July-August 1992

FAA Aviation News

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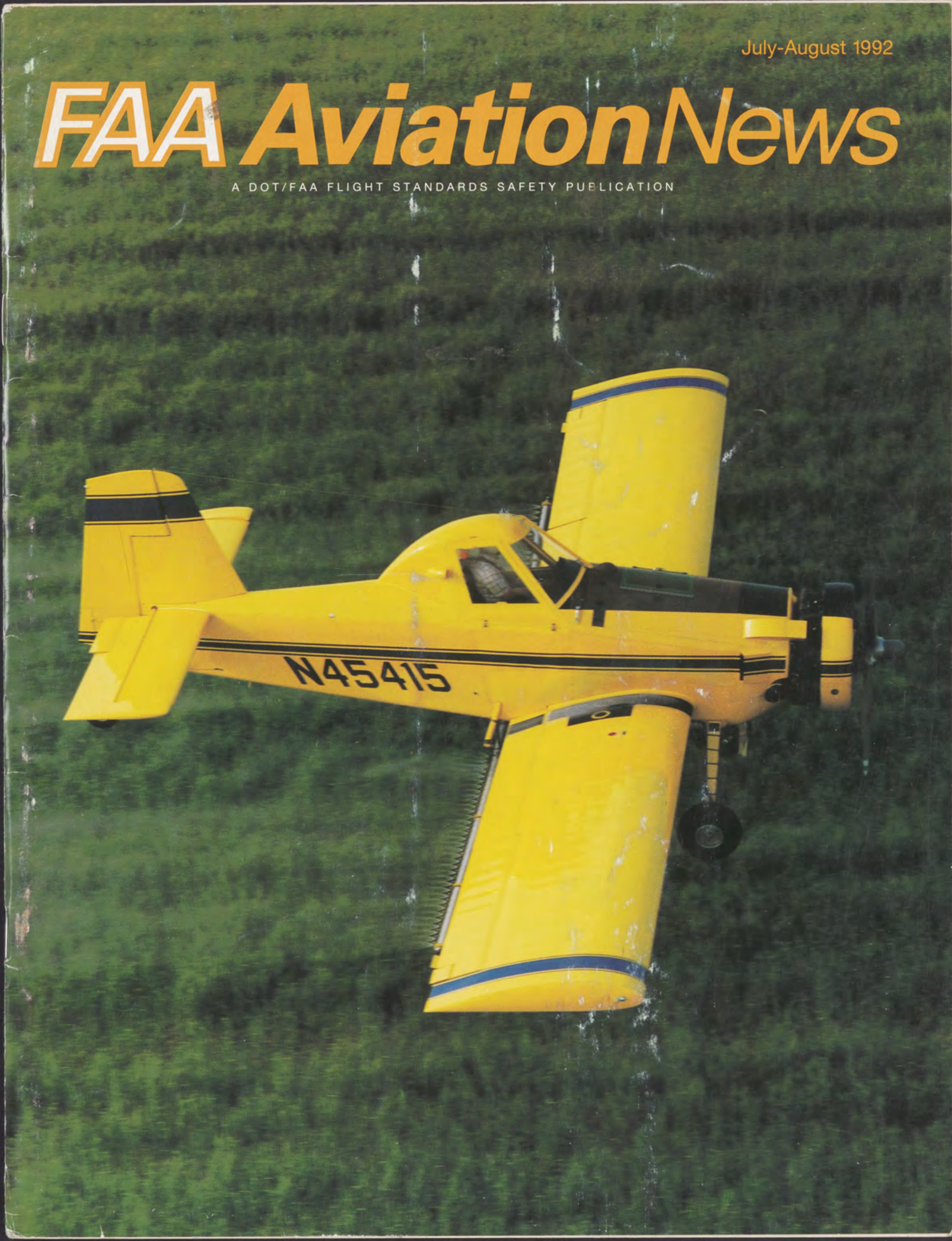

U.S. Department of Transportation
Federal Aviation Administration

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

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July-August 1992

FAA Aviation News

Volume 31 Number 4

FEATURES

DEPARTMENTS

On the Cover:
An Air Tractor (AT) 401 sprays a field. Protecting the nation's crops against pests such as weeds, plant diseases, and insects is the major role of agricultural aviation. Photo courtesy of Air Tractor.

On the Back Cover
Treating potatoes—this Air Tractor, operated by Queen Bee Air Specialisties of Rigby, ID, fertilizes a field of potatoes. In potato-growing states like Idaho, aerial applicators spend nearly half the season spreading fertilizer, foliants, and herbicides on potatoes.

Making A Difference

Flight Standards Support for General Aviation

by Robert A. Wright, Acting Manager, General Aviation and Commercial Division

Beginning with this issue, we are inaugurating a series of editorials that will explain Flight Standards' position and philosophy as it completes its transition to a customer-oriented organization. The topics of the editorials will be issues close to your heart and ours—the future of aviation, particularly general aviation, in this country. This first editorial introduces a plan FAA's Flight Standards has for general aviation. More than a blueprint, the "General Aviation Action Plan" represents Flight Standards' commitment to the largest single portion of the aviation community. ***—Editor***

Mr. Wright owns and flies a Mooney 201 which he bases at Washington-Executive Airport (Hyde Field), a general aviation airport 15 miles east of Washington, DC.

General aviation in the United States faces many challenges in the 1990's. The safety record of general aviation has improved greatly in the last 20 years. One challenge will be how we can improve on this record—*improve* not maintain. The future advancement of general aviation is constrained only by a few critical barriers that we must surmount. These barriers result from limitations on technological advancement and competitiveness, from issues involving general aviation access to the National Airspace System, and from issues involving the affordability of general aviation to its users.

The Federal Aviation Administration (FAA) has a responsibility to establish and enforce safety standards and to foster and promote aviation. In spite of what some FAA critics have said, these responsibilities are neither contradictory nor separable. We believe that safety cannot be advanced without fostering and promoting aviation; that is, a safe aviation climate makes it easier for us to promote aviation as a viable part of the nation's economy.

General aviation contributes more than $38 billion to the nation's economy and provides more than 530,000 jobs. It also fills a crucial niche in the National Transportation System, providing the public air access at 17,490 airports versus only 680 served by scheduled air carriers. Any barriers deliberately or accidentally imposed on general aviation not only have severe impact on the nation's economy and infrastructure but also deprive the public of access to the system. One example of such a barrier is the failure to develop meaningful product liability and tort reform. The General Aviation and Commercial Division recognizes the importance of the need for product liability and tort reform and will provide its support for appropriate legislation.

In view of its success in assuring safety in general aviation, the Flight Standards Service also recognizes the need to implement programs which will promote general aviation better. The Service's broad-based strategic plan for the period 1992–1997 incorporates several elements which will help promote general aviation activity. These include an emphasis on an efficient surveillance and certification safety system, an emphasis on partnership with industry, and a customer focus to our programs and activities.

The Service's General Aviation and Commercial Division, the publisher of this magazine, is implementing the concepts in the Flight Standards' strategic plan by developing the *General Aviation Action Plan* (GAAP)—a policy for enhancing the FAA's role in fostering and promoting general aviation safety and prosperity in the United States. This document will govern the activities of the General Aviation and Commercial Division for the same five-year period as the Flight Standards' strategic plan.

Our program encompasses five basic emphasis areas (in the spirit of the election year, we are calling them "planks") to address the issues discussed above.

1. **Safety—**Protecting our recent gains and aiming for a new threshold.
2. **Certification—**Providing the general aviation community with cost-effective services.
3. **Product Innovation and Competitiveness—**Ensuring the technological advancement of general aviation.
4. **Access—**Maximizing general aviation ability to operate in the National Airspace System.
5. **Affordability—**Promoting economic and efficient general aviation operations, expanding participation, and stimulating industry growth.

The FAA programs and resources supporting these goals include advisory guidance, safety and accident prevention programs, airman and air operator/agency certification services, and other tools, such as rulemaking and helping to represent general aviation's interests before Congress and other government agencies. The tools most central to our efforts are communications with the general aviation community and joint action between FAA and its industry partners. The concept of partnership is especially important. For example, our FAA colleagues in Aircraft Certification have teamed with industry organizations and other elements and have made dramatic progress in developing new light aircraft certification standards. The General Aviation and Commercial Division will continue its similar partnerships and look for opportunities to form new ones with industry to accomplish our mutual goals.

We have already been discussing this plan within FAA and with industry groups, and its acceptance seems universal. Future issues of *FAA Aviation News* will provide detailed information on the specific policies and programs that make up the five "planks."

I look forward to our helping general aviation into a bright and productive future. ■

National Agricultural Aviation Association

USA Rice Council

Aerial application involves not only the spraying of chemicals but seeding and pollinating, too. Here a California aerial applicator seeds rice.

by the Aviation News Staff

It was quite an exciting day on the farm. To combat the worrisome "army" worm threatening a field of potentially prize-winning corn, a local farmer had engaged the services of a "crop duster." Other farmers in the area were satisfied with the time-honored method of pulling a spray rig behind a tractor to rid their fields of pests, and they shook their collective heads at the farmer's solution. However, you had to get to "army" worms early, and covering a field this size by tractor could take days. According to this maverick farmer, a "crop duster" could handle it in a matter of hours. Farmers being a curious breed, they came from miles around to watch the high-speed, low-level swath runs and the amazingly steep pull-ups and abrupt turnarounds of the little yellow airplane someone called an *Ag-Cat*. Barely more than an hour passed before the job was done: The "army" worms were dead or dying, a crop and a livelihood had been saved, and a "crop duster" had flown off to assist another grower, leaving the no-longer skeptical farmers muttering to themselves, "Who was that intrepid aviator?" Who, indeed?

They help to feed and clothe us, and they are a part of aviation's folklore. The uninformed may still call them "crop dusters" and figure that they must be crazy to fly like that. Today, in an agri-business world that has to produce more on fewer acres yet in a timely and cost-effective manner, they are "aerial applicators" who work for FAR Part 137 certificated Agricultural Aircraft Operators. To succeed in today's business climate, the modern farmer has highly advanced equipment, and, unlike a century ago, he or she not only has to have a foundation in agriculture but maybe a degree in business administration as well. That business acumen more often than not tells the farmer that swift, practical control of damaging insects and weeds and fast, efficient seeding/pollinating means the use of one of the nation's 2,100 agricultural aircraft operators and their 6,000+ aircraft.

Just as the modern farmer no longer walks behind a horse-drawn implement, gone are the days when any barnstorming pilot with an airplane and a makeshift hopper can claim the label of "crop duster." The pilots now working as aerial applicators must combine a knowledge of chemistry, agriculture, and aviation with an awareness of a multitude of federal, state, and local environmental regulations that constantly change as new, improved substances come into use.

The success that aerial applicators enjoy today is a result of FAA's partnership with the industry through its principal spokesperson, the National Agricultural Aviation Association (NAAA). Headquartered in Washington, DC, NAAA works with FAA and represents agricultural aviation before the Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA), the Occupational Safety and Health Administration (OSHA), and the U.S. Congress. NAAA notes that while there are fewer farms and less acreage under use, aerial application has not diminished proportionately. The 2,100 ag operators are down from 3,300 a decade ago when their 10,000 aircraft flew 2.4 million hours. The two million hours flown in 1988 by 6,000 aircraft represent only a 17% decrease, but the amount of acreage treated in an average growing season has remained the same—250 to 300 million. With many of today's aircraft substantially larger than those of a decade ago, many more acres are covered in a shorter period of time. Whereas the number of operators certificated by FAA as aerial applicators does not approach the number of other operators certificated, aerial application is an important part of FAA's workload in certain areas of the country, namely the south, west, and southwest.

What are the responsibilities of the associates in this partnership? FAA's responsibility is to certificate potential aerial applicators by examining an applicant's ability to comply with FAR Part 137, Agricultural Aircraft Operations. Not only must the operator complete the certification process successfully, but the aircraft involved must meet appropriate airworthiness requirements and any pilots working for that operator must also meet certain FAA requirements beyond their private or commercial pilot certification—and that does not include any training that EPA, USDA, state, or local jurisdictions may require. Once an operator begins providing aerial application services, FAA periodically surveys and inspects those operations to assure continued FAR compliance and safety. Because the FAR do not require any recurrent training or requalification of ag pilots or operators (a FAR Part 137 certificate has no expiration date), NAAA assumes the responsibility of encouraging and assisting its members (approximately one-third of the total operators) to establish their own safety and training programs and of helping operators keep abreast of any regulatory or operational changes. With so many government agencies involved in an industry, that alone is a herculean task.

The FAA/NAAA partnership can and should claim credit for a remarkable accomplishment in the area of aerial application—a nearly 50% *decrease* in the aerial application accident rate in a 10-year period. In 1979 aerial applicators had 16.88 accidents per 100,000 flight hours, but in 1988, that had dropped to 8.55. During the same period, the fatal accident rate per 100,000 flight hours dropped from 1.13 to .50.

Founded some 25 years ago by concerned persons in the industry, NAAA has worked hard and long to educate ag operators and pilots about the importance of safe aerial application operations—not only for the public interest but for the survival of the industry. NAAA draws on plenty of expertise to accomplish this. Its Board of Directors consists of representatives from the nation's 33 state and regional agricultural aviation associations, and NAAA can draw on the expertise of its pilot and operator members as well as associated manufacturers of aircraft, spray equipment, and chemicals. The four-person Washington headquarters staff is headed by Executive Director Harold M. Collins, who is justly proud of the reduction in the accident rate.

NAAA

NAAA Executive Director Harold M. Collins

Along with FAA, there has been no stronger voice than Collins' and the NAAA in encouraging better training and equipment for and protection of ag pilots.

Collins attributes the decrease in the accident rate to a number of things. Better aircraft design is one. In its early years, aerial application relied on modified surplus military aircraft. These aircraft had not been specifically designed for the rigors of aerial application—low flight at full throttle, airframe-straining pull-ups and turn-arounds, and exposure to corrosive chemicals. Airframe failures and power loss were a frequent probable cause of aerial application accidents. When aircraft manufacturers began building aircraft exclusively for aerial application, NAAA took it a step further and pushed for reinforced crash "cages" in the cockpit, quick-dumping hoppers, and more reliable engines. Through its safety and education programs, NAAA taught pilots how to assure their own protection and encouraged the use of crash helmets, lap belts, and shoulder harnesses. (As a result of NAAA's efforts respirators, protective clothing, and other personal protection gear are required for ground support crews in many states.) NAAA was instrumental in conducting an epidemiological survey to study the health effects of exposure to farm chemicals. The results showed that pilots, their spouses, and their children did not exhibit any health effects different from those expected in the general population. This was good news for applicators and their families who are regularly exposed to farm chemicals at levels greater than the general public.

Collins believes today's ag pilot is better equipped and trained in many ways. Contemporary ag pilots may have, in addition to the appropriate airman certificates and ratings, a degree in agriculture or chemical engineering or other, related fields of study. This is part of the pilots' and operators' on-going attempts to keep up with the rapid changes in agri-business. That plus the continuing education state and other federal regulators may require to handle, transport, and dispense chemicals seems almost too much for the operator, especially a one or two-aircraft operation, to handle. This is where NAAA steps in again.

Collins' Washington staff produces *Agricultural Aviation* magazine to keep members informed of the latest industry news and related topics. Managing Editor Marilyn F. McKinnis publishes 10 issues a year for distribution to NAAA members and any other part of the ag industry that subscribes. The magazine features health and safety articles, accident information, and news from the various state organizations. Rick Reed of accident information, and news

NAAA

NAAA President Rick Reed

NAAA

Rick Hardcastle, a Texas aerial applicator, explains production agriculture and safety procedures followed by agricultural pilots to local school children during NAAA's 1991 convention in Las Vegas, NV.


NAAA

Thomas Underwood, Oklahoma State University, signals that the flight line is ready for a spray pass during an Operation SAFE fly-in clinic.


NAAA

Oklahoma Agricultural Aviation Association President Ronnie Booker in his AT-401 sprays a fluorescent dye and water mixture to test the accuracy of his swath run.

from the various state organizations. Rick Reed of Mattoon, IL, is NAAA's 1992 President, and he and Collins contribute an editorial on the state of the industry each issue. The magazine may also include articles on product information, changes in the regulatory arena, farming updates, EPA information, aircraft product news, insurance and liability data, and, of course, what the F A and A is up to. In addition to the magazine, NAAA publishes a newsletter which highlights information for members in a more timely manner.

As if two publications and a national lobbying and educational effort are not enough, NAAA also sponsors an annual Convention and Exposition. The most recent convention in 1991 saw more than 1,400 participants attend (remember, there are only around 2,100 active ag operator businesses). At the annual convention, attendees can see aircraft static displays, the latest spray equipment demonstrated, symposia on new chemicals, and safety forums. The FAA participates in the safety meetings and is available to discuss topics of interest with the ag industry. The 1992 convention, the 26th, is scheduled for December 7–10 in Las Vegas, NV.

Lest you think that NAAA's safety programs are a once-a-year event during the convention, consider this. NAAA has an on-going program called Operation SAFE (Self-regulated Application and Flight Efficiency). These are generally fly-in training clinics where ag pilots can brush up on controlling spray drift from their swath runs. Pilots use dyed water or some other inert substance to simulate chemical drops under the expert eyes of Operation SAFE analysts.

NAAA is committed not only to making ag pilots as safety aware as possible but also to establishing a good working relationship with the public, including farmers whose fields are not being treated. Chemical and product safety are very important to NAAA. NAAA works with its members, manufacturers, government agencies, scientists, farmers, pilots, and ground crews to develop better application techniques, equipments, and procedures. The goal is to make ag operators more efficient and better able to control the application process. Being able to control distribution patterns of whatever the pilot is spreading not only saves time and money but also protects neighboring fields, people, and animals from spray drift. This is particularly important when aerial applicators spray over urban areas, such as with gypsy moth control. Some local jurisdictions may opt for non-chemical control, and the ag pilot may have to deal with a patchwork of areas that can be treated among areas that cannot. Precision application and taking into account wind and the drift characteristics of the chemical require experience and practice—just what NAAA pursues. The net effect is that the operator, the farmer (or other consumer), and the environment benefit from the skill and the pride in their work that NAAA has instilled in ag pilots.

NAAA's efforts at education do not stop with pilots and operators. NAAA and its auxiliary, the Women of the NAAA (WNAAA), have worked with the FAA and teachers to develop curriculum guides to help teachers instruct their classes on agri-business and the benefits of aerial application. The guides begin in the lowest grades and go up through high school and explain the role of aviation in farming. NAAA has a particularly close association with the Future Farmers of America (FFA), a national high-school level organization that teaches young people the nuances of farming as a business. NAAA not only provides the background material for this but also serves as a resource for showing young farmers the cost-benefit potential of using aerial application. With NAAA's help some FFA members have given up the thought of farming—to become aerial applicators.

Because of NAAA's commitment to a safety partnership with FAA, the future of aerial application seems bright, indeed. The need for timely, efficient treatment of agricultural crops is never more crucial than it is now. U.S. farmers, it has long been said, feed the world—in 1910 a U.S. farmer produced enough food and fiber for seven people; today one U.S. farmer feeds and clothes 114 people. That latter figure would be considerably reduced without aerial application. As you can see, consumers around the world owe a big debt to the American farmer.

And ag operators and pilots owe a big debt to the efforts of NAAA. ■

Editor's Note: *For additional information on NAAA or copies of the handbook for Operation SAFE, contact NAAA at 1005 E Street, S.W., Washington, DC 20003; (202) 546-5722. If you are interested in copies of the curriculum guides, contact NAAA or FAA's Aviation Education Branch, APA-120, 800 Independence Ave., S.W., Washington, DC 20591; (202) 267-3476.*

Doctor's Stuff

Chronic Fatigue Syndrome

by J. Robert Dille, M.D.

Although this article appeared originally in the March 1991 issue of Ag-Pilot *and was designed for aerial application pilots, it carries a good message for any pilot who may have the symptoms of a serious disease that is sometimes jokingly referred to as the "Yuppie Flu." We thank Dr. J. Robert Dille and* Ag-Pilot *for permission to use this article.* ***—Editor***

I concluded my recent column on fatigue with the following:

"Recently, reports have appeared in the medical literature on Chronic Fatigue Syndrome. [Symptoms are] confusion, difficulty concentrating, mood changes and other emotional disturbances, headaches, balance difficulties and other neurological symptoms, and flu-like symptoms lasting for many months. This syndrome is felt to be due to chronic active infection with the Epstein-Barr virus, a member of the herpes group that causes infectious mononucleosis. You will need medical help to diagnose and treat this cause of fatigue."

Since that time I have 1) seen Chronic Fatigue Syndrome (CFS) referred to as the disease of the decade if AIDS had not come along; 2) read a first-hand account by a physician-pilot victim who could have had an aircraft accident due to his symptoms; 3) heard of many more cases; 4) learned that the Epstein-Barr virus is probably not the cause of CFS; and 5) read about a recent national conference where three dozen researchers reported their work on CFS.

The syndrome has probably been around since the mid-1970's and diagnosed as post-viral syndrome, atypical polio, chronic active Epstein-Barr virus infection, and myalgic encephalomyelitis. The number of cases, articles in the literature, resulting physician awareness, and research activity have increased mostly in the late 1980's. The physician-pilot mentioned above was tested extensively with essentially normal findings. Diagnoses considered included viral myocarditis, stress, psychosomatic illness, Lyme disease, brucellosis, lupus, and AIDS. (Hypoglycemia, fibrositis, environmental allergy, and, if female, candidiasis hypersensitivity syndrome, chronic candidiasis syndrome, or polysystemic candidiasis also have been considered.) His CFS was diagnosed by a co-worker—an engineer—at the National Aeronautics and Space Administration who also had the illness. Virologists report immune system activation that they say proves there is a real disorder; they just have not yet found one virus or combination of viruses that was consistently present. However, there are still skeptics who feel that CFS is psychosomatic or due to mass hysteria, and, therefore, non-viral. Perhaps in some diagnosed cases it is.

The clinical course reported by the physician-pilot is considered typical. First, there were the usual symptoms of influenza—fever, sore throat, headache, severe muscular aches, and lethargy. The symptoms recurred two weeks later. Remissions and recurrences alternated for several months. Resumption of jogging was accompanied by an unusually high heart rate for him and a relapse of the flu. Soon, he did not feel well, even during remissions, and his work began to suffer. Perhaps because of this, extreme depression and withdrawal appeared by the end of the second month. Headaches increased in number and severity.

Between the fourth and sixth months, cold sores and sensory symptoms, including luminous patterns in the visual field, intolerance to light, flaring of lights at night, decreased visual acuity in low levels of light, persistence of visual images, problems of balance, and ringing in the ears were noted. Fatigue was severe and at times profound.

Although he was an experienced flight surgeon, he seems to have gone flying while experiencing many of these symptoms! On one flight he had difficulty remembering his flight plan and recalling aeronautical terminology he had used for 26 years. He confused right downwind for runway 32L with left downwind for 32R and shook up the tower controller when she could not locate him until he was halfway down final for the wrong runway. He had trouble with concentration, word recall, and word substitution, and became confused in the traffic pattern on another flight. Fortunately, he did not have an accident and realized that he should not fly any more until he found what wrong with him.

The next month, concentration on his work became nearly impossible. Trouble sleeping, constant nightmares, and abnormal sensations over the face (usually associated with encephalitis) began. Not surprisingly anxiety occurred with the failures to diagnose the disease and later increased when he found that the cause of CFS was unknown and that there was no cure.

He did discover that 1) there were support groups in several cities; 2) Congress had approved CFS research funds for the Centers for Disease Control and for the National Institutes of Allergy and Infectious Diseases starting in Fiscal Year 1989; and 3) information is available from the CDC by calling its CFS hotline (404) 332–4555 (follow the recorded instructions) and from the NIAID, Office Communication, Building 31, Room 7A–32, Bethesda, MD 20892.

Should you have persistent symptoms similar to these, you should not fly until you see a doctor. Even then you may have to ask, "Could this be Chronic Fatigue Syndrome?" Knowing that the cause and any effective treatment are unknown may cause anxiety and depression. Hope for slow improvement in your condition and a breakthrough in effective treatment from the research that is finally underway is helpful. Check on support groups and contact CDC and NIAID in order to stay fully informed. CFS is not very contagious; some people have immune system changes without symptoms, and it is not fatal—be thankful for that good news.

As with many new suspected diseases that have been identified during the same 15 years—such as Legionnaire's Disease, toxic shock syndrome, post-traumatic stress disorder, Agent Orange effects, AIDS, environmental allergy syndrome, and candidiasis hypersensitivity syndrome—early information about causes and risks is usually incomplete and frequently incorrect. Considerable controversy is often present during the years it takes to develop working definitions, diagnostic tests, and effective prevention and treatment.

Chronic fatigue syndrome can affect aircrew performance and aviation safety no matter what its cause. Therefore, I believe you should know something about it. ■

In the Beginning

Early Origins of Aerial Application

This vintage photo is believed to show the first aerial application experiments over a catalpa tree grove in Ohio.

"... What had been a very big thing to them had been a short, easy flying job for us. We had thought of it as being a couple hours of comparatively simple flying.

"In test flying, there are long, complicated, difficult tests that take months to complete and, in those days of aviation uncertainty, they were very dangerous tests. This was a simple, easy test that was perfectly accomplished and apparently satisfied the Department of Agriculture."

Lt. John Macready, test pilot for the first aerial application experiments, not realizing his work would become the basis for a multi-million dollar industry, considered the flights "... comparatively easy flying."

by Louise Oertly, Associate Editor

Writing nearly 50 years after the fact, then Army test pilot Lt. John A. Macready made his 1921 flight sound like it was just another assignment. What he does not say is that this "simple, easy test" laid the groundwork for a new industry, and all because a question had been asked: Was there any way an airplane could apply insecticide to catalpa trees? If you have not already guessed, the new industry was aerial application or "crop dusting" as it was then called.

In 1921 the Federal Aviation Experimental Station at McCook Field near Dayton, OH, was asked to help with an unusual problem. The catalpa sphinx moth's larvae were defoliating and killing the northern catalpa trees—a fast-growing hardwood with a straight trunk used mostly for posts and telephone poles. Ground spraying of insecticides was having little effect as it could not reach the very tops of the trees. Entomologist C. R. Neillie of the Ohio Department of Agriculture had theorized that working with gravity—dropping insecticide from the air onto the trees—rather than against it—ground spraying—might be the solution to the moth problem. He knew that the McCook facility made it a common practice to conduct tests on aviation equipment or theories for manufacturers, private individuals, or agencies. It was only a matter of convincing them that his theory had merit.

The McCook authorities were intrigued by his proposal and set their engineering department to work by assigning engineer Etienne Darmoy to the project. The result was a crude metal hopper with a 100-pound capacity. They bolted the hopper to the side of a Curtiss *Jenny* (JN-6H). A hopper operator, sitting or standing in the rear seat of the airplane, could release the insecticide by turning a small hand crank which would open and close a sliding gate that separated the insecticide from its spreader.

On August 31, 1921, the theory was put to the test. The location was a catalpa grove 10 miles north of McCook near Troy, OH. The insecticide was powdered lead arsenate, which most insects (and everything else!) found lethal when ingested. Macready, the chief of the Flying Section at McCook, flew the test, and Darmoy was in the rear seat as the hopper operator. To Macready it was an "easy test." Nothing extraordinary was being demanded of the pilot or plane. The main problem was deciding the proper wind direction so the released insecticide would drift correctly, with the help of prop wash and aircraft turbulence, over the trees and cover them thoroughly. With the aircraft making strafing passes about eight to 10 feet above the trees, the actual dusting took less than a minute to cover all the trees.

The Ohio catalpa trees had been saved, but they were not the catalyst for the start of a whole new industry. The problem that "crop dusting" could cure would have to be more extensive than saving the telephone pole crop. "Crop dusting" might have been a one-shot deal if not for a distant cousin of the catalpa moth.

In the first decade of the 20th century the boll weevil crossed the Mexican border and caused millions of dollars in losses in the U.S. Cotton Belt. By 1909 the U.S. Department of Agriculture had set up the Delta Laboratory in Tallulah, LA to study cotton insect control and to try to find a way to counteract the invader. The insecticides the lab used had only limited success since the slowness of application (by either hand-cranked or horse-drawn spreaders) made real control virtually impossible. Also, one of the insecticides, calcium arsenate, had some serious drawbacks. It would kill both beneficial and predatory insects along with the pests, and repeated exposure was known to burn the hide off the mule or horse pulling the insecticide spreader. Imagine what it would do to the human operators of the hand-cranked spreaders.

Delta Lab entomologists, Dr. Bert R. Coad and C. E. Woolman, both aviation enthusiasts, heard about the successful tree "dusting" in Ohio and realized this could be the answer to their problems. They successfully lobbied Congress, and in 1922 the Army Air Service transferred its ag flying experiments to Louisiana's cotton fields to wage war against the boll weevil. The U.S. Army continued to be the major purveyor of aerial application modifying World War I vintage airplanes, such as the Curtiss *Jenny* and later the DeHavilland 4–B with its 400 hp Liberty engine. Forced landings were a common occurrence, because of the airplanes poor maneuverability and unreliable engines. Surprisingly, there were no serious accidents during these experiments. Yet, after many design changes and much fine-tuning of the application equipment, aerial application of chemicals again proved to be a success and a valuable asset to cotton farmers.

The success of the project posed some questions. "When would aerial application become commercially available?" wondered farmers. "Could this 'crop dusting' be a paying aviation career?" asked former WWI pilots discharged from the military and tired of trying to make a living barnstorming. At the Delta Lab Coad and Woolman were convinced that aerial application could be commercially successful but, given the safety record of the converted military planes, only if a crop dusting airplane was specially designed. It was an unexpected visitor to the Delta Lab that gave them the chance to convince someone else of their point of view and to take the development of crop dusting one giant step further.

After World War I aircraft manufacturers were relying heavily on the military to buy their new aircraft since civilian pilots were able to buy cheap surplus military aircraft. The Huff-Daland and Company, based in Ogdensburg, NY, was no exception to this rule. Company Vice President George B. Post was flying to a Texas business meeting when he made an unscheduled landing at Tallulah. To fill time until he could continue his flight, he was given a tour of the Delta Lab and a look at its crop dusting operation. Post quickly realized the potential of this fledgling industry. Coad and Woolman had convinced him that aerial application was a field wide open for exploitation. So it is not surprising that Post saw it as an opportunity to advance aviation by opening a new market for selling aircraft and a new career for pilots.

Huff-Daland Dusters' "Puffer"—so called because of its logo (right) depicting a giant blowing a cloud of dust on farm fields. From this humble beginning rose Delta Air Lines.

DELTA AIR CORPORATION
MONROE, LA.

Delta Air Lines, Inc.

By late 1923 Huff-Daland Dusters, Inc., was formed with Post as President. Huff-Daland's basic biplane, the *Petrel 5*, was used initially and later upgraded to the *Petrel 31*. To convert the airplane to duster use, Huff-Daland designers made several important modifications: They cut the fuselage down for better visibility; they reduced the vertical surfaces; and they placed most of the control cables on the exterior to make more room inside for the hopper. With a 50-foot wingspan and a 400-hp Liberty engine, the *Petrel* could carry up to 1,000 pounds of insecticide, but the lack of trim tabs and the small vertical stabilizer caused a common pilot complaint—the constantly changing center of gravity as the insecticide emptied from the hopper. Starting with 18 of these airplanes, Huff-Daland Dusters began servicing Georgia and later expanded to Mississippi, Louisiana, and Arkansas. By 1925 they had some 60,000 acres of cotton under contract for dusting and charged farmers $7.00 per acre for five applications.

In 1928 at the onset of the Great Depression, Huff-Daland Dusters' parent company was in financial difficulty and so sold its profitable dusting operation to avoid bankruptcy. A group of southern businessmen lead by C. E. Woolman, originally with Delta Lab and later a vice president with Huff-Daland Dusters, bought it and renamed it for the area it served—Delta Air Service.

By the mid-thirties new ag flying firms were beginning to form. With the development of new insecticides the scope of the dusting operations had expanded beyond cotton to a greater variety of crops, making competition possible and profitable. But Huff-Daland Dusters had led the way by being the first commercial agricultural flying operation and had been virtually the only commercial aerial applicator for nearly a decade. As Delta Air Service, it expanded its operations to include transporting passengers and parcels and would eventually drop its crop dusting ties. It would again change its name to reflect its expanded air transportation business.

Its new name? Delta Air Lines. ■

Aviation Today

The Pro-Aviation Radio Talk Show

by Phyllis A. Duncan, Editor

Mike Saxton and Rob and Cathy Vuksanovic may not consider themselves the Phil Donahue, Geraldo Rivera, and Oprah Winfrey of radio, or at least not yet. These three aviation enthusiasts host the country's only nationally syndicated radio talk/call-in program on aviation. Whereas they may not discuss such titillating topics as chair-throwing neo-nazis or parents now married to their children's former spouses, they do talk about something near and dear to all of our hearts—airplanes and the people who fly them, or make them, or just like them.

Three years ago, Saxton (a private pilot working on his instrument rating) and the Vuksanovics (He is a Captain for Midwest Express, and she is a corporate pilot.) were dismayed at the negative light the non-trade media sometimes casts on aviation. Saxton, being a grassroots media mogul as Station Manager of WAUK in Waukesha, WI, was trying to think of ways to overcome this, at least locally. Saxton said, "The media is good at promoting negativity and fear about aviation, and I wanted to put it in a positive light. I wanted to promote aviation. I felt people needed to be educated about aviation in a way the media would not or could not do." A radio show about aviation seemed ideal.

Radio talk shows have become the rage recently. Many mixed-format AM and FM stations have successfully gone "all talk" in recent years or added regularly scheduled, national talk shows, with the result that AM, in particular, has enjoyed a rejuvenation among radio listeners. But to fracture an old saying, would an aviation talk show sell in Peoria? Maybe not Peoria, so Saxton tried one station in Wisconsin. The larger, metropolitan market of Chicago recognized the program's uniqueness, and stations there picked it up. Soon, stations in Indiana followed suit. By this time the program had attracted the attention of syndicates and was picked up by the Sun Radio Network. Over 150 stations now carry the "Pro-Aviation Radio Talk Show."

Every Saturday at 7 p.m. Eastern Time, Saxton and his co-hosts broadcast live with guests from all over the aviation spectrum. Callers can ask on-line questions by calling 1–800–878-8255. (Note that some stations may tape the live broadcast and rebroadcast it later. In that case live calls cannot be accepted.) The guest list for the last three years reads like a "Who's Who" of aviation: Former FAA Administrator James Busey, Al Haynes (pilot of the DC–10 that crashed in Sioux City, IA), Duane Cole, Patty Wagstaff, etc. Even the FAA got into the act. "At first," Saxton said, "when we approached someone in FAA's Great Lakes Region to be on the show, they were wary. Was this another media bash job? But once they found out what we were all about, that we wanted to promote FAA's education programs and safety seminars, they were all for it." FAA personnel from the Great Lakes Region have appeared on the show as has Roger Baker, Jr., the National Program Manager for the Accident Prevention Program. The program was first to feature a live, "on the air" FAA safety seminar in the Great Lakes Region.

Feedback from listeners—pilots and non-pilots alike—has been very positive. The obnoxious caller, the bane of any call-in talk show, has been absent from Pro-Aviation, even when the show has featured "hot" topics. "I wanted this show to appeal to everyone," Saxton said. "We don't talk over people's heads, and we steer away from aviation jargon so we won't lose people. If we do use unique aviation terms, we explain what we're talking about, and that keeps people interested."

Saxton and the Vuksanovics brainstorm topics with their producer, Andrienne Stevens, who is also a pilot, but people have come up to Saxton at FAA Accident Prevention Program safety seminars and suggested guests or items to discuss. Saxton tries to work in every suggestion he receives from the audience. He has featured local instructors and pilot examiners, and flying veterans from Operation Desert Storm have been popular guests lately.

But the show is not merely a hangar flying session over the airwaves. "We also want to give pilots something they may not have learned yet," Saxton says. The show is approached from an education point of view—what can we teach people about aviation? Says Saxton, "I want listeners to come away with something they've never had before." Recently, the show featured an air traffic controller from Chicago's O'Hare Airport who talked a VFR pilot, who had inadvertently entered IMC, to safety. Saxton turned the show into a "lesson" on how not to get lost or, if you do, how to avail yourself of FAA services.

If you want to "check out" the Pro-Aviation show, see if a local station is on the list on page 9. Either listen in on Saturday at 7 p.m. Eastern (6 Central, 5 Mountain, 4 Pacific, etc.) or call the station and ask if they carry it and at what time. If your local station does not carry it, you may ask them to consider buying it, even if they are not a Sun Radio affiliate. Of course, local sponsorship of the program is important and necessary for it to enter a market. Saxton says that in many areas, FBO's and pilot schools or even local pilot groups sponsor the hour-long program.

Saxton is also interested in national sponsorship. He said, "A number of nationally known aviation companies have indicated this show is a good idea, and I'm hoping they soon provide us more tangible support. We have such a positive message about aviation, but we need their help to get it across. This show has been a good experience, and I would like it to continue."

Tune in next time. . . ■

Editor's Note: *Anyone with an interesting guest or topic for the Pro-Aviation Talk Show can contact Mike Saxton at (414) 544-6800. Anyone interested in buying the program for their market area should also contact Mike Saxton.*

Mike Saxton and his co-hosts, Rob and Cathy Vuksanovic, present the country's only syndicated radio talk show dedicated to aviation.

SUN Radio Network Affiliates

(Call letters, frequencies, and major markets served)

KBYR 700 AM
Anchorage, AK

KAKN 100.9 FM
Naknek, AK

WTCG 1100 AM
Andalusia, AL

WRJG 1560 AM
Daleville, AL

WIJK 1470 AM
Evergreen, AL

WACV 1170 AM
Montgomery, AL

WABB 1480 AM
Mobile, AL

KBTM 1200 AM
Jonesboro, AR

KBIB 1010 AM
Little Rock, AR

KXAR 1490 AM
Hope, AR

KZNG 1340 AM
Hot Springs, AR

KCKY 1150 AM
Coolidge, AZ

KINS 980 AM
Eureka, CA

KQMS 1400 AM
Redding, CA

KWNK 670 FM
Canoga Park, CA

KPLA 770 AM
Radio City, CA

KLOA 1240 AM
Ridgecrest, CA

KURA 105.7 FM
Montrose, CO

WCNX 1150 AM
Middletown, CT

WJIC 1510 AM
Wilmington, DE

WPRD 1440 AM
Orlando, FL

WBGC 1240 AM
Chipley, FL

WMCU 1010 AM
Crestview, FL

WNOG 1270 AM
Naples, FL

WBRD 1420 AM
Bradenton, FL

WCCF 1580 AM
Punta Gorda, FL

WIPC 1280 AM
Lake Wales, FL

WEND 700 FM
Clearwater, FL

WFDY 1240 AM
St. Augustine, FL

WLKF 1490 AM
Lakeland, FL

WTAL 1450 AM
Tallahassee, FL

WKVQ 1490 AM
Deland, FL

WFTW 1260 AM
Ft. Walton Beach, FL

WEBY 1330 AM
Milton, FL

WZEP 1460 AM
DeFuniak Springs, FL

WWTK 730 AM
Sebring, FL

WAMR 1320 AM
Venice, FL

WPSO 1500 AM
New Port Richey, FL

WLOV 1370 AM
Washington, GA

WBMC 830 AM
Savannah, GA

WBBK 1260 AM
Blakely, GA

WMAZ 940 FM
Macon, GA

KCPS 1150 AM
Burlington, IA

KID 50 AM
Idaho Falls, ID

KFXD 580 AM
Boise, ID

WFIW 390 AM
Fairfield, IL

WINI 1420 AM
Murphysboro, IL

WCGO 1600 AM
Chicago Heights, IL

WRIK 96.3 FM
Metropolis, IL

WJPF 1340 AM
Henin, IL

WRIK 750 AM
Metropolis, IL

WKRS 1220 AM
Waukegan, IL

WTAS 102.3 FM
Chicago Heights, IL

WBGZ 1570 AM
Alton, IL

WEBQ 1240 AM
Harrisburg, IL

WRAJ 1440 AM
Anna, IL

WGL 1250 AM
Ft. Wayne, IN

WPCO 1590 AM
Evansvile, IN

WBNY 1340 AM
Bedford, IN

WWWO 93.5 FM
Muncie, IN

WKAM 1460 AM
South Bend, IN

WYIC 1110 AM
Indianapolis, IN

WIBW580 AM
Topeka, KS

KSPG1360 AM
Wichita, KS

KKRP 93.5 FM
Monroe, LA

KAOK 1400 AM
Lake Charles, LA

WOAP 980 AM
Boston, MA

WXTK 94.0 FM
West Yarmouth, MA

WUCK 1240 AM
West Yarmouth, MA

WCAT 700 AM
Springfield, MA

WNTR 1050 AM
Silver Springs, MD

WTOX 1450 AM
Bangor, ME

WSME 1220 AM
Portland, ME

WFSI 600 AM
Presque Isle, ME

WTCM 580 AM
Traverse City, MI

WCAR 1090 AM
Detroit, MI

WMIQ 1450 AM
Iron Mountain, MI

WGDN 1350 AM
Flint-Saginaw, MI

WKYD 1360 AM
Flint-Saginaw, MI

WSNU 900 AM
Traverse City, MI

WYGR 1530 AM
Grand Rapids, MI

WIBV 1260 AM
St. Louis, MO

KSLQ 1350 AM
St. Louis, MO

KYDO 1200 AM
Springfield, MO

KDKD 1280 AM
Clinton, MO

KSLQ 104.5 FM
St. Louis, MO

KAIN 1040 AM
Jackson, MS

WCSP 590 AM
Jackson, MS

WJNT 1180 AM
Jackson, MS

WTOP 1490 AM
Columbus-Tupelo, MS

KBLG 910 AM
Billings-Harding, MT

KDRG 1400 AM
Butte, MT

WQNX 1350 AM
Raleigh-Durham, NC

WHCC 1400 AM
Ashville, NC

WGNC 1450 AM
Charlotte, NC

WEED 1390 AM
Raleigh-Durham, NC

WHKY 129 AM
Charlotte, NC

WKTE 1090 AM
Greensboro, NC

WLXN 1440 AM
Greensboro, NC

WTXY 1540 AM
Wilmington, NC

WCSI 1590 AM
Charlotte, NC

WQNS 104.9 FM
Waynesville, NC

WZBO 1280 AM
Edenton, NC

WVKZ 1240 AM
Albany-Schenectady, NY

WAUB 1590 AM
Syracuse, NY

WBRJ 910 AM
Mariette, OH

WCTM 1130 AM
Dayton, OH

WDLR 1550 AM
Columbus, OH

WSTV 1340 AM
Steubenville, OH

WNRR 00 AM
Bellevue, OH

WNRR 92.1 FM
Cleveland, OH

WNRE 1540 AM
Circleville, OH

KOKB 1580 AM
Oklahoma City, OK

KWMQ 100.3 FM
Grove, OK

KOHI 1600 AM
Portland, OR

KOPE 103.5 FM
Portland, OR

WKEG 1110 AM
Washngton, PA

WASP 1130 AM
Pittsburgh, PA

WISL1 480 AM
Wikes-Barre, PA

WRTA 1240 AM
Altoona, PA

WCCP 1560 AM
Columbia, SC

WFBC 1330 AM
Greenville, SC

WJAY 1280 AM
Florence, SC

WORD 910 AM
Greenville, SC

WVOC 560 AM
Columbia, SC

WQKR 1270 AM
Portland, TN

WGNS 1450 AM
Nashville, TN

WGOW 1150 AM
Chattanooga, TN

WMIN 1300 AM
Knoxville, TN

WLIQ 92.7 FM
Knoxville, TN

WPXY 1490 AM
Knoxville, TN

KETX 92.3 FM
Livington, TX

KETX 1440 AM
Livington, TX

KFNS 1360 AM
Amarillo, TX

KDNT 1440 AM
Dallas, TX

KPSO 1260 AM
Corpus Christi, TX

KLLF 1290 AM
Wichita Falls, TX

WZBO 1260 AM
Norfolk, VA

WNVA 1350 AM
Bristol, VA

KVI 570 AM
Seattle, WA

KIT 1280 AM
Yakima, WA

KQQQ 1150 AM
Seattle-Tacoma, WA

WAUK 1510 AM
Milwaukee, WI

WIZM 1410 AM
LaCrosse/Eau Claire, WI

WBEL 1380 AM
Madison, WI

WSPO 1010 AM
Wausau-Rhinelander, WI

WGLB 1560 AM
Milwaukee, WI

WTDY 1480 AM
Madison, WI

WDBC 680 AM
Green Bay, WI

WTMB 1460 AM
Tomah, WI

WKOY 1240 AM
Bluefield, WV

WBRJ 910 AM
Parkersburg, WV

WSTV 1340 AM
Wheeling, WV

KFBO 1240 AM
Cheyenne, WY

RESCUED BY THE FAA

When you can't prepare for the unexpected

by Phyllis A. Duncan, Editor

In the March/April 1992 issue we talked about the importance of "preflighting" your passengers, i.e., preparing them for the flight. We were presupposing that the pilot is prepared for every flight; sometimes the degree of that preparedness is not all it should be. This can occur from complacency, or sometimes the pilot's preparation habits were never properly developed during primary instruction. If we are lucky, the fairy godparent of aviation watches over us in our unprepared state and keeps us safe, but we rarely learn from that. If we are luckier still, something will happen to show us our lack of preparation, and we learn a valuable lesson.

The preparation "commandment" comes from FAR § 91.103 (Preflight action), to wit:

"Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight."

A student pilot's preparation—especially for the long solo cross-country—receives particular emphasis from instructors, who carefully examine the student's flight planning before endorsing the student for the flight. The instructor is ever mindful of safety, both the student's and the public's, over whom the student flies. However, one other reason the instructor should stress thorough preflight preparation is that if the student does not properly prepare and the instructor does not catch it before the student goes out and does something that attracts, ahem, FAA attention, it could reflect unfavorably on the instructor's personal and professional reputation. In dire cases FAA has re-examined instructors whose students exhibited a significant lack of knowledge that could be traced back to a lack of adequate instruction.

Moreover, preparation for any flight makes it easier for a pilot of any grade certificate to deal with the ever-changing scenarios a flight may offer. Carrying VFR charts on an IFR flight shows you may be better prepared to handle an emergency where you may end up in VMC and need to identify a nearby airport. Wearing the clothes you want to walk out of the woods in or carrying proper survival gear demonstrates preparation for the survival aspects of an emergency, off-airport landing.

We all know the routine: Before we fly, we check the weather, the airplane, its fuel, and ourselves; we calculate performance and weight and balance; we fold our charts for easy referral; we review our normal and emergency procedures; we carry extra pens and pencils and a spare pair of glasses—in short, we leave the ground prepared for every possible contingency.

Well, not every one, because if we had the precognition to know every unexpected event we might encounter, some of us would be bored by the lack of a challenge, and some of us might never take off. Sometimes it is difficult for pilots, with our healthy egos, to deal with the fact that even though we did everything right, something still went wrong. When that occurs we have to set our egos aside and accept the lesson. In a way we have to prepare for the unexpected, as impossible as that may seem, and when faced with the unexpected, we have to handle it in an appropriate manner, making a mental note not to allow that particular item to crop up unexpectedly again. To have a long, accident-free flying life, we have to keep an open mind about things that do not go exactly as we plan them.

Consider the case of Keith Parrish, Jr., of Scottsburg, IN, a Professional Pilot major at Indiana State University, who carefully prepared himself for his long solo cross-county flight but who encountered something that was difficult to plan for.

When Keith's flight instructor signed him off for his long solo cross-country flight, it was a momentous occasion. He was that much closer to becoming a pilot, which would give him an edge on qualifying for a Marine Corps Reserve flying slot. The early December 1991 trip was planned from Terre Haute, IN to Marion, IL to Taylorville, IL with a return to Terre Haute. Keith checked weather, consulted airport information, noted his checkpoints, calculated his estimated times en route, completed his flight plan, and presented his logbook for endorsement. Everything appeared well-considered, and, with the endorsement secured, Keith departed Terre Haute for Marion, some 126 nautical miles away.

The CG-20 WAC chart shows Parrish's proposed route (dashed line) and his actual route (solid line). NOT TO BE USED FOR NAVIGATION.

That leg transpired about as Keith's flight plan had predicted. After landing at Marion and having his logbook endorsed, Keith updated his weather and found no significant changes to his earlier briefing. He even asked if there were any new winds aloft information, but that was not due out for another hour. Since the winds had been about as predicted for the first leg, Keith departed for the 110-mile leg from Marion to Taylorville with what he had calculated to be sufficient fuel.

The Marion to Taylorville leg was the dead reckoning one, so Keith kept careful watch on his time and distance. To his astonishment his ground speed was working out to 60 kts., about 30 kts. less than he had anticipated. A quick calculation of the time already expended from his tanks showed him he still had enough fuel at this ground speed to reach Taylorville, where he intended to refuel for the return to Terre Haute.

By now Keith had dealt with a couple of minor "unexpected's"—no new wind information and stronger than predicted headwinds along his route. However, the unexpected became downright dismaying when Keith arrived in the Taylorville area and called on UNICOM that he was downwind for runway 36. The person responding over the UNICOM waved Keith off, reporting that the airport had been closed the day before for construction. But Keith had checked his airport information; he reported that he would land on the east/west turf runway that intersected the asphalt one. UNICOM nixed that also—too much recent rain had left it soggy and unusable.

Keith was now faced with probably the most serious decision of his dawning aviation career. Technically, barring an emergency, the could only land at the airports his instructor had endorsed him for, but he also had to consider the fact that, because of the headwinds, he was reaching the endurance limit of his fuel. (The endurance for a Cessna 150 at its suggested cruise performance profile of 2,500 feet with a lean mixture is approximately 3.9 hours, not accounting for any headwinds.) Keith realized that he could not land at Taylorville and that there was insufficient fuel for a return to Marion, a controlled airport with full service fuel facilities. He decided that a landing at any nearby, open airport was the only solution. A check of his sectional showed Vandalia, IN, 34 miles away and near a VOR, so Keith headed there.

Whether caused by the unexpected news that Taylorville was closed or the sudden need to make a great many important decisions or a combination, Keith became disoriented and unable to determine his position. He mistook a flooded area for a landmark lake near Vandalia and began circling for an airport that would not appear. Mindful that his fuel gauges were now showing between 1/4-tank and empty, he began calling over the UNICOM for someone to help him out. He recalled, "I thought I was going to run out of fuel, crash, and die. Waiting at Camp Lejeune to go to Saudi wasn't nearly as scary as this."

Luckily for Keith FAA aviation safety inspectors Mike Lynch (Operations) and George Ballard (Airworthiness) were returning in a rental aircraft to the Flight Standards District Office (FSDO) at Springfield, IL from Effingham, IL (40 miles southeast of Taylorville and 30 miles east of Vandalia VOR) where they had conducted an inspection of an operator. "I heard [the pilot] requesting various cities on the UNICOM frequency 122.8," Lynch said. "I could tell he was in trouble, so I answered him." Lynch turned the flying over to Ballard (himself a student pilot) while Lynch talked to Keith. "He sounded scared to death," Lynch remembered. But the inspector got Keith occupied with looking outside the aircraft for landmarks that Lynch, very familiar with the area, might be able to use to determine Keith's approximate position. Keith had told him about his fuel situation, and Lynch knew that he had to find an airport soon.

By comparing the landmarks Keith reported to his sectional chart, Lynch determined that the Cessna was within the vicinity of Vandalia, IL VOR. "I think that was where he was trying to head," Lynch said, "but I think he was reverse sensing, and that added to his confusion." Lynch continued to keep Keith busy reporting landmarks, his altitude, his airspeed, the OBS needle deflection, etc., so Keith would not have time to be scared. Lynch said, "The main thing was to keep him calm." Lynch knew that Vandalia Airport lies six miles south of the VOR, so he proceeded to talk Keith through tracking to the VOR and then outbound on the 180° radial to set him up for a landing on runway 18.

After reporting to Lynch that his OBS changed from "TO" to "FROM," Keith told Lynch that he had Vandalia in sight, but Lynch wanted to be sure. "I asked him to maintain his altitude," he said, "and describe the surroundings. After I was assured that he had correctly identified the runway, I advised him to slow to 80 knots, pull the carburetor heat, and make sure the mixture was full rich." In the meantime, Lynch and Ballard changed course for Vandalia themselves and entered the traffic pattern just as Keith flared for his touchdown to a safe landing. Lynch touched down not long after and taxied to join Keith.

Keith did not know he was dealing with two FAA inspectors until they met on the ground at Vandalia. "I had heard from all the pilots at Terre Haute that the FAA was out to get you," Keith said. "But I'm living proof that's not true. Mr. Lynch probably saved my life. He was very professional and reassuring. He kept telling me everything would be fine, and it was. Now, I'm the FAA's staunchest defender."

When Keith had his aircraft refueled at Vandalia, the fuel slip showed the Cessna took 24.1 gallons. A Cessna 150 with standard tanks holds 26 gallons total, of which only 22.5 are considered usable. Keith had landed with 1.9 gallons remaining.

From their conversation with Keith, Lynch and Ballard learned that Keith had specifically checked for NOTAM's for Taylorville and had been told that none were on record. (If an airport does not use federal money for improvements, no NOTAM is required when the airport closes. Management at Taylorville Airport had NOTAM'ed the airport closed, but the information had not yet reached the FSS system when Keith got his briefing.) Lynch and Ballard assured Keith that he had done all he could have in the face of an unexpected situation. The important thing was that Lynch was standing at the airport talking to him rather than at his desk filling out an accident report on him.

In their conversation, Lynch stressed the importance of not trying to stretch your fuel and that availing yourself of fuel at any opportunity is a good idea. Airworthiness Inspector Ballard pointed out that time takes its toll on engines and airframes and that Keith's airplane may not be able to perform to the exact figures found in the AFM or POH when the airplane was new. Lynch also pointed out that, even though the *Airport/Facility Directory* provides all kinds of information about an airport and even though there appear to be no NOTAM's, a phone call to an airport you are unfamiliar with, even to check on fuel availability, is sometimes a good part of pre-flight planning. And, of course, the reason we are saying all this is so that we all learn from Keith's experience.

In-flight assists are not part of an aviation safety inspector's usual duties, but Inspectors Lynch and Ballard feel that the "above and beyond" was just part of their duty to *promote* aviation safety. They counselled Keith and his instructor on proper preflight planning, and both feel the occurrence and how they handled it was a more meaningful learning experience for Keith than any enforcement action could ever be.

The lessons learned? From the *Airport/Facility Directory,* you can get the information to satisfy FAR § 91.103(b) and (b)(2) (airport elevation, runway slope, runway lengths), but that and NOTAM's may not necessarily be all the information that is available. The only way to know any out-of-the-ordinary facts about an airport is a telephone call. What is the price of a brief, long-distance call compared to that of a life?

Inspectors Mike Lynch and George Ballard received "spot awards" from their FSDO manager, Charles Nolan, in recognition of a superlative example of safety consciousness from aviation safety inspectors. Keith Parrish, Jr., received his pilot's certificate in January 1992. He is now a pre-med student at Indiana University. ■

Inspectors Mike Lynch (left) and George Ballard (right) receive cash awards from Springfield FSDO manager Charles Nolan (center).

Data Link for General Aviation

by Hugh McLaurin, Manager, Data Link Applications, FAA Research and Development Service

The information and electronics age has arrived in the world of aviation and has begun to affect dramatically the way a general aviation pilot can plan and execute a flight. As many pilots with access to a personal computer and a modem know, you can now prepare for a flight by browsing through a national database of weather reports and forecasts until you can form a picture of the weather along your route of flight. When your pre-flight preparation is complete, you can electronically file a flight plan with the FAA. The explosion in the marketplace of powerful, affordable electronics has even brought the information age into the general aviation cockpit. New LORAN and GPS technology helps you navigate in the best possible way through complex airspace, and advanced signal processors can help you locate and avoid thunderstorm activity.

All of this valuable information, if managed properly, can help the pilot prepare for and safely complete his or her flight in a variety of conditions. Yet there are still some key pieces of information missing from this picture once the flight begins, since we rely on a system of voice communications to receive new information in the cockpit. What does the weather ahead really look like now that you are headed right for it? Where exactly are those hazardous weather cells and that frontal boundary? Has the forecast or surface observation been updated since you last talked to Flight Watch? Is there any traffic nearby that poses a threat? And what in the world did that last ATIS broadcast say?

The gap between the wealth of aviation information that is available on the ground and what is available in the cockpit is closed when you add Data Link to the picture. Data Link in the world of aviation is the automation and communications that allow bits of information to be transmitted between systems on board the aircraft and systems on the ground. Once the capability to transmit data to the aircraft is put into place, the doorway for a multitude of data communications services for the entire aviation community is thrown wide open. In fact, Data Link is already an established communications media in the commercial air transport industry, where Very High Frequency (VHF) Data Link has been used for many years to support company operations. For example, did you ever wonder how the flight attendant knew the gate loca- tions of all those connecting flights? That and much more information was sent to the airplane while still in flight using Data Link.

Beyond the air transport industry, are there any Data Link services that could benefit the general aviation pilot? Who would provide these services, and how could they be obtained in a general aviation aircraft? There are two areas that immediately come to mind where Data Link has the potential to provide information to help the general aviation pilot fly more safely and efficiently, and the FAA is working to develop and implement these Data Link services.

Weather Graphics

A quick look at aviation accident and incident reports confirm what you surely already know, i.e., that weather-related mishaps continue to comprise a high percentage of overall aviation accidents.

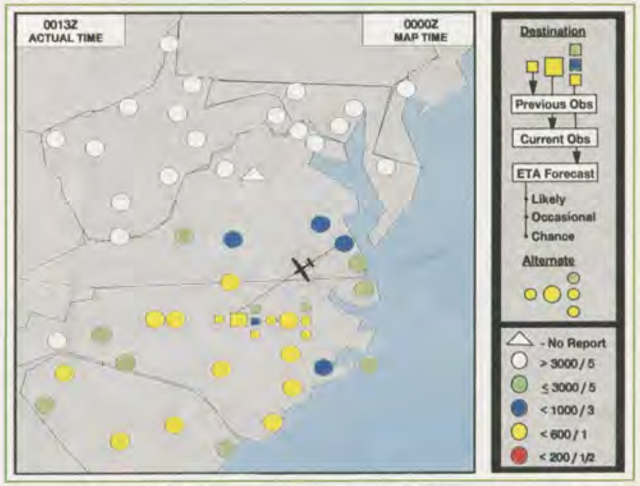

Figure 1. This in-cockpit display can show the pilot weather information relative to the route of flight, destination, and alternate.

Many of these accidents can be attributed to a lack of information in the cockpit—if pilots knew exactly what they were flying into, they would be better prepared to avoid or deal with the situation. Often a clear picture of the weather exists on the ground, but sometimes it may not get conveyed to the pilot in as clear a manner. As the FAA and National Weather Service continue to improve upon the aviation weather products available from automated systems, the FAA is also developing the Data Link services that will allow this information to be transmitted to the cockpit in such a way as to improve the pilot's awareness of the weather situation.

Figure 1 is a display of one of the graphic weather services provided by the Pilot's Automated Weather Support System (PAWSS), developed for the FAA by Hughes/STX. To try to form this same picture mentally while flying and talking with a flight service specialist is probably impossible, and poring over the coded text of all the individual observations represented here could ground even the most dedicated aviator. Yet even a short glance at this type of graphical depiction immediately conveys an enormous amount of general information about the weather situation. The current PAWSS products use standard weather information available today, such as surface observations and terminal forecasts. Additional PAWSS products not shown here allow the pilot to assess the situation easily and in greater detail at a particular airport or in a general area by looking more closely at specific observations, trends, and forecasts. Weather radar images and hazardous weather boundaries can also be overlaid onto the PAWSS maps to identify the areas of most severe weather. The key to obtaining services such as PAWSS in the cockpit lies with the transmission from the ground to the aircraft of the data required to construct these pictures. Last year, while the PAWSS products were still under development, a private venture successfully demonstrated their use in the cockpit of a Piper *Malibu*, using commercial satellite data communications in a prototype airborne system.

You have probably marveled at the wonderful weather graphics and radar images that the meteorologist at your local television station broadcasts on the nightly news. If only you had a small TV set in your panel tuned in to the Weather Channel, you could see where that line of thunderstorms is forming. With Data Link, we can transmit graphics of hazardous weather information from a number of ground-based weather observation systems to the aircraft, which can be displayed in relation to the aircraft's location or route of flight. The Massachusetts Institute of Technology's Lincoln Laboratory has developed practical techniques for compressing complex ground radar images into products suitable for Data Link transmission to the cockpit. The key to doing this is to determine how a radar image can be simplified to the point where it can be transmitted efficiently, while retaining the important features of the image that are needed by the pilot. A compressed radar image can be displayed on a graphic Data Link unit in the panel or integrated into a multi-purpose display unit which includes navigation information. Lincoln is now developing a graphical Data Link service based on this capability, which will undergo flight tests in a Cessna 172 later this year using live weather radar images.

Figure 2. Data Link can provide real-time collision avoidance information for general aviation, using modifications to existing LORAN equipment.

Traffic Advisories

If we glance back at those accident and incident reports again, we find that mid-air collisions and near misses still contribute to the overall number of aviation incidents. As we all know, see-and-avoid can often be strained in busy airspace and poor visibilities and becomes even more of a challenge with a broad mix of aircraft sizes and types. The air transport industry is taking steps to improve this situation by equipping their aircraft with an active collision avoidance system that directs the pilot on how to maneuver to avoid a collision. The expense of this complex system places it far beyond the reach of the general aviation community. However, Data Link can be used to enhance greatly the general aviation pilot's awareness of the traffic situation around the aircraft.

Lincoln Laboratory has developed a Data Link product known as the Traffic Information Service (TIS), which provides a situation display of aircraft in proximity of the TIS aircraft. The TIS algorithm contained within the Mode S sensor uses Mode S radar surveillance information to determine when aircraft are close to each other. When other aircraft are within a given range and altitude of a TIS aircraft, their position can be transmitted from the ground to the TIS aircraft over the Mode S Data Link and displayed to the pilot as an aid to locate the traffic visually. Figure 2 shows a prototype TIS display that Lincoln has developed by modifying a popular LORAN moving-map display. The display shows how multiple aircraft within range can be depicted relative to the TIS aircraft in the center. For instance, the square symbol at one o'clock represents traffic 200 feet above the aircraft, less than two nautical miles away and descending, while the diamond symbol near nine o'clock represents traffic 400 feet below the aircraft and just outside the two nautical mile radius. Aircraft without altitude reporting transponders are shown as targets with unknown altitudes. The display of all targets is updated every few seconds as the Mode S ground sensor Data Links the information to the aircraft with each scan. By depicting standard clock positions and altitudes of targets that are relative to the aircraft, the TIS-equipped pilot knows exactly how the situation is progressing, and where to look to spot the traffic.

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The TIS has been flown and well received by a variety of pilots in a Cessna during successful demonstrations of the service, where the display shown in Figure 2 was used in conjunction with a Mode S transponder and Data Link computer. It is important to note that any transponder will enable an aircraft to be tracked by the Mode S radar as a target, but only the aircraft with Mode S Data Link capability can receive the TIS showing surrounding aircraft. The TIS is only one example of many potential Mode S surveillance-based Data Link applications that use the knowledge of aircraft position obtained from the radar to provide various airspace navigation and alerting services automatically to pilots without controller interaction. You might have already noticed such a TCA alert on the display in Figure 2.

Data Link Avionics

You can probably see from just these few examples that Data Link has the potential to provide a vast array of services to aid the general aviation pilot. But how does all this fit into the general aviation cockpit? What are the different pieces needed to get Data Link services? And how much will it cost?

The Data Link communications architecture is being developed by the FAA and industry to incorporate multiple air/ground Data Link media, including Mode S, satellite, and VHF Data Link systems. Although all of these links will play an important role in the overall Data Link environment that includes the air transport industry, Mode S currently represents the best and most affordable choice for near-term Data Link services for the general aviation pilot. The transponder is increasingly becoming a critical safety component in the ATC system, and Mode S radar and transponders together provide greatly improved performance in aircraft detection and tracking. Data Link capability can be included within a panel-mounted Mode S transponder. Mode S Data Link will provide secure data communications nationwide, connecting the pilot with a vast network of existing and planned aviation services. And the FAA will provide Mode S Data Link services to aircraft with no direct user charges.

The Mode S transponder plays the part of a modem to transmit data between the aircraft and the ground-based Data Link computers. In addition to the transponder, a Data Link avionics suite will include a microprocessor to manage all the bits of information, and display and input/output devices for the pilot interface. With moving-map displays and other computer-based avionics technologies becoming ever more powerful and less expensive, a panel-mounted unit of similar size and weight to those shown in Figures 2 could house both the Data Link computer and display. There is a wide variety of displays that could be applied to different Data Link services, from text to monochrome and color graphics. Virtually all studies of Data Link services conducted with pilots have demonstrated an overwhelming preference for graphics instead of text displays, with color displays offering many advantages and options. Flat-panel color displays are evolving rapidly for use in personal computers and television, which could soon bring color graphics into affordable, lightweight Data Link avionics.

A good model to follow in developing Data Link services and avionics is the one that has been established by LORAN. If Data Link can provide enough useful services at a reasonable cost, then aircraft owners and pilots will equip to receive these services. The FAA is now looking at ways to work with the avionics manufacturing industry to develop a suite of Mode S Data Link avionics, including a transponder and computer/display unit, that will be affordable to the average general aviation aircraft owner. One very important thing to remember is that once you put the Data Link equipment into your cockpit, you will not need to buy another box for every new Data Link service that comes across the airwaves. Adding services becomes as easy as updating software in the avionics, providing a tremendous return for your initial investment.

The Future for Data Link

The FAA considers Data Link to be a vital element in many future automation programs, where Mode S, satellite, and VHF Data Links will provide much of the communications between ground-based and airborne systems in virtually all airspace. In fact, the FAA has already started down an evolutionary path leading to this goal. If you fly from any of 30 of the busiest airports in the country, you may have noticed that the clearance delivery frequency is much quieter and easier to access than it used to be. This is because VHF Data Link is now being used to transmit departure clearances from the control tower to a growing number of transport, commuter and business aircraft (see January/February 1991 *FAA Aviation News*). Beginning later this year, the ATIS information at these airports will also be available to Data Link participants. The Mode S sensor implementation is on track for providing radar and Data Link coverage across the country within the next few years. The TIS will soon be ready for implementation in the Mode S sensor, and the development of weather services has received renewed emphasis. Data Link services have been developed for communications between controllers and pilots in oceanic, enroute and terminal airspace and will soon include airport surface communications as well. These ATC services will be phased into operation during the mid-1990's, beginning with oceanic Data Link. Indeed, the development of Data Link systems and services is accelerating throughout the industry as a routine means of communication.

We have only touched upon the wide range of Data Link services that could greatly benefit the general aviation pilot. Data Link can deliver crucial information to the cockpit to help a pilot make safe, informed decisions. Data Link services can provide unique, ground-based information that becomes even more powerful when used in combination with some of the other growing capabilities available to pilots in the cockpit today. And once Data Link capability has been established in the cockpit, the services available to the pilot can grow over time. The benefits of increased safety and efficiency realized by the pilot using Data Link services extend automatically to the entire ATC system.

We hope this article will start you thinking about the possibilities of how Data Link could help you become a better pilot. Although we feel that the weather and traffic advisory services are amongst the most useful products for general aviation pilots, the FAA is also focusing on further defining the requirements for Data Link services and encourages feedback from the general aviation community. We invite you to stop by the FAA Data Link display at Oshkosh this year, where you can see and feel the products described above, and let us know what you think. ■

Editor's Note: *Pilots who cannot make it to Oshkosh may obtain additional information about Data Link services by contacting Hugh McLaurin, Data Link Applications, ARD–270, Federal Aviation Administration, 800 Independence Ave., SW, Washington, D.C. 20591.*

FAA Accident Prevention Program

This illustration cannot do the rapidly developing spin rotation justice, but this is what it might look like in slow motion. Fast or slow, this situation is to be avoided.

To Spin or not to Spin

Part 2

The Question is Whether You Can Benefit from Spin Training

Adapted by
Phyllis A. Duncan, Editor

In Part 1 of this article in the May/June issue, we discussed the theories behind stall/spin recognition and avoidance. In Part 2 we talk about some concrete training examples that will help to enhance stall awareness and spin prevention. After you finish this installment, test your knowledge with the Stall/Spin Quiz on the inside back cover. —**Editor**

In-flight spin training is not required for any pilot certificate other than the CFI in airplanes or gliders, but recent changes to FAR §§ 61.97, 61.105, and 61.125 require ground instruction in "stall awareness, spin entry, spins, and spin recovery techniques" for all pilots who seek airplane or glider category ratings. Flight instructors should be thoroughly familiar with the stall/spin phenomena and should be comfortable discussing situations that lead to stall/spin accidents with their students. As a CFI you could decide, with your student's consent, to go beyond mere discussion of stall/spin awareness and provide your students with some practical spin experience under your guidance.

Spin Discussion

When you get to the point of discussing stalls and spins, there are a number of points to be covered in order to meet the new requirements of FAR Part 61. Specifically, you should pose and answer the following questions:

- When will an aircraft wing always stall?
- Will an airplane spin without having first entered a stall?
- Is it possible to stall an aircraft at any speed? In any attitude?
- Does the spin follow the stall as the night follows the day? If not, why not?
- What force or forces cause the spin rotation to start?
- Assuming a wing is stalled, what pilot action is required to recover from the stall?
- How does a spin differ from a steep spiral? How does the recovery technique for the former differ from that for the latter?
- What is the sequence of control actions necessary to effect recovery from a fully developed spin in most general aviation aircraft?
- Where do most stall/spin accidents occur and how can they be prevented?

The answers to all except the last question can be found in Part 1 of this article (May/June 1992), which, like Part 2, was based on information from FAA's *Flight Training Handbook* (AC 61-21A) and other commercial flight training sources. You will find the answer to the last question, and some information you may find useful in avoiding the stall/spin accident, in the following in-flight demonstration scenarios—*all of which should be conducted at a safe altitude with a certificated instructor proficient in spin training on board and in an aircraft properly certificated for spins.* Use prescribed recovery techniques immediately, either for an imminent or full stall, if you elect to stop there, or for a spin. (See Part 1 of this article for stall and spin recovery.) Also, use clearing turns as often as necessary to "clear" the airspace below you before practicing either stalls or spins.

In-Flight Spin Training

Flight instructor candidates in airplanes or gliders must have in-flight spin training to prepare themselves for their responsibilities as an instructor. Commercial applicants, even though in-flight spin training is not required, may be highly receptive to adding this maneuver to their repertoire of chandelles and steep spirals. However, approach in-flight spin training with all primary students very cautiously. In-flight spin training might be better introduced late in the primary student's training, once students have soloed and developed sufficient confidence in their ability to handle the airplane. A pre-solo student may be too "eager to please" an instructor to voice any misgivings about suggested in-flight spin training. And, unless the instructor is proficient and demonstrates the spin and its recovery properly, the very abruptness and sometimes violent rotation of the aircraft in a spin could leave an indelible mark on a student pilot's psyche.

Once you as an instructor and your student agree upon in-flight spin training, stay with the time-honored instructional approach: first demonstrate and then allow the student to practice under your guidance. If you are a pilot seeking spin training, have the instructor (who is spin proficient, of course) demonstrate the following scenarios then allow you supervised practice.

Short-Field Takeoff

Departing from a short runway or a runway with obstructions means the pilot must operate the aircraft at the limits of its takeoff performance capabilities. The *Flight Training Handbook* states:

"To depart such an area safely, the pilot must exercise positive and precise control of aircraft attitude and airspeed. . ."

The *Handbook* goes on to describe short field takeoff and climbout technique, but the message is implicit in the phrasing about precise control of attitude and airspeed. To get the point across about the need for precision in a short-field takeoff, demonstrate the following situation.

Simulate a takeoff at a safe altitude with gear and flaps in the takeoff configuration, continuously increase the pitch attitude as might be done in an attempt to clear obstacles (entry is similar to a departure-type stall). This demonstration is most effective if rudder coordination is improper when the aircraft stalls. For example, to make a right turn in a steep climb, a pilot may use insufficient right rudder and excessive right aileron. This produces a slipping turn to the right (ball indicator to the far right) with the result that, if a departure stall occurs, the airplane spins rapidly to the left "over the top."

The tendency of the airplane to enter a spin from a left climbing turn is less pronounced since, with no rudder pressure applied by the pilot, the left yawing moment is approximately correct, resulting in a (more or less) coordinated turn, and the spin may not develop as rapidly after the stall break.

However, approach in-flight spin training with all primary students very cautiously. In-flight spin training might be better introduced late in the primary students training, once students have soloed and developed sufficient confidence in their ability to handle the airplane.

In any event, this demonstration makes the point that a departure stall is especially critical, not only because of the low altitude involved, but also because of the tendency for the airplane to enter a spin rapidly at a critically low altitude.

Engine Failure on Takeoff or Initial Climb

If the airplane's engine fails on initial climbout *before* attaining a safe maneuvering altitude, it is usually inadvisable to turn back to the runway. For whatever reason, pilots are often lured by a false sense of security to try and land where they took off from after an engine failure even though landing straight ahead may be the only viable option. Consider the problems involved in turning back at a low altitude and with little or no power available. If there was wind on takeoff, the pilot must make a downwind turn to return to the runway. This may increase the groundspeed of the aircraft and thus allows little time to plan the approach. All the while the aircraft is losing precious altitude, which further hurries the pilot and makes mistakes more likely. In turning back to a runway, the likelihood of slipping or skidding, cross-controlled turns increases (see following). Also, the increase in groundspeed may cause the pilot to attempt to slow down prematurely. Low and slow and in a bank may set the airplane up for an out-of-control cartwheel instead of a landing. All this can be avoided by lowering the nose to establish best glide speed after an engine failure and landing straight ahead *under control*. If you do not believe us, try this.

At a safe altitude establish a climb at best angle-of-climb airspeed. Note the altitude then reduce the power to idle. If you do not reduce the pitch attitude immediately, a high sink rate develops. Next, lower the nose to obtain best glide speed, execute a 180° turn, and note the total loss of altitude. What will happen is that you will likely descend below the altitude you established as your "runway." You can recover now, or if this is not convincing enough, you can carry the scenario to its inevitable conclusion, provided there is sufficient altitude left, then recover.

Cross-Controlled Turns to Final Approach

If you learned crosswind landings by the "wing-low" method (aileron into the wind to counteract drift and opposite rudder to track the centerline), then most of your landings involve crossed controls, i.e., aileron in one direction and rudder in the other. Cross-controlling becomes a precursor of a stall/spin accident most often in poorly-conducted turns from base to final on a landing approach. These improperly coordinated turns to final, and their resultant stalls and spins close to the ground, are where most stall/spin accidents occur. Usually, they result from a skidding turn to final when the pilot realizes the airplane is too low to make the runway or a slipping turn to final after an overshoot.

■ ***Skidding Turn to Final Approach***

Turn from "base" to "final" at a safe altitude. (FAA does NOT recommend use of flaps in cross-control demonstration because of the possibility of exceeding the aircraft's structural design limits in a cross-control stall.) The scenario is that the airplane is at too low an altitude on the turn from base to final, and, as a result, the pilot hesitates to use a properly coordinated turn and instead attempts to turn using excessive bottom or inside rudder to yaw the airplane onto final approach. The excess rudder causes the airplane to bank anyway and the nose to pitch down. At this point the pilot may be distracted by attention to ground references and could be counteracting the steepening bank with opposite aileron and further nose-up elevator to oppose the down-pitching tendency. The inside wing may suddenly drop, rolling the airplane inverted after an accelerated stall.

■ ***Slipping Turn to Final Approach***

In this scenario the turn from base to final is started too late to avoid overshooting the simulated runway centerline. The pilot rolls rapidly into a steep bank with insufficient rudder pressure in the direction of the turn. The steep bank creates a tendency for the nose to pitch down and not only increases the sink rate but also the roll rate. If opposed with aft elevator control movement, the result may be an accelerated stall and a spin "over-the-top."

Following these cross-control demonstrations, the instructor should emphasize the need for proper planning in the traffic pattern; for airspeed, altitude, and power control; and for properly coordinated, medium-banked turns. In a cross-control stall, the airplane may stall with little warning, thus allowing little or no time for recovery so close to the ground. Further, the instructor should emphasize that these kinds of errors are also likely to occur in the event of either an engine failure shortly after takeoff or a forced landing where the pilot is faced with a difficult situation and might attempt a rapid turn at low altitude while trying to extend a glide by using excessive up-elevator control.

Overtaking Slower Traffic

We do not usually think of a stall/spin possibility when overtaking a slower aircraft. Again, this is usually a traffic-pattern occurrence where the pilot of a faster aircraft has not allowed sufficient spacing for a slower aircraft ahead. Paying attention to the aircraft ahead may divert attention from aircraft control. In a simulated traffic pattern at a safe altitude reduce power and increase pitch to maintain spacing behind simulated slower traffic. At all the points where the slower "aircraft" would reduce power and slow down, continue increasing the pitch attitude until the diversion of attention means you fail to notice instrument or other indications of a near-stall condition.

Power Loss on Final Approach

At a safe altitude simulate power loss on final approach in the landing configuration. Using only back pressure, try to prevent the aircraft from losing more than 100 feet of altitude during the next 20 seconds. You will find that you have to keep increasing the back pressure in an *attempt* to keep from losing altitude—i.e., you are trying to stretch a glide. This seldom works, especially when you have no power and little altitude available, and that increasing pitch attitude can result in a stall. Then you run out of airspeed and altitude at the same time—remember the precise control of attitude and airspeed we talked about earlier? A landing short of the runway under control is less embarrassing and less deadly than trying to extend a glide and causing a stall/spin with no room to recover.

If conducted in a properly certificated airplane, with an appropriately trained instructor, and at a safe altitude, the spin is a routine aerobatic maneuver. There is nothing to fear—it can even be fun!

Go-Around with Full Nose-up Trim

This scenario is similar in some respects to the short-field takeoff situation and demonstrates how an improperly executed go-around can result in an inadvertent stall or spin. This situation is particularly dangerous when the pilot delays initiation of the go-around until obstacle clearance at the departure end of the runway becomes a factor. At a safe altitude, establish a properly trimmed descent to simulate a short-field approach at 1.2 V_{so}; then initiate a go-around by application of full power. Failure to counteract nose-up pitching with forward elevator pressure can result in an extremely nose-high pitch attitude and a stall or spin, especially if the aircraft is loaded at aft center of gravity.

Go-Around with Premature Flap Retraction

This scenario illustrates the effect of flap retraction at a speed below the flaps-up stalling speed, such as you might encounter on a mishandled go-around. At a safe altitude simulate a go-around from the short-field approach speed of 1.2 V_{so}. Reduce speed in a simulated landing flare to just above stalling, apply full power, and retract the flaps rapidly. The result is usually a stall and then a full or partial spin, if you do not recover from the stall.

Left Turning Tendency on a Go-Around in a Right Crosswind

This scenario demonstrates the aggravated left-turning tendency of an airplane on go-around. At altitude and with the proper approach speed and trim, establish a slipping approach to the right such as a pilot may use to compensate for a right crosswind on landing. This requires right aileron and left rudder. Then simulate the go-around by applying full power and establishing a climb pitch attitude, but do not neutralize the rudder. Carried to extreme, this control action can result in a rapid spin entry to the left, especially if the nose-up attitude is too high.

Whew! If you do all of these demonstrations in a single flight training session, you deserve more than a rest. As tiring and challenging as this sort of practice may be, reassure yourself with the knowledge that you have protected yourself from becoming a spin statistic. *Awareness* is the key.

If the thought of conducting or participating in these demonstrations frightens you, it should not. If conducted in a properly certificated airplane, with an appropriately trained and qualified instructor, and at a safe altitude, the spin is a routine aerobatic maneuver. There is little to fear—it can even be fun! ■

Editor's Note: *Parts 1 and 2 of this article were adapted from "To Spin or Not to Spin" from the October 1991 issue of the AOPA Air Safety Foundation's (ASF) Flight Instructor Safety Report. ASF sends the safety report to its members who are certificated flight instructors. For further information on the AOPA Air Safety Foundation, contact them at 421 Aviation Way, Frederick, MD 21701; (301) 695-2171.*

Accidents attributed to density altitude take on new meaning at high elevations with misuse of the mixture control.

Thin Air Accidents

by Mike Liversidge, Area Manager, Prescott, Arizona AFSS

The following article is designed to provide ideas to stimulate discussion and to create an awareness of the effects of high density altitude/high altitude flight operations in general aviation aircraft. We must remind pilots that their aircraft's pilot's operating handbook, flight manual, or owner's manual is the only FAA-approved guide for the proper operation of their particular aircraft. Different aircraft or different aircraft manufacturers using the same model engine may have different operating procedures for the engine. That is why it is important to know and use your aircraft's approved operating procedures. Any conflicting information between the following article and your aircraft's operating instructions or procedures must be resolved by using the information in your aircraft's approved manual or handbook.

In addition to the guidance in your operating manual, there are many books that discuss the concepts discussed in this article. Two sources are the FAA's Flight Training Handbook *(AC 61-21) and the various FAA Accident Prevention Program pamphlets. You can purchase AC 61-21 through the Superintendent of Documents, U.S. Government Printing Office (GPO), Washington, DC 20402, or in one of the GPO bookstores throughout the country. (Check your local telephone directory for the location of the nearest GPO bookstore.) The free safety pamphlets are available from the Accident Prevention Program Manager at your local Flight Standards District Office (FSDO).*

Finally, the best source of information on the safe operation of your aircraft is a well-qualified flight instructor or mechanic familiar with both the make and model of the aircraft you are using and the operating conditions in which you fly or are planning to fly in. ***—Editor***

As pilots, we have all been drilled about that nasty term, "Density Altitude" (DA). We all know it destroys our lift, steals our power, and softens the bite of our prop. Here in Arizona's high country, DA is considered a major killer because of the number of aircraft accidents attributed to this cause. Magazine articles, safety reports, and even hangar stories have repeatedly told us how healthy airplanes and proficient pilots have been conquered by the culprit.

Well, I certainly do not wish to downplay density altitude as a major concern for pilots; it clearly is. What I would like to do is separate the contributing factors from the underlining cause of what I call "thin air" accidents.

Although I am not an accident investigator, I talk with pilots in my work, and that all too often includes talking to them after an aircraft accident while I am preparing the initial accident report. So what have I learned from pilots over the years? Well, for openers, I have leaned that things are not always what they seem. Take many of these so called, "Density Altitude accidents." Frequently, the aircraft was heavily loaded but not over gross. The center of gravity (CG) was not centered but within limits. The runway was on the short side but not too short. The computed DA was high but still within the performance capability of the aircraft involved. It is easy to say that all of these factors combined to bring these aircraft down, but I cannot buy that. Aircraft do not crash because they approach their performance limits. They crash because they exceed them significantly or because they are not operated correctly. That is not to say that other factors do not apply; they surely do. Runway gradient, runway surface, tire inflation, surface winds, precipitation, and a host of other conditions may have to be factored in when determining safe takeoff and landing conditions. Still, close only counts in horseshoes and hand grenades. If a given aircraft had sufficient performance to operate under clearly specified conditions and failed to do so, it is either a mechanical problem or pilot error.

In following up these "thin-air accidents," as I prefer to call them, mechanical problems are seldom found. At this point, investigators tell us that it was an insidious collection of events resulting from "high density altitude." Welcome to the Twilight Zone! The real issue here is pilot technique or more to the point, lack of it. How do I know that? I know because it is the only conclusion a reasonable person could make and because I found myself making the same mistakes as the pilots I talked with.

I would like to illustrate my point with one of my own indiscretions. Let me take you back 14 years. I had just purchased my super Cessna 150/150. I was so proud of that little ship and that big engine; it climbed like a scalded ape. My story occurred while I was based at Boulder City, Nevada. It was a beautiful day! Airport elevation was 2,458 feet; temperature was 88 degrees. My wife and I were aboard, and we were about 40 pounds under gross weight. We took off on runway 21. After about 500 feet of roll, we were climbing at 85 miles per hour and 1,100 feet per minute. I turned to my wife and said, "Great, huh?" "Sure, Mike, sure," was her response.

Five thousand, 6,000, wow, 7,000 feet, then silence. The engine had quit without warning. The nose fell through the horizon, and my wife was no longer impressed. My eyes and hands rushed around the cockpit. Mags! Fuel selector! Carb heat! Fuel gauges! What!!! Then I saw it: full-rich mixture. I pulled it half way out and life quickly returned to my "bird." With power restored all seemed fine, but with my confidence shaken, I returned my Cessna to the plane doctor for a complete examination. "Doctor Flygood" found my little bird fit and healthy. I had simply tried to choke it to death on too much raw fuel and too little air. Now, admittedly, my aircraft may be a bit more critical when it comes to mixture adjustment. After all, I have a 150-horsepower engine breathing through a 100-horsepower induction system. Still, the factors remain the same. From that day on, I had a whole new area of concern when talking to pilots involved in "thin air accidents."

It was about this time period that, in addition to talking to pilots, I started reading everything I could get my hands on dealing with proper mixture operation. My aircraft POH had nothing informative to say on the subject, and active flight instructors I talked with regarded the mixture control as little more than a device to save fuel on cross-country flights. Then, at safety seminars, I listened closely and questioned safety representatives from engine manufacturers. As I gathered more and more information, the resulting conclusion was inescapable. We, the pilots of the 1950's, 1960's, and 1970's have all been systematically miseducated on proper mixture operations. During that time, aircraft and engine manufacturers knew little about proper mixture operations, and what they did know, they kept pretty much to themselves. Most of today's flight instructors, chief pilots, flight test examiners, and, yes, FAA inspectors are products of flight instruction received before the 1980's. They set the standards for us in aviation. The unfortunate result is a continuing void of this specific knowledge in today's pilots. They gave us the best available training that could be offered. But when it came to light, direct-drive engines, the word of the day was, "You can never go wrong with full-rich mixture."

If you wonder why pilots of that era came to that conclusion, consider the following: Most flight training of the 1960's and early 1970's was given in Cessna 150's and 172's and Piper *Cherokees*. Depending upon the year issued, a review of the pilot operating handbooks or owner's manuals for each of these aircraft would reveal about the same thing. That is, almost nothing about correct mixture operation. A case in point is the manual for a 1968 C–172. The operating checklist for starting calls for a "full-rich mixture" with no exceptions. This is followed by the checklist for takeoff, which clearly excludes the mixture control from any review. The first hint that "full rich" may not be a requirement for all operations is under the "climb checklist" where it states in fine print as a footnote, "mixture may be leaned above 5,000 feet." You might ask 5,000 feet what? AGL? MSL? Pressure altitude or density altitude? No one was really sure, but you had best be careful about pulling out the mixture knob and, heaven knows, keep your hands away from it below 5,000 feet!

The only other mention of mixture control in this entire manual is under the cruise tables, where it states "all figures are based on a lean mixture." The manual makes no reference to high altitude departures and states all letdowns are to be done with a full-rich mixture. This same manual, under the "takeoff data" tables, shows that the Cessna 172 at 2,300 pounds (full gross weight) could take off from Flagstaff, Ariz., airport (elevation 7,011 feet MSL) on a summer day with 100 degrees Fahrenheit, using little more than about half of the available runway and clearing all obstacles safety. Now you may find that rather optimistic and if the above procedures are followed, it is doubtful that this aircraft could be safely landed under these conditions, much less take off. On the other hand, I do believe Cessna's figures to be reasonably accurate if the same aircraft were flown correctly, using proper leaning techniques.

In truth, aircraft manufacturers of that era did not have much to go on either. They knew that a properly leaned mixture improved power, but they also knew that over leaning could mean destruction of the engine possibly resulting in loss of life and property. A conservative approach to this mixture knob was clearly in order; after all, that is why it is RED. Engine manufacturers knew considerably more about leaning, but at the time, they felt the risk outweighed the advantages of teaching pilots more about the subject.

At the close of the 1960's, engine manufacturers were starting to rethink their positions. There was growing evidence that overly rich mixtures were contributing to many engine problems and may have been a factor in several aircraft accidents as well. The swing to leaner mixture operations came from AVCO Lycoming on January 31, 1969, when it issued Revision "C" to Service Instruction No. 1094. This substantially broadened the application and use of mixture control in the operation of all smaller, direct-drive engines manufactured by Lycoming and even conservatively addressed the problems of high altitude departures.

As the aviation industry entered the 1970's, several more factors came into play. First, 80 octane avgas became hard to find with the introduction of the then new 100 low lead (100LL). This was a new grade of "one size fits all" avgas. It was unfortunately, low lead only when compared to the standard 100 octane avgas of that era. During that period, 100LL had almost five times as much lead as 80 octane avgas. Over the years, the amount of lead in 100LL has been substantially reduced, but it may still be a problem for some low compression engines. Embry-Riddle Aeronautical University in Florida had a large fleet of Cessna 172's powered by 150 HP Lycoming 0–320 engines. As they used the new 100LL fuel, they found growing numbers of fouled plugs and sticking valves. Other operators around the country reported similar problems with other aircraft. Both Lycoming and Continental engines had problems. Lycoming's solution was to design a new higher compression engine for 100LL fuel. Its 0–235 was used in the new C–152, Piper's *Tomahawk*, Beechcraft's *Skipper*, and the American *Yankee*.

So now with these new trainers on board, the problem should have been solved, right? Afraid not. Problems in these new aircraft in some cases were worse. Badly fouled plugs were bringing these new trainers down short of the airport. Something had to be done. New, fine-wire and extended core spark plugs helped in some engines, but problems still plagued many small direct drive engines as well as some more complex power plants. TCP, (tricresyl phosphate) a fuel additive, which is a lead scavenger, came on the scene. This fuel additive was originally developed for high altitude operations in the giant B–36 bomber in order to overcome catastrophic lead fouling problems. Light aircraft engine manufacturers were initially against the use of TCP in their engine lines, but growing problems with fouled plugs and sticking valves resulted in a conservative endorsement of the product. TCP was part of the solution. The other part of the solution was in the proper leaning of the mixture to optimize the combustion within each cylinder. Research showed that proper leaning could lead to maximum cruise efficiency or maximum power setting for general aviation engines. For small, direct-drive engines without EGT gauges, maximum power can normally be set by leaning to maximum RPM. Again, operators must follow the instructions in their owner's manuals regarding the safe operation of their aircraft.

As we moved into the 1980's, engine manufacturers came to pretty much the same conclusion. The problems of the 1970's were compounded with less forgiving and more complex fuels which simply had magnified a long standing problem. Proper leaning techniques had not been taught to pilots.

So now, we have entered the 1990's. Well, the fuel is better, and so are the spark plugs. POH's for newer aircraft are considerably more complete, though still lacking some details. Accident rates have improved and problems of sticking valves and fouled plugs have declined. The late 1970's and early 1980's had provided pilots with numerous sources of enlightenment on the subject of mixture operation. For example, during that time frame the *AVCO Lycoming Flyer* published a complete series of excellent articles on the subject. Some of the recommended articles include: "Leaning AVCO Lycoming Engines," "Proper Leaning at Cruise Aids Safe Flight," "The Need for Fuel Management," and "The Exhaust Gas Temperature (EGT) and Fuel Management."

In the *AVCO Lycoming Flyer*, Lycoming contends that, "There are certain basic leaning benefits which apply to all piston engines in general aviation despite their variations." They are:

1. Conservation of fuel by proper leaning means lower cost of operation.
2. Rich running engines are rough—proper leaning at cruise makes them smooth, which protects engine accessories and engine mounts.
3. An engine properly leaned from full-rich mixture is a more efficient powerplant and can result in a slight increase in airspeed during cross-country flight.
4. Leaning at cruise extends the range of the aircraft—a safety factor.
5. Proper leaning during cruise and descent means less spark plug fouling, longer life for plugs, and reduced maintenance costs.
6. Correct leaning at cruise power means cleaner combustion chambers and less possibility of pre-ignition from undesirable combustion chamber deposits.
7. Leaning helps achieve the normal desirable engine temperatures necessary to boil water and acids out of the engine oil.
8. A lower cruise power, properly leaned, saves fuel and extends range, and only increases en route flight time by a few minutes.

FAA Accident Prevention Program

". . . A conservative approach to this mixture knob was clearly in order; after all, that is why it is RED. . . ." Engine manufacturers had to balance the benefits of a properly leaned engine against the dangers of overleaning in their recommended procedures in pilot operating handbooks.

Lycoming also recommended leaning at any altitude at the aircraft's manufacturer's recommended cruise power. Other articles went on to address the importance of leaning during taxi and more detailed procedures for high altitude departures. The *AVCO Lycoming Flyer* also went on record as suggesting that proper leaning procedures be a mandatory part of the FAA's Biennial Flight Review, a point I highly endorse.

If we return to the basics, I think you will share my concern on this subject. For example, a 180-horsepower Cessna *Cardinal* operated at a density altitude of just 4,000 feet with 75 percent cruise power will burn 11.9 gallons of fuel per hour with a full-rich mixture. If the mixture is leaned to peak EGT and power maintained, the fuel burn will drop to 9.7 gallons per hour. That means that the full-rich mixture was jamming 2.2 gallons of undigested fuel per hour through this engine. Think of the accumulative effects of running this 23% inefficient fuel/air ratio. To run smoothly and develop the proper power, this engine, like all normally aspirated engines, requires approximately one part fuel to 15 parts air. That can only be attained with proper leaning. [Editor's Note: This approximate ratio should not be confused by the use of some engines that use "extra" fuel provided by a full-rich mixture to help cool the engine when operating at full power such as during takeoff.] All of this and we are only talking about a density altitude of 4,000 feet. That is equal to Phoenix Sky Harbor Airport (elevation 1,133 feet MSL) on just a warm day.

So now back to square one. We are at Flagstaff in that fully loaded Cessna 172 on a 100 degree day. That is a density altitude of over 11,000 feet. If we do a full static run up and adjust our mixture to peak power we will develop only about 65% of our rated power or approximately 98 horsepower. About the same as a C-150 at sea level.

As inviting as this mountain airport is, are you prepared to use it? Density altitude, an upsloping runway, or improper fuel management could spoil everyone's day if you have forgotten these factors in your preflight preparations.

Assuming the aircraft is perfectly healthy, the tires hard, the runway gradient and winds favorable, no downdrafts, and your technique on the money, you should be able to depart, but it would be a shaky experience that you would not soon forget. In spite of the fact it could be done, no experienced mountain pilot would ever recommend pushing the limitations that close. But wait, let us back up this shaky departure. What do you think a full-rich mixture would do to the remaining 98 horsepower? What do you think the effects of running almost 11 gallons of fuel per hour through an engine that can handle only about seven gallons per hour would be? What do you think the accumulative effects of four gallons per hour of raw undigested fuel would be on combustion chambers and the spark plugs? Ever fly a 65 horsepower Piper J3 *Cub*? Well, from a power standpoint, that is what we are about ready to do. Put that little Cubbie powerplant in our fully loaded C-172, and as we continue to operate, the power will deteriorate to the power output of an ultralight engine. Now we have the stuff that "thin air accidents" are made of, guaranteed! Density altitude accident? Close, but no cigar. Pilot error? You bet your E6B it is!

While the preceding scenario illustrates the problem to the extreme, it remains a common cause of thin air accidents. Over the past years, pilots involved in thin air accidents or near thin air accidents, have provided some pretty consistent responses to my rather novice questions. In the case of light aircraft with direct-drive engines, the mixture was either in the full-rich or nearly full-rich position in every accident. In the case of departure accidents, a full-static run up was never accomplished and an EGT instrument was never used. Many of these pilots reported that the aircraft continued to lose power after becoming airborne. In the case of fixed-pitched props, some pilots reported low RPM (2,000 or less). Even those who witnessed these accidents had observations that added to the overall picture. In some cases, they reported black smoke or dark exhaust coming from the aircraft. These are not the footprints of density altitude accidents but are clear indications of mixture mismanagement. The safety aspects of mixture mismanagement do not just apply to the takeoff environment, but rather to all phases of flight.

If I sound frustrated on this subject, it is because I am. Proper mixture management is not one of those nice to know techniques. It is a basic survival skill which pilots in the mountainous west cannot do without. In many light aircraft accidents involving a lack of power, it is a major factor. With all the information available today, why do a high percentage of chief pilots, flight instructors, examiners, and experienced pilots still treat the mixture knob like an optional control? Old habits, old POH's, old technologies, and old aircraft are no longer satisfactory excuses for ignorance of proper mixture control usage. Remember, failure to manipulate that little red knob efficiently can put you in the weeds. Believe it! ■

Editor's Note: *Mr. Liversidge is a pilot with more than 20 years flying experience who combines his love of flying with serving the needs of other pilots as a Flight Service Specialist and Area Manager. His article reminds all pilots of the importance of knowing their aircraft's operating requirements and its limitations. The information is particularly important to "low-land" pilots flying in mountainous areas during the summer.*

Visiting Rodina
(Homeland)

by the FAA Alaskan Region
Flight Standards Branch

The IFR Enroute Low Altitude chart for Alaska (L-3, L-4) shows the routing and NAVAID's available for the flight from Gambell, Alaska to Provideniya, Russia. NOT TO BE USED FOR NAVIGATION.

Ever since Charles Lindbergh made his eastward flight in 1927, traffic in small airplanes across the Atlantic has become more and more commonplace—at least the trip no longer grabs the headlines like Lindbergh's did. Today a few thousand U.S.-registered, non-commercial aircraft "cross the pond" each year from America's east coast to Europe. What about in the other direction? Some pilots have flown to Hawaii in small airplanes as well, but what about westward to a foreign country, direct from the west coast of the U.S. non-stop in, for example, a Cessna 310 or even a Piper *Cherokee*? Impossible, you say; the Pacific is too broad. Take a look at western Alaska and go west across the Bering Sea to. . .

. . . Russia? The largest republic of the 13 that comprise the Commonwealth of Independent States (CIS)? This country—formerly the USSR or the CCCP (in the Cyrillic alphabet)—is big by any standards. It encompasses 12 time zones and is nearly 9,000 miles across.

Only a few years ago the thought of flying a private aircraft into the then Soviet Union was anathema (remember the German pilot Mathias Rust who landed his rented Cessna 172 next to the Kremlin Wall?). *Glasnost* (openness) and the demise of Communism now mean that general aviation traffic can cross the 50 miles of open water from St. Lawrence Island, Alaska, to Provideniya, Russia.

According to Jim Cook, an FAA flight service specialist in Nome, Alaska, travelling to Provideniya is simple, if you follow a few guidelines. Jim has made the trip from Nome to Provideniya in his Cessna 310 three times and has become, if you will, the guru of advice for flying a private aircraft to Russia.

The first step is to be invited by a host family—apparently not too difficult since the Russians of the Far East are eager to meet their neighbors. The preponderance of Russian place names and surnames in Alaska testifies to a common heritage that predates the Cold War. With an "official" invitation from Russian citizens, you do not need a travel agent's itinerary to guarantee food and lodging. Jim says, "Many Russian families look forward to inviting guests from the United States." Jim is happy to provide details to anyone interested in such a trip and asks that you contact him at P.O. Box 1313, Nome, AK, 99762; (907) 443-5193.

There are, however, some things that you can get done before contacting Jim for the specifics. Apply for your visa (the travel permit not the card; they do not take any plastic for payment in the Russian Far East). When you apply, request your travel days within a larger period of time, i.e., do not lock yourself into a specific week. Indicate that you would be able to depart during any week of the month you would like to visit. This will accommodate any delays you might encounter, like bad weather, for example. A copy of your official invitation must accompany the visa application. To obtain a visa contact the Russian Consulate General, Embassy of the Russian Federation, ATTN: Visa Section, in a city convenient to you. (You will need to check the foreign embassy section of your telephone book.) The consulate Jim used is located at 2790 Green Street, San Francisco, CA 94123; (415) 202-9800.

In addition to all your pilot and medical certificates and a visa, you also need a valid passport. If you need one or need to renew yours, you can get an application from any Postmaster or by contacting the U.S. Department of State, Office of Passport Services, 1425 K Street, N.W., Washington, DC 20542; (202) 647-0518. You should also contact the Immigration and Nationalization Service in Alaska to apprise them of your intent to travel to Russia. Contact Ed Tharp, Port Director, 620 East 10th Avenue, Suite 102, Anchorage, AK 99501; (907) 271-4518. If you are unsure of any immunization requirements, contact John Robertson, U.S. Public Health Service in Seattle, WA;

(206) 442–4519. Before travelling outside the U.S. with items such as ivory, marine mammal skin clothing, etc., you should review the Marine Mammals Act. To do so, contact the U.S. Fish and Wildlife Service, James Sheridan, Law Enforcement, P. O. Box 92597, Anchorage, AK, 99509; (907) 786–3311.

That takes care of your paperwork; next comes the airplane's paperwork. You must have a written authorization for your aircraft to enter the airspace of the Russian Far East. You can telex a request for an authorization to International Department, Ministry of Transport, Air Transport Department, Moscow; TELEX: 412303 CDSSU. There are specific routes that you must follow, all over water, and they are indicated on current, U.S. government IFR enroute charts. Even if you fly there on a VFR clearance, treat it like an IFR clearance: Stay on the course and altitude assigned and maintain continuous contact with the Russian ATC facilities. This may require high frequency (HF) radio equipment on some routes. ADF/NDB navigation is the primary means of navigation in the Russian Far East. We recommend a dual ADF installation if you are planning flight operations beyond Provedeniya. LORAN is NOT approved for air navigation in Russian airspace at this time.

When a U.S.-certificated pilot operates in any foreign country, he or she not only must adhere to any applicable FAR but also to any foreign regulations. You can find Russian operating rules in the Russian Aeronautical Information Publication (AIP), which their Ministry of Transport sells. This publication without its corresponding NOTAM service is $160 per year; with NOTAM service, $400 per year. To purchase the AIP, contact the Ministry of Transport, Air Transport Department, Leningradsky Prospect 37, Moscow. The only other source for Russian flight information is Jeppesen-Sanderson, who publish an Eastern European edition that includes routes and approach plates for Russia. A one-time trip kit costs $70.30; the base subscription price is $82.80 with an annual revision service for $593.10. Contact Jeppesen-Sanderson at 55 Inverness Drive East, Englewood, CO 80112–5498; (303) 799–9090.

As for non-aviation information, the U.S. State Department disseminates information on travel to Russia. Contact the Citizens Emergency Center, Department of State, 2201 C Street, N.W., Room 4811, Washington, DC 20542; (202) 647–5225. "Tips for Travelers to USSR" (Russia) is available through the Superintendent of Documents, Government Printing Office, Washington, DC 20402. The current cost is $1.00 per copy. For tourist information, contact Intourist Russia Corp., 630 5th Avenue, Suite 868, New York, NY 10111; (212) 757–3884. For U.S. Customs information, you should contact their office in Gambell, AK, when you arrive on St. Lawrence Island. A small settlement on the island's western tip, Gambell is approximately 50 miles from Provideniya. You can clear Russian Customs in Provideniya. To assure Customs services in any location outside of Anchorage, contact C. Duane Oveson, District Director, U.S. Customs Service, 605 W. 4th Ave., #205, Anchorage, AK 99501; (907) 271–2675.

Once you have obtained all the necessary information and paperwork, you are ready to go. To get to Alaska, you may want to refer to the article "Flying to Alaska" in the January/February 1992 issue of *FAA Aviation News*. We have subsequently issued a reprint of that article, which is available from your local accident prevention program manager. After arriving in Alaska, the real-time preparation for the Russia trip begins, and that involves all the usual things for any cross-country flight—charts, NAVAID's, weather information, etc.

U.S. Sectional and WAC charts end with Alaska, but the Defense Mapping Agency produces topographic charts, which pilots can purchase, for VFR navigation. The charts depict some airports; however, navigation facilities, airways, and communications frequencies are not shown. These charts are $3.25 each, and a catalog is available from DMA Combat Support Center, ATTN: PMS, Mail Stop D–16, Washington, DC 20315–0010. For specific information on navigation facilities, airways, etc., you may have to rely on the Russian AIP, on the Jeppesen-Sanderson service, on information from Alaskans like Jim Cook who have made the trip, or on NOAA instrument charts.

After navigation information, reliable weather information is the next step in flight planning, and you will be in luck here. The National Weather Service (NWS) provides official weather for the Russian Far East from its office in Fairbanks, AK; (907) 456–0247/0249. Russia transmits terminal area forecasts every six hours. Russian meteorologists transmit observations for major airports each hour during the day and as needed at night. The NWS receives the weather over the Global Telephone System, translates it into ICAO format, and makes it available to pilots through local (Alaskan) flight service stations. These FSS also accept and disseminate flight plan information.

Your pre-flight fuel planning and in-flight fuel management must be carefully done. Aviation gasoline may not be obtainable at many Russian airports. Additionally, the quality and grade may not be compatible with your aircraft, so you need to plan ahead for your refueling needs. You should assure that, wherever your last stop in Alaska is, there are fueling facilities. Another consideration is maintenance. Should you have a breakdown, parts for your aircraft may not be available in Russia, and U.S. certificated mechanics are not available. You may have to be prepared to pay to have the parts, the tools, and the mechanic shipped to your Russian location, and that could take time to coordinate. When you plan your trip, make sure the airplane does not go out of annual in the middle of it, and do not continue the flight from Alaska if the airplane is not performing well until you have a U.S. mechanic troubleshoot the problem. Review what you can do to your aircraft as a pilot under the preventive maintenance regulations. FAR Part 43, Appendix A (c)(1)–29) Finally, if you want to fly beyond Provideniya into the republic's vast interior, you must have a Russian navigator/interpreter on board, who will probably charge for his or her services. The Russians will also charge fees (in U.S. currency only) for air navigation, landing, security, and parking. For example, in August 1991, the fees for a Cessna 310 to fly to Provideniya, stay three nights, and return were $160. The Russians in Provideniya do not accept credit cards, traveller's checks, or money orders for these fees.

Like any crosscountry to a new and unfamiliar place, this trip requires careful planning, planning that may have to start months ahead of time. We hope that this information provides you with a good starting point in planning a personal trip to the Russian Far East. It may be that this trip is not for everyone, but it would certainly be a challenge and make for interesting hangar flying when you get back home.

Besides, for a people struggling to learn the nuances of democracy, what better demonstration than the freedom of the skies? ■

Editor's Note: *For additional information gathering or sharing, contact Gary Childers, Operations Specialist, FAA, Alaskan Region, Flight Standards Division, 222 W. 7th Ave., Box 14, Anchorage, AK 99513; (907) 271–5908. In preparing this article, we appreciate the assistance we received from Charles "Chuck" Lund, Manager, Flight Standards Branch, FAA Alaska Region.*

Scenes from Sun 'n' Fun 1992

Margaret Haldane

A FAA's Aviation Safety Center forms the backdrop for the second largest gathering of aircraft in the U.S. The FAA's DC–3 stands nearby, flanked by homebuilt aircraft of every description.

B Sun 'n' Fun means exciting airshows. Here the North American T–6 Team executes a complex maneuver that only looks like a mid-air collision about to happen.

C Sun 'n' Fun means introducing the next generation to the joys of flying. A brother and sister get ready for an open-cockpit biplane ride courtesy of Beagle Air Tours.

D Sun 'n' Fun means trying your hand (and eyes) at a Preflight Contest. FAA inspectors stand by to grade how the contestants did on spotting "discrepancies" on a Cadet loaned by FlightSafety International.

E Sun 'n' Fun means airplanes from all over the country and people from all walks of life coming together to celebrate the past, present, and future of aviation.

• Takeoff Minimums

With regard to IFR take-off minimums the IAP (instrument approach procedures) book states, "Civil users: FAR 91 prescribes take-off rules and establishes take-off minimums for certain operators as follows: (1) Aircraft having two engines or less—one statute mile. (2) Aircraft having more than two engines—one half statute mile."

I have been told by a CFII that these restrictions do not apply to operations conducted under FAR Part 91, which seems to conflict with what I am reading.

Name withheld

The CFII is correct, and there is no conflict between what you were told and what you read. But you must also read FAR § 91.175.(f) which defines the "certain operators" mentioned in the IAP. Basically, the FAR says if there are no prescribed takeoff minimums under FAR Part 97 for a given civil airport, the minimums you listed apply to those operating under FAR Parts 121, 125, 127, 129, and 135. FAR Part 91 operators are not listed. This exclusion of FAR Part 91 operators could result in a situation where someone operating under FAR Part 91 could legally takeoff from an airport but not have the landing minimums needed to return and land at the same airport after takeoff. Flight safety and common sense dictate that a FAR Part 91 operator should apply similar rules as those for commercial operators to prevent a situation where one could not return and land without declaring an emergency.

• Alaskan Adventure

My compliments on your Alaska presentation. The information is straightforward and nearly complete and most helpful (as are most offerings in the FAA Aviation News*).*

You leave two matters unsettled: LORAN and GPS. You never even mention the words. As I understand it, GPS should cover the area without difficulty and a look at the LORAN maps, including the new mid-continent chains, indicates good coverage for most of the trip.

I am planning a flight to Alaska in a light plane which is equipped with about everything (dual radios, VOR, transponder with altitude, and a good LORAN) needed for VFR flight. Having used ADF for most of my flying years (about 35) and with the advent of the newer (old) LORAN and now GPS, I made the choice to not invest in an ADF.

If necessary to add something, I would prefer a GPS to the ADF any time.

A postscript to your article covering LORAN and GPS would be helpful.

Melvin C. Shaffer
Richmond, VA

Thank you for your comments about the Alaska article. The story was a team effort involving people in Canada, Alaska, and other areas of the United States who provided the information and photographs used in the article. Without the support of everyone involved, the story could not have been written.

Regarding your comments on LORAN, GPS, and ADF navigation systems, each pilot must make his or her own decisions on using one or more of the systems. Each system has its unique advantages and disadvantages. Only one system, ADF, has approved instrument approaches available to the public in both the United States and Canada. Neither LORAN or GPS is currently approved for public instrument approach use in the United States. Another problem is there may be areas where LORAN or GPS may not provide adequate navigational coverage. Because of these reasons, we did not comment on the use of either system on any of the routes described in the article. We prefer that pilots as part of their preflight planning process determine for themselves the best navigation system or systems to be used based upon both their skill in using it and its operational availability. The various government information sources listed in the article can provide the information needed for using any type of navigational system in their respective areas of Canada or Alaska.

Our most recent update article on LORAN-C was printed in the November-December 1991 issue. We are planning on printing an article on GPS at a later date.

• Vanishing Editor's Note

After each article the magazine tries to print a little background information on a contributing writer. Unfortunately, there was not enough room for it following the May/June 1992 "FamousFlights," so we are printing it in this issue:

Editor's Note: Mr. Michael D. Piccola, an air traffic controller for 28 years, is now an instructor for the SSRA contract at the New York Air Route Traffic Control Center. He also holds a Commercial pilot's license with single and multi-engine land and sea ratings. He also conceptualized the *U.S. Intrepid* Sea, Air, and Land Museum.

Our thanks to Mr. Piccola for sending us his article.

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

• Multi-Question IFR

Is one required to conform with FAA published IFR departure procedures when departing from an airport with an operating control tower? For example, on a VMC day, would one have to comply with the published IFR departure procedures *if they were not explicitly included in a clearance?*

Where is the missed approach point (MAP) on an ILS circle to land approach? (Do the circle to land minimums represent MDA's or DH's for such an operation?)

Rob Jones
Prescott, AZ

It depends. Are you departing VFR or IFR? Are there Noise Abatement Procedures in effect for the airport? Are there any special procedures for the airport? The answer depends on the airport, weather conditions, and type of flight plan. Normally, if you are departing IFR, you can expect to be given astandard instrument departure procedure (SID) if one exists for the departure. If ATC expects you to fly a SID, it will be included in your clearance. You must have at least the textual description of the SID before you can accept it. You can also refuse a SID if you do not have at least the textual version of it or if you do not want to accept it. The preferred method of refusing a SID is by writing "NO SID" in the remarks sections of the flight plan. The alternate method is telling ATC verbally that a SID is not desired or that you do not have at least the textual description of the procedure. If you cannot comply with the SID it is your responsibility to so notify ATC. In VMC as in IMC you should follow ATC instructions or notify ATC if you cannot comply.

There is no ILS circle to land approach. If there is a circling approach listed for the airport the altitude is the MDA. The MAP is based upon the final approach fix (FAF) for the procedure as shown on the chart.

Facing Up to Fiscal Realities

You may not be counting, but we are. This is our eighth full-color issue of *FAA Aviation News*. Ever since the U.S. Government Printing Office (GPO) graciously consented to allow us to bring you your safety information in living color, we have anxiously awaited GPO's biennial price audit. The reality is that color printing is much more expensive than our former, two-color format; consequently, GPO has decided on a price increase. The good news is that it is only an increase of $1.50 from the old price of $6.50 per year to $8.00 per year. (Check the envelope in the centerfold for multiple-year and foreign subscription details.) With our full-color presentation and more pages containing more timely information and more modern photographs, that 23% increase is probably worth it. Think of how $8.00 a year compares to some of the commercial publications. We are the best buy around.

Oshkosh Bound

For those of you who are just about going through Sun 'n' Fun withdrawal, never fear, Oshkosh is not that far away. This year's 40th Annual Experimental Aircraft Association (EAA) Fly-in and Convention will be held at its perennial site, Wittman Field in Oshkosh, WI from July 31 through August 6.

As usual for the nearly 14,000 aircraft that will fly in to be part of Oshkosh, there will be special air traffic procedures to make sure everyone gets there safely. Special Oshkosh procedures will be published in the June 11, June 25, July 9, and July 23 issues of the *Notices to Airmen* (NOTAM). This multi-page NOTAM has instructions for all special arrival and departure procedures, appropriate frequencies, and pictorial descriptions of arrival and departure routes. Use of the information in this NOTAM is just about essential for a safe, efficient flight to and from aviation's most famous event. Contact your local Flight Service Station (FSS) to see a copy. (*Notices to Airmen* is a U.S. Government Printing Office subscription item and issued biweekly.) If you do not have the information it contains or a hotel reservation, you may be in for a bumpy flight.

In addition to static displays of Warbirds, homebuilt and restored aircraft, and ultralights, Oshkosh features a continuous round of safety programs and seminars sponsored by EAA and the FAA Accident Prevention Program. Also, if you have not already picked a copy of the *FAA Aviation News* Reprint, "The ABC's of Airspace Reclassification," from your local FSDO, 8,000 copies will be available for free distribution at the FAA's Safety Center during the fly-in.

Is There a Pilot Personality, and Can It Be Reproduced?

There is so much romantic mythology surrounding aviation that it is difficult to separate the truth from the fiction. Back when aviation was young, pilots were seriously referred to in the journals and newspapers of the day as "Intrepid Birdmen." Such a phrase is rarely used now except in a sarcastic or ironic tone. Despite the present mature state of air transportation, most pilots know that the occupation is worth an extra drink or so at any social event, based on the profession's romantic and dangerous origins. (That is, with the exception of any gathering, anywhere, of flight attendants. They have a more realistic and jaundiced view of pilots.)

The belief that it takes something exceptional in the way of physical and mental skills to fly an aircraft dies hard. It is not dead yet, by any means, if the success of a television series like "Wings" is any yardstick.

Cognitive psychologists and aviation medical specialists have long studied the history of pilot training and selection, postulating that there are common personality traits shared by most pilots. So, the argument goes, if we effectively test for the good personality traits, employers could hire only sober, sensible pilots and weed out all the hell-bent-for-leather glamour pusses who only want to "live fast, die young, and make a good-looking corpse."

The search goes on for a personality profile revealing the "at risk" aviator. According to Dr. Robert O. Besco, retired American Airlines captain, the search is futile, since no such ideal personality exists. He says that there are "Top Guns" in aviation who go to church every Sunday; others who are intellectual and read Kafka and Nietzsche; and many who could not pass a basketball or hit a baseball if their lives depended on it. In short, aviators come in all complexions, genders, and character types. The common trait is that they love to fly.

Besco argues that there is simply no way to relate low performance in aviation with one set of traits and high performance with another set of traits. Moreover, there are no "scientifically defensible studies" on personality which can separate the professional-pilot sector from the general population. However, Besco has his own list of behavioral traits that distinguish good pilots. It runs like this:

- Good pilots detect mistakes immediately after they occur—first their own errors, then those of fellow crewmembers, and then the errors of others.
- Good pilots cope, correct, and compensate for these errors gracefully and uneventfully.
- Good pilots communicate their assessment of these errors immediately to their fellow crewmembers and to supporting personnel.
- Good pilots accept that errors will occur and know that they can compensate for them.
- Good pilots do not let the threat of past, current, or future errors increase their own error rates or their ability to cope.
- Good pilots develop and maintain an attitude of wariness and anticipation of errors.
- Good pilots have the character strength to say NO to marginal conditions and to resist the organizational pressure to press on.
- Good pilots exert a stabilizing influence on others when the system is degenerating and goal conflicts are developing.
- Good pilots adapt quickly to changes in the demands and environmental conditions of their profession.

Reprinted courtesy of the Aviation Safety Letter, Transport Canada—Aviation, Systems Safety Directorate

Answers to Stall/Spin Quiz:
1. c, 2. d, 3. b, 4. d, 5. b, 6. c, 7. a, 8. d, 9. a, 10. a, 11. d, 12. b, 13. b, 14. d, 15. b

Albin and Anna Lange, Morton, Illinois

Where else but Oshkosh can you enjoy such a juxtaposition of aviation history? These aircraft displayed at Oshkosh '91 depict aviation's beginnings (replica Wright Flyer) through the supersonic age (British Airways Concorde).

The pilots, ground crew, and aircraft of the 1992 U.S. Aerobatic Team who will compete in the World Aerobatic Contest this summer in France.

Going for the Gold in the Olympics of the Air

This year has given us the Winter Olympics from Albertville, France, where we watched ski jumpers and ice dancers do their version of flying. The Summer Olympics in Barcelona, Spain, has its flyers, too, in the form of pole vaulters and long jumpers. But what about the Olympics in LeHavre, France?

Lest you think there is some forgotten event from Albertville, the world's best airplanes and pilots will come to LeHavre on July 5, 1992, to participate in the World Aerobatic Contest, what one might call the Olympics of the Air. Every two years national teams from the United States, Germany, Great Britain, France, Czechoslovakia, the Commonwealth of Independent States, and from many other countries compete for the World Aerobatic Championship. The Federation Aeronautique Internationale (FAI) conducts the international contest.

Each team flies four competition flights: Known Compulsory, Freestyle, Unknown, and Four-Minute Free. The top three pilots for each flight receive Gold, Silver, and Bronze medals. The Nesterov trophy goes to the top three male pilots from the same country and the Challege Cup to the top three women pilots from the same country. The overall men's individual champion receives the Aresti Cup while the overall woman's individual champion receives the Royal Aero Club trophy. Since world competition started in 1960, U.S. pilots have won the team championship in 1970, 1972, 1980, 1984, and 1988. Americans won individual titles in 1972, 1980, 1982, and 1988.

Contestants fly in a 1,000-meter aerobatic "box," and an international team of judges grades individual maneuvers as well as the position of the aircraft in the box on a scale from one to 10. Judges look at precision of the lines and angles of the maneuver, symmetry of figures, as well as other factors determined by the FAI. Each maneuver also has a difficulty coefficient, or "K-factor." To determine total points, judges multiply the score for each maneuver by its K-factor. The team with the most points wins.

The USA Aerobatic Team was selected from the top 10 fliers in last year's U.S. Aerobatic Championships. The team also consists of mechanics, judges, and other support personnel. The pilots of the USA Aerobatic Team are:

Patty Wagstaff—Anchorage, AK
Kermit Weeks—Miami, FL
Pete Anderson— Fowler, CA
Linda Meyers—Miami, FL
John Lillberg—Boynton Beach, FL
Phil Knight—West Palm Beach, FL
Robert Armstrong—Athens, GA
Richard Massegee—Albuquerque, NM
Deborah Rihn—LaPorte, TX
Cecilia Aragon—Berkeley, CA
Linda Gillmore—Lindonhurst, IL

The Team's ground crew are:

Burton Barrett, Chief Mechanic—Tulsa, OK
William McIntyre, Judge—Mesa, AZ
John Morrissey, Trainer—Lee's Summit, MO
J. Randall Reinhardt, Manager—Lexington, KY
Charles Sanford, Mechanic—Chama, NM
Ken Stout, Assistant Judge—Woodbine, KS
Robert H. Wagstaff, Delegate—Anchorage, AK

The USA Aerobatic Team, unlike many national teams, receives no support from the government and must depend on contributions to the U.S. Aerobatic Foundation from the public to fund its efforts in world competition. For information about contributing to the USA Aerobatic Team, contact the U.S. Aerobatic Foundation at P. O. Box 3086, Oshkosh, WI 54903 or telephone them at (414) 426-4800. The U.S. Aerobatic Foundation is a non-profit organization, and contributions are tax-deductible.

Harmonization in Aircraft Simulation

Getting a flight simulator approved for use in every country that operates the airliner that the simulator represents can be a nightmare. There is little reciprocity of requirements among the world's regulatory agencies. All that may soon change. Representatives of the world's major regulatory organizations, aircraft and flight simulator manufacturers, and airline and pilot groups recently endorsed common standards for flight simulators. The new technical guidance will apply to about 90% of the new aircraft simulators and, if adopted by the International Civil Aviation Organization (ICAO), would become an international standard as well. A number of regulatory agencies have already begun incorporating the standards.

Most western countries qualify simulators used by their airlines to their own standards, regardless of whether the simulator was located within that country's borders. According to FAA's Manager of the National Simulator Program, Edward M. Boothe, a flight simulator located in the United Kingdom, for example, and qualified by the British Civil Aviation Authority, could not be used by U.S. pilots until FAA inspectors had examined and qualified it under U.S. standards. Such a lack of common standards led to redundant examinations of the same simulator.

A 34-member working group drew up the standards over a two-year period. The 50-page document, "International Standards for the Qualification of Airplane Flight Simulators," is one of the foremost examples of harmonization of regulations among the world's various aviation regulatory bodies. The basis for the international standards were the standards published in FAA's Advisory Circular (AC) 120-40B. FAA had done the most recent work in upgrading simulator standards, and its standards were adapted to accommodate the requirements of other authorities. The standards address the two highest levels of flight simulation that any nation has—those with both motion and visual systems. FAA's highest level, Level D, equates to the new International Level 1, which are simulators acceptable for "zero-flight time" training and pilot certification in commercial aircraft.

The proposed international standards not only reduce the regulatory burden in evaluating and inspecting simulators, they also aid manufacturers in building simulators to a single, acceptable standard. The working group intends to propose the new standards to ICAO this year.

This article is based on information in the March 2, 1992 Aviation Week & Space Technology. Copies of AC 120-40B are free from the U.S. Department of Transportation, Utilization and Storage Section, M-443.2, Washington, DC 20590.

TEST YOUR PILOTING IQ:

Stall/Spin Quiz

Test your stall/spin awareness. You should have read Part 1 (May/June 1992 *FAA Aviation News*) and Part 2 (this issue) of "To Spin or Not to Spin" in order to answer these questions. Answers are on p. 27.

__1. Stall/spin accidents are most common in all but which of the following situations?
a. Takeoff and landing.
b. After engine failure.
c. During normal cruise.
d. During unwarranted flight at low altitude.

__2. Following engine failure in a climb, the pilot's first action should be to
a. Hold climb altitude while switching fuel tanks.
b. Check engine instruments.
c. Locate an emergency landing field.
d. Lower the nose to best glide attitude.

__3. An aircraft wing never stalls when
a. The indicated airspeed is above the power-on stall speed.
b. The angle of attack is less than the stall angle of attack.
c. The calibrated airspeed is above the power-on stall speed.
d. The pitch attitude is nose down.

__4. The indicated airspeed at which an aircraft will stall
a. Increases with increased altitude.
b. Decreases with increased altitude.
c. Depends on temperature and humidity as well as altitude.
d. Does not change with altitude.

__5. Which of the following statements is false?
a. An aircraft can stall at airspeeds above the unaccelerated stall speed.
b. An aircraft can stall at any angle of attack.
c. An aircraft can be in an unstalled condition at airspeeds below the stall speed.
d. Stall speed increases with increasing load factor.

__6. Which of the following characteristics of a spin is NOT characteristic of a steep spiral?
a. Rapid loss of altitude.
b. High rate of rotation.
c. Stalled wing.
d. Steep nose-down pitch attitude.

__7. Intentional spin entry is made with
a. Full nose-up elevator deflection and full rudder in the direction of the spin.
b. A steep diving spiral.
c. Full power.
d. Rudder and aileron cross-controlled.

__8. Spin recovery is made by
a. Applying full power and forward wheel.
b. Applying full forward wheel followed by coordinated roll-out.
c. Applying forward wheel followed by aileron against the spin.
d. Reducing power to idle, rudder against the rotation, and forward wheel.

__9. A departure stall occurs in a climbing right turn, and the pilot is not applying enough right rudder to center the ball. If the stall is prolonged
a. A spin to the left may occur.
b. A spin to the right may occur.
c. A right yawing tendency will be evident.
d. A right rolling tendency will be evident.

__10. An aft center of gravity location usually
a. Makes it easier to enter and more difficult to recover from stalls and spins.
b. Makes it more difficult to enter and easier to recover from stalls and spins.
c. Can be moved forward during a spin to assure recovery.
d. Has little effect on stalls and spins.

__11. An accelerated stall occurs during a steeply banked left turn. Rudder coordination is improper with the ball to the left, indicating a slipping turn. At the stall, the aircraft will
a. Shudder but continue in the steep turn.
b. Recover wings level because the rudder counteracts the elevator in a steep turn.
c. Roll to the left or spin toward the inside of the turn.
d. Roll to the right or spin toward the outside of the turn.

__12. An aircraft is in a power-off glide at best gliding speed. If the pilot increase pitch attitude resulting in a nose-up glide at a reduced indicated airspeed, the gliding distance
a. Increases.
b. Decreases.
c. Remains the same.
d. May increase or decrease depending on the airplane.

__13. Ailerons tend to have reduced effectiveness at high angles of attack and low airspeeds
a. Because of high dynamic pressure.
b. Because deflecting an aileron may cause it to stall.
c. Because they are balanced.
d. Because they cause yaw in the direction of a turn.

__14. The most reliable way to determine the spin characteristics of a new aircraft is
a. Through design specifications.
b. Wind tunnel data.
c. Computer calculation.
d. Flight test by a manufacturer's test pilot.

__15. Ailerons
a. Are effective for spin recovery.
b. Deflected against a spin may increase or decrease the rotation rate.
c. Should not be neutralized in a spin.
d. Have an effect that is dependent on aircraft center of gravity position.

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