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FEATURES

DEPARTMENTS

On the Covers:
Is it an ultralight or aircraft? See page 18 to tell the difference.

What does the future hold for this man? See page 11. FAA and Education: MTSU

What's going on at Denver Airport? See page 27. AvNEWS/BRIEFS

by Gregory G. Gorak

Webster defines threat as an indication of something impending or an expression of intention to inflict evil, injury, or damage.

Most instructors would not knowingly threaten their student, but some do not understand how students perceive instructor actions as threats. We know from *Aviation Instructor's Handbook* (AC 60–14) that threat affects perception by narrowing the perceptual field. Exactly what does this mean, and can it happen in the cockpit?

Let's look at a typical training scenario during which the CFI could possibly introduce a threat into the cockpit without even realizing it.

What Does the Student Do When "God" Taps the Altimeter?

A particular student has a total of seven hours of flight time, of which one-half hour is simulated instrument time. The instructor assigns the student the task of flying straight and level on a heading of 360 degrees at 3,000 feet for three minutes while wearing a view-limiting device. (The three-minute time requirement is stated in the Practical Test Standards.) After one minute the CFI notices that the student is 150 feet low and reaches over and taps the altimeter.

Now, pray tell, what does this seven-hour student with one-half hour total simulated instrument time do when "god" taps the altimeter?

It doesn't require much imagination to visualize the student's reaction. With eyes glued firmly to the altimeter, the student applies sufficient back pressure to correct the 150-foot deficiency at a rate of, oh, say, 7,000 feet per minute. The student and instructor sink into their seats with the increased "G" load, and upon re-arriving at the assigned altitude, the student thrusts the yoke forward to arrest the dramatic rate of climb. In the meantime, you can imagine what has happened to the heading, and, if the CFI technique is consistent, the CFI then taps on the heading indicator, and the scenario repeats itself. The student increases the *meaningless* velocity of his or her scan.

Why did the above take place? Well, without even knowing it, the instructor introduced a threat into the cockpit. The student narrowed his or her perceptual field on the offending instrument with less than desirable results.

Remember, Continue to Instruct!

As CFI's who strive to do the best job possible at all times, we all may have been guilty of narrowing the students perceptual field without even being aware of it. As a caring teacher, how could you remove the threat from the above instructional situation?

Upon noticing the altimeter discrepancy, ask the student to focus on the attitude indicator while encouraging a ¼ to ½ bar width correction. Now point out to the student that the aircraft is climbing at an acceptable rate based on the above correction. You might also want to compliment the student on his or her use of pressure versus movement of controls. This praise at a critical time will serve two functions: It serves as a motivation and will also keep the student's self concept high.

Now continue to direct precise heading control, because the student is keeping the wings level with the attitude indicator. Stress the vertical speed indicator, airspeed, and altimeter, indicating it is now time to level at three thousand feet with the same gentle pressure that the student used to enter the maneuver.

You can end the exercise by complimenting the student in the following manner: "Here we are, level at 3,000 feet, heading 360 degrees. *Nice job!*"

What did we accomplish? We removed the threat from the cockpit by remembering to continue to instruct. We kept the student's self-concept high with well-placed praise. The student has been successful and feels good about that success and is eager to continue.

Congratulations, Mr. or Ms. Flight Instructor! You are well on your way to keeping your student's perceptions high by reducing the threat in the cockpit! ■

Mr. Gorak is an ATP-rated airman and flight instructor; an Accident Prevention Counselor for the Milwaukee, WI FSDO; founder of Gaits Aviation Seminars; and author of several trade publication articles and the book, The Comprehensive Flight Log. *He has a Masters Degree in School Administration.*

FlightINSTRUCTION

The Flight Instructor as a Professional

Dear Phyllis,

I thought this might be a very good article for FAA Aviation News. *I'd like to get the aviation community thinking again about the important role CFI's play in the safety of everyone in aviation. I personally think the CFI is our number one element in our safety program. The author of this article is one of my very active Accident Prevention Counselors. I hope you will consider printing it.*

Sincerely,
James E. Pyles
APPM, Salt Lake City FSDO

PART ONE

Introduction

The term professional flight instruction is strewn across the advertising pages of many flying magazines these days, and naturally every flight instructor likes to think of him or herself as a professional. Yet, a study prepared for the Transportation Research Board found that a shocking number of flight instructors do not engage in the activities and training expected of professionals. For instance, less than one out of 10 instructors attended some form of advanced training, studied advanced training materials, participated in professional societies and activities, or maintained/referenced a collection of peer-reviewed literature or FAA or NTSB studies.

As an occupation, flight instructing is relatively new. In past times, the term *profession* was reserved for highly esteemed callings such as medicine, theology, engineering, or law. Many years of rigorous, dedicated study were required for these noble and dignified professions. Because these professions served such intimate interests for the public, it is likely that these professions will continue to be looked upon as pinnacles of the professional world.

Flight instructing has only existed since shortly after the Wright Brothers taught someone else how to operate one of their aircraft. It now encompasses teaching more than the mere physical coordination for flight; i.e., basic physics, physiology, human factors, psychology, etc. Flight instructing has certainly advanced in the depth and breath of material to be taught. It is a very "maturing" occupation. But can a flight instructor be considered a professional?

What makes a person a professional? Does possessing a flight instructor certificate make one a professional? Does possessing a thick logbook? Lots of ratings? Wearing captain's epaulets, a leather jacket, or a suit and tie? Does graduating from some big flight school's curriculum or belonging to some organization make one a professional?

Several definitions of "profession" are found in dictionaries, and they range from, "the business which one professes to understand and to practice for subsistence; a calling, occupation, or vocation distinguished from a trade, craft, or handicraft" to, "a vocation, calling, occupation, or employment involving labor, skill education, special knowledge, and compensation or profit, but the labor and skill is predominantly mental or intellectual rather than physical or manual."

One of the best definitions of a professional is given by the U.S. Congress in the Labor Management Relations Act, Amended 1947 (Taft-Hartley Law). According to the LMR Act, a "professional employee" is one who is:

1. engaged in predominantly intellectual work, and is varied, as opposed to routine mental, mechanical, physical work;
2. involved in the exercise of discretion and judgement in his/her work;
3. the output produced or the result accomplished cannot be standardized in relation to a given period of time; and
4. requiring knowledge of an advanced type in a field of science or learning customarily acquired by a prolonged course of specialized intellectual instruction and study in an institution of higher learning, as distinguished from a general academic education or from an apprenticeship.

In addition to these criteria, other requirements are frequently added, such as:

1. professional registration requirements (tests, experience);
2. activity in a professional society and other professional activities;
3. public service nature of the occupation; and
4. adherence to a professional code of conduct and ethics.

The FAA further notes in the *Aviation Instructor's Handbook* (AC 60–14) the following:

"Professionalism . . , is achieved only after extended training and preparation . . . is based on study and research . . . requires the ability to reason logically, accurately, and make good judgemental decisions . . , cannot limit their decisions to standard patterns and practice . . . "

Finally, a profession is not seen as a "stepping stone" to another career, but rather the pinnacle of many years of disciplined study, research, and examinations. Professionals are normally expected to rise within the ranks of their peers, but very seldom do you notice medical doctors using their medical practice as a stepping stone to something "higher."

Professional Registration

The primary purpose of registration laws is to protect the public from shoddy work. State laws will require that professionals license themselves before practicing in the state. Medical practitioners, engineers, and lawyers are all required to register with the appropriate state professional licensing bureaus. It is necessary that the applicant convince the licensing board that he or she is qualified to perform work at the professional level, which may come in the form of qualifying requirements such as exams and years of apprenticeship. Professional registration for an engineer involves completing an accredited undergraduate engineering degree (which is a minimum of four years of study), a background check into the individual's past civil and criminal records, followed by passing an exam (Fundamentals of Engineering, for example, is eight hours long!), followed by some years of full-time work under the supervision of a licensed professional before the individual is allowed to take the final examination with the state's licensing board.

Flight instructors, on the other hand, are not required to be licensed at the state level, but at the Federal level by the FAA. In order to be licensed, the prospective flight instructor must successfully pass two written tests and a practical exam given by an FAA inspector or designated examiner. The FAA's *Practical Test Standards* stipulate the fields of knowledge and performance levels required to pass the practical test. Whereas a newly graduated engineer must be supervised by a professionally licensed engineer for four years, once an applicant successfully completes the practical test for the flight instructor rating, he or she has a certificate stating that they are as qualified as a 40-year veteran. In contrast to many professions, flight instructors are not required to practice as an intern before full certification.

Professional Societies

Professional societies exist for a number of important reasons. Professional societies can establish standards of education, training, apprenticeship, and expertise required for membership. They also function to give guidance to outside groups on topics concerning their specialty. They have the objectives of advancing the science and practice in the public interest and to act as an advisory, communication, and information exchange agency for member activities. They also are concerned with the social, economic, political, and professional interests of their members. They function in roles to help support members' professional development. They provide avenues for members to associate with each other on professional levels. They encourage research in their field and often will sponsor conferences and monthly journals for members to showcase their work. Such functions also serve for the other members to scrutinize recent findings, which contributes to society through the peer review process by providing critique on new research. The end result is that the fundamental concepts will survive the process and be considered state of the art, while less complete ideas will be sent back to the drawing board for more work.

Professionals are expected to actively participate in professional societies, which means more than simply paying dues. Some societies are more exclusive than others. While some will require a mere fee to join, other societies will have membership requirements such as completion of certain courses of education, tests, training, etc. This participation ranges from attending meetings, presenting papers, serving as a reviewer for some of the latest research, sponsoring meetings, to making volunteer appearances at public functions to inform the public of the efforts of the organization and its members, and getting involved in community affairs.

Professional Life

Getting a flight instructor certificate is not the automatic beginning of a professional career but rather a stepping stone. A professional approach to flying should have been instilled from the first ground school lessons. Doctors, lawyers, and engineers can be expected to be treated as professionals by peers and by the public. The treatment for emergency trauma or other ailment by a doctor is immediately recognized as a vital contribution to society. However, in many ways, a flight instructor's contribution to society is unseen, even though a lay person can be just as dead from a flying accident as from a disease. Since the flight instructor's contribution to society is so unrecognized, it is even more important for the flight instructor to act as a professional if he or she expects to establish and maintain the respect accorded to professional people.

Professionals are expected to keep up to date with the latest developments in their fields of practice. In truth, a professional's education is never finished. For example, doctors and engineers are expected to subscribe to the journals in their specialties that contain peer-reviewed articles

of the latest research and advances. You would not expect a professionally licensed engineer to design a dam based on some article he or she read in a general media magazine. Such popular literature is mainly for the lay person; the professional is expected to digest the hard core, substantive journals which contain the latest research and proposals, material which the lay person or even persons with somewhat advanced education will not usually be able to understand if they do not have training in that field.

Professionals are expected to attend conferences and give presentations on their findings in the field and to critique other works in order that the most accurate and fundamental concepts will survive and possible shortcomings in other works will be scrutinized and "sent back to the drawing board" for more research.

While the professional's earnings are directly tied to his or her day-to-day efforts, his or her off-duty hours are spent in these endeavors, which makes a distinction between the blue collar worker and the professional. The blue collar worker's day is done at the whistle; however, the professional's day does not end when he or she leaves the office. The point is that there is always more to learn.

Many flight instructors live near urban areas with colleges or libraries which provide abundant learning materials and may also provide opportunities for continuing education. Courses on learning methods, educational psychology, fluid mechanics, dynamics, and many others all pertain to flight instruction. Most libraries will contain books and journals on teaching methods, educational psychology, aerodynamics, and meteorology, physics, and materials behavior, which are just a few areas in which flight instructors must have a sound base of knowledge. The FAA publishes Advisory Circular (AC) 00-2.7, "Advisory Circular Checklist" (free from U.S. DOT, General Services Section, M-443.2, Washington, DC 20590), on government publications and instructions for obtaining other government materials. Frequent reading of state of the art materials and attendance at advanced training courses are all requirements for being a professional.

Professional Conduct

Personal conduct directly reflects on our credibility. The flight instructor who brashly brags how he or she landed below minimums in zero-zero conditions, flight instructors who attempt to deliberately roll a Cessna 152 after a touch and go, or who attempt to perform loops around a bridge, or buzz wind surfers on the beach, or give spin instruction in aircraft prohibited from spinning teach future generations that such conduct is valid and gives exactly the wrong impression to future pilots. This conduct reflects negatively not only upon the individual flight instructor but upon flight instructors in general and upon general aviation pilots as a whole.

Appearances can be deceiving. A neatly trimmed, fresh smelling, appropriately dressed person makes a much more favorable first impression than someone in worn overalls with grease spots or in a sweaty T-shirt. The general public would tend to place more credibility in a doctor or engineer displaying the former dress than the later. At some flight schools these days, a shirt and tie is required for instructors. Others even require a uniform jacket.

Some may well argue that the best flight instruction they ever received was at some small, grass strip in a rural area where the flight instructor was a WWII veteran wearing old jeans and faded shirts. Appearance is important but does not make one a professional: Captain's epaulets does not necessarily make one a professional, and just because a flight instructor is wearing faded jeans does not mean he or she will do a poor job.

Dress for the flight instructor has to remain flexible to the instructing situation. Someone conducting flight instruction in the Rocky Mountains should be dressed for survival, and someone giving seaplane instructions needs to be prepared for a possible dunk. In fact, several aviation safety publications suggest the flight instructor should dress as if the aircraft might go down with the possibility of a post-crash fire. In one recent training accident which occurred in the Rocky Mountain area in February, the flight instructor's picture, which appeared in the news, showed her wearing high heeled shoes while walking through muddy fields. If the aircraft had experienced its difficulties in the training area just a few miles further south, its occupants would have been in mountainous terrain—not the type of terrain suitable for high heels.

Flight instructors must at all times project a professional image. This includes setting an example by attendance at safety meetings and acting as a responsible citizen in all other matters. For example, what sort of message does a flight instructor give when he or she zips out of the parking lot with wheels screeching and barely comes to a pause at a stop sign in his or her car? Also, the "Right Stuff's" drinking-and-driving-and-driving-and-flying days have no place in today's aviation. ■

End of Part One. Part Two will appear in the next issue.

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

H. Dean Chamberlain

The Effects of Environment on Communications

by Bill O'Brien, *Aviation Maintenance Inspector*

Environment as described by the Funk and Wagnall's standard desk dictionary means, "The external circumstances, conditions, and things or group." Since environment affects the individual it must also affect communication between individuals. To prove my point, I would like to describe for you the worst possible environment for communication.

Imagine, if you will, a classroom situation with a student/teacher ratio of one to one. The classroom is a small, sealed compartment with just two seats side by side. This compartment is capable of movement about three axis, and at no time is the compartment perfectly stable. The noise level of the compartment can vary between 65db to 91db (91db is the equivalent of a boiler factory) with the higher noise level occurring during times of greatest student stress/workload. Because of the seating arrangement the student/teacher seldom have eye contact, and because of the noise level, verbal communication between them is louder than normal and carried out in short sentences. The heating and ventilation is either inadequate or unreliable. In the winter time after an hour long lesson, both occupants leave half frozen, and in the summer time when the lesson is over both the student and teacher leave with the distinct impression that their underwear is sticking to their bodies.

In this classroom there are no training aids. The student must master a series of hand, eye, and foot coordinated maneuvers as well as receive, understand, and comply with instructions from the teacher inside the compartment and instructions given from outside the compartment. In addition to the above mentioned body movements, the student must also operate sophisticated electronic equipment, solve mathematical problems, and learn to make decisions as if his or her life depended on it—because it does. The student has been given a reference learning time of 40 hours to accomplish these tasks. In addition, the student pays $45.00 or more an hour to learn—adding extra economic stress and burden on the student.

This "Hell's Kitchen" of a classroom I described is not one or even two of a kind. There are thousands of these classrooms in use seven days a week, 24 hours a day all over the country. If you would like to try this type of classroom experience, just sign up for flight instruction at your local airport and take a flight in a flight training aircraft. All that I told you so far is true because I have sat in both seats in that classroom. First as a student and later as an instructor.

As an instructor in this type of environment I had to learn early to prepare my students to adapt to this type of environment because it was impossible to change the environment itself. To prepare the students I first had them sit in the aircraft (classroom) and get them accustomed to the flight controls, radio/navigation equipment, engine controls, and flight instruments while safely on the ground. I tried to get them to use ear plugs, as I did, to reduce the high noise level but still allowing normal voice communications. I also suggested the different types of clothing they should wear. Before each flight I went over the last lesson we had and the one we would do now in detail. Once in the aircraft I projected an image of calm professionalism to increase the student's confidence in stressful situations. (It has been said that I taught my body to sweat only on the side away from the student.) After the lesson on the ground, I again reviewed the flight from beginning to end and explained what the next lesson would concentrate on. All this reinforcement of skills learned in the air, I believe, was the most important part of the lesson because I knew more learning (communication) took place at this time in a relaxed atmosphere, than what took place in the aircraft.

The impact of the "Environmental Effect" is an important ingredient of good communications. This valuable lesson I had to learn in a cockpit of a small aircraft where extremes of noise, temperature, workload, and stress were the standard. Granted, not all communications occur in my "Hell's Kitchen," but when I reduced all four extreme conditions even slightly, I found the result was better communication and faster learning took place. ■

PART ONE

Introducing the Old Cap'n

by Richard D. Hague

Many of our long-term subscribers have inquired over the years about "Pappy," a grizzled, old CFI who imparted his piloting wisdom in these pages in the mid-1970's. Well, "Pappy" retired at the same time staff writer Ruth Benedict—his progenitor—did, and there was just not another "Pappy"—perhaps until now. Dick Hague, FAA's Accident Prevention Program Manager in Fresno, CA, draws upon his experience as a Naval aviator (a contributor to the Naval Aviation News' *"Grandpa Pettibone" series) and airline pilot to introduce us to the "Old Cap'n." The "Old Cap'n" says Dick is "a wise old aviation soul, somewhat detached through his anonymity, yet clearly caring and concerned about the well-being of his fellow airmen." If you like this article and would like to see more of the "Old Cap'n," let us know, and we'll feature him regularly.*

—Editor

As I was collecting my thoughts for this article, an ancient airman huffed his way into my office.

"Listen up, Kid," he trumpeted, "and listen up good! They call me the Old Cap'n, and when I've got something to say about airplanes, you either pay attention or I'll get your attention with this." He produced a wobble pump handle from an oil-stained cavalry boot and brandished it ominously. I decided to let him have his say.

Eyes focused on the middle distance, voice resonating, he continued, "I was the lineboy at Kitty Hawk. Why, I wouldn't have let a nice young man like Orville fly that thing without a test hop first. Did it myself the night before. And who do you think taught that skinny fella Lindbergh how to dead reckon a midnight mail flight from Moline to Milwaukee? And aerobatics? Pshaw! Yeager wasn't my first student; just the best. And back when the planes were wood and the pilots steel, who do you think . . ."

"Excuse me, Cap'n," I interjected, "but how may I help you?"

"*You* help *me*?" he bellowed. "That's a good one. I'm going to be helping you put this article together. Don't thank me, Laddie."

"Actually, Cap'n, thanking you hadn't crossed my mind. I was thinking more of . . ."

"Good, Kid, because a lot of you Junior Birdmen kinda pussy-foot around aviation safety, and nothing overtorques my head bolts quicker. Why, when somebody does something dumb, I want the world to know about it, and we—make that I—am going to tell 'em."

So, rather than take a chance on having my ears re-rigged by the Old Cap'n's wobble pump handle, he will be writing this article from now on.

The ultralight pilot hand-propped the vehicle. It traversed the ramp and crashed into the pilot's pickup truck. No damage to the ultralight but some damage to the truck.

"Well, dip me in AvGas and call me 'Stinky,'" says the Cap'n.

"Ya dern fool! What's the point of having a pick-up truck if not for carrying stuff. Like chocks, dummy! Skies'd be safer if you'd have run over your plane with your truck instead of the other way around.

"Some of you kids are laughing out there, but let me tell you something about chocks. If you use 'em right, they're the best thing there is to prevent inadvertent aircraft movement. And if you don't believe me (and you should), what's the first thing they do when 750,000 pounds of 747 pulls up to the gate?"

Light single. The pilot stated that he was conducting a local VFR flight to test a new gear-up light that had been recently installed. Trying to get it to function properly, he forgot to put the gear down and landed wheels up.

"Great balls of fire!" says the Cap'n. "How many times am I going to have to tell you, 'FLY THE AIRPLANE FIRST!'?

"What are practice areas for, nitwit? Why do you suppose they put wings on airplanes? For one reason, to allow dodos like you to climb to a safe altitude, clear the area, and then do your fiddling with your equipment. Why the guy who installed your switch didn't put the machine on jacks and test the work on the ground before you bought it is your business, even though it seems to me that it would have been a lot cheaper and safer way of getting the job done. But that's not the point.

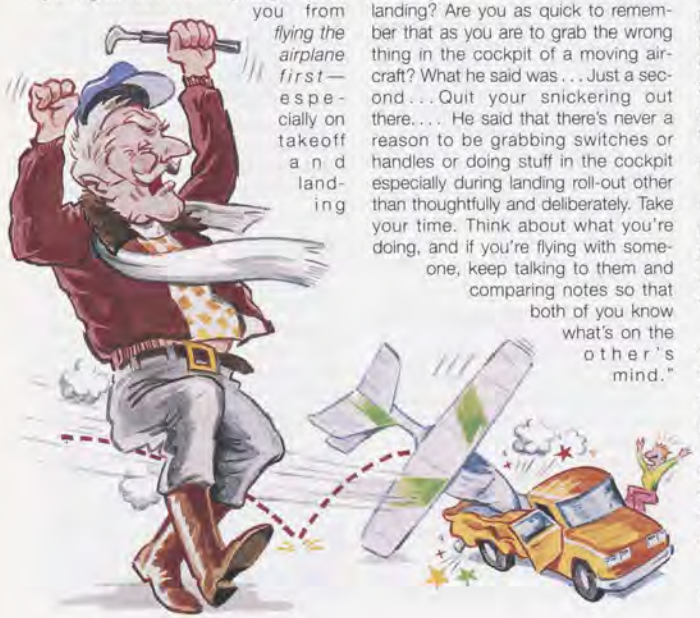
"Wiser heads than yours (like mine, for instance, since there ain't none wiser that I can call to mind) have been preaching for years: Whether you're driving a J-3 or 767, ***FLY THE AIRPLANE FIRST!***

"Do you remember when that emphasis was first stressed by the Old Cap'n and his partners, the FAA, CFI's, and Accident Prevention Counselors? Probably not. You were too busy figuring out how to make your cockpit look like a video game. Well, I'm going to tell you again, Kid, so listen up. And that goes for the rest of you out there, and quit your giggling when I'm talking to you.

"So often in our flying, procedures and special emphasis comes from tragedy. I thought of the "fly-the-airplane-first" concept after an experienced airline crew, during a manual landing gear extension, planted a jumbo jet in the Everglades.

"'How could a thing like that happen?' I wondered, so I got to looking at airline simulator training procedures, and this is what I found: The crew members would all, when the flight engineer was cranking the gear down, turn around in their seats to watch the FE work a crank. Sure, they *thought* that the autopilot was engaged, and, sure, they *thought* that the Altitude Hold was working. Most of the time, everything did work, but one time, it didn't. Bingo. Here comes the van from the six o'clock news.

"From then on, I've made every CFI and every airline VP of Flight Operations write in blood that they would instruct their students to FLY THE AIRPLANE FIRST! And now, I'm telling you again. Don't let anything distract you from *flying the airplane first*—especially on takeoff and landing when you're close to the ground. Find yourself an Ag pilot (most of the older ones know me) and ask 'em if the Old Cap'n isn't telling it to you straight."



The airplane sustained minor damage when the landing gear was inadvertently retracted during the roll-out phase of a touch-and-go landing. The pilot stated he is a flight instructor student and was performing PIC functions from the right seat. Unaccustomed to this position, he reached for the flaps to retract them. Instead, he mistakenly retracted the landing gear in one quick motion before his instructor could prevent the action.

"Holy Cow!" says the Cap'n. "Why, it'd be easier trying to put a spit shine on a buffalo chip than to make you a CFI.

"A student flight instructor, eh? '. . . unaccustomed to this position . . .' you say? I'd tell where your head was, but I only refrain for fear of offending my more gentle and cultured readers.

"What's the first thing your CFI told you about the roll-out phase of the landing? Are you as quick to remember that as you are to grab the wrong thing in the cockpit of a moving aircraft? What he said was . . . Just a second . . . Quit your snickering out there. . . . He said that there's never a reason to be grabbing switches or handles or doing stuff in the cockpit especially during landing roll-out other than thoughtfully and deliberately. Take your time. Think about what you're doing, and if you're flying with someone, keep talking to them and comparing notes so that both of you know what's on the other's mind."

The following comments from the Cap'n resulted from a conversation he had recently with—in his words—"a gussied-up, Ray-Banned, glitzed out, scarf-wrapped Coffee Shop Captain, ace-of-the-base, 'there I was,' Smilin' Jack of the pilot lounge."

The Cap'n asked, "What phase of WINGS you workin' on, Sky King?"

"Uh, right, Cap'n, the WINGS program. Yes, well, ahem, I've been thinking about doing that."

"Since?"

"Uh, about 1984."

"Weren't you listening when I told you that 52% of private pilots that have gone more than 12 months without spending some time with a CFI can no longer successfully complete a 180-degree turn under the hood? A one-eighty! The bread-and-butter maneuver. The can opener. The short term life insurance policy. And I'm not talkin' about the Practical Test Standards. I'm talkin' angle of bank between wings level and a knife edge pass. Airspeed somewhere between initial buffet and mach tuck. Heading control? I'll buy rolling out in the same zip code. Fifty-two percent. Half of all private pilots haven't been maintaining their proficiency. Again, King, why aren't you doing WINGS?"

"Cap'n," he replied aggressively, "WINGS takes too much time." Now bellicose, he added, "My CFI's too busy." Then, furious, "And beside it costs too much money to fly with a CFI three hours a year."

"Too much money? King, you're walking around wearing $2,000 of stuff trying to *look like* a pilot, but you won't spend change from a $200 bill to *be* a pilot? Sorry, that doesn't compute."

I had kind of dozed while this was going on, and when I jerked awake I was alone. I figured I had dreamed up the "Old Cap'n." But, then, I saw these words on the computer screen:

"Keep the blue side up, Kiddo. See ya next time." ■

Magellan

Commonly Asked Questions about Portable Hand-held GPS Receivers

The following questions and answers are taken from a pamphlet entitled, "Portable Hand-Held GPS Receiver—What You Should Know," produced by the RTCA. Information on prices and ordering copies of the full pamphlet will be provided at the end of the article.

—Editor

How do the portable, hand-held receivers differ from panel mounted receivers?

Portable receivers require less installation planning, are easy to take to and from the aircraft, and cost less to buy. Hand-held receivers should not be interfaced with other installed aircraft equipment unless approved by the FAA.

Is my portable, hand-held GPS approved for IFR?

No. Hand-held GPS receivers are suitable for use as an aid for VFR navigation only and are not currently approved for IFR.

Do I need an external antenna for the unit to work properly in my airplane?

Most users of portable, hand-held GPS equipment will not need an external antenna. This, however, will depend on the unit you buy and availability of a suitable location for the GPS antenna.

Does the portable antenna have to be located all the way forward in the windshield in a high-wing aircraft?

The antenna should be placed where it has the best view of the sky. Most portable hand-held GPS receivers will receive signals from satellites to the front and sides of the aircraft. However, this may not provide the best tracking performance since much of the visible sky is obscured by the aircraft. You may need to install an external antenna to achieve optimum performance.

Can the portable antenna hang upside down?

A GPS antenna is designed for maximum tracking sensitivity when oriented right side up. The under side of the antenna is typically designed to reject signals entering through the bottom side. This helps reduce the effects of "multipath" signals that bounce off reflective objects such as an aircraft wing. Some antennas are more tolerant to orientation than others depending on the antenna design. If signal tracking is a problem, you may need to consider an external antenna.

Can I mount the portable antenna outside the aircraft?

No, the portable antenna is not designed to be mounted on the outside of the aircraft. Some manufacturers offer external antenna packages for portable, hand-held GPS receivers.

Will I need an external antenna for my airplane since I have metal oxide-coated windows? Can I use two antennas in the cockpit—one on each side window?

Coated windows may interfere with the reception of GPS signals. If you experience difficulty receiving GPS signals inside the aircraft, you may consider relocating the antenna to another window or install external antenna for improved performance. Dual antennas are not recommended.

Where should the external antenna be mounted?

The external antenna should be mounted on the top of the aircraft well away from the tail, transmitting antennas, or any other obstruction to the GPS signal. Installation of an external antenna will require FAA approval.

Can I paint my external GPS antenna?

No. The GPS signal is very weak and may be degraded by certain kinds of paint.

Will the GPS interfere with other equipment in my aircraft?

Most portable GPS receivers will not interfere with other aircraft instruments. However, use caution when placing the unit near the magnetic compass and check the aircraft's navigation and communications systems for interference from the GPS receiver during initial use.

Can I connect my portable, hand-held GPS to a moving map display or portable PC?

Some portable GPS receivers may be connected to moving map displays or to portable PC's. Consult the manufacturer of the equipment (both

Continued on page 13


MTSU

Special Series: **FAA AND EDUCATION**

Middle Tennessee State University

by Dr. Ronald Ferrara

Nestled on the edge of the Cumberland Plateau, 32 miles southeast of Nashville, Tennessee, lies Middle Tennessee State University (MTSU), the home of the Flying Raiders. MTSU is a public, tax-supported university with a student population of approximately 16,000. The school was founded in 1911 as a two-year teacher's college, called Middle Tennessee Normal School. It became a four-year teacher's college in 1925. Since that time it has evolved into a fully accredited university with 33 departments. The student body is composed primarily of full-time, undergraduate students, approximately half of which are women. What makes MTSU different from most other regional universities is its Department of Aerospace. This unique department is the third largest in the university in terms of full-time student majors.

MTSU began its association with aviation with a Civilian Pilot Training program during World War II. Subsequent flight training programs were initiated immediately following the war with credit courses in aviation offered as early as 1950. What today is the Aerospace Department actually began as a flight training program in 1948 with the establishment of the Mid-State Flight School. This flight school operated in conjunction with the university and was established to satisfy the flight training needs of the university. Mid-State Flight School was approved for ROTC and GI Bill flight training.

Over the years, ground school classes were integrated into the university curriculum, and a two-year aviation program was developed within the Department of Industrial Studies as a minor area of study. This program was under the direction of one full-time instructor. In 1969 it was proposed that a full four-year aviation curriculum be approved and that an independent Aerospace Department be established. The Aerospace Department became fully autonomous on July 1, 1971, with an enrollment of 58 students. At this time there were two emphases available, Aero Technology and Management (Administration). In 1981 a professional pilot program and a maintenance management program were established.

Since that time the Aerospace Department has developed into one of the largest and most widely recognized departments in the University. Enrolling over 800 full-time students, this program ranks in the top 2% of the nation's collegiate aviation programs in terms of enrollment. Students are drawn from 26 states and 12 foreign countries. The department employs 12 full-time faculty members and uses numerous experts from the aerospace industry in a part-time capacity. The Aerospace Department is one of nine departments that make up the College of Basic and Applied Sciences.

Aerospace students choose a major area of study, or emphasis, from one of four aviation-related offerings. In addition to an FAA-approved FAR Part 141 pilot ground school for professional pilot candidates and an approved FAR Part 147 maintenance technician school, students may choose to major in either aviation technology or aviation administration.

The department is presently in the process of purchasing additional aircraft, increasing its operational training fleet to 13 university-owned aircraft, 10 of which will be fully IFR certified. This effort is in conjunction with the development of a fully approved FAR Part 141 flight school. This in-house approach will replace a system of subcontracting flight training to various fixed base operators, except in the case of private pilot training.

In addition, a new 136,660 square foot facility, located on the main campus, has been approved and is scheduled for completion in 1995. This facility will be shared by the Aerospace Department and the College of Business. In order to provide state of the art training, a Beechcraft *King Air 90* was recently purchased for use by the maintenance department. Although non-flyable, this aircraft is also used for turbine engine operation and familiarization by the professional pilot candidates.

Graduates of the aerospace program receive a Bachelor of Science

MTSU

Learning the art of welding remains a part of the maintenance curriculum.

degree in Aerospace. A minor area of study is also required. The minor area of study may be selected from subject areas such as Business Administration, Psychology, Computer Science, Industrial Technology, Management, Electronics, and others.

MTSU is one of very few schools in the nation approved for all five areas of study under the FAA Airway Science curriculum. MTSU also recently became one of the first four schools in the country to be accredited by the Council on Aviation Accreditation. In addition, MTSU is the only university in the United States offering a Master of Science degree in Aerospace Education. This degree is awarded through the Department of Education with a minor in Aerospace.

MTSU has been very active in FAA's Airway Science Program since its inception and has been awarded a number of grants by the FAA. The 18,000-square foot H. Miller Lanier Airway Science Building (named in honor of Tennessee aviation pioneer and founder of the Mid-State Flight School, H. Miller Lanier, which houses the aero maintenance school) was funded by an Airway Science grant. In addition, the Kavouras Weather Center located on the main campus, which allows students access to real time weather information, was also funded through an Airway Science grant.

MTSU is the only university in Tennessee to offer a full complement of aviation and aerospace-related programs and is a member of the Southern Education Board's Academic Common Market. Because of the comprehensive nature of the course offerings and as a member of the Common Market, the university accepts students from eight southern states on a Tennessee-resident tuition basis. This results in substantial savings to non-Tennessee residents who desire to attend the school and major in aerospace. Participating states include West Virginia, Virginia, South Carolina, Maryland, Georgia, Louisiana, Kentucky, and Arkansas. Moreover, the states of Arkansas, Alabama, Mississippi, Kentucky, and South Carolina approve graduate study in Aerospace Education at MTSU. Thus, the majority of southern states have designated MTSU as the public institution of choice for aerospace programs.

The largest aviation program offered by the Aerospace Department is the professional pilot emphasis. Approximately 350 of the 800 aerospace majors are enrolled as professional pilot candidates. Successful completion of the professional pilot curriculum results in the graduate holding the commercial pilot certificate with instrument and multi-engine ratings. The majority of the professional pilot candidates also receive the flight instructor, multi-engine instructor, and instrument flight instructor certificates. The university uses four flight training devices (flight simulators) to the maximum extent permitted by the FAR, to supplement the actual flight training. In fact, a 727 cockpit procedures trainer has recently been added. This not only increases the efficiency of the training program but also helps to reduce the financial burden on the students.

MTSU has attempted to identify and address the most appropriate methods to qualify professional pilot graduates for careers within the aviation industry, particularly the commuter and regional airline segment. In a survey conducted by Dr. William Herrick of the MTSU faculty, regional airline chief pilots indicated that the best way for students to become qualified for positions with the airlines is through "real work experience with responsibilities over time." This poses a dilemma to all low-time pilot and all flight training institutions. How and where is this required experience to be gained?

MTSU has developed a number of non-traditional approaches to help solve this problem of gaining valuable real-life experience before graduation. There is a very active internship and cooperative education program in place with a number of employers. The most unique of these programs involves the Tennessee Office of Aeronautics, a state agency under the Tennessee Department of Transportation. Presently the Office of Aeronautics accepts two professional pilot candidates per semester as interns. These students are required to work a minimum of 20 hours per week for the Office of Aeronautics. The candidates fly right seat on various missions in the aircraft operated by the state. These missions include aerial photography, VIP transportation, and airport inspection tours. The aircraft used for these missions included everything from a Cessna 182 to a Beech *Baron* and an *Aero Commander*, up to a *King Air 200*. A high-altitude checkout and certification, as required by FAR § 61.31(f) is included as part of the internship.

This particular program has proven to be beneficial to both the students and the Office of Aeronautics. The chief pilot for the State of Tennessee, Jeff Slaney, has indicated that he has been highly impressed by the student interns and has found them eager to learn. He has also remarked that these students perform a valuable service and help to reduce the workload on his limited staff.

In addition to the professional pilot intern program, two maintenance management students per semester also intern with the maintenance division of the same office. These students work under the supervision of the state's A & P mechanics and help to maintain the state's aircraft. Through this arrangement, these students are exposed to aircraft and maintenance procedures that are unavailable to them at an average maintenance technician training school. Beginning with the summer semester of 1993, one additional position was established for an aerospace administration major in the State Office. This person is to work with the airport planning and inspection teams. Students are awarded up to six semester hours of college credit for successfully completing two semesters as interns.

Other internship/cooperative education positions available to MTSU students include the Space and Rocket Center at Huntsville, AL; Federal Express in Memphis; American Airlines; and; of course, the Federal Aviation Administration.

Among the largest and longest-lived of these programs has been the cooperative education program with the FAA in the area of Air Traffic Control. This partnership between the FAA and MTSU has resulted in more than 40 students completing this training over a 15-year period. The majority of these graduates are actively employed by the FAA as air traffic controllers, at all levels, in virtually every region of the country.

The Department of Cooperative Education is continually exploring additional possibilities and developing new positions to allow Aerospace students to gain this valuable type of experience. Needless to say, there is stiff competition among the students for the available positions, and only the best are selected.

The Aerospace student's agenda at MTSU includes more than college courses and examinations. MTSU has a very active and competitive flight team. As a member of the National Intercollegiate Flight Association (NIFA), the team competes annually in regional and national flight and ground competitions with other colleges and universities. There is also an active chapter of Alpha Eta Rho, the international aviation fraternity. In addition, a newly formed student chapter of the American Association of Airport Executives (AAAE) has begun to generate a significant amount of interest within the aviation community. For maintenance management students, there is the Aero Maintenance Club and a student chapter of the American Society of Non-Destructive Testing (ASNT).

MTSU

MTSU Aero Maintenance students working on the restoration of a de Havilland Beaver.

MTSU is also the home of one of the nation's oldest and largest Aerospace Education workshops. Held annually since 1958, these workshops are an attempt to educate public school teachers and guidance counselors to the value and career possibilities in the aerospace industry. In the words of Dr. Wallace Maples, former chairman of the Aerospace Department, "Teachers are the smartest distance between two points."

The intent of the workshops is to encourage and assist teachers and guidance counselors in integrating aerospace concepts and examples into their curricula. Once again sponsored by the Tennessee Office of Aeronautics, all participants receive a scholarship covering tuition and a stipend to cover expenses. There is a basic and advanced workshop available and graduate credit is awarded for both. To date, more than 3,500 teachers have attended one or more of these workshops within Tennessee.

The workshops are interdisciplinary in nature and are divided into grade levels. They make use of various learning modes such as field trips, flight experience, and guest speakers from the aviation and aerospace community. A participant who has completed both workshops will have received at least six hours of flight experience and a significant amount of hands-on simulator experience. They are also eligible for eight hours of graduate level college credit toward a Master of Science degree in Aerospace Education. These workshops are available to any teacher or guidance counselor in Tennessee, kindergarten through graduate level, specializing in any subject area. There are also a limited number of openings for non-educational personnel who have some interest in aerospace education.

In order to assist these teachers to develop sources of information and material, the FAA has designated MTSU as an FAA Resource Center. In this capacity the university maintains curriculum guides, video tapes, and other materials for the use of public school teachers who have integrated, or desire to integrate, aerospace concepts into their classroom activities. The Aerospace faculty is also available to assist in designing a curriculum emphasizing aerospace or integrating aerospace concepts into an existing curriculum. They are also available for career days and classroom presentations upon request.

MTSU has developed one of the largest and most well-respected non-engineering Aerospace programs in the nation. MTSU's unique approach to aviation education and commitment to quality promise continued growth and success for the future. ■

Dr. Ferrara is Chairman of MTSU's Department of Aerospace. For information on MTSU contact, Dr. Ronald Ferrara, Chairman, Department of Aerospace, P. O. Box 67, Middle Tennessee State University, Murfreesboro, TN 37132.

Medical Stuff

HIV Infection in Aviators: Some Neurologic Considerations

by John D. Hastings, *MD*

Infection with the human immunodeficiency virus (HIV) is an increasing worldwide health concern. In 1992, the Center for Communicable Diseases (CDC) estimated that 2,000,000 persons in the U.S. were infected with the virus and that 390,000 to 480,000 cases of AIDS would exist in this country by the end of 1993.

Neurological manifestations of HIV infection are many and may involve all areas of the nervous system. Neurologic manifestations are also very common and may be the presentation of the illness AIDS. Twenty percent of AIDS patients first consult a physician because of neurologic symptoms or signs when first diagnosed. Seventy to 90 percent develop neurologic symptoms or signs during the course of the illness, and 80 to 100 percent have pathological changes at autopsy.

There has been appropriate concern regarding HIV infection and aviation safety. One HIV-related neurological disorder—HIV encephalopathy—also known as AIDS dementia complex, has been a source of major concern.

Recognizing that the nervous system is involved early in HIV infection and that dementia in its early stages may be subtle and difficult to detect, some have felt that allowing airman medical certification to HIV-positive individuals compromises aviation safety.

In May of 1992, an ad hoc committee of the Aerospace Medical Association, noting the high incidence of nervous system involvement in HIV infection, made recommendations leading to a position statement by the association. The statement advised that any HIV-positive airman be disqualified for flying duties.

Others have felt that seropositivity alone did not constitute an unacceptable risk to aviation safety, suggesting that other criteria be used, such as the development of AIDS-related symptoms or laboratory abnormalities. Discussion and controversy continue in this area.

The human immunodeficieny virus is a retrovirus, belonging to the subfamily Lentoviridae or "slow virus." These viruses can be latent, cause persistent infection, and can be sequestered in monocytes. Mutations often occur during HIV infection in human leading to antigenic variation. The virus can be latent or productive but noncytopathic in infected cells, or it may alter cell function, leading to death. Most infections in the U.S. involve the HIV type I virus. A type II virus also exists.

The clinical manifestations of the HIV infection can be divided into early, middle, and late stages.

EARLY STAGE

This stage (primary, acute, seroconversion) occurs one to six weeks after infection, before seroconversion. Fifty percent of infected patients have a mononucleosis-like illness. Symptoms include fever, night sweats, malaise, lethargy, headache, myalgia [muscle pain], anorexia, nausea, vomiting, and a macular [blotchy] or maculopapular [blotchy bumps] truncal [torso] rash. Conjunctivitis, sore throat, palatal vesicles [fluid-filled pouches on the roof of the mouth], pharyngitis, tonsillar hypertrophy [swollen tonsils], and dry cough are seen. Cervical, occipital, and axillary adenopathy [glandular enlargement in the neck area or armpit] appear. Anti-HIV antibody is usually negative at this point.

Later, HIV-specific immunoglobulin M is the first antibody to appear, implying this is a primary HIV infection. Antibodies may not appear until weeks, months, or, in some cases, years after the primary infection.

The meninges [membranes that envelope the brain and spinal cord] and central nervous system (CNS) may be infected early. Acute aseptic meningoencephalitis occurs in five to 10 percent of infected individuals just before seroconversion, during or after the mono-like syndrome. This is self-limited, with seroconversion occurring one to two months later.

MIDDLE STAGE

This stage is characterized by long asymptomatic [no symptoms] intervals. Fifty percent of patients have persistent, generalized [lymph gland disorders], defined as enlarged . . . nodes [in the neck, jaw, occipital area, and armpits], persisting for three months with no other cause being found. Mild thrombocytopenia [a persistent decrease in the number of blood platelets that is usually associated with bleeding] and autoimmune disease may be found. Half of asymptomatic HIV-positive individuals have a mild increased cell count or mild protein elevation in the spinal fluid. Immunoglobulin G response in the spinal fluid is seen in a large proportion of these asymptomatic individuals.

LATE STAGE

One-half of HIV-infected persons will develop AIDS within five to 10 years. Some occur earlier, some later, and it is not certain that all will develop AIDS.

The hallmark of AIDS is severe immune deficiency. Opportunistic infection, malignancy, wasting, and dementia characterize the disease. Before antiviral treatment was available, life expectancy after diagnosis was about one year.

Common systemic manifestations of AIDS include pneumocystis pneumonia, thrush, retinitis related to toxoplasmosis or cytomegalovirus, Kaposi's sarcoma, diarrheal illness, and disseminated tuberculosis.

The neurological manifestations of AIDS are many. CNS infection occurs early and may persist.

HIV ENCEPHALOPATHY (AIDS DEMENTIA COMPLEX)

Despite early invasion of the CNS by HIV, major disturbances of neurologic function manifest themselves only when the patient becomes immunosuppressed. HIV encephalopathy occurs exclusively in AIDS and is the most common neurologic manifestation of AIDS. In five to 10 percent of cases, disturbances of cognitive function may be the first indication of symptomatic immunosuppression.

The incidence of HIV encephalopathy is increasing, along with the incidence of AIDS. It reached an incidence of 1.9 per 100,000 in 1990 and was present in 7.3 percent of 144,184 persons with AIDS studied between 1987 and 1991. Its highest prevalence is in the 30 to 44 year age group, and it is a common cause of dementia between ages 20 and 59.

The pathophysiology of HIV encephalopathy is poorly understood. Why it occurs late when the virus can be cultured early is not known, nor is it understood how infection of macrophages (scavenger cells) and glial [brain and spinal cord tissue] cells produces dementia. Theories include latent or minimal infection in neurons, toxins, or perhaps another agent.

Early signs of HIV encephalopathy may be difficult to detect, as is true in any dementing illness. Apathy, inattention, impaired concentration, forgetfulness, mood swings, and withdrawal may mimic depression. Symptoms typically progress over months but may fluctuate or remain stable. The clinician can only maintain a high index of suspicion to identify the illness before disabling cognitive and behavioral changes render the diagnosis obvious.

CONCERNS AND RESEARCH RESULTS

There has been concern about asymptomatic HIV-positive individuals who have yet to develop dementia or other indications of symptomatic immunosuppression. Some have reported changes in neuropsychological testing; others have not. Variables including age, sex, race, ethnic group, cultural background, education psychiatric disease, and drug and alcohol history influence this testing. Though a useful adjunct, neuropsychological testing has not been shown to demonstrate consistent changes.

[There has been a study of] 95 asymptomatic HIV-positive individuals [that included] neurologic examination, neuropsychological testing, nerve conduction studies, lower limb somatosensory evoked potentials, P300 auditory evoked potentials, and magnetic resonance imaging [MRI] scans. [The study] found no change from HIV-negative controls.

[Another study] found no changes on standard neuropsychological testing but did find a progressive slowing of response time in HIV-positive individuals. This paralleled increasing levels of quinolinic acid—a CNS toxin—in the spinal fluid of those tested.

Others have found delayed response time also, and it appears that this occurs in 10 to 30 percent of asymptomatic HIV-positive individuals. The clinical or occupational significance of this finding is unknown.

Available data in the literature do not indicate that aviation safety is compromised by allowing certification of asymptomatic HIV-positive individuals. [Emphasis added.] More specifically, the risk of HIV encephalopathy in these persons does not appear to justify their being barred from the aviation environment.

With the onset of symptomatic immunosuppression—AIDS—it is quite a different matter. A very significant risk of HIV encephalopathy and other neurologic manifestations of AIDS appear, along with the risk of systemic compromise. These complications worsen with advancing disease. The risks involved to aviation safety may justify the disqualification of individuals with AIDS. ■

Dr. Hastings is a senior AME, a practicing physician in neurology, and a consultant in neurology to the Federal Air Surgeon. We have excerpted this article from the original which was written for physicians—you may have noticed—and appeared in the Federal Air Surgeon's Medical Bulletin, *an FAA publication for AME's.*

Commonly Asked Questions about Portable Hand-held GPS Receivers

Continued from page 8

GPS and moving map or PC) before-purchasing to be sure the units are compatible. The interconnection to an installed moving map display will require FAA approval.

Can I connect my portable, hand-held GPS to my autopilot or other avionics?

No. A hand-held GPS should not be connected to any cockpit avionics other than a moving map display or portable PC.

What is the accuracy of the GPS altitude? Why does it not match my pressure altitude? Why does the altitude vary up and down while I am sitting on the deck?

GPS altitude is accurate to within 140 meters. GPS altitude is actual altitude above mean sea level and is not equivalent to altitude measured by pressure altimeters. Pressure altimeters measure the altitude in the standard atmosphere which corresponds to the given pressure measured by the device. However, if conditions differ from the standard atmosphere, the altitudes may be different even though the altimeter is correctly set using arrangement of the satellite constellation and implementation of Selective Availability (purposeful degradation of the GPS signal accuracy by the Department of Defense). GPS altitude may vary significantly even when maintaining constant altitude. For these reasons, GPS altitude from portable hand-held receivers should not be used for vertical navigation. ■

RTCA offers copies of the pamphlet from which the above Q&A were taken for sale. For one to 49 copies, the cost is $3.00 each; lots of 50 are $40.00 per lot; lots of 100 are $70.00 per lot; and lots of 1,000 are $500.00 per lot. For $1,500 you can obtain a license from RTCA to reproduce unlimited copies of the pamphlet; this is particularly beneficial for companies producing more than 3,000 units. RTCA is located at 1140 Connecticut Ave., N.W., Suite 1020, Washington, DC 20036; (202) 833-9434; FAX (202) 833-9339.

Don't Forget the Children!

by Phyllis Anne Duncan, *Editor* and John M. Wensel, *Aviation Safety Inspector*

When I was a child of three or four, my father would let me drive the car. I sat on his lap, able to see only the speedometer, so I couldn't see that he was really driving. Neither of us knew it then, but each time he let me do that, he was putting my life in danger in the event of an accident. (Actually, we're talking about a 1956 Pontiac, a tank-like vehicle that most cars on the road today wouldn't scratch.)

Every state now requires that children younger than a particular age or smaller than a particular weight to be buckled in an approved car seat ("child restraint" sounds like we are torturing them) which is in turn fastened in the car by a conventional seat belt.

Before these requirements became widespread, thousands of small children every year died needlessly in sometimes minor automobile accidents when impact made them human projectiles. My brother had a brief business venture as a tow-truck operator. One of his contracts was with the county police back home to tow away wrecked cars. The imprints of tiny heads in windshields switched him to the repair side of the business. I now cringe whenever I see a child standing between its parents in a moving car, unmindful that I literally travelled hundreds of miles as a kid in the bed of a pick-up truck or on the hitch of a tractor—before I knew better.

Changing Times

A few years ago I had taken a student on his first cross country flight to Charlottesville, VA. As we were walking toward the FBO, a young man and a little girl no more than three left the FBO and headed toward a Cessna 172 where the man proceeded to place his daughter in a car seat strapped in the cockpit.

"Co-pilot?" I called out.

"Since she was two days old," he replied.

A minivan with car seat (now built in) has become the symbol of family travel on the roads in the last decade. In the 1950's small plane manufacturers displayed many an ad showing families flying off for some recreation in the family plane. This is the ideal aspect of recreational flying—being able to provide quick, reliable transportation for yourself and your family. In the 1990's why not a general aviation aircraft with car seat? Nowadays you wouldn't think of driving anywhere without securing your children in their car seats. Why not the same philosophy for your aircraft?

That little piece of added equipment—the child's car seat—is probably a very good idea to use in a general aviation aircraft. Many minor automobile accidents turn tragic when a child not restrained in an approved seat or seat belt is injured or killed by bouncing around the car's interior like some horrific pinball. An otherwise survivable aircraft incident can become just as tragic for the same reasons.

Over the years changes in aircraft design and FAA requirements for seat belts and shoulder harnesses have greatly increased safety for adult occupants in small aircraft. Pilots should insist that small aircraft be equipped with crashworthy seats and restraints which meet the requirements in FAR § 23.562.

Some Accident History

Two years ago, a general aviation airplane carrying two adults and two children entered an uncontrolled descent and crashed. Parts of both wings and both horizontal stabilizers separated before the aircraft struck the ground. The impact involved high vertical and side loads, and the adult in the copilot's seat received fatal injuries. However, the adult in the pilot's seat survived as did a four year old boy and a 10-month old girl both of whom happened to be secured in their child restraint systems in the rear bench seat. The NTSB attributed their survival to their restraint systems. The 10-month old's car seat provided upper body restraint, and the four-year old's mini-shield child safety booster seat (with a crotch strap) provided him extra protection that he might not have had in an adult-sized safety belt. All three survivors sustained serious injuries in a crash where NTSB estimates the occupants sustained between 20 and 40 G's during the impact sequence.

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Another accident five years ago also shows the benefits of using approved child restraint systems. During a forced landing attempt, an airplane crashed at the bottom of a canyon on a 60-degree slope just short of a sandy beach. Both front seat occupants sustained serious back and head injuries. The rear seats were in a club seating configuration, and two adults occupied the rear-facing seats. One of these adults sustained back injuries, and the other had fractured ribs. Two children—a two-year old and a six-month old—were in their restraint systems in the forward facing seats and were not injured.

NTSB has also investigated general aviation accidents where children were held on an adult's lap and/or restrained by the adult's safety belt. In each case these actions contributed to or caused fatal injuries in the children.

Three years ago, an airplane crashed in a rural area. The two pilots and one passenger were killed, and two passengers sustained serious injuries. One of the surviving passengers was holding her 17-month old daughter on her lap with the single safety belt around them both. The mother survived, but her daughter died of safety-belt induced internal injuries and crushing to the base of the skull.

Seven years ago an airplane stalled after takeoff and struck the ground in a nose-low attitude. The two front seat occupants were fatally injured. The occupant space at the rear seat remained relatively intact; however, an adult passenger and her three-year old son were killed. The child was in his mother's lap sharing her safety belt—*in non-compliance with FAR § 91.107(a)(3)(i)*. The child suffered a crushed skull and serious internal injuries likely exacerbated by the weight of the adult on whose lap he was sitting.

What the Regulations Say

FAR § 91.107 requires that the pilot not take off until each person on board is briefed on how to fasten and unfasten his or her seat belt, that the pilot ensures that each person has been notified to fasten his or her seat belt, and that each person must occupy an approved seat or berth with a seat belt fastened around him or herself (and shoulder harnesses, if installed). (Free balloons with a gondola or basket are excepted.)

The rule goes on to say that notwithstanding the above, a person ***may*** (emphasis added):

- Be held by an adult who is occupying a seat or berth if that person has not reached his or her second birthday.
- Use the floor of the aircraft as a seat when sport parachuting.
- Occupy an approved child restraint system.

Since we're not dealing with parachuting here, we're going to leave that out of our discussion. Let's consider the ramifications of that first option. Remember, the regulation says, "a person may" not a person must.

You can hold a child under two years old on your lap provided you are occupying an approved seat or berth with your seat belt (and shoulder harness, if installed) fastened about you (only you; *not* you and the child).

Have you seen the commercial on TV where a man is holding a perfectly adorable 20-pound child on his lap? The voiceover announcer says something to the effect of, "So you think you could hold onto your child in a car accident." The announcer explains that with the deceleration forces in a typical car accident, a 20-pound child reacts with the moving force of 400 pounds (about 20 g's). The commercial switches to the father trying to hold a Sumo wrestler on his lap—an amusing but very accurate analogy for what would happen in any kind of accident.

Some people may believe—erroneously—that if they fasten the seat belt around themselves and the child they have secured them both. The two accident examples cited above show that the opposite is true. A few models of older aircraft (Cessna 190, Beech *Travelaire*) equipped with rear bench seats had one long safety belt for the occupants of the bench seat. The belt was designed, built, and installed to secure two to three adults *seated side by side*. Placing more than the allowed weight limit (usually placarded or provided in operating information) within the belt could cause failure, and placing a child in the large seat belt alone would leave too much slack. With another child or adult in the same belt could also leave slack or, worse, cause the individuals to slam together on impact.

As for securing a seat belt around an adult holding a child in his or her lap, Newton's Third Law of Motion is implacable: Once an object is in motion, it remains in motion until a force acts upon it. When an aircraft experiences the rapid deceleration of a crash, its occupants continue in motion—that's why we have seat belts and shoulder harnesses. However, put another body between yourself and the seat belt or shoulder harness, and what you end up doing is crushing that body between yourself and the strong restraining force of the aircraft's seat belt/shoulder harness. The FAR do not allow this, and common sense says to either put the child in a seat belt if he or she is old enough or weighs enough (over about 40 pounds) or place him or her in an approved child car seat.

Flying your own general aviation aircraft means you don't have to worry about buying an extra seat from the airline for the baby—as you would have to do when using your car seat on board an airliner—but you should be giving some thought to how you're going to keep the child safe in the aircraft. It's easy. *Take the car seat out of the car and put it in the airplane.* Using an approved car seat for your child when you take him or her flying is more part of your parental responsibilities than your pilot in command responsibilities.

Types of Child Restraint Systems

Just as with child restraint systems for your car, you should "customize" the car seat you use in your aircraft for the age of the child. The instructions provided with the seat on how to install it in a car are transferable to aircraft installation. The car seats can be installed without a mechanic, but before doing so, you might have your mechanic check the integrity of the seat belt itself and the security of its attachment

points in the aircraft, especially if your aircraft is between inspection intervals.

Infant Seats

Birth to about 20 pounds

Advantage: Small and portable. Fits small newborn best.

Disadvantage: Must be replaced by a convertible seat when outgrown.

Protection for newborns should consist of an infant safety seat or a convertible seat in the infant position. Either of these seats cradles the baby in a semi-reclining position (because the baby cannot yet control its neck muscles to hold its own head upright), protects the infant with a harness, and is anchored with the safety belt. An infant seat *must face the rear* so that the strongest portion of the seat and the strongest portion of the baby—its back—can absorb the forces of the crash. By the time the child is about one year old and/or weighs at least 20 pounds he or she can ride in a forward-facing seat. When the child outgrows the weight limitation of an infant seat—usually when the child's head reaches the top of the car seat—you must replace it with a larger seat. A convertible seat can be changed to fit a toddler by following the manufacturer's instructions.

Convertible Seats

Birth to about 40 Pounds

Advantage: Fits child from seven to eight pounds up to about 40 pounds.

Disadvantage: Bulky, less portable than an infant seat.

Convertible seats recline and face rearward for infants and can be changed to be front-facing and upright for toddlers. The manufacturer's directions explain how to convert a seat from one position to the other, how to use the tether (only on older seats), and how to reroute the lap belt through the seat in the toddler position. In addition, the instructions will explain when the child is big enough to require the toddler position. (Rather than age, this is usually a weight consideration.)

Forward-facing seats are for children who are over the weight limit for or who have outgrown infant-only seats. These seats can only be used in airline type the forward-facing position. Some still have a five-point harness for the child, but other models use a shield system joined to the harness. It is important to secure the car seat with the lap belt *exactly* as recommended by the manufacturer.

Booster Seats

Booster seats are intended for older children who have outgrown their conventional car seats but don't yet fit in a vehicle lap belt/shoulder harness configuration—usually over 40 pounds and over four years of age. Unfortunately, parents often move the child from the convertible seat to the booster seat before the child is of adequate size. A convertible seat with shoulder straps provides greater protection for children less than 40 pounds.

There are primarily two types of booster seats on the market today. The *small shield booster* distributes crash forces through the shield. It is attached using the lap belt, which passes in front of the shield or under the seating platform. The advantage of this type of booster seat is that it provides better protection than a lap belt alone. The disadvantage is that it gives less protection than a convertible seat or a *belt-positioning booster seat.*

The advantage of the belt-positioning booster seat is that it is designed to be used with lap/shoulder belts, and it is preferred to a shield booster when a lap/shoulder belt is available. The disadvantage is that it cannot be used with lap belts only unless the seat comes with a separate shield. The base of this booster raises the child so that the shoulder belt will fit correctly over the child's chest and guides the lap belt over the hips to prevent it from riding up over the abdomen.

Booster seats may be a necessary transition because even tightened to its utmost, a lap belt may still have enough slack for children to slip out of during an accident. Also, shoulder harnesses designed for adults usually cross a child's upper body at the head or throat—placing the child in danger of strangulation or a broken neck when the inertial reel shoulder harness locks during impact.

Booster seats are *not* recommended for use in airline type aircraft whose seat backs are designed to break over easily. Seats in most general aviation aircraft operate like those in automobiles; i.e., they are locked in place and require operation of a release lever or button to allow them to move forward.

When children outgrow any child restraint system, they are big enough to use the aircraft seat belts safely. But again, you will have to check to see where the shoulder harness crosses their body to determine if they are large enough to use that.

Considerations

Choosing the "Best" Seat

- The "best" car seat for your child is one that fits your child's size and weight, fits in your aircraft, and can be used correctly on every ride.
- Choose a seat that meets the requirements of FAR § 91.107.
- Low- and high-priced models generally provide similar levels of protection. Higher prices may mean added convenience features, which make the seat easier to use.
- If you get a used seat, check the labels to make sure the seat meets the requirements of FAR § 91.107, get all the instructions and parts, and make sure it has not been in an accident (car or aircraft).
- Try out the seat in the aircraft, if possible. Release the buckles, adjust the harness, etc. (Note that seats displayed in stores may not be used correctly.)
- Make sure the aircraft seat belt can be fastened easily through the belt path on the car seat.
- Look for a seat with harnesses that are easy to adjust while the seat is in the aircraft. Check where the harness adjustors are located in the forward and rear-facing position, and make sure you can reach them when the seat is installed.

In the Aircraft

Anyone who is planning to purchase a child car seat for use in a small airplane should be aware of two important factors. First, consider the size of the car seat, and be aware that some of the larger models may not fit through the door of the plane. And, once through the door, it may be difficult to maneuver a large restraint into the seat. Second, consider that that automobile seats and restraints are different from aircraft equipment. Consequently, if the car seat doesn't fit easily in the available space or if the belts in the airplane don't securely tighten on the car seat, don't use it.

If the car seat you've selected does fit, there are a couple of precautions to consider when using it in your general aviation aircraft.

The child seat should be used only when it is placed in a forward-facing aircraft seat. All the crash testing done for automobiles and aircraft show that forward-facing seats are most effective in protecting children in car seats used in aircraft.

You should maintain the car seat in good condition, as per the manufacturer's instructions, and secure the seat as indicated by the manufacturer. The manufacturer must provide instructions for care, use, and installation with the car seat. All straps provided with the seat should be used. All instructions should be followed carefully. If not, the car seat will, at best, provide you with a false sense of security and, at worst, be a hazard to the child or other occupants of the aircraft.

The child seat should be attached with a lap belt or the lap belt portion of a combined seat belt/shoulder harness only. The shoulder harness can be used to help stabilize the car seat but should not be used to restrain the child unless you are using a belt-positioning booster seat.

Place the car seat where it does not interfere with the operation of the cockpit controls or block an exit. Although the seat can be placed anywhere, the preferred location is a rear passenger seat, when available, with another adult occupying an adjacent seat. One reason for this is structural; the other is operational. If a child occupies a car seat in the front of a general aviation aircraft, the protection the car seat offers could be nullified by the impact of an adult passenger in a rear seat without a shoulder harness striking the front seat back. This appears to be a problem more with small shield booster seats.

If you have to put the child seat in the front (a la a Cessna 152), before takeoff, check the controls for free and correct movement in all directions with the seat in place and occupied. You might even want to add a special emphasis item concerning this in your pretakeoff checklist. Also, the child should be in the seat at all times, especially if there is no other adult to supervise the child. You do not want to be distracted from flying or from your traffic scan to put Junior back in his or her child seat.

Weight and balance should not be a problem. The typical child restraint is generally no more than 20 pounds, but count it in your calculations anyway. It may mean you have to leave a piece of luggage home, but arriving at the end of your trip with the baby safe is better than bemoaning the clothes you couldn't bring.

Approved Child Seats?

We've used the term "approved" throughout this article, but what does that mean? FAA has approved car seats for use in aircraft only if they meet Federal motor vehicle standards; i.e., if your car seat can be used in your car, you can use it in your airplane.

You can tell if the restraint is FAA-approved by checking it for the appropriate markings, usually one or more labels. A seat manufactured between January 1, 1981 and February 25, 1985 must have a label which says:

"This child restraint system conforms to all applicable Federal motor vehicle safety standards."

Vest and harness-type child restraint systems manufactured before February 26, 1985 but bearing such a label are ***not*** approved for use in an aircraft.

Seats manufactured to U.S. standards on or after February 26, 1985 must have two labels—the one above and the following one in red lettering:

"THIS RESTRAINT IS CERTIFIED FOR USE IN MOTOR VEHICLES AND AIRCRAFT."

Seats that do not have these labels must have a label showing approval by a foreign government or a label showing that it was manufactured under United Nations standards. If the car seat does not have any of these labels it cannot be used in an aircraft; specifically, seats manufactured *before* January 1, 1981 are not approved for use in aircraft.

Remember . . .

Child seats are certified by their manufacturers to meet federal safety standards when they are used *as designed*. Improper installation or use may reduce protection to the child. So, here are a couple of reminders in that regard.

Always anchor the seat with the lap belt exactly as specified by the manufacturer.

- *Always* protect your child with either the car seat's harness or padded front shield—depending on the model. Some car seats have both, and, if so, both must be used.
- *Always* adjust the harness around seasonal clothing, leaving an inch of room so the child can move. The strap ends must be doubled back through the buckles so that the harness will not pull apart.
- *Always* use the tether if your seat or booster requires one. The tether must be attached to the aircraft to keep the child from being thrown forward. Consult your mechanic if installation of a tether requires attachment to the aircraft's structure.
- *ALWAYS* CONSULT THE MANUFACTURER'S (AIRCRAFT AND CAR SEAT) INSTRUCTIONS WHEN INSTALLING A CHILD RESTRAINT SYSTEM.

By all means, take your children flying with you and introduce them to its joys and wonders. Just make it safe for them, too. ■

For additional information consult Advisory Circular (AC) 91-62A, "Use of Child Seats in Aircraft." This AC is free from the U.S. Department of Transportation, M-433.2, General Services Section, Washington, DC 20590. This article was prepared using information provided by the FAA Civil Aeromedical Institute and DOT's National Highway Traffic Safety Administration. Also our thanks to Deborah Davis Stewart and Safe Ride News *for much invaluable information. Mr. Wensel is an Operations Inspector in the Operations Branch in FAA Headquarters.*

H.D. Chamberlain

Ultralight or Aircraft?

by H. Dean Chamberlain, *Associate Editor*

Recently, a trade publication printed an article about an aircraft it defined as a "microlight." In reading the article, the author took the liberty of defining a microlight as something that looks like an ultralight vehicle but that is heavier and faster. As an FAA publication, we think the article provides a good opportunity to review the regulatory differences between an aircraft and an ultralight vehicle. To clarify any misconceptions that might exist in anyone's mind about what is an ultralight vehicle and what is an aircraft, in the United States, the answer is simple, "If it ain't an ultralight vehicle, it is an aircraft." There is no such thing as a "microlight" or "light aircraft" in the U. S. Federal Aviation Regulations (FAR). Some foreign governments do use the terms in describing certain categories of aircraft in their countries.

So what is a U.S. ultralight vehicle? It is anything that meets the definition of an ultralight vehicle contained in FAR Part 103 (See Part 103 Sidebar). If *"you supply the example"* does not meet the definition contained in FAR Part 103 for an ultralight vehicle; it is an aircraft. And if *"you supply the example"* is an aircraft, it must be certificated under the FAR. All U.S. certificated aircraft must be flown by FAA-certificated pilots. The example of calling an aircraft a microlight is sort of like coloring a duck yellow and calling it a canary. No matter what its color, a duck is a duck. The same applies to aircraft. It doesn't matter what you call it, if it does not meet the requirements of FAR Part 103, it is an aircraft regardless of how it is made, how fast it flies, how slow it flies, its color, or the name you call it.

In talking to Mr. Bill Cook of the FAA about this issue, when asked if there are any illegal ultralight vehicles being flown, he said, "There is no such thing as an illegal ultralight vehicle. You either have a FAR Part 103 ultralight vehicle, or you have an illegal aircraft if it is not properly certificated."

Since most "fat" ultralights (a term used in many of the trade publications when referring to illegal aircraft that look like FAR Part 103 vehicles but don't meet the regulatory definitions to qualify as an ultralight vehicle) are assembled from kits, they must be certificated as experimental category aircraft and flown as such. Builders may also certificate kits that meet FAR Part 103 ultralight vehicle requirements as experimental aircraft if they want. If an ultralight vehicle is certificated as an aircraft, only FAA-certificated pilots can then fly it. (One benefit of certificating an ultralight vehicle as an aircraft is that the flight time flown in it is loggable toward meeting pilot currency requirements and in meeting minimum piloting requirements for other certificates.)

There is one exception to FAR Part 103 that allows two-place ultralight vehicles to be used for ultralight vehicle training purposes only. To operate legally as a powered ultralight vehicle trainer, a two-place, powered ultralight vehicle must be operated under authorization from the Experimental Aircraft Association (EAA) or the United States Ultralight Association (USUA) and used for training purposes only. These two organizations are the only ones to whom the FAA has issued an exemption that allows the organizations and their authorized representatives to deviate from FAR Part 103's sole occupant restriction for powered ultralight vehicles. Unless a two-place powered vehicle is operated in accordance with the FAA exemption issued to one of the organizations, it is not an ultralight vehicle. When not operated under the terms and restrictions of the FAR Part 103 exemption, the aircraft must be certificated as an aircraft and operated as such. The FAA also issued the United States Hang Gliding Association (USHGA) a similar exemption for two-place unpowered ultralight vehicles.

In talking to Cook about FAR Part 103 and the advancements in the ultralight industry since the days of the simple powered hang gliders of the 1970's to ultralights made today using ultralight construction techniques that mimic aircraft built during the 1930's and 1940's, he pointed out that FAR Part 103 has been very successful over the years. "Part 103 was designed to exempt for sport use simple, lightweight, single-occupant, 'vehicles' from *some* of the regulatory requirements that apply to aircraft and certificated pilots," he said.

H.D. Chamberlain

Ultralight or aircraft (hint, check the N-number)?

Like other aviation sport activities, such as skydiving, the FAA expects participants in the sport to assume a greater amount of personal responsibility for their actions in what is largely a self-regulated sport. This is why the FAA does not certify ultralight vehicles or operators of the vehicles or spend a large amount of time monitoring the sport. As a sport regulation, FAR Part 103 is designed primarily to protect non-participants both on the ground and in the air from injury rather than participants in the sport. According to Cook, FAR Part 103 has protected the public. Accidents and injuries in the sport have been limited to participants who assumed responsibility for their own safety when they took up the sport.

The FAA's duty to protect the public is the reason for the agency's concern about the possible misuse of two-place aircraft being operated as unauthorized ultralight vehicles. The FAA authorized the use of two-place ultralight vehicles for training purposes only to minimize the training risk to new ultralight vehicle operators. Because there is no regulatory requirement that operators receive any training, it was felt that by authorizing the use of two-place training ultralights, more operators would seek training and thereby reduce the risk to the public and other users of the National Airspace System. But now there is concern that some uncertificated, two-place aircraft are being operated by non-certificated pilots to carry passengers illegally under the guise of ultralight vehicle training.

Because of the FAA's mandate to protect the public, it 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. Under the FAR, only properly certificated pilots flying certificated aircraft may carry passengers. This is why student pilots cannot carry passengers. Although student pilots are safe to solo with the proper training and endorsements, there is still a greater element of risk involved in their flights than there is for certificated pilots. This is an element of risk that the FAA believes a passenger need not be exposed to.

But as the trend in ultralight vehicle design continues toward larger and more powerful designs that exceed the weight and speed limitations of FAR Part 103 (some designs do meet foreign ultralight, microlight, or light aircraft definitions for export purposes), the need to protect the public from the possible misuse of non-certificated aircraft by non-certificated pilots will continue to grow as larger, ultralight-like aircraft become available. Hopefully, the adoption of the Primary category aircraft regulation in 1993 and the earlier approved recreational pilot certificate may eliminate any possibility of public risk through proper certification of both such aircraft and their pilots. In the interim, everyone associated with FAR Part 103 and FAR Part 103 look-alike aircraft needs to be aware of the rules outlined above.

So what can the flying public do to minimize its risk? First, everyone needs to be aware of the FAR and its requirements. This brief overview is a start. Ultralight vehicle operators and students need to remember that they are responsible for their own training and safety. Although FAR Part 103 does not require any operator training, like all segments of aviation, proper training and currency are the only ways to reduce ultralight accidents and to minimize risk. The FAA encourages every operator and student to seek competent training. Finally for passengers: *There are no authorized passenger flights in two-place ultralight vehicles.* Two-place ultralight vehicles are for operator training purposes and then only with proper authorization from EAA, USUA, or USHGA. All other two-place "ultralight-like" aircraft must be certificated by the FAA and flown by FAA certificated pilots.

Hopefully, this safety summary of FAR Part 103 has provided some insight into FAR Part 103, its requirements, and the licensing requirements of aircraft that do not meet FAR Part 103. ■

From FAR Part 103
Subpart A—General

§ 103.1 Applicability

This part prescribes rules governing the operation of ultralight vehicles in the United States. For the purposes of this part, an ultralight vehicle is a vehicle that:

(a) Is used or intended to be used for manned operation in the air by a single occupant;

(b) Is used or intended to be used for recreation or sport purposes only;

(c) Does not have any U.S. or foreign airworthiness certificate; and

(d) If unpowered, weighs less than 155 pounds; or

(e) If powered:

(1) Weighs less than 254 pounds empty weight, excluding floats and safety devices which are intended for deployment in a potentially catastrophic situation;

(2) Has a fuel capacity not exceeding 5 U.S. gallons;

(3) Is not capable of more than 55 knots calibrated airspeed at full power in level flight; and

(4) Has a power-off stall speed which does not exceed 24 knots calibrated airspeed.

Surf's Up! or "Hanging Ten" in your airplane

by Bruce Edsten, *APPM, Louisville, KY FSDO*

Ah, yes, I can see it now: Frankie and Annette on the beach in some island paradise. Reality check! Other than the fact that it's a little early for that sort of stuff here in the midwest, there really isn't anything wrong with a little daydream, is there? Actually, considering the crummy weather we have had this winter, maybe we need some daydreaming to avoid getting too depressed!

Seriously, though, the "surfing" I'm talking about has to do with making surfboards out of your airplane's tires. As the snow and ice problems disappear with temperatures warm enough to melt the stuff, a new set of problems appear. April is famous for its showers, which adds to the problem, and that is wet runways and taxiways. Under the right circumstances, the water can be as big a problem as ice or snow.

We are speaking of hydroplaning, of course, where the tire loses contact with the surface and acts like a surfboard. How does this happen? Basically there are three types of hydroplaning which can occur separately or together.

Dynamic Hydroplaning

This is the most common form, and it's because of fluid density pressures. Essentially, this just means that the water can't get out of the way fast enough. Now we normally think of water as being pretty soft, and maybe it seems a bit unusual that the water truly can't get out of the way, but that's how it works. Think back to your days as a kid at the lake. Ever do a belly flop off the diving board? How soft did the water feel that time?

Anyway, as a result of the inertia of the water, the tire does not make full contact over its normal "footprint" and starts to ride up on a wedge or film of water. This is *partial hydroplaning* and obviously, steering and braking effectiveness will suffer!

Now increase the speed a bit further, and the at-rest momentum of the water is such that the tire does not make contact with the surface at all. This is called *total hydroplaning*. Steering and braking effectiveness are now non-existent! If you are going fast enough to still have aerodynamic control, you should be okay, but typically there isn't a lot left in that speed range.

What speed range are we talking about? This will depend on tire pressure. It sounds too good to be true, but extensive testing done by NASA and tire manufacturers has shown that a very simple equation is surprisingly accurate. This equation is expressed as follows:

$$V = 9\sqrt{P}$$

This means that the total hydroplaning velocity (V) in knots is equal to nine times the square root of the tire pressure (P).

Let's see what this actually means to us light plane drivers. My old Cessna 150 Owner's Manual says the main gear tires should be inflated to 21 PSI. Thus, $V = 9\sqrt{21}$ or 9×4.58 or about 41 knots. Since Vso (stall speed in the landing configuration) is shown as 41.5 knots (48 mph), it is apparent that you will have to be right on the ragged edge at touchdown to completely avoid hydroplaning speed!

Several other typical general aviation machines fare about the same. A Cherokee *Arrow* is a bit heavier, and the mains are supposed to get 27 PSI. Nine x $\sqrt{27} = 47$ knots with a Vso of 55 knots. Hmmmmmmm. The book for the B model *Aztec* says 42 PSI for the main tires, which produces a 58-knot hydroplaning speed, and Vso is listed as 54 knots. Since normal approach speed is 1.3 x Vso, it can be seen that in almost all cases you will be touching down well above the minimum hydroplaning speed.

Of course, if you can land into the wind, this speed problem will largely disappear, since it is ground speed we are really concerned with. After all, the water is sitting on the ground, and what counts here is how fast we hit the water! You could still blow it, though. If you add five knots for the spouse and kids, another five for the crosswind, another five for the gusts, etc., you will be right back where you started.

From a technique standpoint, the secret is to keep flying the airplane, and let aerodynamic drag do its thing until you are below the magic speed for your airplane. Then, with the tire in full contact with the runway, you can expect normal steering and braking responses.

All of the above applies to tires that are the correct size, in good shape, and properly inflated, of course. [As the tread wears down and/or the pressure drops, so does the hydroplaning speed.] Those big, bald "tundra" tires that you see on Alaskan Super Cubs will hydro at just about any speed!

Viscous Hydroplaning

This one can fool you, because it can happen even at very low speed. Essentially, it is sliding on some liquid other than water or in a situation where water has mixed with something. For example, an area of a ramp or runway could become contaminated with a number of substances. The run-up area would be a good candidate here, because a lot of aircraft sit over the same spot for a few minutes. Although not leaking much oil individually, the collective effect of a drop or two from dozens of aircraft can produce a noticeable stain. Then along comes a little rain to lift this out of the pavement surface, and it gets slick in a real hurry!

Touchdown zones are even worse, because they get oil shaken loose by the landing impact and a lot of rubber dust, too. At some really busy airports, they have to periodically go out and grind this stuff back down to the pavement! Once again, just add water for a nice, slippery mess! In most cases, a good hard rain will wash away most of this, so most occurrences are as the rain starts or after a light shower or heavy dew.

Reverted Rubber Hydroplaning

Here's a real weird one that you'll probably never encounter. For this to happen, a very precise amount of water must be present, not too much and not too little. The friction generated between the skidding tire and the pavement does two things: It melts the rubber which forms a seal around the footprint of the tire and turns the water to steam, which, sealed in by the melted rubber, supports the tire. Obviously, this requires a VERY delicate balance of forces, so it does not happen a lot nor does it last very long. Well, I did say it was a weird one!

Hydroplaning Prevention

So, how do we combat this monster? Get the water off the runway, that's how! Needless to say, proper drainage should be considered in any runway or ramp construction, but many smaller airports (with correspondingly smaller budgets) just can't do much about it. Hopefully, the smaller airport won't be so small that you can't land beyond the water.

If outright avoidance isn't possible, then you really have to try your utmost to encounter water at the lowest possible speed, certainly below the critical speed for your bird.

In many cases, even good drainage isn't good enough, because the water is falling and flowing as fast as possible, but the flow itself is deep enough to cause hydroplaning. Thus, most all-weather airliner-type runways have to resort to another strategy: grooves. The good news is that runway grooving provides a path for water to escape from under the tire. The bad news is that it costs more. The decreased surface area causes the pavement to wear out faster and need replacing sooner. In some cases, it has been possible to grind it all flat and regroove it, and I heard someplace that new runways are being designed with two or three "retreads" built in.

As far as the airplane is concerned, sound, properly inflated tires are the first line of defense. Then, as mentioned earlier, avoid the water when possible, and keep "flying" the airplane.

Y'all be careful out there! ■

InstrumentCORNER

Continued from page 24

Regarding who can install a piece of avionics gear, an airframe rated mechanic with a valid Inspection Authorization (IA) can install avionics equipment and return the aircraft to service. A better installation choice is an FAA-certificated Repair Station with the appropriate radio rating. An appropriately rated Repair Station can also perform maintenance on the installed equipment.

Generally, the FAA certificates qualified persons who can install a piece of avionics equipment in an aircraft. The FCC sets the standards for transmitting equipment and determines who can make any internal adjustments to that item. The FAA prescribes maintenance and installation standards for avionics components and systems.

Finally, regarding your question about an "undocumented" installation, only major alterations and repairs require FAA Form 337. Either an appropriately rated Repair Station or an A & P mechanic with an IA can review the installation, and if an installation meets appropriate airworthiness standards, the installation can be signed off with an appropriate maintenance record entry. A new aircraft weight and balance must be computed and the equipment list revised when installing or removing avionics components. Each installation of new equipment must also be documented in the aircraft's equipment list and weight and balance records.

Quiz Answers

Answers to Quiz on Inside Back Cover:
1—B, 2—D, 3—F, 4—H, 5—J,
6—A, 7—I, 8—G, 9—E, 10—C

Who's in Charge?

Pilots are always interested in hearing about the flight experiences of other pilots, no matter where they fly. The following is from the December 3, 1993, New Zealand Flight Safety Supplement and brings up an interesting point about the safety pilot issue that is just as pertinent to U.S. airmen. ***—Editor***

A recent airspace violation had an unusual twist—and a lesson that applies more widely than just to airspace.

Two pilots were on an instrument training flight. The pilot in command (PIC) was flying the aircraft from the left-hand seat and was using a "hood" to simulate not being able to see outside. The other pilot, equally well-qualified, was in the right-hand seat as a "safety pilot" (SP) and was also setting exercise tasks for the PIC.

You've probably guessed what happened. The TMA (equivalent to our Class B airspace) was violated, and ATC had to give avoiding action instructions to a jet airliner. A further maneuver by the offending aircraft necessitated yet more radar vectoring of the airliner, but with ATC thus in control of the situation there was no imminent danger on the day.

In the training cockpit, the SP had—too late—detected that they had entered the TMA. The next mistake by the SP was to attempt to retrieve the situation by giving the PIC another compass turn exercise. The PIC, unaware of the aircraft's improper position, took some time to get ready for the exercise, and this worsened the situation.

The whole affair raised a very interesting matter in law. An act of parliament, and regulations, quite clearly would hold the PIC responsible for this occurrence; natural justice, however, would readily identify the SP as the person who was at fault.

What do you think?

In the following paragraphs, we discuss the situation from the two perspectives.

Pilot in Command

If you have the option, choose your SP carefully. You are going to have to trust them.

Be aware of the regulatory requirements, the most important elements of which are the need for dual controls and for a SP with a valid Private Pilot license [with appropriate category and class ratings] (or above) who can see outside and who can talk to you.

Brief your SP before the flight. Indicate what you expect of her or him, whether and in what circumstances they should touch the controls, and in what circumstances you would wish to be brought out from under the hood. What words do you want used in this situation? (It may be a matter of urgency—"Look Up! Look Up!" might be a useful phrase.)

If your exercises are maneuvers rather than procedures, consider whether you might wish to re-orient yourself part way through the flight by raising the hood for a short break and finding your bearings again, so to speak.

Safety Pilot

Don't accept the job as SP unless you are [current and] happy with the PIC, the aircraft, and the environment (particularly controlled airspace).

If your PIC doesn't give you a briefing, ask him or her what they expect of you, e.g., whether to touch the controls, and in what circumstances the PIC would expect to be asked to look up.

Understand (ask) what the intended flight profile is, i.e., upper air work, approach procedures, etc.

During the flight, act as if you were PIC by constant monitoring in order to make decisions—but leave these to the PIC unless briefed otherwise. Keep the PIC informed of significant developments. During upper air work, an occasional "situation report" might be useful, advising the PIC of the aircraft position in relation to the ground and to clouds. This will let her or him know that you are on the ball, and it might help re-establish spatial awareness.

If in doubt about what to do in any situation, mentally transfer yourself to the PIC seat and ask yourself "what would I want my SP to do?" Do it.

Which is better, a pair or a royal flush? For some lucky pilots around the country who want a chance to win a good prize, they need to know.

But what does poker have to do with aviation safety? Everything!

The FAA Accident Prevention Program Manager at the Birmingham, AL, Flight Standards District Office (FSDO), Jim Toombs, has taken an old aviation fun activity used by other groups and put a new spin (pun intended) on it. He has organized a multi-FSDO, multi-state, and multi-region aviation safety "poker run." The May 14 event's theme is "Don't Gamble With Your Safety."

Ante Up!

But what does poker have to do with it? It's simple, really. All a pilot has to do is fly to five different airports in an area participating in the poker run. At each airport the pilot and any passengers attend a safety activity such as watching a video presentation. After participating in the safety activity, they receive a playing card. Then all pilots must return to a designated location by a specific time for a show down. The best natural poker hand will win a local prize. National prizes will be awarded on May 25th after the winner has been determined and it has been verified that the winner holds a valid pilot's certificate. Student pilots and recreational pilots are encouraged to participate. In case of identical hands, the person with the senior suit will win. (Suit seniority in decreasing order is Spades, Hearts, Diamonds, and Clubs.) In case of a remaining tie, a drawing will determine the winner. Each card and hand will be validated by local site coordinators.

Participating FSDO's include the Alabama FDSO (including the Florida panhandle) with 24 sites organized into three clusters; the North Carolina FSDO with 12 sites organized into two clusters; the Springfield, IL, FSDO with 10 sites organized into two clusters; the DuPage, IL, FSDO with six sites and one cluster; the Tennessee FSDO with 24 sites and 4 clusters; the St. Louis FSDO with 10 sites and two clusters; the Honolulu, HI, FDSO with five sites and one cluster; and the Baton Rouge FSDO (tentative) with five sites in one cluster. There are three soaring sites in Alabama and one in South Carolina for sailplane pilots which will constitute one cluster.

Weather minimums are 2,500 feet broken and four mile visibility existing and forecast. In case of marginal weather on May 14, Flight Service Stations (FSS) in the respective areas will know if the event is postponed until the following day, May 15. All participants are reminded to check with their local FSS as part of their preflight preparations.

The Winning Hand

Grand prizes include a two-night, three-day, Las Vegas vacation for two at the Showboat Hotel and Casino and a Trimble handheld GPS receiver. The winner of the best hand has his or her choice of the Las Vegas trip or the GPS receiver. The second best hand wins the remaining national prize. Round trip transportation for the Las Vegas vacation is courtesy of USAir from one of its gateway cities. Accommodations are provided by the Showboat Hotel-Las Vegas. Applicable taxes, ground transportation, meals and other incidental expenses relating to the Las Vegas trip are the responsibility of the winner. The GPS receiver is courtesy of Avemco Insurance Company. The AOPA Air Safety Foundation is providing materials for the Poker Run. John and Martha King of King Schools, San Diego, in cooperation with the General Aviation Pilots Association, will provide a prize for each of the 16 clusters. The prize is the winner's choice of one of the 11 written exam video courses or one of 13 "Take-Off" aviation video library tapes. Local sponsors include the General Aviation Council of Hawaii and the Birmingham Soaring Society.

Contact your local FAA Accident Prevention Program Manager in the areas noted for additional information, or call Jim Toombs at (205) 731-1641. Check your local airport or Flight Standards District Office for additional information. ■

Avionics Questions

Because the following avionics questions are commonly asked, we decided to expand our explanation to help others understand the relationship between FAA and FCC regulations concerning aircraft avionics equipment. —Editor

I have several questions about avionics equipment and licensing based upon the following situations. I have seen many advertisements for avionics equipment that offer the equipment at low prices, but I am not sure who can install it or which type equipment I might need. I have also passed up an opportunity to buy an aircraft that had radios installed for which there were no FAA Form 337's because I was uncomfortable with the undocumented installation. And I would like to use a handheld radio in the aircraft I rent, what must I do?

Please answer the following questions based upon the above information:

Who can install which avionics, and what FAA and FCC licenses or certificates do they need?

If I rent an airplane with no radios that does not have an FCC station license what can I do to operate legally a handheld transceiver?

What avionics need be TSO'd and under what circumstances?

Are avionics considered instruments for maintenance purposes?

Frank D. Roskind
Cheverly, MD

Your questions involve both the Federal Communications Commission (FCC) and the FAA. Basically, the FCC requires all transmitters used in an aircraft to be licensed as well as anyone making any internal adjustments to those transmitters. It may or may not require operators of that equipment to be licensed. Examples of aircraft transmitters include transponders, ELT's, radios, and airborne telephones. Normally, all of the transmitters aboard an aircraft are listed on the aircraft's radio station license. Although some aviation related frequencies are available for all airborne stations, the FCC has select frequencies for specific classes of aircraft operators or operations such as air carrier; private aircraft; flight test activities; aviation support which includes flying schools, soaring and free ballooning operations, ramp operations, and safety related activities; and public service applications. In the case of air carrier and private aircraft, you can only apply for one category of aircraft service on the same application.

If you use your handheld transceiver only as a backup on an aircraft that has a radio station license, you do not need a radio station license for the handheld. If the aircraft does not have a radio station license, then you will need to apply to the FCC for a "portable" radio station license before you can transmit using your handheld transceiver. But before you mail in your radio station application, you should check your aircraft. If the aircraft has an ELT installed for example, it should have a radio station license. If the aircraft is not required to have an ELT aboard, FAR § 91.207 applies, and you could not find any other transmitter that requires a radio station license, then you should apply for a "portable" radio station license for your handheld transmitter using FCC Aircraft Radio Station Application (FCC 404) form.

Because you would be asking for a portable license, you will be asked for a statement about why you need a portable station license. Once issued, though, a radio station license is valid for five years. The current application fee is $35 per aircraft per application. The FCC 404 application form's directions explain about the required comment and how to compute the required fee. FCC 404 is available from the FCC through its regional offices listed in your telephone book or by writing to the FCC Private Radio Bureau, Licensing Division, Consumer Assistance Branch, 1270 Fairfield Rd., Gettysburg, PA 17325-7245. Telephone (717) 337-1212.

The FCC publishes fact sheets that list requirements for its various licenses. For example, Private Radio Bureau, PR-5000, Fact Sheet Number 4, March 1993, *Aircraft Radio Stations*, states, "No Restricted Radiotelephone Operators Permit is required to operate VHF radio equipment on board an aircraft when that aircraft is flown domestically. However, when operating other than VHF radio equipment on domestic flights and when operating any radio equipment on international flights, the operator must hold at least a Restricted Radiotelephone Operators Permit (FCC Form 753)." A $35 fee is required for the permit.

Regarding your question about TSO'd equipment, TSO'd equipment is only required to be installed if specified in an FAA regulation. For example, FAR § 91.215 lists TSO requirements for general aviation transponders. If not required by FAR, you can install only those items which meet the aircraft's certification basis (FAR Parts 21, 23, or 25).

Regarding the term "instrument," if you are asking is a radio considered an instrument, the answer is no. FAR Part 1 states the word *instrument* "means a device using an internal mechanism to show visually or aurally the attitude, altitude, or operation of an aircraft or aircraft part. It includes electronic devices for automatically controlling an aircraft in flight." The FAR Part 1 definition for the term *appliance* applies. The broadly defined term *appliance* includes communication equipment. As defined, an aircraft appliance can be just about anything installed in or attached to an aircraft that is not part of an aircraft's airframe, engine, or propeller.

Continued on page 21

• High Performance

If a student pilot takes his private check ride in a high performance airplane (such as a Cessna 182), does he still need a high performance airplane sign off in accordance with FAR § 61.31(e) or is the check ride itself sufficient? Note that FAR § 61.31(e) specifically states that it applies to private or commercial pilots (how about ATP?) and not student pilots, so therefore the instructor could not sign him off before the checkride. If a separate sign off is required, can it be done by the examiner or must it be done by an instructor after the check ride?

How about the case of a private pilot without a high performance sign off getting an additional rating such as multiengine land or single-engine sea where no solo time is required? How would this sign off be accomplished?

What about a student pilot who has been signed off for solo flight in a tailwheel airplane? Does he need an additional sign off to meet the requirements of FAR § 61.31(g) either before or after his private check ride? What about a commercial pilot taking a FAR Part 135 checkride in a tailwheel airplane who does not have this sign off? Keep in mind that not all 135 instructors and check airmen are also CFI's.

Believe it or not, these have come up recently. To be safe, we signed him off after his check ride, but are still not sure if this is required.

Charles M. Jamieson, Jr.
Metairie, LA

Every applicant must come to a check ride with all required instruction and endorsements. This includes appropriate aircraft and instructor endorsements. The easiest way to handle this situation is to make an appropriate logbook endorsement when the appropriate instruction is given.

• Landing Minima

The Landing Minima page of the IAP booklet refers to meteorological visibility and to RVR. Flight visibility is not mentioned. FAR §§ 91.175 (c)(2) and (d) state that operations below DH/MDA and landing are not permitted when flight visibility is less than the visibility minimum for the particular procedure. The FAR does not mention either RVR or meteorological visibility. Can a pilot legally land an aircraft on a runway for which reported RVR is below the prescribed minimum, if the pilot estimates that the flight visibility is greater than the minimum RVR prescribed for the particular runway?

Name withheld
Ponte Vedra Beach, FL

Yes, for FAR Part 91 operations.

• Currency and PC's

I am writing this letter in response to your short note on Logging of Instrument Time in the October 1993 issue. FAR § 61.57, Recent Flight Experience, section (e)(l)(i) says that within the past six calendar months we must have logged at least six hours of instrument time under actual or simulated IFR conditions, at least three of which were in flight in the category of aircraft involved, including at least six instrument approaches.

Note that it does not say some or any of this time must be instrument currency training as you indicated in your second sentence. If I have made six actual approaches within the past six months, are these considered training? If I have made six approaches in VFR conditions under the hood with a private pilot watching out for traffic, are these considered training? An instructor is not required to sign off on this flying, and I can find no reference in the FAR that says instrument time or approaches done in a ground trainer or simulator, after you have your instrument rating, needs to be signed off by an instructor.

FAR 61.65(e)(2), flight experience to qualify for an instrument rating, says that one must have 40 hours of simulated or actual instrument time, of which not more than 20 hours may be instrument instruction by an authorized instructor in an instrument ground trainer acceptable to the Administrator. There can be little doubt that this ground trainer instruction is covered by FAR § 61.51(b)(2)(v) and (c)(5), but I don't see anything in the FAR that says approaches done in a ground trainer or simulator to satisfy currency requirements have to be classified as "pilot ground trainer instruction" (v) and therefore require an instructors endorsement under (c)5. Personally, I call it "other pilot time"(vii).

Since we didn't have any confusion about this FAR 10 years ago, I assume it has come about by the increased sophistication of computer based simulation and the proliferation of PC's. Rather than discourage the home use of these programs or other ground trainers, why not encourage their use. Who cares whether the time is PIC or solo. What difference does it make if the flaps, gear, throttle etc. are controlled by a mouse as long as the correct action is taken.

Your statement that "everyone can play to their hearts' content" tells me a lot about what the FAA is thinking, but I can assure you that any serious instrument pilot does not sit down at any type of ground trainer to play. It really discourages me to see the FAA playing word games with the FAR to get around some perceived problem, because it makes it very hard for instructors to convince their students that the FAR really do make sense, and that you can go by what they say.

Maybe my view of instrument pilots is naive, but from my own experience as an instrument flight instructor for 20 years, I believe that you will increase the interest in maintaining currency and improve the general skill level more by encouraging a freer use of ground

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trainers and PC simulation than you will by limiting their use with requirements such as instructor signoffs for that time to count for currency. The new programs with data bases for the entire US, the ability to set instrument failure probabilities, and physical controls for throttle, flaps, gear, etc. can make practice at home a challenging and continuous learning environment.

Unless the FAA has statistical information to show that FAR § 61.57 isn't doing its job as written, then I believe we should stick to the exact wording rather than trying to read into it words that are not there.

Bob Plumb, CFII
Trinity Center, CA

Six actual instrument approaches constitute an acceptable portion of the currency requirements as does six simulated instrument approaches in flight with an appropriately rated safety pilot.

Regarding your comment about training devices and simulators, our answer referred only to the FAA requirement that *all* 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. FAR § 61.51(b)(2)(v) and (c)(5) provide the only reference to the use of a ground training device or simulator under FAR § 61.51. FAR § 61.51(b)(2)(v) states FAA-approved training device or FAA-approved simulator time is logged as "pilot ground trainer instruction."Subparagraph (c)(5) states that pilot ground trainer instruction must be signed off by an appropriately rated instructor.

Regarding the use of PC-based instrument programs, the FAA does not accept such time towards meeting pilot training or currency requirements specified in the FAR. No FAA-test program has shown a transfer of IFR piloting skills from PC-based flight programs to that required for the actual control of an IFR aircraft that warrants approving the logging of such PC-based time for pilot training or currency purposes. The FAA has spent thousands of dollars testing PC-based training concepts, but until it can be proven that there is a positive transfer of instrument flight skills from PC-based programs to the cockpit that ensure the safe operation of an IFR aircraft in flight, PC-based hours will not be loggable for FAA purposes.

Regarding your comment about encouraging the use of training devices and simulators, the FAA does encourage the use of approved training resources to minimize training risks both to pilots and crews as well as to aircraft. Such devices have been used for training for years. Today, certain types of pilot training and check rides can all be done in an approved simulator.

• Logging of Cross Country Time

I am aware of the requirements of FAR Parts 61 and 91 as they relate to what constitutes loggable cross country time for meeting the requirements for Private and Commercial Pilot certificates, but I have encountered considerable differences of opinion as to what may be logged as cross country time once one has attained a Commercial Pilot certificate.

Specifically at issue is the legality of logging cross country for prolonged trips to remote points when no landing is executed at the remote location; particularly affected would be power line patrols, military training missions, and photo missions out of the local area.

My logic would say that the time should be loggable as cross country since the pilot must exercise his navigation skills in getting to the remote location and returning home. It seems almost silly to fly an hour or more, using VOR's, ground tracking skills, and communications, only to return to home base and log the flight as LOCAL just because no landing was made.

Perhaps you could clarify this issue in your FlightFORUM column . . .

Lauren Johnson
Glen Allen, VA

The answer to your question was printed in the May–June 1992 *FAA Aviation News*'s FLIGHTFORUM. A commercial pilot may log as cross-country flight time that time from one airport to a landing at another airport. FAA policy requires that civil commercial pilots must land at an airport other than their departure airport to log cross-country time. By policy, the FAA exempts certain military flights from this landing requirement.

• Uncontrolled IFR

Can instrument meteorological conditions legally be entered in uncontrolled airspace (e.g,. below 1,200 feet AGL) without an ATC clearance, if pilot and airplane are legal for instrument flight?

Cyril Toker
Ponte Vedra Beach, FL

Yes. A qualified pilot can fly IFR in uncontrolled airspace without an ATC clearance as long as he or she complies with the FAR. For example, IFR altitude rules based upon direction of flight and altitude apply as well as minimum IFR altitude rules based upon terrain and flight path. Certain IFR rules apply regardless of type of airspace. Although every flight or situation can be different, this question is an example of what may be legal may not be wise. In the eastern part of the U.S. it is hard to find enough uncontrolled (Class G) airspace for such a flight without entering controlled airspace. And all airspace is controlled in the Continental U.S. above 14,500 feet.

A cursory review of some IFR en route charts for the Nevada, Utah, and Montana areas show that much of the uncontrolled airspace left in the west is crossed or cut by controlled airspace. Entry into controlled airspace in IMC without an ATC IFR clearance is grounds for FAA enforcement action as well as being unsafe. Unauthorized IFR entry into controlled airspace in IMC also violates the trust that all pilots have with each other to operate according to a given set of rules (the FAR) for the safety of all.

Finally, ATC provides many important safety services to IFR pilots on an IFR flight plan in controlled airspace that an IFR pilot in uncontrolled airspace may not receive.

Denver Airport Opening is Delayed So Save Your Old Charts

The new Denver International Airport's opening has been delayed until May 15. Many of the proposed changes involving the airport and surrounding airspace that were to go into effect with the airport's earlier opening are also on hold until the proposed May opening. Every pilot and operator operating in the Denver area needs to check the latest FAA NOTAM's for important charting and operating information affected by the delay.

For example, the IFR and VFR charting changes that were to take effect on March 9 are on hold until the airport opens. The IFR graphic, "Denver Area Graphic" is to be discarded although the information on it is current. A new graphic will be distributed with the April 28 IFR charts.

Other charting delays include the March 9 VFR Denver Terminal Area Chart, the Denver Sectional Chart, the Cheyenne Sectional Chart, and the Wichita Sectional Chart. All are on hold until the airport opens. Pilots are to continue to use the respective charts dated October 14, 1993, until the airport opens. After the airport opens the March 9 charts are to be used.

Other delays include the activation of the new Denver International Airport surveillance radar, the relocation of the U.S. Custom Service from Stapleton International, and the commissioning and decommissioning of the Denver VOR/DME and Denver VORTAC respectively to support the new airport. Pilots should continue to check NOTAM's for any unexpected delays or changes to the proposed opening date. Pilots are reminded that the new airport is closed and no flight activity is authorized at the new airport until it is officially opened. Because the new airport is considered a congested area, there is a 1,000 feet AGL minimum overflight altitude in effect until it is opened. FAR § 91.119 applies.

U.S. Airlines Suffered No Passenger Fatalities in 1993

The major U.S. scheduled airlines suffered no passenger fatalities in 1993, the National Transportation Safety Board reported today in releasing its preliminary aviation accident data for last year. The fatal accident rate for the scheduled airlines was the lowest since 1980. At the same time, air taxis and general aviation registered their lowest number of fatalities on record.

The Safety Board reported that 800 people lost their lives in 2,158 civil aviation accidents either in the U.S. or involving U.S. registered aircraft in 1993, down from 998 fatalities in 2,221 accidents in 1992.

The major scheduled airlines experienced only one fatal accident, that involving a ground crewmember being struck by a propeller. The fatal accident rate of 0.013 fatal accidents per 100,000 departures was the lowest since 1980, when there were no fatal accidents among scheduled airlines.

Paradoxically, the airlines experienced more accidents in 1993 (23) than the previous year (16) resulting in a higher total accident rate, 0.297 vs. 0.207.

The charter airlines experienced their fourth consecutive year without a fatal accident.

The fatal accident rate for commuter airlines dropped from 0.240 to 0.127 per 100,000 departures, but fatalities rose from 21 in 1992 to 24 last year. The total accident rate dropped from 0.756 to 0.509.

On-demand air taxis registered their lowest number of fatalities in the Board's history with 42. In 1992, there were 70. The total accident rate dropped from 3.78 per 100,000 aircraft hours to 3.38, and the fatal accident rate from 1.19 to 0.90.

General aviation accidents registered historic lows in number of accidents (2,022), fatal accidents (385), and fatalities (715). While the fatal accident rate dropped in 1993 to 1.67 per 100,000 aircraft hours from 1.87 the previous year, the total accident rate rose from 8.71 to 8.79.

Foreign registered aircraft had five fatal accidents in the U.S. and nine fatalities, while unregistered aircraft in the U.S. had eight fatal accidents, also resulting in nine fatalities.

The Safety Board said that aircraft flying in the U.S. logged approximately 39,993,000 hours in 1993, according to figures supplied by the Federal Aviation Administration.

GPS Approval for Civil Use

FAA Administrator David Hinson recently announced that the satellite-based Global Positioning System (GPS) is now operational and an integrated part of the U.S. National Airspace System.

Hinson said the FAA is implementing civil use of GPS's Initial Operational Capability (IOC). GPS IOC means the 24 satellites that make up the navigation system are operating in their assigned orbits and providing signals for navigational use. The Secretary of Defense notified the Secretary of Transportation that the GPS satellites achieved IOC in December 1993. The GPS signal for civil use now meets the performance characteristics defined in the 1992 Federal Radio Navigation Plan.

The Administrator also said the FAA has approved two Garmin International GPS receivers, models 155 and 165, under Technical Standard Order C129 (TSO), Airborne Supplemental Navigation Equipment Using GPS. Other man-

ufacturers will be receiving approval in the near future.

These models received an A1 designation indicating that they are complete with internal databases and integrity monitoring capable of providing stand-alone instrument flight rules (IFR) guidance for oceanic, domestic enroute, terminal, and non-precision approaches. TSO C129 prescribes the minimum performance standards that airborne supplemental area navigation equipment using GPS must meet in order to be used under IFR conditions.

The two achievements—civil use of Initial Operational Capability and the approval of the Garmin receivers—mark a significant milestone in the FAA's GPS implementation program. With IOC and the newly-certified avionics equipment, GPS is now the first navigation system to be approved for use as a stand-alone navigation aid for all phases of flight through non-precision approach.

Young Eagles Take Flight

According to EAA more than 50,000 young people have now received an introduction to the exciting world of flight through the first full year of the EAA Aviation Foundation's "Young Eagles" program, which was created to introduce a new generation to aviation.This success gives the Young Eagles program a fast start toward the goal announced at its debut in 1992 providing 1 million young people with a demonstration airplane ride by the year 2003, which is the 100th anniversary of powered flight and the 50th anniversary of the Experimental Aircraft Association (EAA).

"We are pleased with the response to the Young Eagles program," said Foundation President Tom Poberezny. "The first year of any program is often the most difficult to organize and publicize. Reaching 50,000 kids is a significant milestone. In addition, almost 6,000 pilots and thousands of other volunteers have already participated. Numerous aviation organizations and businesses have also joined with the Foundation to form partnerships to promote Young Eagles. We are very confident that we'll

EAA photo/Jim Koepnick

reach our goal of flying a million young people in the next decade."

During 1993, kids from across North America became Young Eagles, as did young people from a number of other countries including Scotland, Taiwan, Greece and South Africa. Aircraft used for the rides ranged from small private airplanes and antique biplanes to helicopters and business jets.

The EAA Aviation Foundation also expanded the program this year to include Field Representatives, who serve as a source of information and a resource for pilots and EAA Chapters interested in becoming involved in the Young Eagles program.

"The success of the Young Eagles program is due in large part to the personal involvement of our Field Representatives, pilots, aviation organizations and businesses who recognize the importance of passing our aviation heritage on to our nation's young people," said Ed Lachendro, National Director of the Young Eagles program. "Our future success will depend on people currently involved in aviation giving some of the enjoyment they've experienced to a new generation eager to learn about how airplanes work and what it takes to fly them."

Most of 1993's Young Eagles were flown by volunteer EAA pilots, either through individual flights at local airports or through flight rallies organized by EAA Chapters. Recently, a number of leading aviation organizations have become "partners" in the Young Eagles program. They include the International Flying Farmers, the Soaring Society of America, American Bonanza Society, Kansas State University, and Parks College (St. Louis, MO), among others. More organizations and institutions will likely become affiliated with the Young Eagles program in the future.

Several prominent businesses also joined the Young Eagles effort in 1993, providing corporate support in a wide variety of areas. Companies and individuals have since added their support through the "Eagle Flight Society," a group dedicated to the preservation of general aviation by exposing young people to the world of flight through programs such as Young Eagles.

"We are pleased so many aviation-minded companies and individuals have supported our Young Eagles efforts," Poberezny said. "They realize the pilots and aviation enthusiasts of the 21st century will come from the young people we're working with today. The Young Eagles program offers an outstanding 'hands-on' opportunity to discover more about the possibilities within the world of flight and, more importantly, within each individual participant."

The Young Eagles program was announced at a Washington, D.C., news conference in May 1992. The first flights were launched two months later during the 1992 EAA Fly-In Convention in Oshkosh, WI.

Each flight begins with the pilot showing the "Young Eagle" about how an airplane works and the proper preparations for safe flight. Following a short demonstration flight, each participant receives a certificate signed by the pilot that commemorates the event. Every young person and pilot's name is also entered into the "World's Largest Logbook," which is on permanent display in the EAA Air Adventure Museum in Oshkosh.

SAFETY NOTICE

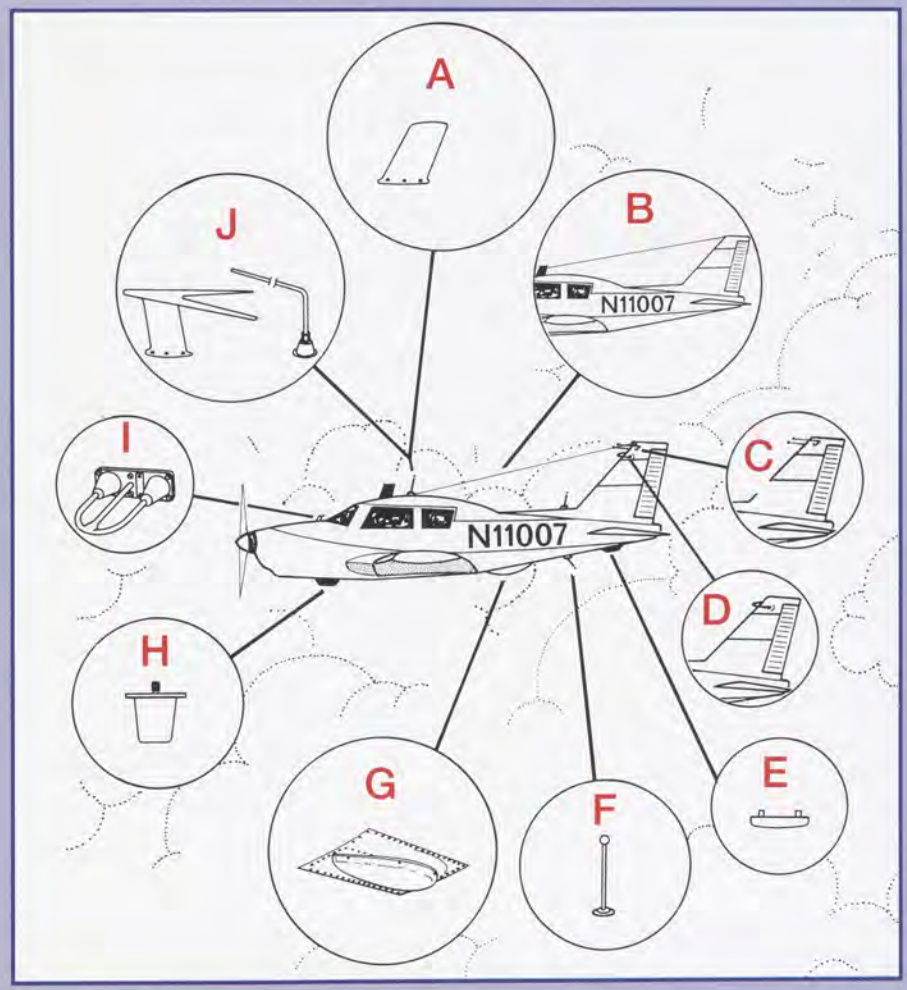
Items included in the *Notices to Airmen* publication are NOT given during pilot briefings unless specifically requested by the pilot.

TYPICAL ANTENNA SHAPES

During a thorough preflight a pilot always checks the exterior of the aircraft to see if anything is wrong, but how many pilots, especially renter pilots, stop to think about the types of antennas attached to the aircraft. Now is your chance to test your knowledge, how many of these can you identify. (The answers are on page 21.)

* *Denotes navigation antennas*

__ 1. ADF Sense*
__ 2. VOR* (Towel Bar)
__ 3. Transponder*
__ 4. DME*
__ 5. Communications Radios & NAVAIDS
__ 6. Communications Radios
__ 7. Glide Slope*
__ 8. ADF Loop*
__ 9. Marker Beacon*
__ 10. VOR* (Cat's Whiskers)



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