September 1994

FAA Aviation News

A DOT/FAA FLIGHT STANDARDS SAFETY PUBLICATION

G.A. Renaissance

U.S. Department of Transportation

Federal Aviation Administration

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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 safety in the air 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: $15.00 ($18.75 foreign) for one year; $30.00 ($37.50 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) 512-2303; FAX: (202) 512-1268. To keep subscription prices down, the Government Printing Office mails subscribers only one renewal notice. You can tell how many copies are left in your subscription by checking the number that follows "ISSDUE" on the top line of your mailing label. For example, when this number is 003, it means you have three issues left in your subscription, and GPO will send you a renewal notice. The number 000 means you have received your last issue. To be sure that your service continues without interruption, please return your renewal notice promptly.

FAN SMITH 212J ISSDUE003 R 1
JOHN SMITH
212 MAIN ST
FORESTVILLE, MD 20747

September 1994

FAA Aviation News

VOLUME 33 • NUMBER 6

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On the Cover: *Is there a renaissance for general aviation? See page 4. Photo by H. Dean Chamberlain*

Will primary category aircraft reduce the cost of flying? See page 8. Photo courtesy of Aviat Inc.

Do you know what this person is doing wrong? See MedicalSTUFF on page 17.

"There Is No Airplane Fairy"

Remarks at the Symposium on General Aviation, Ingredients for a Renaissance

by William Monroe

Mr. Monroe presented the following remarks at the first Symposium on General Aviation held at the Smithsonian Institution on May 19, 1994. His remarks do not necessarily reflect Federal Aviation Administration policy or official position and are strictly his own. However, they contain a feast for thought.—***Editor***

I love the title of this symposium because it presumes there will be a renaissance in general aviation. I hope we can all agree on this point—THERE WILL BE A RENAISSANCE, if for no other reason than man has always yearned to fly—from before the days of the vagabond barnstormer who flew wherever fancy took him, slept under the wings of his biplane, and hopped passengers for a couple of bucks to earn a living; to that fresh-faced kid barely out of school who flew hairy-chested *Mustangs* and *Corsairs* against the *Zero's* and the best of the Luftwaffe, who muscled impossible loads over the Hump, and braved the flak and fighters in the big iron to bring the Axis to its knees.

Yes, man has always yearned to fly and today the fascination is alive and well, even though younger generations have become somewhat desensitized to its adventure and romance. You see, these newer pilots tend to look at aviation the way older generations look at railroads—a mode of transportation. Most can't remember their first airplane ride because, at a very early age, the airlines took them to see Grandma and, in the years after, it's how they went on vacation or traveled to and from school.

But the lure of the skies is still there, and it always will be. I believe that the percent of the population that yearns to fly is the same today as it has always been. And for that reason and that reason alone, there will be a renaissance in general aviation. However, the extent to which we all will benefit from this renaissance remains somewhat uncertain. You see, I think we have been less than frank with ourselves when it comes to understanding and dealing with the depths of our woes. And until we do, real, sustained recovery will remain an elusive dream.

There is no single answer or action that will make things "all better." Or should I say, "There is no airplane fairy." Our present dilemma is the culmination of years of a dependency, an addiction if you will, to the taxpayer's checkbook. Governments, both as customers and benefactors, have been the primary source of our prosperity. As a consequence, our industry only scarcely learned and practiced how to compete in the private sector. We don't understand our customers and their values, their needs, and their wants, and we don't compete well for their discretionary income.

In order to understand our inadequacy to compete, we must first understand the roots of our dependency. Governments have been and continue to be big customers even with the end of the Cold War. They buy aircraft in bulk, they buy spare parts and ground support equipment, and they buy technical service and maintenance agreements.

H. Dean Chamberlain

Government Involvement

And governments have been our biggest benefactors. They have trained most of the commercial airline pilots flying today and most of the aircraft buyers of the 1970's. They have provided government facilities to conduct research and development and have provided enormous grants for capital equipment and research studies. They have subsidized the cost of flight training through veterans' benefits and grants-in-aid . . . .

And governments own and maintain most of our airports and the facilities thereon and provide the logistical services required to keep them operational . . . . Whether we like it or not, we are, in a sense, welfare recipients.

Now, before I mislead you, let me say some of government's role in our

G. S. Livack

business is welcomed and necessary for the good of our industry and the nation as a whole . . . . But the point is we have been so dependent on the government's ability to spend money that we only paid lip service to learning and practicing the skills necessary to compete in the private sector. The result has been we have developed a complacency. We act as though we have some divine right to exist and that we are exempt from the cardinal rules of free enterprise . . . . Let me cite some examples of our complacency.

Private Sector

First, we build products that have 30- to 50-year useful lives. The nature of our products and the regulatory maintenance requirements almost preclude any degree of natural obsolescence . . . . We should have anticipated the consequences and the appropriate response to this reality. I believe we didn't because we were too distracted with more profitable customers.

Our complacency has made us very comfortable with conventional wisdom and traditional methods. The world has changed around us, but we seem to be caught in a time warp. How did we respond to the deregulation of the airlines? Quite simply, we didn't. It was business as usual.

And in 1978, the peak production year for piston engine aircraft, we didn't have many competitors for the consumer's discretionary income. We didn't have $100,000 recreational vehicles, $50,000 automobiles, boats, personal computers, exotic vacations, and the explosion of vacation condominiums. Our homes were where we ate and slept; they hadn't yet become our personal entertainment centers. And consider this, potential buyers weren't supporting two or more families. And most of the buyers were from single income households where the man of the house was the sole breadwinner. In that time, whatever the "old man" wanted, he got.

Today, most families have dual incomes where financial decisions are made bilaterally, not unilaterally. Unless both wife and husband are pilots or at least both enjoy flying, the decision to buy an airplane becomes a lot more complicated.

And take a close look at the lifestyles of Americans today. Their lives are fast-paced and filled to the brim with activities and responsibilities. They want convenience and social interaction with those who share the same values and passions. They have been trained by other industries to expect superior customer service and immediate gratification, and more importantly they are prepared to pay for this attention. They bring these expectations into our industry only to be disillusioned and disappointed.

Flight Training Cost

Flight training is a perfect example. What has changed in flight training over the past 25 years? Only two things I can think of; first, the aircraft are much older, and second, the cost of learning to fly is much cheaper. That's right! On a constant-dollar basis, it's less expensive to learn to fly in 1994 and it was in 1969.

The Consumer Price Index has risen four and a half times since the late 1960's. If you do the math, you'll discover that a private license today should cost about $5,500 for 40 hours of instruction. However, the average price in today's market is about $3,500. But to make matters worse, the cost of learning to fly in the late 1960's was probably subsidized by our reliance on government spending. In other words, the price probably didn't reflect the actual costs. That means learning to fly in 1994 is an even better bargain than the numbers show it to be.

But who has time to learn to fly, and why do we sell only the destination and not the trip? We still make students endure a time-honored ritual of initiation just to test their mettle and to make sure not just anyone joins our exclusive club. If we would work half as hard getting new participants as we do making sure they don't get in, this symposium wouldn't have been necessary.

Aircraft Maintenance Cost

And speaking of prices, what about shop rates for aircraft maintenance. The average rate in the country today is about $35 per hour. But go down to your local auto dealer and see what they charge—about $60 per hour for unlicensed mechanics with minimal liability. There is something terribly wrong with this picture.

Again, the culprit is our complacency. Instead of constantly striving to improve and enhance our products and services, we became comfortable with the status quo and marketed our offerings like they were pork bellies. Instead of raising the ante for earning a good living in aviation, we created a superhighway that allowed countless new entrants who were more interested in flying than profits. And what was our response—hold prices down and absorb cost increases. Whoever first coined the phrase, "We lose a little bit on every sale, but we make it up in volume," was probably in the aviation business.

Piper Aircraft Corp.

Product Liability

And there is another consequence of our complacency, one with which we are all too familiar. We allowed our defense lawyers, our insurance companies, our financial experts, and our own obsession with short-term earnings and the value of our stock to hide the long-term consequences of out-of-court settlements. Instead of aggressively defending ourselves against frivolous lawsuits, we settled before trial because it was cheaper than projected defense costs. We inadvertently created another superhighway—only this time with a dinner bell.

As this problem mushroomed, it became such an obsession with the industry and our customers, we couldn't differentiate between different degrees of fact. For example, it is commonly believed there is $30,000 to maybe $80,000 in products liability costs in every new airplane built today. This may be true for those manufacturers with long liability tails, but it is not true for those who don't. The consequence: Customers don't buy new airplanes today because they don't believe the price reflects actual manufacturing costs. They're worried they may find themselves upside down on their financing if new aircraft prices were to suddenly decrease. Nobody wants to be made the fool!

Renaissance Recipe

Okay, enough examples of complacency. Our purpose today is to identify potential ingredients for a renaissance. I have a few.

First, let's get this notion out of our heads that sometime in the future there will be an aircraft in every garage. It may happen, but not in our lifetimes. Learning to fly requires a serious commitment of time and energy which most people either don't have or are unwilling to give. And from the financial perspective, flying is out of reach for the majority of the population—it always has been. So let's top trying to sell it as economical and affordable for everyone.

Second, let's try to get more women involved in aviation. The days of my vagabond barnstormer and fresh-faced bomber pilot are gone—forever. Half the population of this country is just waiting for an invitation.

Third, for everyone who earns a living in this business, start obeying the cardinal rules of business. If you don't know what they are, go to school and learn them or hire someone who knows them, but don't just sit there. Do something. Get in or do us all a favor and get out.

Fourth, let's bring back the concept of shared ownership and shared risk. We have the technology today to make partnerships, aero clubs, and lease-backs safe and secure—operationally and financially.

Fifth, if we want to conquer the issues of products liability, then let's take matters into our own hands. Treat this issue like a battle strategy against a larger opponent—divide and conquer. If anyone remotely associated with this industry uses the services of an attorney either regularly or occasionally, call your attorney and ask him or her to do the following: Send you a letter that states unequivocally their endorsement for the statute of repose and tort reform in products liability. Tell them to send copies to their elected officials . . . . Let's put these rascals at odds with each other. If your attorney refuses to comply with your request—FIRE HIM OR HER OR THEM. Trust me, you'll be able to find another attorney.

Concluding Thoughts

I am a commercial gladiator—I must have an arena in which to compete and a formidable competitor to keep me at my best. But today there is no arena. My potential customers are in a holding pattern without an expected further clearance. Or to put it in stronger words, they are being held hostage, the industry is being held hostage.

On the one hand I am competing against a ghost; on the other, a system that allows a player to remain in the game without a stake. In the meantime, there are casualties all around us, and no one seems to notice. And how many more will fall before we become mad as hell and decide we're not going to take it anymore. Whoever defined insanity as "doing the same things over and over again and expected different results" was also probably in aviation.

Our future is in our hands—not the hands of those who walk the middle ground, who perpetuate the status quo, and who compromise and equivocate. Creation of wealth is the role of the private sector, and it's high time we get on with it. The "Airplane Fairy" doesn't exist and never did.

In the end, I hope we will be measured and remembered by the resolve we exhibited in overcoming our adversities. ■

Mr. Monroe is President of the U.S. General Aviation Division for Aerospatiale, Inc.

Phyllis Anne Duncan

The Renaissance of General Aviation

by Phyllis Anne Duncan, *Editor*

Renaissance: *noun meaning rebirth, revival; the transitional movement in Europe between medieval and modern times beginning in the 14th century and lasting into the 17th Century and marked by a humanistic revival; a movement of vigorous artistic and intellectual activity.*

The Smithsonian Institution in Washington, DC is the height of intellectual activity in this country, so its National Air and Space Museum was the logical choice for a scholarly symposium on the renaissance of general aviation. Representatives from all aspects of the general aviation industry and from several government entities with aviation interests came to a "Symposium on General Aviation—Ingredients for a Renaissance." The symposium was sponsored by the National Air and Space Museum, *Air&Space* magazine, the National Aeronautics and Space Administration, and the American Institute of Aeronautics and Astronautics.

The purpose of the symposium was to discuss the future of general aviation and factors of major consequence to its prospects. The sponsors brought together experts in general aviation as speakers, among them Bruce Holmes of NASA, Bruce Landsberg of the AOPA Air Safety Foundation, Paul Fiduccia of SAMA, Ed Stimpson of GAMA, Robert Wright of the FAA, various manufacturing executives, Phil Boyer of AOPA, and Tom Poberezny of EAA, among others. U.S. Representative James M. Inhofe (R.-Ok.), a commercial pilot and aircraft owner, also addressed the attendees.

The symposium was divided into five parts, representing the future and the present of the general aviation industry: What's Next? Advanced Cockpit Technologies; Wanted: A Fair Deal for Aviation in Policy and Law; General Aviation Manufacturers: Hard Times, Winning Strategies; The Consumer Perspective; and Turning Public Interest into Pilots.

Bruce Landsberg, Executive Director of AOPA Air Safety Foundation, detailed to the attendees what he called a "Pilot's Wish List for the General Aviation Cockpit."

1. ***Annunciators***—Pilots need good information on fuel status, so a "low fuel" annunciator, similar to what is standard on most automobiles now, should be on future general aviation airplanes and even retrofitted on the current fleet.
2. ***Attitude Indicators***—Give no warning of failure. We need an attitude indicator with a pop-up warning flag.
3. ***Reminder Bugs***—More!
4. ***Angle of Attack Indicator***—Important for all new and existing airplanes.
5. ***Miniaturization of Gauges***
6. ***Improved Cockpit Visibility***
7. ***Squat Switch***—On both main gear!
8. ***Lights***—On the rear of the aircraft so that faster aircraft can tell when they are overtaking a slower one.
9. ***Seating***—Better seats for those long flights in slow airplanes.
10. ***Four-Point Safety Harness***—Put them in all new airplanes and figure out some way to retrofit the current fleet.
11. ***Fuel Systems***—Simplify it to "On" and "Off." Design slow seeping tanks and better check valves.
12. ***Flap Preselect Systems***
13. ***Placards***—Design better checklists instead and reduce placards to needed information only.
14. ***An "Aw Shucks" Button***—A simple cockpit control that would right you from those unusual attitudes.
15. ***More System Redundancy***—Electrical system, instruments, power, and radios on separate power sources.

Bruce Holmes, Manager of the General Aviation/Commuter Element Office for NASA, presented the possibilities for the general aviation "glass cockpit" aircraft. Moving map displays, GPS navigation, computer datalink in the cockpit—all now an everyday

Continued on page 20

Expert Decision Making on the Flight Deck

by Judith Orasanu, *NASA Ames Research Center*

We are only now beginning to understand what constitutes effective decision making and what skills should be taught.

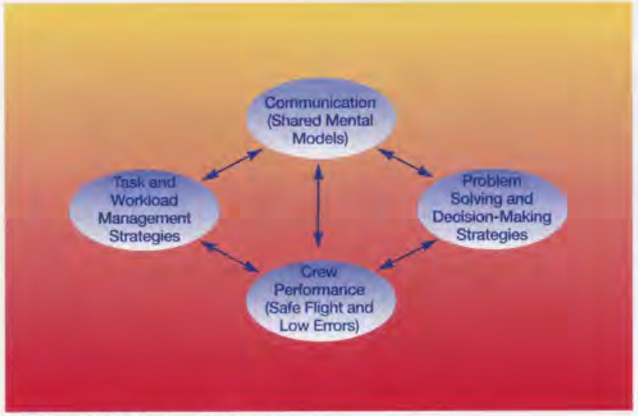
DECISION MAKING is an essential component of a captain's expertise. The captain is responsible for making the hard decisions: choosing where to divert after a system malfunctions, when fuel is short and weather is deteriorating; determining how to cope with a passenger's medical emergency; evaluating whether to takeoff with a placarded [inoperative] system given past experience with the projected weather and traffic at the destination. While the captain has ultimate responsibility for the decision, the entire crew in the cockpit, in the cabin, and on the ground can provide information and suggestions that contribute to a good and safe decision. The captain's judgement is most critical when conditions are ambiguous and no clear guidance is provided in manuals, checklists, or company policy.

The significance of poor decisions is evident in reports from the U.S. National Transportation Safety Board (NTSB). There we find cases of crews who flew into thunderstorms and encountered wind shear; decided to reject a takeoff after they were off the ground; decided to land after retracting the landing gear in preparation for a go around; took off with snow and ice on the wings; or decided to fly on to their destination on battery power rather than return to the airport from which they had just departed. NTSB reports from 1983 to 1987 implicate crew judgement and decision making in 47 percent of the fatal accidents.

Decision making is a component of most crew resource management (CRM) training courses given by major airlines (see U.S. Federal Aviation Administration Advisory Circular No. 120-51A, 1993). However, little scientific research has been available until recently to support that training. We are only now beginning to understand what constitutes effective decision making and what skills should be taught.

Decision making in the cockpit is unlike decision making in several other situations. Most often we think of decision making as choosing between options A, B, and C, such as when we buy a new car. In the case of car-buying we know what models are offered, what dimensions are relevant for comparing models, and what we want in a car. The task is a matter of deciding which car will best satisfy our needs. In contrast, decisions in the cockpit are not ends in themselves—they are the means by which crews achieve their larger goal, namely, to deliver passengers and aircraft safely to their destination. Several features characterize decision tasks in the cockpit (as well as in other complex domains such as nuclear power, military command and control, medicine, and fire-fighting) and influence the nature of the decision process:

- ***Dynamic conditions.*** Conditions change over time, making the situation unstable and unpredictable (e.g. weather or some system malfunctions).
- ***Ill-structured problems.*** It may not be clear to the crew what the problem is, what options are available, or what would constitute the best solution.
- ***High-risk.*** Decision errors, especially during abnormal and emergency conditions, can have severe consequences.
- ***Time pressure.*** Certain decisions must be made very quickly. The aviation environment is unforgiving: correct decisions made too late can be fatal.
- ***Competing goals.*** While safety is usually paramount, economic considerations put pressure on crews to save fuel and to be on time. In addition, crews must conform to government regulations and company rules. Sometimes safety is pitted against these other very real goals.
- ***Multiple participants.*** Several participants (cockpit crew, cabin crew, company dispatch, maintenance, ATC) may bring different perspectives, knowledge, and goals to a problem. Conversely, multiple participants can monitor and evaluate each other



Ingredients of effective crew performance

re-ducing the likelihood that important information is overlooked or that faulty plans are adopted.

• **Expertise.** While pilots may not be expert decision makers, they bring vast knowledge and experience to the decisions they make.

Decision problems in the cockpit do not come neatly packaged with the options, goals and constraints clearly specified. Before a decision can be made, the crew must recognize that a situation exists that requires attention. The nature of the problem must be determined, its severity assessed and options considered. In general, decision making in dynamic environments includes two major components: situation assessment and choice of a course of action.

Situation assessment involves interpreting the cues that signal a problem and judging the levels of risk and time pressure. Some decisions require a fast response, such as rejecting a takeoff or deciding to go around. Others allow time to consider several options and to gather relevant information. Some decisions involve recognizing conditions that trigger a prescribed response (rule-based decisions), some involve a choice from among several options, some mainly require priority setting, and some might more properly be called creative problem solving because no recognized solutions or options exist.

Where does expertise enter into this picture? Studies of experts in domains ranging from physics and chess to college admissions and medicine show that expertise influences how we perceive and respond to problems. In general, expertise confers an ability to size up a situation quickly, to focus on important information, and to retrieve good solution strategies.

Expertise in the cockpit is manifested in several ways. Good situation assessment is reflected in accurate and timely recognition of the cues that signal a problem. Most effective crews go beyond the information given and appreciate the significance of cues. For example, an alert crew may note a weather front that is moving toward their destination and foresee the possibility of a missed approach or diversion. Their situational awareness allows them to set up contingencies and options before being faced with the pressures and workload of a decision during final approach.

Another component of good situation assessment is appreciation of risk and time pressures. If crews are slow to understand the seriousness of a situation, their responses may come too late, as in the case of the crew that underestimated the extent of a fire in the aft lavatory and continued to takeoff, then circled around [the airport] and [further] landed; delays in taxiing and evacuating the aircraft resulted in fatalities caused by smoke and fumes. On the other hand, crews may feel pressure to respond quickly when a fast response in fact is not necessary. By being too quick, they may fail to consider essential aspects of the problem or to consider relevant options.

A corollary of good situation assessment is realizing what information is needed in order to make a good decision; then seeking it and using it. In the case of choosing an alternate following a hydraulic failure in a Boeing 727, for instance, the crew must recognize the consequences of the hydraulic failure: manual gear and alternate flap extension procedures are required which take extra time and make a long straight-in final approach desirable; once the landing gear is extended it cannot be retracted, so a go around is undesirable, making weather a consideration. These constraints can guide information seeking and define what constitutes a good solution.

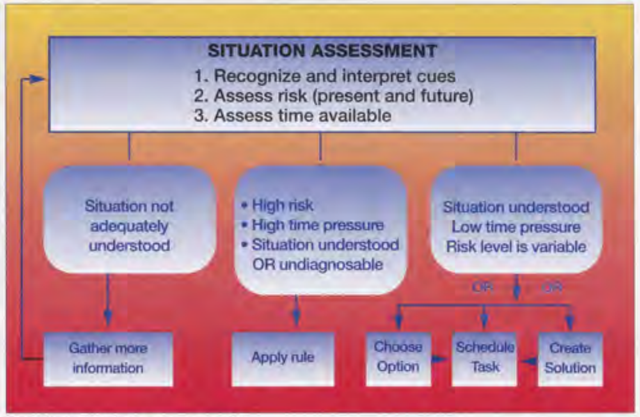
Regardless of whether a fast or a more deliberate decision must be made, more effective captains manage the situation in ways that allow them to make effective decisions. A primary way to do this is to plan for contingencies. They anticipate what might happen and set "triggers" for themselves. Then, if and when conditions deteriorate, they are prepared rather than surprised. Effective crews shift their thinking from a high workload, time-pressured phase to a lower pressured one.

Similarly, when a complex problem requires evaluation of several options, more effective captains arrange the situation so they have thinking "space" to sort through the possibilities. They can do this by off loading tasks, including responsibility for flying the plane. Or the captain may buy time by requesting a holding pattern or vectors. This allows time to gather and evaluate information before committing to a course of action. Effective time and workload management strategies not only reflect awareness of the demands of the problem; they also reflect sensitivity to one's own cognitive limitations, especially under high-stress conditions.

An integral part of decision making in general and task management in particular is communication. Effective captains do not function as "lone rangers." When faced with problem situations, they share their concerns, make clear what they want to accomplish, and invite participation by other crew members. They also listen to the suggestions offered by other crew members. This interaction allows the crew to build a shared model that assures they are all working to solve the same problem and facilitates contributions by all.

Errors that result in poor decisions are the converse of effective decision strategies just described. NTSB accident reports suggest that serious outcomes result from poor situation assessment, mainly when crews fail to appreciate the risk inherent in a situation. Crews that get into trouble uniformly seem to suffer from severe cases of "get-there-itis." Many accidents occur following schedule delays or at the end of long trips, when the crew is eager to get home. Crews exhibit a strong tendency to assume that ambiguous cues fall within the range of normal, rather than being seen as potentially dangerous, and carry on as if nothing is wrong until the consequences overtake them.

Discrepant information often is explained (or wished) away, especially if it is ambiguous. Consider the case of a Boeing 737 on takeoff roll with snow and ice on its wings and throttle position that suggested less than full takeoff power, despite the engine pressure ratio (EPR) readings. When the first officer brought the discrepant cues to the captain's attention, the captain repeatedly affirmed that everything was OK. The captain was using only the pieces of information that fit his model of normalcy and ignored those cues that indicated a problem with engine power. Realistic assessment of the risk in a situation, facing the possibility of a worst-case scenario, and preparing for it before the situation begins to unravel are probably the only strategies that assure safe decisions.



Simplified decision process model

Given the number of hours that flight crews accumulate, we might expect them all to be "expert" decision makers. The problem is that modern aircraft are so reliable that most pilots have little real experience coping with abnormal and emergency situations, and hence few learning opportunities. While this is a situation for which we are all thankful, it means that other opportunities must be found to allow crews to practice the needed skills. Line oriented flight training (LOFT) provides such an opportunity, but these sessions offer limited time for handling diverse problems. Low-fidelity simulators could be used to exercise component skills. Classroom time often is devoted to reviewing videotaped re-enactments of accidents and discussing ideal solutions. However, discussion of how you should respond is not quite the same as doing it. Ideally, discussion of decision strategies would be complemented by real-time practice.

The research community has not yet discovered a "silver bullet" for training or aiding that will guarantee that every decision is the best possible one. At this point we can only recommend processes that assure that the crew understands the situation and what would constitute an appropriate response. A few general recommendations can be made:

• Understand what the problem is before acting.

• Assess the risk and time factors.

• Match your response strategy to the features of the situation (e.g. fast vs. thoughtful response).

• Set up contingency plans whenever possible.

• Consider the implications—the non-obvious future consequences—before deciding on a course of action.

• Manage workload to allow time for decision making when time and fuel permit.

• Create a shared problem model by communicating with the [appropriate] crew (cockpit, cabin, and ground). Be sure all understand what the problem is, what the plan is, and who is doing what.

Expertise comes with experience. By practicing the above in relatively benign situations, when workload is low, crews can get in the habit of thinking of these strategies. Experience may be a great teacher, but some lessons exact a high cost. The aviation industry is trying to provide opportunities to learn at low risk and low cost. How to do this is the challenge to our collective expertise. ■

Judith Orasanu is a researcher at the U.S. NASA's Ames Research Center. The opinions expressed in this article are the author's and should not be construed as official policy of any government agency. This article is reprinted from the September 1993 issue of the ICAO Journal.

Aviat Inc.

The Primary Step

by H. Dean Chamberlain, *Associate Editor*

FAA Associate Administrator for Regulation and Certification, Tony Broderick, may have made history during this year's Sun 'n Fun Experimental Aircraft Association's (EAA) April Fly-In and Convention in Lakeland, FL. He may be the highest ranking FAA official to fly in the first provisionally type certificated primary category aircraft, the Quicksilver GT-500.

As the Associate Administrator responsible for both the Aircraft Certification Service and the Flight Standards Service, Broderick played a key role in the development of the new primary aircraft category through the Aircraft Certification Service, and he also played a key role in the approval of the still relatively new recreational pilot certificate through the Flight Standards Service.

Broderick's involvement in both airman and aircraft certification issues around the world made him the ideal candidate to fly in the first certificated primary category aircraft in the United States.

He flew the GT-500 after hosting a "Meet the Boss" session at the FAA Safety Center at Sun 'n Fun. During the session, Mr. Walter F. Colby from Dover, NH, asked Broderick about FAR Part 103 ultralights and invited him to go down to the ultralight area to meet the people and look at the ultralights there. During the discussion, Colby offered a demonstration flight in a GT-500 to Broderick. Then, as they say in the news, the rest is history.

When asked why he invited Broderick to take a flight, Colby, a certificated pilot, ultralight operator, and USUA-registered ultralight instructor said he wanted Broderick to see how the industry has changed. A strong supporter of ultralight vehicles, Colby wanted to show Broderick how safe ultralight vehicles are today as well as their derivatives such as the provisionally type certificated GT-500.

When asked about his flight, Mr. Broderick said, "This is, I hope, the first of many relatively affordable general aviation aircraft for recreational flying. The GT-500 is fun to fly—getting the pilot and passenger really in touch with the basics. It represents a great introductory class of aircraft, or recreational aircraft for pilots of more sophisticated aircraft looking for a change of pace. This class of aircraft is the direction I will go when I find a way to get the time to get back into flying. It's a good value, with good safety, and exhilarating fun!"

GENERAL AVIATION AIRCRAFT CERTIFICATION

Since we have been discussing the GT-500 and Broderick's flight in it, this seems like a natural opportunity to review some of the latest information about FAA aircraft certification. As the FAA Associate Administrator for Regulation and Certification, Broderick is cognizant of all of the issues and benefits involving both airman and aircraft certification, including the recreational pilot certificate—designed to reduce the cost of learning how to fly—as well as the new primary category aircraft—designed to reduce the cost of flying.

Other Aircraft Certification Produres

We do not want to imply that the primary category is the only way to certificate new light general aviation aircraft. There are other ways. According to Tim Smyth of the FAA's Chicago Aircraft Certification Office, several small general aviation aircraft have been certificated under other regulatory standards such as the European Very Light Aircraft (VLA) standards and other standards that the U.S. recognizes and accepts.

FAR Part 23 Certification

Besides the new standards, manufacturers still can certificate their aircraft under FAR Part 23. For example, Mr. Malir said, "the multipurpose Husky A-1 made by Aviat Inc. of Afton, WY, is a good example of a recent FAR Part 23 aircraft."

Primary Aircraft Construction

The primary category offers some innovative construction concepts for aviation. Pilots may be surprised by some of the non-traditional construction techniques being developed for some of the primary aircraft. In the case of the GT-500, it shows its lineage from the ultralight vehicles Quicksilver is famous for making by sharing some of the same construction techniques. As a result, pilots not familiar with the primary category GT-500 may consider it an ultralight vehicle rather than an FAA-certificated aircraft. Composite construction is another option. Other proposed primary category aircraft candidates use more traditional construction techniques such as fabric and tubing.

Quicksilver

Associate Administrator Tony Broderick receiving preflight instruction before taking off in the GT-500

For those not familiar with the primary aircraft category, it is designed to provide a simplified process for the type certification, production, airworthiness, and maintenance of simple aircraft designed for pleasure and personal use. Although the regulation prohibits the carrying of persons or property for hire, the aircraft can under certain circumstances be used for flight instruction and rental use. With a maximum certificated weight of 2,700 pounds and seating capacity of four, the category includes unpressurized

BRAND LOYALTY: FACT OR FICTION?

Since we have all been told consumers tend to buy those products they are more familiar with, it is going to be interesting to watch the sales of primary category aircraft once they become available as well as the sales of the other new aircraft being certificated. We have been told that like car buyers, pilots tend to buy the brand of aircraft they first learned to operate. The industry once thought so, too. Remember back in the "good ol' days" when general aviation aircraft were being produced how the various manufacturers competed to get new student starts in their respective aircraft in hopes of getting future aircraft sales once those new students learned to fly.

Since few certificated pilots today may be familiar with the names of some of the manufacturers working on certificating a primary category aircraft and the names of the other manufacturers selling new aircraft certificated under the harmonization

H. Dean Chamberlain

process, we hope this article will generate interest in the new aircraft and result in future sales for the aircraft. General aviation needs the support.

We think it is important to remind pilots and aircraft operators that all of these new aircraft and those aircraft pending certification either have or will have met appropriate FAA aircraft certification standards before being certificated.

A final thought. Whenever you hear someone wondering about the next generation of light general aviation aircraft and their pilots, we hope you remind him or her of this article and Mr. Broderick's flight and role in promoting the creative talents of aircraft designers around the world by providing alternative means of certificating new FAA-approve aircraft.

After years of industry talk about the lack of new general aviation training and rental aircraft, that question has been answered by the industry and the FAA. Now the only question is how many FBO's and pilots will buy the new aircraft when they become available.

The opportunity to buy new general aviation aircraft is here today. The FAA, Quicksilver, and others have and are doing their part. The question now is when will you, the flying community, do your part by buying and flying the new aircraft.

As the saying goes, the ball is in your court.

Have a safe flight.

GT-500

Quicksilver

Mr. Paul Mather of Quicksilver said the company was delighted about Mr. Broderick's GT-500 flight. When asked about the proposed cost of a primary-category, production-model GT-500 compared to the cost of one of its kit-built siblings, he said factory production of any aircraft is going to be more expensive than the production of a similarly designed kit aircraft. Mather said the proposed cost of a certificated primary category GT-500 will be about $30,000 FAF (fly away factory). Although this price may seem high compared to the cost of a basic Quicksilver GT-500 kit plane, he said a buyer has to compare the price of a production primary category aircraft to a comparably equipped GT-500 kit-built aircraft. He estimated the cost of a comparable kit-built model at about $32,000. He said one reason kit aircraft seem to cost less than production aircraft is because most kits are sold bare-bones. The buyer then has to purchase instruments, sometimes the engine, and other components needed to complete the aircraft. A certificated production aircraft is sold complete because it must meet, at a minimum, the FAA's basic VFR day flight equipment requirements plus comply with its FAA-approved, type-certificate specifications.

The result is when buyers compare the cost of a production primary category aircraft with a kit-built version of similar design, they have to remember the price of the production model includes all of the components needed to fly it away from the factory; the kit does not have to be complete. Obviously, they must remember they are buying a complete aircraft which includes the cost of assembly rather than parts of a kit that has to be completed.

Some pilots may also be surprised to learn that a new primary aircraft may cost as much as a used normal or utility category aircraft. They, too, have to remember they are buying a new zero time aircraft and not an aircraft that may have thousands of flight hours on it and its engine.

airplanes, gliders, rotorcraft, and manned free balloons. Both unpowered and powered aircraft are approved under the rule, but powered aircraft are limited to a single, naturally aspirated engine. Airplanes must have a stall speed of 61 knots or less, and rotorcraft must have a main disk loading of six pounds or less per square foot.

As FAA-certificated aircraft, the new primary category aircraft offer certificated pilots and fixed-based operators (FBO's) the opportunity to buy new, FAA-certificated aircraft that can be used for both personal transportation and flight instruction as well as aircraft rental. Although not as inexpensive as some would hope, the new primary aircraft can provide the replacement training and rental aircraft many FBO's need to replace their aging training and rental fleets.

There may be a possible reluctance on the part of some FBO's to buy the new type of aircraft because of their appearance or construction since some primary aircraft, such as the GT-500, may look like large, two-place ultralights, while other designs in the certification process look more like traditional aircraft and others reflect new, state of the art techniques. Regardless of their appearance, primary aircraft are certificated aircraft and like other certificated aircraft, a primary category aircraft pilot must have an appropriate pilot's certificate and current medical certificate, if required, to fly one.

This is a brief overview of aircraft certification using the new primary aircraft category and the harmonization process as examples. For those interested in obtaining more information, they can contact their regional ACO. ■

Density Altitude

by Thomas N. Jones, *APPM Winston-Salem, NC*

What is DENSITY ALTITUDE? By definition it is: Pressure Altitude corrected for non-standard temperature.

Why do we care what Density Altitude is?—With an increase in temperature there is a decrease in air density. With an increase in altitude there is a decrease in air density. The aircraft will perform as though it is at the computed density altitude. The wings will not support as much weight, the propeller will not push as much air, the engine will not produce as much power as with colder temperatures and/or lower altitude.

How does this affect the airplane? With a high density altitude, it will require a longer take-off roll. It will use more runway while landing, and the airplane will stall at a higher true airspeed. The useful load may have to be reduced. The climb rate will be reduced. The aircraft might not make it over the next bush, tree, house, or hill.

How do we compute Density Altitude?—First, go to the airplane and set 29.92 in the altimeter setting (Kohlsman) window on the altimeter. The altitude indicated will be Pressure Altitude. Second, determine the temperature *on the runway*, or the ramp nearby. The aircraft's outside air temperature gauge is a good reference. Do not use the temperature indicated on a thermometer in the shade or in an air-conditioned office. Third, use the Koch Chart (Figure 1), the Density Altitude Computation Graph (Figure 2), or a navigational computer—such as the E6B or CR series—to determine *DENSITY ALTITUDE*.

Next, consult your aircraft performance charts, determine the runway length required for takeoff and landing using the computed density altitude. (Have a plan for an emergency return.) Compute the indicated airspeeds to use for takeoff and landing. If there are obstacles around the airport, take them into consideration also. Perform weight and balance computations (Figure 3). Be sure the aircraft is well within the weight (for the conditions) and center of gravity limits. Remember to consider engine performance and proper fuel leaning procedures.

Can you make it over the ridge?

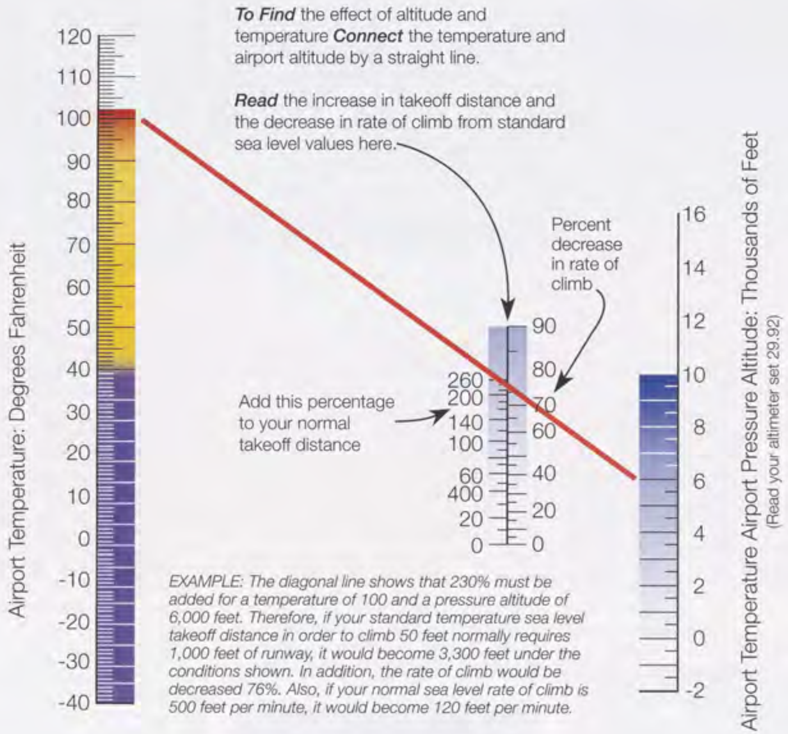
When using the aircraft charts, *remember* they were computed using *new* aircraft with properly inflated *new* tires, on *good* runways with excellent *test pilots*. The airplanes most of us fly are not new, we do not always have new tires, and the runways are not always good. We may be considered test pilots because we are never sure about obtaining the performance indicated in the charts but excellent test pilots?

Always add a "fudge factor" by adding at least 10% to the most conservative calculations of runway required for takeoff and landing. Remember to add that stuff in the back of the airplane to the useful load figures. This has something to do with old pilots and bold pilots and no old, bold pilots.

Consider making your takeoff during one of the cooler times of day—morning or late afternoon. Reduce the weight aboard the aircraft. If necessary, make several trips ferrying passengers and luggage to an airport at a lower elevation or without obstacles to clear. Leave luggage behind and buy what you need when you get to your destination. Almost anything is less expensive than an accident!!

If you ever find yourself saying, "I think it'll make it," it probably will not!! Consider the consequences. ■

The Koch Chart for Altitude and Temperature Effects



EXAMPLE: The diagonal line shows that 230% must be added for a temperature of 100 and a pressure altitude of 6,000 feet. Therefore, if your standard temperature sea level takeoff distance in order to climb 50 feet normally requires 1,000 feet of runway, it would become 3,300 feet under the conditions shown. In addition, the rate of climb would be decreased 76%. Also, if your normal sea level rate of climb is 500 feet per minute, it would become 120 feet per minute.

This chart indicates typical representative values for "personal" airplanes.

For exact values consult your airplane flight manual.

The chart may be conservative for airplanes with supercharged engines.

Also remember that long grass, sand, mud, or deep snow can easily double your takeoff distance.

The chart below gives a rule of thumb example of temperature affects on density altitude.

STD TEMP	ELEV/TEMP	80°F	90°F	100°F	110°F
59°F	Sea Level	1,200′	1,900′	2,500′	3,200′
52°F	2,000′	3,800′	4,400′	5,000′	5,600′
45°F	4,000′	6,300′	6,900′	7,500′	8,100′
38°F	6,000′	8,600′	9,200′	9,200′	10,400′
31°F	8,000′	11,100′	11,700′	12,300′	12,800′

Figure 1

Density Altitude Computation Graph

To find density altitude, either at field elevation or while in flight, enter the graph with pressure altitude at left and temperature at base of graph. Read density altitude from the sloping lines where the temperature and pressure altitude lines cross. Pressure altitude for an airport is usually available at any briefing office. If pressure altitude is desired while in flight or on the ground when not otherwise available, it may be found from a pressure altimeter. To determine pressure altitude from the altimeter, place the altimeter setting indicator at standard sea level pressure (29.92 inches) and read the indicated altitude which will also be pressure altitude. Corrections for instrumental error, if any, must be made.

Example 1: With the altimeter setting indicator at 29.92 inches, the altimeter reads 9,500 feet. Outside air temperature is –8°C. Find 9,500 feet (pressure altitude) on the scale at the left side of the graph and follow it across the graph to where it crosses the –8°C line. Density altitude is 9,000 feet.

Example 2: Density altitude is desired for takeoff from an airfield at 5,300 feet with a runway temperature of 97°F (runway temperature is preferable to shelter temperature if available). The weather station furnishes a pressure altitude of 4,950 feet. Entering the graph at 4,950 feet and moving across to 97°F indicate a density altitude of approximately 8,200 feet. Note that in the warm air, although pressure altitude is lower than true altitude, density altitude is considerably greater.

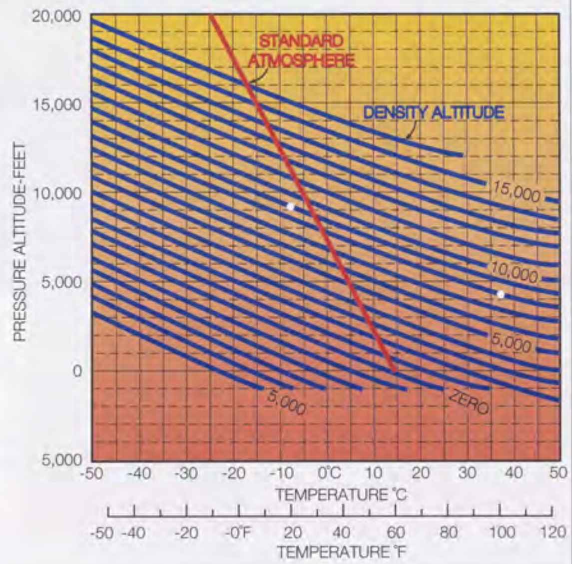


Figure 2

The following is a sample weight and balance form. Always check your aircraft's operating handbook or aircraft flight manual for the recommended format for your aircraft. Always use the correct data for your aircraft.

Weight and Balance for N ______________

Station	Weight	Arm	Moment
Airplane			
Oil (7.5 lb./gal)			
Front Seat Passenger[1]			
Second Row Passenger/s[1]			
Third Row Passenger/s[1]			
Fourth Row Passenger/s[1]			
Front Baggage			
Baggage			
Aft Baggage			
Baggage			
Fuel[2]			
Fuel[2]			
Fuel[2]			
Misc.			
Misc.			
Totals			

Weight X Arm = Moment

Moment/Weight = Center of Gravity______________

Pressure Altitude = ______________

Density Altitude = ______________

Max Forward CG = ______________

Max Aft CG = ______________

Ambient Temperature = ______________

Distance Required to Clear __________ = __________

[1] Use actual weight, not average weight [2] Gasoline = 6 lb./Gal; Jet A = 6.7 lb./Gal

Figure 3

IFR Mountain Flying—It Can Be Iffy

by Ken Hoffman

Part 1
Planning and Departures

We learn to fly by the rules. We have rules passed down by the authorities. FAR § 91.3(a) says "the pilot in command of an aircraft is directly responsible for, and is the final authority to, the operation of that aircraft."

We have rules we use to teach by: "If your engine quits on takeoff, never turn back to the runway."

Most rules seem to be written to justify or explain something unfortunate that happened. These are often classified as Rules of Thumb (ROT).

"He crashed because his engine quit, and he tried to make it back to the runway."

ROT's are particularly good for those of us who are all thumbs. In this series, I'll offer some.

ROT #1. *Generally speaking, all Rules of Thumb should be prefixed with the qualification, "generally speaking."*

Any good IFR flight starts with good planning. That goes double for mountain IFR. Some pilots feel the best way to fly mountain IFR is to take off from the prairie, climb to 41,000 feet, and don't let down until Los Angeles.

If flying something that won't go that high, or if flying in or out of places like Glenwood Springs, CO, or Angel Fire, NM, or Hailey (Sun Valley), ID, or South Lake Tahoe, CA, you need to know a few things about operating safely in the mountains.

A pilot should carefully consider his or her capabilities as well as the airplane's [and] knowledge of basic mountain flying and weather. How can a pilot judge this?

I would love to give you a definitive answer for that one. I have more than 16,000 hours flying airplanes, helicopters, and gliders, mostly while based in the Rockies. There have been times that I have felt my capabilities profoundly inadequate.

I guess the best answer is to ask constantly those important questions: "Am I pushing too hard to make this flight?" "Is my desire to go overriding my better judgement?" "Should I get more training?" "Should I take my CFI with me?" "Why is my [spouse] threatening to divorce me if I make [him or her] go?"

I climbed a mountain one time to ask a very smart man, "How do I get to be a good pilot?"

"Good decisions," he said.

"How do I learn to make good decisions?" I asked.

"Experience."

"How do I get experience?"

"Bad decisions."

ROT #2. *Generally, speaking, what I say is true.*

The FAA once produced a booklet entitled *Terrain Flying* in which it suggested that a good source of advice is the "Seasoned Local Pilot" (SLP). Today, the SLP is probably an Accident Prevention Counselor (APC) [or Aviation Safety Counselor (ASC) as they are now known. See page 21 for more information.] The FAA or an FBO can put you on to a good SLP or APC.

An SLP from the Salt Lake City area would say to get plenty of altitude before heading eastbound over the Wasatch Range. An SLP from Aspen might suggest that you be able to see the top of Triangle Peak before making the GO decision. An SLP at South Lake Tahoe will advise that with westerly winds aloft, climb performance will occur on the east side of the lake, providing that ridge icing is not a factor.

Regarding the capabilities of the airplane, let's first consider performance. When I wrote the *AOPA Mountain Flying Course* in the late '60's, we said that a recommended minimum performance standard for a takeoff from a mountain airport would be the capability to climb 300 feet per minute after takeoff. The same is true today.

ROT #3. *For a mountain IFR flight you should be able to climb 300 feet per minute at your cruise altitude.*

In planning the flight, determine the cruise altitude and density altitude. Check your rate-of-climb chart from the airplane handbook. Be sure you can climb at least 300 feet per minute at cruise altitude. The published ser-

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DETACH ENVELOPE HERE ▲ ENCLOSE FORM WITH CHECK OR MONEY ORDER (Do not send cash) vice ceiling is the altitude where the airplane can climb only 100 feet per minute at gross weight, which is not much reserve performance. There may be times when you will wish you could climb 3,000 feet per minute at cruise altitude.

While in the handbook, note the effect weight has on the rate-of-climb. Departing from Steamboat Springs (6,878 feet MSL with runway length at 3,550 feet), the prudent pilot would ship ski gear and junk via UPS, send the overweight in-law via Continental Express, and/or reduce the fuel load by making the first leg a short one to a lower altitude airport with longer runways. In a normally aspirated (not turbo-charged) V35 *Bonanza*, reducing the takeoff weight from 3,400 pounds to 3,000 pounds increases the density altitude at which the airplane will climb 300 feet per minute from 14,000 feet to 17,600 feet.

Consider the systems of the aircraft. Is there redundancy in the systems, or are you dependent on everything working perfectly? The prospect of accumulating structural ice must be addressed year round in the mountains. It is seldom that we can fly mountain IFR safely without the capability to deal with ice. However, "full anti-ice and/or deice equipped" does not mean we can handle all icing situations.

A few years ago, a Beechcraft *King Air* 200 sat for most of the day at Centennial Airport just south of Denver, CO. Snow had accumulated on the airplane during the day. Late in the afternoon, the two highly experienced, professional pilots loaded their six passengers and departed for Lufkin, TX. On the southeast climbout, they made it over 12,000 feet MSL when they advised they were icing up and needed to return. They didn't make it back.

One theory is they allowed the airspeed to get too low, creating a relatively high angle of attack and iced up the bottom of the wings. Another is they iced up the engine induction system and lost power. Three things seem certain: The pilots were highly experienced and well-trained, the airplane was certificated for flight into known icing conditions, and they encountered more ice than they could handle.

In most single- and light multi-engine airplanes, much IFR weather in the Rockies is not flyable because of inability to handle icing conditions and lack of performance at high altitudes.

Yet, when icing is forecast, it does not necessarily mean that the flight cannot be made safely. There will probably be a forecast for icing any time there is a possibility of clouds at or above freezing level.

I've been flying in the Rockies since '59 and instructing here since '62. Of all the times I have seen icing in the forecast, I have experienced only a few serious encounters, none of which resulted in a fatal situation.

While planning the flight, pay attention to the route, which may end up being considerably longer than "direct." Consider Minimum Enroute Altitudes (MEA), forecast weather along the route, NAVAID's, and accessibility to alternate airports.

When United Airlines used to fly airplanes with propellers, the training center published a number of circulars to advise pilots of local conditions. For example: On climbout from Denver for points west, when icing was forecast or reported over the Continental Divide, pilots were advised to get plenty of altitude before proceeding west. If serious icing were encountered, one option might be to reverse course and gain still more altitude. Another option would be to change routing and fly the old airmail route that went from Cheyenne to Laramie to Rock Springs and further. Still another option was to fly a southerly route to Pueblo, CO, to Alamosa, CO, to Farmington, NM, or to Las Vegas, NM, to Albuquerque, NM.

One feature common to all [these] alternate routes is they have well-spaced VOR's, a number of good airports, and are often out of the influence of the mountain wave and serious icing conditions that may exist over Corona Pass west of Denver.

In thunderstorm season, there are departure decisions to make. The time of day can make a big difference.

Flying from the Denver area to the southwest part of Colorado in the summer, the air is normally smooth and stable until the sun rises above the 45-degree arc. By late morning, the top of the turbulent level can be between 14,000 to 16,000 feet and by mid-afternoon, the turbulence level top can be between 22,000 and 24,000 feet MSL. After the sun descends below the 30-degree arc, the air begins to smooth out. With the right amount of moisture, the midday thermal heating can spawn spectacular thunderstorms reaching in excess of 50,000 feet.

I file IFR in the mountains in non-radar equipped single-engine and light twins when there is a forecast for thunderstorms and they are sure to exist. However, I hold the self-admonition that I will not fly a route or accept a vector that would put me in the clouds. The main reason to file IFR is to get in the system and take advantage of Air Traffic Control (ATC) help in the form of vectors. Because I know ATC's radar limitation for seeing weather, I will not fly in the clouds because I want to be able to see the thunderstorms for myself.

If the departure airport is below approach minimums, a prudent pilot will plan a departure alternate in the event things do not go well.

ROT #4. Always leave yourself an out and keep your options open.

When I was flying for Combs Gates in the '70's, my mentor and ultimate boss regarding flight ops was Chuck Dyas, a delightful white-haired gentleman who was Director of Flight Operations for Gates-LearJet, our parent company.

"Bill (he had forgotten my name), you never have an emergency until you run out of options," he told me.

The best departure alternate airport is downhill at lower altitude. Trying to make it to higher terrain with ice building may not be practical. A sectional chart helps figure the lay of the land.

ROT #5. Always know which way to fly downhill.

Departing from Granby, CO (field elevation 8,023, runway length 5,115 feet) to the west, the Colorado River is about a mile away. If you can stay over the river you don't have to climb at all. It's downhill all the way to the Sea of Cortez in Mexico. If you take off to the east, you need to climb 800 feet in 2.5 miles or 5,000 feet in 12.5 miles.

ROT #6. Always fly in a position from which you can turn and fly downhill.

I've known of few mountain flying accidents when an airplane has crashed flying downhill. Nearly all mountain flying accidents occur with the airplane flying into rising terrain.

Check the departures. One of my favorite questions when giving a flight test is, "What is the departure procedure for this airport?"

Amazingly, the majority of pilots, including professionals, will look for a Standard Instrument Departure (SID) and, having found none, will usually say, "There is no departure procedure for this airport."

The back of Jeppesen's chart for Eagle, CO reads, "IFR DEPARTURE PROCEDURE; Rwy 7, climb to 14,000 feet via outbound on the IEGE LOC east course to intercept RLG VOR-198 (V-361–421) to RLG VOR before proceeding on course. Rwy 25, immediate climbing left turn to 13,500 feet via heading 215°, reaching 9,000 feet or crossing SXW VOR R-152 or DBL VOR R-322 to intercept RLG VOR R-229 (V8) to RLG VOR before proceeding on course."

Whew! Study that one before taxiing.

A successful departure is often the result of incredible preparation. One morning my alarm went off at 3 a.m. in our home in Carbondale, CO. In my standard 20 minutes, I was on my way to the Glenwood Springs Airport. After brushing the snow from the International *Scout*, I nursed it to life and plowed the snow from the ramp and runway. When all passengers were accounted for, I called Eagle Radio on the phone to pick up my clearance.

"ATC clears *King Air* N36MC to the Rock Springs Airport as filed, maintain one seven thousand, contact Denver Center on 128.5, squawk 4122. ATC service not provided outside controlled airspace. Clearance void if not airborne by one three two zero, time now one three zero five."

At that time, the controlled airspace began at 10,500 feet. We were on our own for terrain avoidance and traffic separation until we entered controlled airspace. ATC [has neither the authority nor the responsibility to control airplanes] outside controlled airspace. Flight in uncontrolled airspace does not require a flight plan or a clearance.

We hastily boarded, started, and taxied into position on runway 14. Our first reference for minimum visibility is an outcropping of rock a little over a half mile along the left side of the valley. After lining up, we turned on radar and identified Mount Sopris at 17 nm slightly right of the nose at an elevation of 12,953 feet. Having studied the U.S. Forest Service charts and flown VFR dry runs, I had a clear mental picture and plan. Our initial climb was straight for Sopris, our primary obstacle. If we could maintain a track within 15 degrees either side of runway centerline, climbing straight would keep us clear of other terrain.

In the E-90 *King Air*, at our weight and density altitude, we could take off, lose an engine, and climb straight over Sopris, assuming no significant ice. At 12,500 feet, we could turn right and fly to Grand Junction, CO. If we got within seven miles of Sopris and still didn't have 12,500 feet, we could turn left and fly to the Carbondale NDB (privately owned and operated by Rocky Mountain Airways) and climb in a holding pattern until reaching MEA.

That morning the trusty Pratt and Whitney PT6 engines purred beautifully. The snow was very cold and kind enough not to stick to the airframe. Passing 13,000 feet in fewer than six minutes after takeoff, Denver Center said, "Radar contact." We turned on course to the Meeker VOR.

The bad news about this trip was we arrived at Rock Springs, WY at two minutes before seven, and I sat at the airport with no wheels and no estimated time of departure for 10 hours and 12 minutes until we departed in a panic to get back to our unlighted runway at Glenwood Springs before it got too dark.

The important point of the story is [that] as the pilot you have to take responsibility for staying clear of terrain on departure.

ROT #7. Don't run into anything except the restroom before you depart.

It's difficult to shoot an approach with your eyes full of tears. To avoid running into anything, a good sense of spatial orientation is fundamental. A careful study of the sectional and the low-altitude en route charts help form the picture.

ROT #8. Don't take off with any ice or snow sticking to the airplane.

A friend, Vince, told me of departing in a Beech *Duke*, with snow sticking to the top of the engine cowling.

"Kenny," he said, "I felt like it wasn't going to fly. Once it was in the air, it shook and shuddered. I was sure glad to get it on the ground again."

Once a LearJet taxied out at Albuquerque, NM for a west takeoff after a quick fuel turn. The pilot had declined the lineman's offer to sweep the two inches or so of accumulated wet snow.

"It'll blow off," he said. The pilot should have listened. He could not get the Lear to fly after using up most of the 13,375-foot runway. In fact, he waited too long before aborting and ran off the runway and down an embankment, doing considerable damage to the airplane, scaring the foo out of the passengers, and adding two names to the unemployment roles.

If all of the above hasn't scared you off, stay tuned for the next issue. Part Two addresses en route mountain IFR, while Part Three deals with arrivals. ■

Mr. Hoffman is the owner of TechniFlite, an advanced pilot training facility located at Centennial Airport in Colorado. He is a 17,000-hour pilot with all the ratings in the world. He says that if you would like to share your story about IFR flying in the mountains, curse his "distortion of facts," or simply have questions, contact him at TechniFlite at (303) 792–9720. Babette André of Wings West *magazine has graciously given us permission to reprint this series, which appeared in the Fall 1993, January/February 1994, and April 1994 issues of* Wings West.

Preventing Back Injuries

by LtCol Alan M. Lafky, 1 MG/MGHT, Langley AFB VA

Back pain is one of the most common maladies known to mankind. Eight out of 10 Americans will experience a painful back episode at least once in their life. Over 100,000,000 Americans have serious back problems and over 250,000 have back surgery every year . Back pain ranks second only to upper respiratory infections in terms of work time lost due to illness.

Your spine consists of 24 bones, called vertebra, that are separated by discs. These discs function as shock absorbers. The upper 7 vertebrae are called the cervical spine, the next 12 are called the thoracic spine, and the lower 5 vertebrae are called the lumbar spine. Notice the curves of the spine in Figure 1. These curves are normal and must be maintained at all times by correct posture.

Figure 2 depicts the structure of a disc, which is made up of two parts, much like a jelly doughnut. The inner jelly-like part is the nucleus and is subject to hydraulic forces. It is surrounded by layers of fibrous connective tissue. The discs allow spinal movement, but abnormal forces on the disc can cause it to tear, especially while bending too far forward or twisting.

Through wear and tear or injury to the disc, cracks develop in the layers of the connective tissue (see Figure 3). Since the nucleus is highly fluid, it flows into the cracks, which can cause the disc to bulge. Tears inside the disc are called "herniated discs," and tears all the way through the layers to the outside of the disc are called "ruptured discs." Although painful by itself, a bulging disc may press on a nerve root, causing further severe pain which usually radiates down from the buttock into the leg as far as the foot (see Figure 4).

Another analogy to the disc is that of toothpaste. Bending backward tends to press the nucleus forward, where the disc is thicker and stronger; and bending forward presses the nucleus backward where the disc is thinner and weaker, much like squeezing a tube of toothpaste. So most disc injuries involve bending forward when lifting or twisting.

When the lower back is allowed to "bow out" in a "C" curve like a banana, the nucleus is forced backward. If enough force is involved, such as lifting a very heavy object, or sudden force from an auto accident, the disc layers may tear suddenly, causing a herniated or ruptured disc. Figure 5 depicts the right and wrong posture for lifting. Notice that the normal curve is maintained in the correct technique.

The disc can also be injured from the gradual subtle forces of a lifetime of

Figure 1

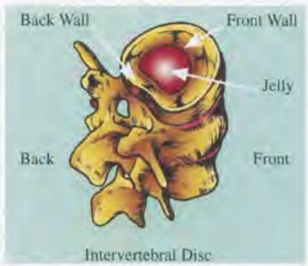


Figure 2

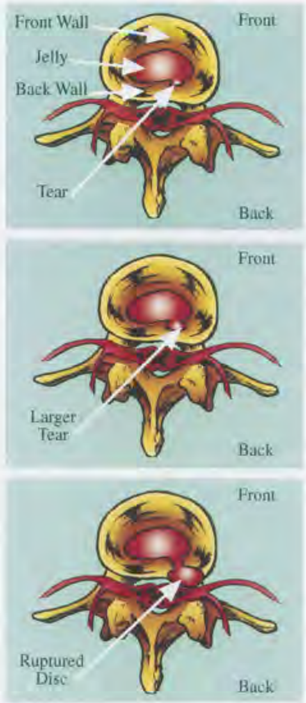


Figure 3

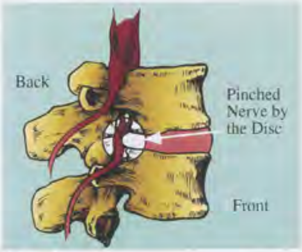


Figure 4

poor sitting posture. When the normal lumbar curve is not supported, the lower back tends to "bow out," increasing pressures on the disc. When the lumbar curve is supported, the pressures are reduced (Figure 6).

There is a common notion that the "rule" for lifting is to "lift with the legs, not your back," or "bend your knees when lif ting." These clichés are very misleading. Figures 5 and 7 show that it is possible to lift with your legs and still "bow out" the back . Since the real issue in correct lifting is preventing BACK injuries, you must think of your BACK when lifting. The correct "rule" to remember when lifting is this: ARCH YOUR BACK! In addition to maintaining the normal curve in the low back, you must also keep the load close to the body and avoid twisting while lifting.

Sometimes a person has to pick up something while in an awkward position, such as from the trunk of a car, or leaning over to reach into a bin. Since most people think bending the knees is the issue in correct lifting, it may appear that one has no choice except to bend over from the waist, as is the case in Figure 7. However, if one keeps the low back arched or "bowed in," it is possible to prevent abnormal pressures from occurring in the discs.

In addition to using correct posture when sitting and lifting, there are other factors to consider. To fully minimize the effects of all the stresses and loads on one's body requires a certain degree of physical fitness, which means getting in shape through regular exercise and healthy nutrition. Research has shown that high sugar diets not only lead to obesity, but tend to weaken the connective tissues.

It is important to consider one final point in the prevention of back injuries. Most people understand the importance of proper "warm up" before a workout; but fail to realize that there are times when it is necessary to "warm up" before lifting, particularly when the loads are fairly heavy. Straining one's muscles when not properly warmed up frequently leads to injuries or strains. "Warm up" involves actually increasing the temperature inside the muscles rather than stretching the muscles. Unfortunately, most people equate stretching with warm up, which it is not. In fact, simply stretching a muscle prior to exercising provides NO benefit whatever. To truly warm up muscles, one must begin to use those muscles more. For example, to warm up for running, instead of stretching quads and hamstrings, perform a brisk walk for 5 minutes, or even slow, careful 1/2 squats for about 30 to 50 repetitions. Only increasing muscle activity leads to proper "warm up."

In summary, prevention of back injuries involves maintaining the normal inward curve of the lower back when sitting and lifting, never twisting while lifting, being physically fit, eating a balanced diet, and properly warming up before exercise or strenuous work. ■

Reprinted from the March 1994 issue of The Combat Edge.

How to Prevent Them

Practice proper body mechanics. Learn to lift and carry safely. Maintain a healthy weight. Follow a regular exercise program. Try exercise, relaxation or meditation to reduce stress. Keep your three natural curves in balance. Warm up properly before sports activities. All of the above!

Who Gets Backaches?

People who sit or bend when they work. People who lift or carry when they work. People who are overweight. People who are inactive. People who are under stress. People with poor posture. People who play sports. People like you!

Back pain is epidemic. It brings us to the doctor more than any other ailment—except colds and sore throats—and it affects everyone. One hundred million Americans suffer from back problems!

Figure 5

Figure 6


Figure 7


H. Dean Chamberlain

Ultralight Training

In the April 1994 issue of *FAA Aviation News*, we published an article called "Ultralight or Aircraft?" We wrote that article because of our concern about the possible use of unregistered aircraft operated as ultralight vehicles. However, we received a complaint about the fact that we didn't mention the professional ultralight organizations' training programs. We did not include this information since the article was not about ultralight training.

In the article we stated that FAA—

> "... is concerned about the possibility that unsuspecting passengers may be flown for other than training purposes by unqualified operators in illegal, uninspected aircraft by unqualified and non-certificated pilots."

That statement also caused some concern. FAA, and any professional organization, must share the concern that the public may be placed in danger by unauthorized individuals flying passengers contrary to the FAR. This goes for a student pilot illegally carrying a passenger in a Cessna 152 or Piper *Cherokee* as well as a non-certificated person who flies a passenger in an unregistered aircraft that does not meet the requirements of FAR Part 103.

The statements in the article concerning what does and does not constitute an ultralight vehicle reflect the current status of FAR Part 103. If a configuration does not meet the weight, speed, fuel, operating, seating, etc., requirements of FAR Part 103, it must be registered as an aircraft. As an aircraft it must be operated by a certificated pilot.

Consequently, unless FAR Part 103 requirements are changed, *FAA Aviation News* cannot advocate any ultralight operation other than one that conforms to the regulation.

In our FAA/Industry Partnership series, we have highlighted the two major ultralight organizations and their efforts in providing training to ultralight operators of ultralight vehicles. The April issue in which the ultralight article appeared was designated as a "Special Flight Instruction Issue," but the ultralight article *was not* a part of that series. The articles for that series were distinguished from other articles in the issue by a distinctive "FlightINSTRUCTION" logo, which was not included on the ultralight article.

We want to acknowledge that there are qualified ultralight instructors available to teach safety-minded ultralight operators under the auspices of the two professional organizations, Experimental Aircraft Association (EAA) and the U.S. Ultralight Association (USUA), that hold an FAA exemption to use two-place, powered, ultralight vehicles for training purposes. The problem is the public, not knowing the difference, may lump the operators well-trained by these organizations with the few people who violate the FAR. Those professional organizations and the FAA do not want that.

The USUA provided us with the following statistical information:

- USUA uses ultralight instructors who are registered with their organization to teach a standardized flight and safety training course.
- In 12 years USUA has trained nearly 17,000 ultralight operators in nearly 4,000 ultralight vehicles, consisting of 38 different models.
- USUA's exemption requires that the organization submit a summary of instructor safety reports every six months to FAA. During a recent 30-month period, there were 778 reports, which indicated that during 46,515 training hours there were only 17 accidents, accounting for four injuries and no fatalities. All of the accidents were caused by some mechanical problem.
- USUA's 374 registered basic flight instructors (BFI) over that 30-month period flew an average of 299 hours of instruction. Their life-time total experience averages 475 hours, and USUA's instructors have conducted a grand total of 369,161 hours of ultralight instruction.
- In the most recent six-month reporting period, instructors averaged 52 hours of flight time, and there were only five accidents with no injuries and fatalities, again none caused by operator error. ■

The Renaissance of General Aviation

Continued from page 4

occurrence in air carrier aircraft—could soon will be available on new general aviation aircraft. "We need to do this," Holmes said, "to attract the upcoming generation who are used to Nintendo." [And too young to remember Buck Rogers!]

Paul Fiduccia, President of the Small Aircraft Manufacturers Association, noted the success of the home-built, experimental aircraft. In a decade where the numbers of new, factory-built aircraft have declined, home-builts have increased dramatically. In 1993 alone, over 3,000 home-built kits were sold; new factory-built aircraft were just over 700. Kitplanes now account for 10% of the piston fleet.

"The home-built industry," Fiduccia said, "allows more room for innovation" when you don't have to incur the costs of FAA certification. "Compliance," he said, "is based on the fact that the person who builds the airplane flies it."

Robert Wright, Manager of the General Aviation and Commercial Division, outlined the revised General Aviation Action Plan. The GAAP has been revised to make it a single-source strategic plan for general aviation for the entire FAA.

Aircraft and engine manufacturers related the strategies their companies have used to remain successful while general aviation sales and production have been declining. Philip Boob of Textron Lycoming stressed situational analysis and changing to fit the changed market. For example, Textron previously did few engine overhauls when they were building hundreds of new engines each year; now that the demand for new engines has decreased, Textron switched a portion of its business to overhauls to remain competitive.

William Monroe, President of the U.S. General Aviation Division of Aerospatiale, informed everyone there was no "airplane fairy." His remarks were so unique and interesting that we published exerpts as an editorial on p. 1.

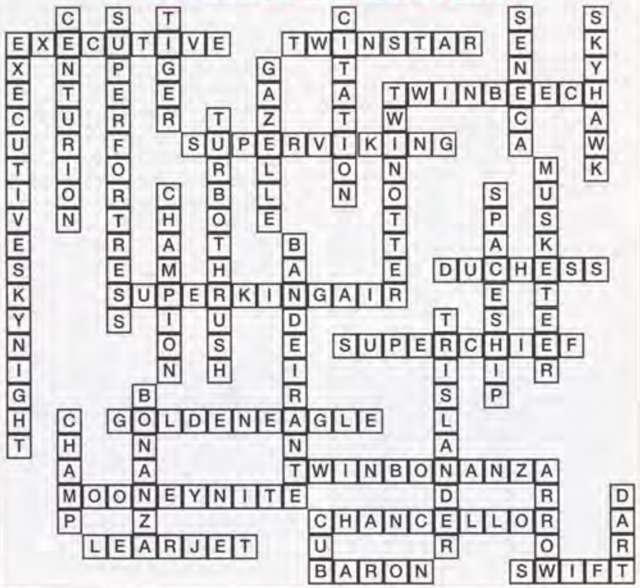
Phil Boyer of AOPA and Tom Poberezny of EAA, from two of the largest general aviation interest groups, gave the consumer perspective. Both emphasized that any renaissance of general aviation had to involve an increase in student starts and subsequent pilot populations. Boyer outlined AOPA's "Project Pilot," and Poberezny reported on EAA's "Young Eagles" program.

AOPA's program is designed to have existing pilots mentor new pilots, and the Young Eagles program aim is to fly 1,000,000 youngsters by 2003, the 100th anniversary of the Wright Brothers flight.

Most people at the conference were enthusiastic about the technology spinoffs that would be available to enhance general aviation aircraft. But, as one conference attendee said, "The bells and whistles are fine, but we have to get people in the airplane!"

With efforts like Project Pilot and Young Eagles, with strategic thinking like the GAAP, and with support of the industry as evidenced by the attendance at the first—but not last—general aviation symposium, that rebirth seems assured. ■

The Answers to Last Issue's Puzzle



What's in a Name?

For 25 years FAA's Accident Prevention Program has been recognized as the agency's safety and education outreach program. Through Accident Prevention Program Managers (APPM) in each Flight Standards District Office (FSDO), nearly 800,000 airmen attend safety seminars each year. The Accident Prevention Program established industry partnerships long before they became a cornerstone of the agency's strategic plan.

Why change a good thing?

When the Accident Prevention Program was a test program in the late 1960's, the general aviation accident rate was horrendous. In 1967 there were over 6,000 accidents, over 1,200 fatalities, and roughly 80,000 fewer pilots than there are today. "Accident Prevention" was the program's purpose, and the name was highly appropriate.

Roger M. Baker, Jr., National Accident Prevention Program Manager, said, "Through the Accident Prevention Program's efforts in three decades, general aviation accidents are now about 2,000 per year, and fatalities less than 800. We have learned how to prevent accidents and how to involve airmen in safety education.

"In the past five years, the Accident Prevention Program has also broadened its outreach. Once aimed only at pilots, the Program now includes airworthiness safety education and outreach and is taking on air carrier and air taxi/commuter safety issues. 'Accident Prevention Program' no longer adequately describes what is now an overall safety program. We realized it was time for a name change."

The General Aviation Action Plan Coalition, consisting of 11 representatives from aviation industry groups, also recommended in a November 1993 letter to FAA Administrator David Hinson that the Accident Prevention Program needed a new name that would reflect its true mission—aviation safety.

"We held sort of a contest," Baker said. "We asked Flight Standards employees and the Coalition members to submit their ideas for a new program name and a short explanation of why that name would reflect our mission."

As the suggestions came in, a pattern quickly emerged, and the new name, approved on June 24 by Flight Standards Director Thomas Accardi, is the ***Aviation Safety Program.*** The APPM's are now ***Safety Program Managers.*** "The Accident Prevention Program," Accardi said, "has always been part of the FSDO's overall safety program. This new name reflects this and the recent integration of airworthiness into the Accident Prevention Program's efforts. Besides, if you have a *safety program*, you will prevent accidents."

The time-honored Accident Prevention Counselor also gets a new title. The 3,600 volunteers, who support the agency's safety outreach and education efforts and who conduct the program at the grassroots level, will now be known as **Aviation Safety Counselors.** The National Staff is working on a logo and a slogan that will be instantly identifiable with the new name, much as "Safety is no Accident" was with the "Accident Prevention Program."

There will be some confusion for a while, but the APPM's—oops!—the Safety Program Managers will go on with their work of improving safety and promoting partnerships. ■

In the **HANGAR**

Is There a Cellular Phone on the Plane?

All good pilots know that the FCC prohibits the use of cellular phones in airborne aircraft, but sometimes there are exceptions to the rule. The following is from the NASA Aviation Safety Reporting System's CALLBACK.

Operating an aircraft with an MEL for #2 [com] transceiver inop . . . . We were cleared into position and shortly afterward cleared for takeoff . . . .After takeoff the remaining com and both nav radios failed. We both attempted contact on the remaining com without results. I made a decision to return and turned the aircraft control over to the First Officer. We squawked 7700 for one minute, followed by 7600. Using the TCAS II, I decided to fly a wide pattern to insure we cleared all traffic....Meanwhile I was making transmissions in the blind and reporting our intentions while listening on the VOR radio, without success. I asked the flight attendant to inquire if any passenger had a cellular phone, and she brought one up to the cockpit. I had the number of the Tower, and was able to get clearance to land and explain our situation to the controller. After landing, I got clearance to cross the intersecting runway and taxi to parking without further incident. I returned the phone to the passenger with my gratitude. A short in the wiring harness caused the #2 com failure and subsequently the total com/nav failure . . .

Although it may have given the wrong impression to the passengers when the Captain used a cellular phone in flight, I did brief the passengers that we had lost all our communications radios before asking if anyone had a cellular phone.

Although airborne use of cellular phones may cause disruption of ground-based cellular transmissions and other interference problems, we doubt the passengers got the wrong impression.

Famous**FLIGHTS**

Beech Corp.

Angels on Earth

by Phyllis Anne Duncan, *Editor*

For most of the history of FAA Aviation News *we regularly printed a highly popular continuing feature—"Famous Flights" and "Famous Flyers." These stories concentrated on noteworthy aviators or historical flights, and when we miss an issue—as we occasionally have to do to fill space with safety information—we usually get letters. "FF," as we call it here on the editorial staff, will still feature historical articles, but we'd also like to expand its scope to feature interesting aviation operations that don't necessarily fall under safety or our various partnership series. Read on, and let us know what you think.*—***Editor***

A decade ago my mother had cancer, and her doctor offered her two treatment options: 1) drive 100 miles round trip to a hospital for radiation treatments, or 2) stay in her local, rural hospital and have surgery, followed by chemotherapy. Raised in and a resident of a rural area all her life, she felt she could not drive to a urban area with its traffic and busy streets. Even when someone offered to drive her, she felt she couldn't cope with what she believed would be a nerve-racking experience. She opted for the surgery and chemotherapy, and six weeks after her surgery, she died from the effects of the strong chemicals.

Her choice of treatment is not the point here; rather, it's the fact that she couldn't face having to travel what was to her an overwhelming distance for the treatments and so she opted for a treatment that took her life before it eradicated the cancer.

Depending upon the nature of their illnesses, many seriously ill patients don't have a choice. Their treatments may only be offered at specific hospitals or medical universities across the country, requiring extensive travel. Treatments, especially some temporarily debilitating ones, may leave patients unable to drive, and distances may preclude easy commute by car. The cost of airline seats—even in these days of cheap fares—adds up quickly when you have to go for treatment monthly or even weekly. Because no health insurance—current or planned—picks up the cost of transportation, patients are faced with difficult decisions. How do they pay for traveling to life-saving treatments without going into bankruptcy? How do they face a long, cross-country flight with the stressful knowledge they have a fatal disease?

If ever a situation called for angelic intervention, this certainly is one. And that's exactly what happened.

In 1969 Priscilla Blum, a private pilot from New York who describes herself then as "a freelance writer, volunteer worker, and airport bum," discovered she had cancer. She was treated, and her cancer was taken care of. Because she was a cancer survivor, she was selected to be on the Connecticut chapter of the American Cancer Society. While serving on this committee, she heard harrowing tales of patients' difficulty traveling to places to obtain their treatments. For example, 25 years ago, only a hospital in Seattle did bone marrow transplants, and one patient was unable to come up with the airfare to fly there.

In the middle of this meeting, hearing this wrenching story, Ms. Blum had what she describes as a gestalt episode. Corporate aircraft, she realized from her aviation experience, flew all over the country—with empty seats and a more flexible schedule than commercial airlines. Best of all, the seats would be free, because the corporate aircraft were traveling anyway.

She literally blurted this idea out in the middle of the meeting and received a great deal of skepticism. However, her co-members agreed to let her research the idea. She immediately contacted a corporate executive friend of hers who owned a Beech *KingAir* used in his business. It would work, he said, and work well.

The Corporate Angel Network was born in December 1981.

Based at Westchester County Airport in White Plains, NY, the Corporate Angel Network (CAN) has arranged over 6,000 flights and boasts over 500 U.S. corporations whose empty seats on their aircraft are available to transport patients along with their executives.

Word of mouth added to the number of corporations as well as what Ms. Blum calls her "chair lift" approach. Whenever she went skiing and ended up in a chairlift with a stranger, she asked her companion what business he or she was in and if that business had an airplane. Then, the chairlift companion would get a briefing on CAN. What she tells them is that joining CAN won't cost them anything, that they can exercise some corporate social responsibility, that it looks good in shareholders reports, and that it will make them feel good.

Blum and her partner, Jay Weinberg—also a former cancer patient—three paid staff, and 55 volunteers in offices donated by Westchester County, consult the computerized flight schedules (received weekly) from their 500 corporate providers and match them up with patients who need to go to the cities where the corporate airplanes are headed. When a match occurs, CAN contacts the corporate flight department to determine if the flight is still scheduled, if seats are available, and if an executive will approve use of the seats.

When the seats have been cleared, CAN obtains all flight details and provides the information to the patient. CAN is the intermediary, although the patient and the flight department do exchange phone numbers in case there is a last minute change in schedule. CAN notifies the patient if a flight is canceled. CAN also oversees ground transportation for patients, in some cases arranging free limousine service.

The youngest of the 6,000+ travelers has been a 13-day old baby in need of a bone marrow transplant, and the oldest was a 92-year old who drove herself to the airport. A Seeing Eye Dog® also accompanied its partner on a flight.

Patients have to be able to board the aircraft unassisted, and they cannot require life support systems or special services. They have to give CAN their doctors' names so CAN can verify the patients' medical condition. Patients have to be traveling to and from recognized treatments, checkups, or consultations. The traveler can also be the bone marrow or blood platelet donor for a specific patient. If space permits, the patient can be accompanied by someone, and children must be accompanied by one or both parents, again, if space permits. The patient does not have to be in financial need.

Bonnie Sue Rauch

CAN founder Priscilla Blum and her partner Jay Weinberg

The biggest concern of most prospective corporate providers is that the business aircraft is an extension of the office, that legitimate business discussions and negotiations go on during flight. CAN heads off such concerns by assuring corporate executives that patients will not interfere with any business discussions and that if the flight may involve sensitive corporate discussion or security matters, the patient will take another flight.

Patients must also dress appropriately, not smoke on board the aircraft, and limit luggage to one suitcase and one carry-on per person. To assure that the flight departs smoothly, patients must obtain directions to the airport, must arrive one hour before the departure time, and must bring personal identification. CAN suggests that patients make back-up travel arrangements in case the corporate flight is canceled by mechanical problems or a change in business schedule. (One CEO was so distressed at having to cancel a flight with a patient scheduled to be on board that he offered to buy airline tickets for the patient. However, CAN does not accept monetary donations from the corporations that provide the aircraft seats. Blum's partner Weinberg asked the CEO to write instead to the CEO's of his fellow Fortune 500 companies and ask them to join CAN. He did better than 500; he wrote to 1,500 companies, and CAN received 450 replies—350 from companies with no airplanes but who thought CAN was a great idea and 100 from companies with airplanes offering their services.)

The many flights that do go off provide some interesting experiences. A patient who flies to his or her treatment on a Ford Motor Company corporate jet may return home on General Motors' aircraft. Someone who takes one trip on B.F. Goodrich's aircraft may take the next trip on Goodyear's (unfortunately, not the blimp).

For all the corporations who have participated since CAN's inception, 200–300 have dropped out, usually because the flight department has been shut down or because the buying company in a merger said "No." One major electronics company was what Blum calls a "wonderful citizen," but when it was bought out by its

biggest rival, the new owners no longer allowed CAN patients on board. "So much," Blum says, "for corporate social responsibility."

Yet, some corporations who had previously refused have joined up following a change in management. One CEO changed his mind after his own bout with cancer. Actually Blum believes that non-participation is not really from a lack of corporate social conscience but from the reminder of mortality that the patients unwittingly give.

To recognize its most enthusiastic supporters, CAN designates flight departments who have flown more than 100 Angel flights as "Frequent Flyers." The corporation receives a plaque bearing its designation as a CAN Frequent Flyer. As you've no doubt seen in its television commercials, Dow Chemical was the first with over 100 flights, and Xerox was second.

And what do patients think when they first hear of CAN? "The reaction," Blum says, "is one of disbelief, that it's too good to be true." Comments from the patients say it best:

> "I appreciate what each of you has done over these past months. I can't thank you enough and realize yours is not an easy task, and most of you volunteer your time to helping to SAVE LIVES! . . . I'm so grateful to CAN. Your kindness is heartwarming. THANK YOU."

> "Dear Angels,
> Words cannot express our thanks and gratitude for turning what could have been a very expensive nightmare into a wonderful, once in a lifetime dream."

> "It was an unforgettably beautiful October day that we flew into New York with a vivid sunset all around us and the city growing dark, lights twinkling beneath us; and the ease, beauty, and care of it made the trip seem auspicious rather than the first in a series of ordeals."

> "We felt like royalty. A lovely fantasy to remember no matter now difficult reality may become."

Remember, state of mind is very important in successfully battling any serious disease.

CAN is a not-for-profit organization supported by donations and grants from foundations. It has received the Eleanor Roosevelt Award for Voluntary Service, the NBAA Jack Doswell Award, an FAA Eastern Region Award, and the President's Voluntary Action Award. Then President Ronald Reagan said when presenting the Voluntary Action Award to CAN:

"Never in our history have so many Americans given so much of their time, energy and resources to help others."

Blum would say of CAN that, "The most important advantage is that it allows cancer patients to fly in dignity and comfort. And it tells them, at a very low point in their lives, that somebody cares."

CAN, and several other, similar organizations, personify the social conscience of general aviation. The next time someone complains about general aviation noise or safety, tell them about the Corporate Angel Network.

There really are angels—sometimes they wear business suits instead of wings. ■

The growth of services like CAN and similar organizations is an adjunct to any health-care reform with no cost to taxpayers. Corporations whose aircraft are used by patients cannot deduct the costs of the flights because the flights had already been scheduled for business purposes. If you are interested in adding your corporate aircraft to CAN's "fleet," contact CAN at Westchester County Airport, Building One, White Plains, NY 10604; (914) 328–1313. If you are in need of a CAN flight or if you would like to contribute to CAN, contact them at the same address and telephone number.

AirspaceCORNER

I am wondering about part of your response to the question regarding saying, "Class B," or "Class Bravo" (Jan/Feb 1994 issue). Did you intentionally use the word "clearance" for Class C airspace? It has been my understanding that only a Mode C transponder and two-way radio communication are required to enter Class C airspace.

A related question is, "Just what does two-way radio communications mean?" If you call outside Class C airspace and the controller answers, Grumman 26115, Burbank approach, standby," can you enter the Class C airspace before ATC gets back to you?

Thank you for your excellent publication.

Paul Sternberg
Tokyo, Japan

Yes, we used the term "clearance through" to indicate the pilot's intention of flying through the Class C airspace. The example tells ATC very quickly what the pilot wants to do, and ATC's response was also very explicit. You are correct, the only equipment required to operate in Class C airspace is a two-way radio and unless otherwise authorized by ATC, an operable radar beacon transponder with automatic altitude reporting equipment. A pilot must establish two-way communication before entering Class C airspace.

Regarding Class C airspace, two-way radio communication means ATC has used your aircraft call sign in answering your call. In your example, yes, you can enter Class C airspace since ATC used your call sign (established communication) in its reply to you, and ATC did not tell you to remain outside of the Class C airspace. If ATC had not used your call sign or had told you to remain outside the Class C airspace after using your call sign, you could not enter the airspace. Chapter 3 of the *Airman's Information Manual* explains the various types of airspace and entrance requirements for each with examples.

• Swiss Professional CFI's

In your April issue you published the first part of an interesting article, "The Flight Instructor as a Professional." In this article, the author talks about professional registration. He might be interested to know that in Switzerland, once one has completed the instructor course (three weeks organized by the Swiss FAA with admission only after successfully passing a flight and a pedagogical examination), one becomes a flight instructor only after having fully trained two student pilots for their private certificate under the supervision of a designated "senior" flight instructor. Then, the flight instructor is authorized to teach private pilots without supervision. The second and last step, based on total experience, is to allow this flight instructor to teach commercial students.

This solution is, however, as good as the supervising instructor!

When I received my first flight instructor certificate, I set as a goal to obtain an additional rating every two years (CFII, multi-engine, etc.).

Also, the Wings [Pilot Proficiency Award Program] is unfortunately not available for those of us living outside the USA, since no safety seminar is organized outside the USA. I would happily try to contribute to such a seminar once a year.

I really appreciate your magazine.

J. Lovenbach
Lucerne, Switzerland

FAA AVIATION NEWS welcomes comments from its readers. We may edit letters for style and/or length. We will select a representative letter from those on the same topic for publication, and because of our publishing schedule, responses may not appear for several issues. We will not print anonymous letters, but we will withhold names or send personal replies upon request. Address: Editor, FAA AVIATION NEWS, AFS-810, Washington, DC 20591. FAX (202) 267–9463.

Switzerland has some interesting ideas for certificating CFI's, which would probably not be tenable for a country, like the U.S., with tens of thousands of CFI's. Setting a personal goal to add CFI ratings is a good idea as is CFI's participating in the Wings program.

The FAA currently does not conduct the Wings program in Europe, even for U.S. airmen there. This is mainly because of budget and because the FAA cannot "interfere" with safety programs conducted by other countries' aviation authorities. However, we would be happy to provide information and advice for any aviation authority interested in starting its own version of the Aviation Safety Program's Pilot Proficiency Award Program.

• Abeam One More Time

I am irritated beyond belief at the response to the "Over/abeam the Fix" question in the March '94 issue of FAA Aviation News. The examples cited are simply irrelevant: none of them show how over the fix can occur later than abeam the fix.

When you are established in a holding pattern you will always pass over the fix prior to the abeam position. There's no way you will ever reach the fix later than the abeam position—unless you're flying it backwards!

But listen to how Thomas Accardi answers the question: "Begin your outbound timing of 1 minute when you cross over the fix for teardrop and parallel entries, and when you complete the turn or are abeam the fix for a direct entry." The implication is clear: the offending sentence only applies to entries.

Although he clarified it for me, he may not have shared it with the rest of the FAA.

James M. Thoburn
Rochester, NY

Thank you for reminding us of an important point. In all of our discussions, we also failed to make the point that the initial one minute outbound is only an approximate time to keep an aircraft within protected airspace so the pilot can maneuver to establish the aircraft in a holding pattern with a one minute inbound leg. Unless one is adjusting a holding pattern to depart at a specified time, the important time in the pattern is the one minute inbound leg. Enough said. Finally, there has been a change in the Airman's Information Manual regarding holding pattern entry.

• Handpropping

In the January-February 1994 issue, "Hand Prop" is among the best I've seen about an oft neglected subject. May I offer some advice in connection with item number 4? Even prior to World War I (I believe) the term contact was in general use rather than switch on. Considering the usual noisy airport environment, there is little chance for mistaking contact's meaning whereas off and on sound very much alike. With the advent of "self-starters" much propping lore has disappeared.

I loved the WACO on p. 25, plus the even rarer New Standard on the back cover.

Charley Hayes
Park Forest, IL

You are right. The term "contact" is an excellent choice for identifying when the mags are turned on or hot. It is important that mutually agreed upon terminology is used and understood between both the pilot and person hand propping anytime an aircraft is hand propped.

Another danger everyone needs to be reminded of is the dangers of walking around and into a turning prop. Another recent accident report told of a person who removed a chock from one wheel and who then turned and walked into a spinning prop.

Everyone needs to be extra careful when walking around aircraft on a flight line. Pilots need to be especially careful and responsible when escorting non-pilot friends near aircraft. Non-flying friends seldom know the dangers around aircraft. This advice is especially important when children are involved. A child can run into a prop or jet blast without ever realizing the risk. Children and aircraft are too precious to ever lose through an accident.

• Special VFR Clearance

I have a question concerning when one must request a Special VFR (SVFR) clearance in order to fly in a Class E extension to a Class D surface area designated for an airport. My question is prompted by the answer in your May/June "FlightFORUM."

Sky Acres Airport (44N) is located on the New York sectional. It is an uncontrolled field approximately eight nm northeast of Dutchess County Airport (POU), Poughkeepsie, NY. Dutchess County Airport has a control tower and is situated in Class D airspace. Sky Acres is located in its Class E extension.

Situation: *Assume that I am arriving from the north to land at Sky Acres. I do not intend to enter Poughkeepsie's Class D airpace. Poughkeepsie is reporting ceiling 900 feet, visibility two miles in fog. Sky Acres has no weather reporting available. From my aircraft, I perceive Sky Acres to be clear with visibility much better than 3 miles. Remember, my aircraft may not have a radio, since communication with ATC is not required in Class E airspace when operating VFR.*

Question: *Must I request a SVFR clearance to enter the Class E airspace and land at Sky Acres?*

Jacqueline Tulumello
Babylon, NY

Yes, in this particular instance, a SVFR clearance IS required to enter the Class E (surface area) extension of the Dutchess County's Class D airspace when the ceiling at the primary airport (Dutchess) is below VFR minima.

The key is FAR § 91.157(c). This section specifies that you cannot operate under Visual Flight Rules within the horizontal boundaries of the surface area when the ceiling at the primary airport (in this instance, Dutchess County) is reporting a ceiling less than 1,000 feet regardless of whether your aircraft is able to remain in visual meteorological conditions in that portion of the surface area where the aircraft intends to operate. The intent is to protect ALL of the airspace required for instrument operations at the primary airport. Arrivals may be using the Kinston VOR for an approach to land at Dutchess and departures may be coming off runway 6 (or missed approaches off the ILS for runway 6) proceeding over that VOR enroute, thus it was, and is, necessary to protect that airspace when the Dutchess County Airport is IFR.

InstrumentCORNER

• Simulated IFR

Your answer to the instrument currency question in the October 1993 issue only points out that FAR § 61.51(b)2) and (c)(5) requires all time logged as instruction to be signed by an appropriately certificated instructor. No one disputes this, however instruction or retraining is not a requirement for instrument currency. FAR § 61.57(e)(1) states that recent experience is the requirement for currency. This "recent experience is clearly described and it is only necessary to log the time. The need for an instructor during the accumulation of this recent experience is not mentioned. What AC or FAR supports the comment that no one can solo either a simulator or ground training device?

Russell Anderson CFII
Madison Heights, MI

Maintaining IFR currency in flight does not require an instructor. Our answer referred only to the FAA requirement that simulated instrument time acquired in an FAA-approved training device or simulator used to meet IFR training or currency requirements must be signed off by an appropriately rated instructor. This is supported by FAR § 61.51(b)(2)(v) and (c)(5). Currency can be maintained either in an aircraft or by a combination of aircraft and training device or simulator. If a training device or simulator is used the time acquired must be signed off by an appropriately certificated instructor.

First Airports Cleared for Satellite Approaches

Several thousand airports throughout the country will soon have their own piece of satellite technology giving them the capability to handle landings in bad weather, courtesy of the FAA.

Widespread use of a Department of Defense-developed satellite navigation system is beginning with FAA's authorization of aircraft approach guidance the three public use airports based on information from the Global Positioning System (GPS). The program to authorize use of such GPS approaches will be expanded to all airports that would benefit over the next few years.

The three airports—Frederick, MD; Oshkosh, WI; and Denton, TX—will be the first of several thousand to receive GPS-specific, or stand-alone, approaches—meaning that the airports will not need expensive conventional ground-based navigation aids for aircraft to fly an approach, even in bad weather.


AOPA

FAA Administrator David R. Hinson was the first to fly one of the newly authorized GPS approaches at Frederick Municipal Airport in Maryland. Joined by Aircraft Owners and Pilots Association (AOPA) President Phil Boyer for a short flight in AOPA's upgraded Cessna 172, the Administrator pronounced the GPS approach a complete success. "Unbelievably accurate," he said, "It was right on the centerline."

In June 1993, FAA authorized the use of approximately 2,500 "overlay" approaches—procedures that use ground-based navigation aid procedures as a framework. Another 2,000 overlay procedures will be published by 1994.

By contrast, stand-alone procedures are designed specifically for GPS and require no ground-based navigation aids. Of the more than 5,000 public use airports in the United States, fewer than half are currently served by any type of ground-based instrument approach. Conventional ground-based navigation aids can be very costly and require frequent maintenance. With GPS, an aircraft has a receiver in the cockpit to pick up radio signals from the GPS satellites, and the airport does not need any hardware on the ground. The specific approach information is available in a data base that is contained within the airborne GPS receiver.

GPS approaches may eventually replace all ground-based instrument approaches. The FAA plans to publish about 500 to 1,000 stand-alone procedures per year, making all-weather air service possible at thousands of airports that are currently limited to good weather operations.

by Patrice Allen-Gifford, *FAA System Engineering and Development*

Debris in the Tank

Recently, the British Civil Aviation Authority's General Aviation Safety Information Leaflet (GASIL) contained an article about debris in fuel tanks. According to the article, metal clips (which clip the Fuel Anti-Ice Dispensers to the fuel nozzle during refueling) were found in a fuel tank. The article also mentioned a previous report about debris from plastic oil bottles being found in oil systems. The article reminded pilots and maintenance personnel of the need to be careful when adding any product into an aircraft's fuel or oil system. Since many pilots now use oil in plastic oil bottles, they should be especially careful about not losing the plastic retaining collars from the bottles into the oil system. What compounds the problem is that many of the oil bottles are designed for inserting directly into the oil filler tube. If there is any doubt about any loose part being able to fall into either a fuel tank or oil reservoir, the wise thing to do would be to remove the object.

New FAA/Mexico ATC Link

New FAA satellite communications equipment will improve the exchange of air traffic control information between Mexico and the U.S. Mexico's national ATC network, Servicios a la Navegacion en el Espacio Aero Mexicano (Seneam) already uses equipment compatible with the new FAA system, which replaces a terrestrial telephone line system. The new system transmits voice and data between FAA and Mexican air traffic centers, easing the tracking and routing of flights between the two North American neighbors.

Story's End

In our May/June 1994 issue, the last paragraphs were inadvertently left off the article, "The Flight Instructor as a Professional, Part 2." Here is the missing copy.

So, what can flight instructors do to start on a professional path? First, make the decision and firm commitment to becoming a professional. Adopt an attitude of doing your job right. Start attending advanced training from professional sources, stick around the professionals to get all of their input that you can, subscribe to some hard-core flight science periodicals [The subscription form is in the center of this magazine; if missing call me at (202) 267-8017.—***Editor***] and spend time digesting the material, get many of the excellent handouts from your Aviation Safety Program Manager, incorporate the procedures and practices of professional flight organizations into your flight instruction (checklist usage, "captain's" briefings, etc.), conduct yourself on the ground and in the air as a professional, follow the rules and regulations, and set a professional example.

The list could go on forever, but the main point is attitude, devotion, and commitment. ■

This article is copyrighted, so permission is required from the author before it can be reprinted. Part One of this article appeared in the April 1994 issue of FAA Aviation News *and was an introductory discussion on professionalism and how it relates to flight instructing. The second part provides specific suggestions for enhancing and improving the flight instructor's image.*

Mr. Patrick R. Veillette is an Aviation Safety Counselor with the Salt Lake City, UT Flight Standards District Office. He is also a pilot examiner finishing his PhD in Aeronautical Engineering and is currently working with NASA on the subject of cockpit engineering and human factors.

Airworthiness Alerts

Aircraft owners, operators, and pilots who want the latest information about reported airworthiness problems and suggested solutions involving their aircraft and installed equipment should make sure they are on the FAA's *General Aviation Airworthiness Alerts* (*Alerts*) distribution list. Published by the Flight Standards Service's Safety Data Analysis Section, AFS-643, the free *Alerts* safety publication reports about problems and proposed corrective actions sent to the FAA by A&P mechanics, IA's, and others who operate and maintain general aviation aircraft. Information in the *Alerts* is taken from maintenance Malfunction or Defect Reports submitted to the FAA.

To request a free annual subscription to *Alerts* (AC 43-16), print or type your name and address, including Zip Code, and send the information to *Alerts*, AFS-643, DOT/FAA, P.O. Box 25082, Oklahoma City, OK, 73125-5029, and ask to be put on the mailing list for AC 43-16. For additional information about the publication you can call Mr. Phil W. Lomax, the Aviation Safety Inspector, Airworthiness, who publishes *Alerts* at (405) 954-6487.

WIAC Draws 650 Participants

The fifth annual International Women in Aviation Conference, held March 10–12 in Lake Buena Vista, FL, drew 650 participants from 45 states and seven foreign countries. During ceremonies at the conference, four women were named to the conference's Pioneer Hall of Fame: Mary S. Feik, pilot first woman engineer in research and development in the Air Force's Air Technical Service Command; Jessie Woods, whose 65-year career in aviation includes wing walking, piloting, and flight instructing; Evelyn Bryan Johnson, a flight instructor with more than 53,000 flight hours, and, posthumously, Olive Ann Beech, a member of the founding family of Beech Aircraft Corporation.

Author and speaker Donna Vilas Fisher spoke on power networking at the opening session. Other speakers during the conference included Ed Stimpson, president of the General Aviation Manufacturers Association, and Sharon Lucid, NASA astronaut. Panelists Pat Wagner, Montaine Mallet, and Sandra Williams discussed women in the airshow business. Breakout sessions were held for those in corporate aviation, the airlines, and aircraft maintenance. Topics covered in the 20 concurrent sessions ranged from women airline pilots to women of the FAA and women as self-mentors.

The WIAC is sponsored by Parks College of Saint Louis University, Cahokia, IL, and chaired by Dr. Peggy Baty, associate vice president and dean at Parks. Next year's conference will be held March 16–18 in St. Louis, MO. For information on the 1995 event, contact Parks College at (618) 337-7500.

Better Late Than . . . ?

Because of a problem with awarding a printing contract for *FAA Aviation News*, the July/August 1994 (and possibly this issue as well) was printed on a single-issue, spot contract. Because of the time involved in issuing the spot contract, the July/August issue was not printed until July 8, and distribution did not begin until the week of July 11. We apologize to subscribers who may have received the July/August issue, which contained time-sensitive Oshkosh material, late.

The Government Printing Office expected to award a long-term contract by the end of July, and subsequent issues should be produced without delay.

FAA Airmanship Award to Evergreen Crew

FAA has awarded the Order of Daedalians' Award for 1993 to an Evergreen Airlines crew who successfully landed a B-747 after it lost an engine, parts of a wing, and portions of its flight controls on takeoff from Anchorage, AK. The incident occurred March 31, 1993.

Because crews rarely land such damaged airplanes safely—two similar failure two years ago in Taiwan and The Netherlands resulted in fatal crashes—FAA selected the Evergreen International pilot and crew for the highly prestigious award, considered the highest in the aviation industry. The Order of Daedalians, a national fraternity of commissioned military pilots—has presented the award annually since 1958.

Captain Lawrence I. Branstetter fought the controls while First Officer Arjang Fatoli and Flight Engineer Georgia L. Gambrel secured the lost engine, locked down the leading edge flaps, and dumped fuel. Captain Branstetter delayed gear extension until 300 feet AGL, and the crew made a successful three-engine landing. Said Flight Engineer Gambrel, "The only way out is to take all you know about flying and about 747's, mix in some creativity, and never give up."

Previous recipients of the award include John L. Testrake, pilot of the TWA plane hijacked to Lebanon in 1985, and John Schornstheimer, who safely landed an Aloha Airlines B-737 after its roof was torn off. An FAA official presented the award to the crew during the Daedalians convention in Washington, DC in late May.

California Coast Airshow

The Half Moon Bay Airport Pilot's Association has announced that this year's California Coast Airshow will be held November 5 and 6 at the Half Moon Bay Airport. The show will be open from 9 a.m. to 4 p.m., with the flying acts performing between 12 noon and 3 p.m.

Currently scheduled to appear are Eddie Andreini in his *Super Stearman*, Julie Clark in her Mopar *T-34*, John Piggot in his *Sukoi*, Dave Morse in his *Lancair*, Dan Buchanan and *Silent Flight*, Joann Osterud and her *Ultimate 10-300S*, and Amelia Reid with her special *Aerobat 152*. There will also be ground displays and flyovers of military aircraft, Warbirds, historic aircraft, homebuilts, and foreign aircraft, along with an extensive array of food, booths, and activities for the entire family.

For more information on the airshow, call (415) 726-ROLL.

Strategies for Managing Workload in Flight

Good Situation Awareness + Appropriate Workload Management Strategies = Effective Crew Performance

***PLUS:* Good communication is essential to establish a shared problem model and assure coordination.**

1. Good crew performance depends on matching crew resources to the demands of the situation.
2. Good workload management depends on good situation awareness.

Situation Awareness

- Understand the problem before acting.
- Three important ingredients of ***Situation Awareness:***
  1. What is the problem?
  2. How much time is available to deal with it?
  3. How much risk does the problem entail?
- Be alert to cues that may signal an important problem.
- Don't ignore or explain away discrepant cues too quickly.
- When doing checklists in order to diagnose a problem, be thorough—the information may be useful down the line.

Workload Management Strategies

- Prioritize tasks:
  1. What demands immediate attention?
  2. What can be done later?
  3. What might not get done at all?
- Assign tasks explicitly.
- *Use low workload periods to prepare for high workload phases*, when possible.
- Make contingency plans when the crew can anticipate needing to make decisions during high workload phases (e.g., possibility of a missed approach because of weather). Set triggers: If X happens, we'll do Y; otherwise, continue with Z—or: When we get to X, we'll do Y.
- Rehearse tasks to be accomplished during high workload phases of flight (e.g., plan the timing and coordination of non-normal tasks such as manual extension of gear or flap extension using alternate procedures).
- Review information that may be needed during high workload phases, like missed approach information (which should be part of a routine approach briefing but which needs emphasis in bad weather conditions). Or review what system functions are lost and remaining after a system malfunction.
- Manage workload to allow "captain thinking space" when difficult decisions must be made. This can be done by shedding tasks; i.e., copilot flying the plane or working the radios.
- When thinking space can't be found by task management, buy time by requesting vectors or holding. *Don't be driven by tasks—actively manage windows of opportunity* to create time for gathering and evaluating information needed for making difficult decisions—providing fuel is adequate, of course.
- When more than one essential task must be accomplished by the entire crew (e.g., reviewing the abnormal procedures checklist to diagnose a system problem while making a major decision like whether or not to divert), set priorities based on risk and time pressure, and explicitly orchestrate which will be done by whom and when. Assign responsibility for monitoring or keeping track of secondary tasks so that they aren't lost.
- COMMUNICATE! Communication is essential to set the stage for dealing with in-flight problems. Assure that everyone has the same understanding of what the problem is and the strategy for dealing with it. By articulating goals and plans, everyone can contribute. Communication is necessary to assure coordinated action when workload is an issue.

These strategies were developed by Judith Orasanu (her article on decision making is on page 5) and Ute Fischer at the NASA-Ames Research Center.

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