northwest Airlines had five accidents in 3.3 million departures.

What was remarkable about the FAA data was that nine of the 10 discount airlines (all but ValuJet) studied had had no serious accidents (involving injury, death or major damage to a plane) in the six years. None. Even with minor accidents included, the low-cost airlines had the same accident rate per 100,000 departures (0.3) as the large carriers. Southwest, the largest of the discounters, has never had a fatality. In the FAA study, it had a lower accident rate than United, American and Delta.

In fact, since the airlines were deregulated in 1979 and competition increased, air travel has become safer—not more dangerous. The Air Transport Association reports that in the 16 years prior to deregulation, there was one fatal accident for every 814,000 commercial flights. In the 16 years since, there's been one for every 1.8 million flights.

Federico Peña, the secretary of transportation, was right to brag, in a speech last month, about the success of low-fare airlines...."In cities where low-cost airlines fly, Americans pay $54 less per flight," he said, noting that these new carriers had saved Americans $6.3 billion last year and attracted an additional 47 million passengers.

But at a hearing last Tuesday, [a senator] ridiculed Peña, telling him to "get off this 'Whooppee, we've saved $6.3 billion line after we look around and see 110 dead.'" [The senator] was trying to make a connection between low cost and low safety. None exists.

Crashes also lead, inevitably, to calls for stronger measures by federal safety agencies. But relying too heavily on the FAA would be a mistake. Some 20,000 commercial flights take off every day in the United States. With all this activity, the first line of defense against accidents has to be the airlines themselves. They certainly have the incentive.

I'm not saying that the FAA should go out of business, or even be cut back. But augmenting its power won't necessarily reduce accidents....

In the meantime, let's stop exaggerating the dangers of flying. Safe, inexpensive air travel is one of the great successes of our age. It brings families together, makes business dealing easier, gives us more time for leisure, lets us see the world. And every hour spent in a plane, rather than a car, increases your longevity.

Yes, the plane you board tomorrow can fall out of the sky and kill you. That's a risk. So is being struck by lightning.

U.S. Department
of Transportation

**Federal Aviation
Administration**

800 Independence Ave., S.W.
Washington, D.C. 20591

Official Business
Penalty for Private Use $300

DO NOT DELAY -- CRITICAL
TO FLIGHT SAFETY!