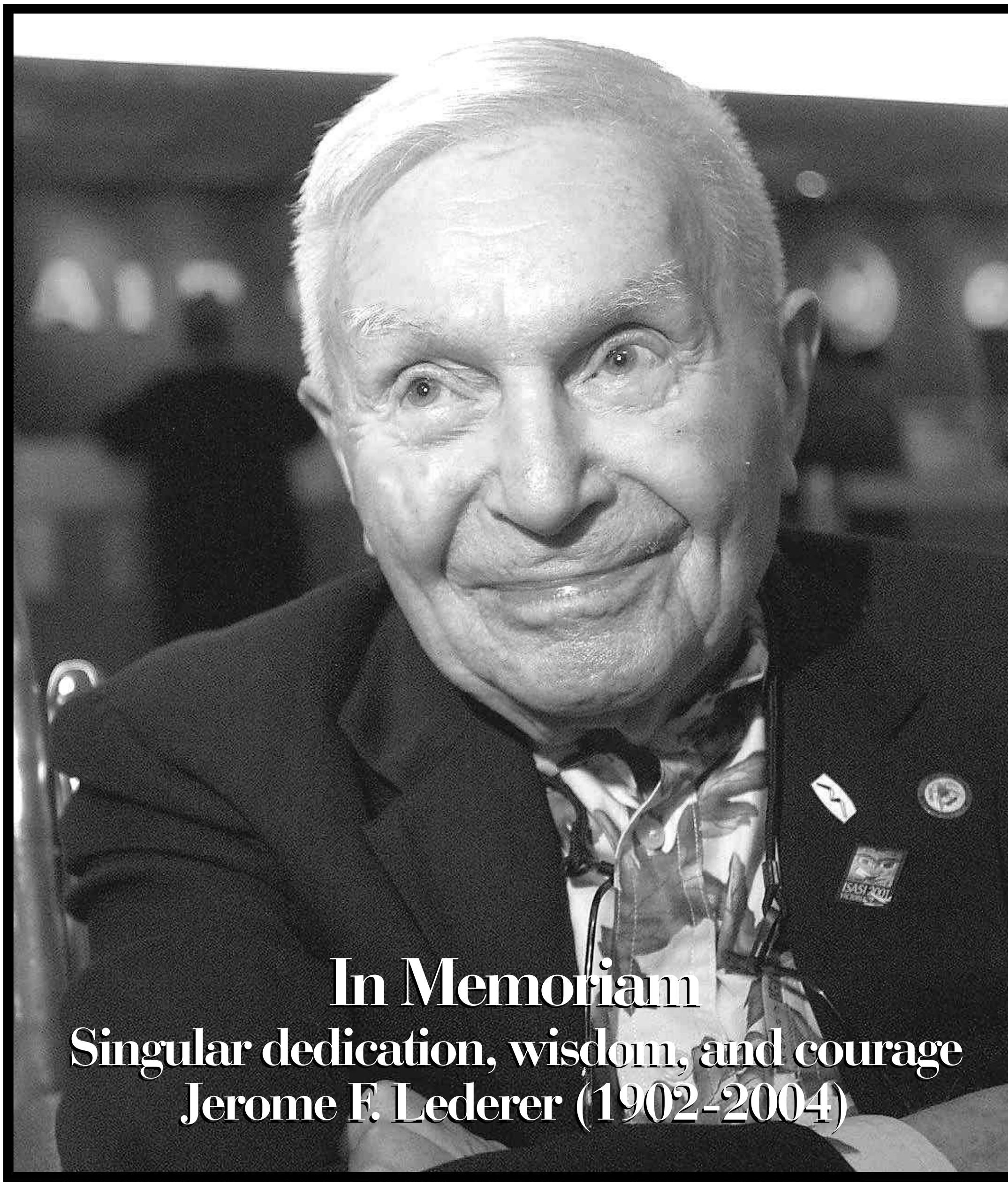
ISASI FORUM

APRIL-JUNE 2004

"AIR SAFETY THROUGH INVESTIGATION"



In Memoriam
Singular dedication, wisdom, and courage
Jerome F. Lederer (1902-2004)

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Jerome F. Lederer in a photo by Bruce Stotesbury, Victoria Times Colonist *(Victoria, British Columbia, Canada) taken during ISASI 2001 and used in a feature article titled* From the Wright Brothers to the First Man on the Moon. *(The photo is reprinted with one-time-use-only permission.—Editor)*

ISASI FORUM

"Air Safety Through Investigation"

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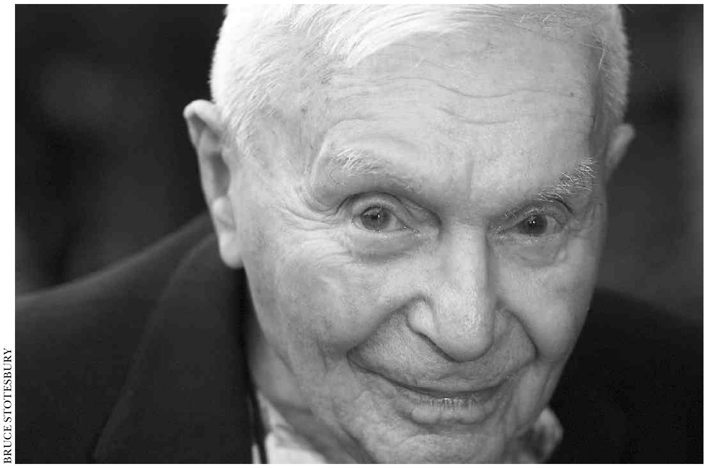
AIR SAFETY INVESTIGATORS
INCORPORATED AUGUST 31 1964



BRUCE STOTESBURY

IN TRIBUTE

While the few pages that follow reflect only a small bit of Jerry Lederer's tremendous contributions to the world's level of aviation safety and accident investigative techniques, we publish them in a celebration of his life that came to its final end, at age 101, due to congestive heart failure at 2:30 a.m. PST February 6 at Saddleback Memorial Medical Center in Laguna Hills, Calif.

Jerry's aviation lore stretches back to the time of wooden wings and iron men when he joined the U.S. Air Mail Service in 1926 at Maywood, Ill., as an aeronautical engineer. His aviation safety prowess would become renowned. Along his route to becoming a legend, he became, in 1965, a member of the Society of Air Safety Investigators, forerunner to ISASI, and in 1969 he became the second president of our organization. In time, we would establish the Jerome F. Lederer Award. In his honor, it is awarded for outstanding lifetime contributions in the field of aircraft accident investigation and prevention.

I first heard Jerry's name being mentioned in 1980 when I joined the FAA Office of Accident Investigation. A few years later, I became the Secretary of ISASI and discovered that Jerry's writings were in constant demand and his reputation was widespread. As others talked about Jerry and his accomplishments, my deep-seated, but unspoken, wish was to meet him one day and shake his hand. In 1986, at an ISASI seminar where he was to present the award named after him, I got my wish. Shaking his hand and speaking with him was a thrill I shall never forget. As the years went by, Jerry and I spent more time together and we had fantastic conversations about aviation safety. He shared his insights with me, and the more I heard, the more I realized that owing to his background, training skills, and experiences he stood head and shoulders above all in recognizing and explaining what creates safety in aviation.

We recently celebrated the invention of the airplane by the Wright Brothers, a tremendous accomplishment. However, it was Jerry and a few others who initiated the changes and improvements that have advanced aviation to what it is today.

My thoughts are that we should not dwell on Jerry leaving us, but rather on being thankful that our industry had his presence for all these years and for his many contributions that have made flight safer for persons worldwide. We should consider ourselves very fortunate that we had Jerry's genius. And if you had and took the opportunity to talk and work with him, be doubly grateful. I believe Jerry Lederer's spirit lives on in each of us as we continue our pursuit of accident investigations and that his teachings shall forever be found in future air safety advancements.

—Frank Del Gandio
ISASI President

Jerome F. Lederer: 'Father of Aviation Safety'

Aviation and manned space flight have seldom, if ever, had one person contribute so much for so long to the advancement and the consequent well-being of humanity. Saving lives and conserving other resources is what accident prevention is all about. Jerry Lederer, upon making his final flight west at age 101, has created a textbook without an end in this area. Succeeding chapters will be written ad infinitum based upon his legacy.—*Author Unknown.*

Prepared from news and magazine sources by Esperison Martinez, Editor

Known as the "Father of Aviation Safety" throughout the industry even before the U.S. Congress recognized him as such in 1997, Jerry himself never believed that to be true: "It's nice to be known as that, but I don't really think I am," he told Jeff Rud, reporter for the *Vancouver Times Colonist* newspaper in September 2001, while attending the ISASI annual seminar. "I think the Wright Brothers really deserve that honor," Jerry added to his comment. He pointed out that it was they "…who originated simple design concepts that included positioning the engine beside the pilot to lessen danger …and who invented the first flight data recorder…," wrote Rud.

That exchange personified Jerome F. Lederer's quiet, unassuming nature. Yet, those who knew him, worked with him, talked with him recognized the depth of knowledge and selflessness that lay within the man whose small frame, cherubic features, and twinkling blue eyes belied his towering public stature.

Born Sept. 26, 1902, the year before the Wright Brothers launched the world into powered flight, Jerry's flight safety career spans the entire aerospace safety spectrum and other areas of public interest as well. During his remarkable aviation career of more than seven decades, he has become, as one author wrote in 1970, "a veritable walking encyclopedia of aviation lore and safety facts and figures and a man of vision to challenge the seers of all times."

He lived with the growth of aviation safety from the time the U.S. Post Office operated the nation's accident-plagued transcontinental air mail service and with the nation's early ill experiences of space flight safety to the present, when aviation is considered the safest form of public transportation.

"Jerry," as this most congenial of gentlemen liked to be called, was graduated with honors from New York University's College of Engineering in 1924 with a bachelor's degree of science in mechanical engineering, securing his master's degree the next year. During his school year, he also was appointed assistant director of aeronautical engineering. "I erected and operated the first wind tunnel at New York University. It was a 4-foot, 40-mile-per-hour wind tunnel that we got from Curtiss Co. and I was paid $12.00 a week," Jerry recalled during a recorded living history interview with Flight Safety Foundation (FSF) staff members.

U.S. Air Mail Service

In 1926, Jerry joined the U.S. Air Mail Service (1918-1927), at Maywood, Ill., and became aeronautical engineer of the world's first system of scheduled air transportation, in which one of every six airline pilots died in crashes each year. It was here that his predilection for flight safety took hold. Bad-weather flying,

PHOTO COURTESY FSF

Born in New York City, N.Y., on Sept. 26, 1902, Jerry is shown here at age 5 in his neighborhood, Washington Heights.

Jerome F. Lederer
1902–2004

coupled with technical problems, predominated as the cause of aircraft accidents that were taking the lives of so many pilots.

"We used the British de Havilland 4 biplanes-powered airplane. When we lost all those Air Mail Service pilots in the early 1920s, the usual cause of death was a fire following a crash. We built a concrete ramp with a concrete wall at the end of it, put these ships under full power, and let them go down the ramp into the wall. Slow-motion pictures showed that when the airplane crashed, the fuel spilling out of the tanks—which were carried up front in the fuselage—would go onto the hot exhaust manifold and start the fire. I drew specifications for new parts and developed test methods for new ways of operating the plane. I put out my first bulletin when I was with the Air Mail Service. We had a lot of crack ups, of course. We had a lot of spare wings but no spare fuselages. So my first safety bulletin addressed to the pilots said, 'If you do crash, please crash the wings first. Go between two trees and take the wings off. We have plenty of wings, but no fuselages,'" he told FSF.

While with the Air Mail Service of "helmet-and-goggled pilots," Jerry met Charles Lindbergh. The two men were working at Maywood, Ill., where Lindbergh flew for an airline carrying U.S. mail. Their first meeting involved a discussion about a silk parachute Lindbergh had used during a bailout, which ended in a field covered with grasshoppers. The parachute was full of great big, brown holes. Unbeknown at the time was the fact that grasshoppers exude a juice that burns through silk. The interests the two men shared in aviation developed into a life-long friendship. On the day before Lindbergh began his historic solo flight across the Atlantic, May 20, 1927, Jerry had this experience: "I went out to the field and I looked the airplane over. I did not have too much hope that he would make it. He did not ask me to look at the airplane. I just went out because I was a friend of his and I wanted to see it, to look the situation over." After the flight Lindbergh was called "Lucky Lindy."

Designer, fabricator, communicator

In June 1927, Jerry left the Air Mail Service and began a consulting career by forming his own company, Aerotech, in Davenport, Iowa, later that year. He did structural work on the world's first cabin monoplane that had, in his words, "very odd wheels that looked like baby-carriage wheels." His work involved some 48 changes in the structure of the airplane before getting it certified by the Aeronautic Branch of the Department of Commerce. He began work that led to having the design of the two-place Monocoupe accepted for certification, then helped convert the Velie automobile manufacturing plant into an airplane plant manufacturing the Monocoupe. He would later design the four-place Monocoach for Velie.

PHOTO COURTESY FSF

Jerry at age 25, just about the time he formed Aerotech in Davenport, Iowa.

His involvement in aircraft accident prevention began in earnest when he joined Aero Insurance Underwriters of New York in 1929. He became chief engineer in charge of loss prevention for one of the world's largest insurance companies. "I was in charge of accident risk analysis. I would go over the losses, and I learned a lot about what was happening in aviation that should not happen. I started writing a newsletter to keep our insured operators out of trouble. We reduced accidents. The newsletters made such a big hit that we used to send them by the thousands to airlines [worldwide]," he told FSF interviewers. In his lifetime he would write one book (*Safety in the Operation of Air Transportation,* Norwich University, 1938) and hundreds of papers and articles that are now archived in the FSF Jerry Lederer Aviation Safety Library.

"I put out my first bulletin when I was with the Air Mail Service. We had a lot of crack ups, of course. We had a lot of spare wings but no spare fuselages. So my first safety bulletin addressed to the pilots said, 'If you do crash, please crash the wings first. Go between two trees and take the wings off. We have plenty of wings, but no fuselages.'"

Jerry believed that risk management was a more useful term than safety. He often stated, "Risk management is a more-realistic term than safety; it implies that hazards are ever present, must be identified, analyzed, evaluated, and controlled or rationally accepted. Accepting the premise that no system is ever absolutely risk free or conversely that there are certain risks inherent in every system, it becomes an absolute necessity that management should know and understand the risks that it is assuming." For more than a decade, he helped reduce losses through safety audits and other programs.

PHOTO COURTESY FSF

Jerry Lederer, right, and C.R. Smith, president and CEO of American Airlines, at a celebration of Flight Safety Foundation's (FSF) 10th anniversary.

Aviation's first safety chief

By 1940 Jerry had attained a full-fledged reputation in the flight safety arena and was selected to become the first director of the Safety Bureau of the Civil Aviation Board, serving until 1942. As director, he was responsible for the promulgation and violation investigation of all civil aviation safety regulations and for directing all civil aviation accident investigations. During his tenure, Jerry laid the foundation and led the development of accident investigation procedures and regulatory standards. The principles and procedures he developed are essentially followed to this day by the United States National Transportation Safety Board (NTSB) and countless other government and military safety investigation groups. Indeed, the provisions eventually became a part of the U.S. contribution to standards, recommended practices, and guidance material in Annexes 1,6,8, and 13 of the ICAO Accident Investigation and Prevention Manuals as well as other documentation.

The rapid growth in aviation and the increasing emphasis on national regulations placed a heavy burden of responsibility on the Bureau. For example, the crash of a Douglas DC-3 over Lovettsville, Va., in August 1940 in which U.S. Sen. Ernest Lundeen of Minnesota died, along with 25 other persons, spotlighted the Air Safety Bureau and its handling of the investigation. After only 1 month on the job, Jerry came under great pressure to ground the DC-3, owing to alleged stall characteristics of the aircraft. At that time the DC-3 represented about 90 percent of the air traffic in the country. Jerry arranged to borrow two DC-3s from local air carriers, and the airplanes were sent to Langley Field, Va. Aerodynamics of the DC-3 were reevaluated as the CAB considered, and then rejected, the stall theory in the Lovettsville accident.

In recalling the incident for FSF, he noted that there was severe turbulence and lightening during the storm. Jimmy Doolittle, flying in the same storm in a light plane, reported the storm as the worst he had ever encountered. The CAB, in its final report, said that the probable cause of the accident was "the disabling of the pilots by a severe lightning discharge in the immediate neighborhood of the airplane, with resulting loss of control." Changes in DC-3 pilot training later were implemented.

Jerry said, "When a senator gets killed, all hell breaks loose. I was investigated by both houses of Congress.... I got my gray hair at that time. The Senate Committee on Aviation was pretty mean.... I indicated that perhaps he [Sen. Lundeen] might have been sabotaged...so they ended the investigation. We developed the wheel-landing system tail high so that the airplane would not be flying near the stall, and the DC-3 came to be a pretty safe airplane. So I did not have to ground it...."

During his years at the CAB, Jerry was involved with many safety advances. Two in particular involve the evolution of anti-collision lights and flight data recorders. Jerry received a report from the Air Line Pilots Association (ALPA) of a developing nighttime hazard involving DC-3s and the faster military aircraft being developed. The report said that military pilots could not distinguish the stationary lights of the DC-3 from city lights when the DC-3 was being overtaken in flight.

Jerry recorded this recollection, "Because ALPA believed we should do something about it, I started a project to test flashing lights. Some people in the Civil Aeronautics Administration did not

PHOTO COURTESY FSF

Jerry is sworn in as director of safety (1970) for NASA by Dr. George Mueller, associate administrator for manned space flight.

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think much of the idea and were fighting me…. We went ahead anyway. American Airlines loaned us a DC-3. We had several different kinds of flashing lights made and put on the airplane, on the tail, and also on the navigation lights. The way we judged the best intervals of the light/no light was to stand on the roofs of our houses at night and make notes while the airplane circled… that's was how anti-collision lights evolved."

Today's FDRs began with very primitive FDRs being installed on DC-3s owned by TWA and United. Jerry and his staff found the instruments very useful in their investigations and determined that FDRs should be in all transport airplanes by regulation. The decision was unpopular with ALPA and air carriers. "ALPA said that this was just nothing but a mechanical spy that would tell lies about the pilot. I put through the regulation anyway. A few weeks later a pilot was accused of flying too low….We proved by the FDR that he was flying at the correct altitude. He was a member of ALPA and that persuaded them to go along with the FDR. The airlines were a little harder. After I put the regulation through, World War II began and the airlines said the war effort…stood in the way of buying FDRs. The CAB rescinded the regulation," Jerry recorded.

The war years were an especially busy time for Jerry, as they were for so many others. In 1942, he was tapped by the U.S. Air Transport Command to serve as director of training within the Airline War Training Institute. In this position he had oversight responsibility for the training of more than 10,000 pilots and navigators and 35,000 aircraft technicians. Under his guidance, the command produced 15 textbooks in 15 weeks, including one on survival in the event of a crash in a jungle, in the ocean, or elsewhere. It was urgent to produce this textbook immediately because an aircraft carrier could not embark on its mission until the book was published.

He was later appointed to the United States Strategic Bombing Survey in Europe to evaluate the effectiveness of this strategy. Of this experience he said, "We learned that bombing of a factory was not always very productive because bombs could not damage the steel machinery very much, but would damage the brick walls and make the Germans in the area very angry. So they would all pitch in and build a factory again very quickly. The bombing of the oil industry in Germany was effective, because that reduced the amount of fuel going to the air force. We bombed the German transportation centers, their canals, railroads, and bridges and kept them from putting their war materiel together."

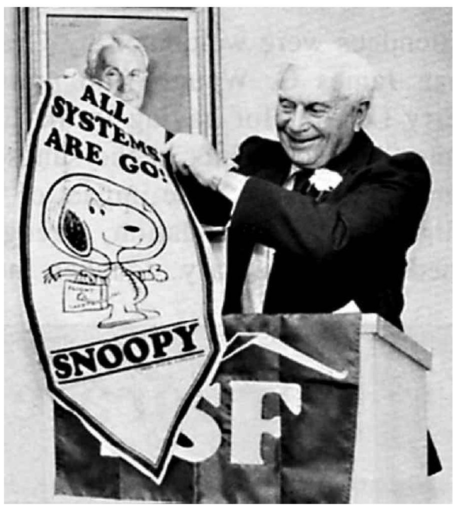

PHOTO COURTESY FSF

During Jerry's tenure at NASA, Charles M. Schulz's Snoopy was the astronauts' mascot, and they presented this banner to Jerry. Here he displays it just before presenting it to the FSF Jerry Lederer Aviation Safety Library in 1989.

Breaking new ground

Following the war, Jerry found a way to achieve his passion for sharing safety information; he established the Aircraft Engineering for Safety (AES). It disseminated safety information across commercial and national boundaries. The event leading to the formation of AES in 1947 was the crash of a TWA Lockheed Constellation resulting from an inflight fire that killed all occupants except one pilot. As a result of the investigation and public hearings into the crash, several flight safety experts recognized the usefulness of the Aero Insurance Underwriters safety bulletins, which Jerry had published. It was suggested that similar efforts would also be valuable to the entire aviation industry. "When word got around that I was starting up, some people said that I should not get into this stuff, that I would be sitting on a keg of dynamite, that it would ruin my career and that safety was not a saleable object—shows you how safety was a hard sell in those days. You mentioned safety and you scared people away. That is the big thing that I had to overcome—by diplomacy, mostly, and by not putting out things that would scare people," said Jerry.

AES merged with a group that was studying cockpit layouts from a human factors point of view. The merged group took the name Flight Safety Foundation (FSF). The first seminar drew only eight people, but the number grew to 50 at the second seminar and kept growing. The present-day FSF is rooted in the recognition that sharing safety information is vital to the health of the industry. Jerry's work has made the FSF a leader in influencing the formation of airline safety cultures and in implementing worldwide accident prevention programs.

While at the Foundation in 1948, he organized the first U.S. aircraft accident investigation course by a private organization, using former CAB colleagues as instructors. More recently, the FSF formed the industry task force for the prevention of controlled flight into terrain (CFIT) and approach and landing accidents. The FSF has been instrumental in assisting, and continues to assist, ICAO with the promulgation of standards and recommended practices and other prevention materials to combat CFIT. Jerry directed the FSF for 20 years and developed most of the programs for which it is noted, such as the worldwide exchange of prevention information, research projects, and safety seminars.

E. MARTINEZ, EDITOR

Jerry addresses the audience of ISASI 2001, held in Victoria, B.C., Canada.

These activities continue today. The FSF has established an extensive library in his name.

National roles

From 1950 to 1967, concurrent with his FSF leadership, Lederer was director of the Cornell University-Guggenheim Aviation Safety Center, whose mission paralleled that of the Foundation. The Center frequently highlighted significant areas for further research. In 1956, he was appointed to U.S. President Dwight D. Eisenhower's seven-person Aviation Facilities Investigation Group, which paved the way for the organization of the FAA and modernized the air traffic control system. And in 1965, Jerry represented the United States in supporting the ICAO Jet Transport Implementation Panel formed to evaluate the acceptance of the introduction of jet transport aircraft in international civil aviation.

Two years later, in 1967, following the tragic space capsule fire at Cape Kennedy in which three astronauts lost their lives, Jerry was invited to organize and become director of the new Office of Manned Space Flight Safety for NASA. At that time, he was 65 and had just retired from the FSF, having already earned the unofficial title "Mr. Aviation Safety" among his peers.

He told his interviewers, "I did not know what I was getting into, and probably would not have taken the position if I had known this would be the most complicated thing I could ever imagine. For example, the idea of getting to the moon by stages and then taking off from the moon, and meeting another stage in flight to come back to Earth was very foreign to me. If I had had anything to say, I would have said this was impossible, but it was done." Neil Armstrong and Jerry became good friends during the Apollo program. In recalling his time with Jerry, the astronaut said, "Jerry was a realist. He recognized that flight without risk was flight without progress. But he spent a lifetime working on minimizing that risk."

In 1970, having been awarded the NASA Exceptional Service Medal for his work in the Apollo program, he became director of safety for all NASA activities, responsible for the concept and execution of safety programs throughout the entire organization. He knew the daunting task of managing the risk associated with the complex NASA technology. His background of analyzing risk in the aircraft insurance field influenced his thinking and the terms he used to communicate his ideas about safety. He further believed that defining the task as risk management would help attract the caliber of personnel he wanted at NASA, because "it served as more of a challenge to mental resources than safety, because it stresses the uncertainties." His close friend, Charles Lindbergh, supported this view in a note written in 1969.

Jerry dedicated much of his free time to investigations of unique and challenging safety problems, such as drug abuse, subtle cognitive incapacitation of pilots, cockpit boredom, and interpersonal communications. He also served as chairman of the Crew Fitness Panel, SAE Committee on the Technology of Human Behavior. He is listed in *Who's Who in America*, *Who's Who in Engineering*, *Who's Who in Aviation*, *American Men of Science*, and the *Architects of the Age of Flight*. He was elected into the OX-5 Aviation Hall of Fame, the Safety and Health Hall of Fame, and the International Space Hall of Fame.

E. MARTINEZ, EDITOR

J. Lederer receives FAA award from FAA Adminstrator Marion Blakey.

Following his retirement from NASA, Jerry turned to academia to spread his safety beliefs. He served as adjunct professor and lecturer at the Institute of Safety and Systems Management at the

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University of Southern California. He actively lectured at various civil aviation safety seminars as well as at the United States Air Force Safety Center at Norton Air Force Base. He organized and conducted numerous meetings on aviation safety for the FSF, the International Society of Air Safety Investigators (ISASI), the System Safety Society, the National Fire Protection Association, the Institute of Navigation, the Society of Automotive Engineers (SAE), and the American Institute of Astronautics and Aeronautics; and he served as president emeritus of the International Society of Air Safety Investigators.

Following the Three Mile Island Nuclear Power accident, Jerry became a member of the Institute of Nuclear Power Operations (INPO) Advisory Council, a group mandated to enhance the safety of nuclear generations. He served two 3-year terms with the Council where he was instrumental in transferring aerospace risk-management concepts to the nuclear power industry. Jerry's fundamental accident prevention advice about incident reporting, team training, involvement of top management in safety issues, etc., became accepted as major parts of INPO's modus operandi.

Honors

As one might expect, many organizations bestowed membership upon Jerry, for example, Honorary Fellow of the Institute of Astronautics and Aeronautics Society; Fellow of the Aerospace Medical Association; Fellow of the Human Factors Society; Honorary Fellow of the System Safety Society; Honorary member of the National Academy of Engineering; Tau Beta Pi, Pi Tau Epsilon; Fellow of the Royal Aeronautical Society and Royal Society of Arts; Honorary member of the Institute of Navigation, the Air Traffic Controllers Association, and the Air Line Pilots Association.

Jerry received more than 100 honors including the 1999 Edward Warner Award, one of civil aviation's highest honors, from the Council of ICAO. In November 2003, he received the 2003 Cliff Henderson Award for Achievement from the National Aeronautic Association. In February 2003, he was selected as one of the Laurel Legends for 2002 by *Aviation Week & Space Technology*; the award honors individuals who have made significant contributions to the global aerospace field. In 2002, he received an honorary doctorate in safety science from Embry-Riddle Aeronautical University. Among his other awards are the NASA Exceptional Services Medal, the FAA Distinguished Service Medal, the Daniel Guggenheim Medal, the Amelia Earhart Medal, the Von Baumhauer Medal of the Royal Dutch Aeronautical Society, the Airline Medical Directors Award, and the Aerospace Life Achievement Award of the American Institute of Aeronautics and Astronautics (AIAA). In 1988, Lederer received the K.E. Tsiolkovsky Medal from the Soviet Federation of Cosmonauts. In 1965, he was awarded the prestigious Wright Brothers Memorial Award. The citation read, in part: "Aviation's extraordinary safety record to a significant degree is a result of the tireless and devoted efforts of Mr. Lederer. For 35 years, he has worked unceasingly to improve all elements of the flight safety spectrum and concentrated on making compatible the primary elements of flight—the man, the machine, and the ground environment—to ensure maximum safety. In accomplishing this objective, he has taken the leadership in correlating, coordinating, and improving the flight safety activities of the many varied organizations and agencies comprising world aviation."

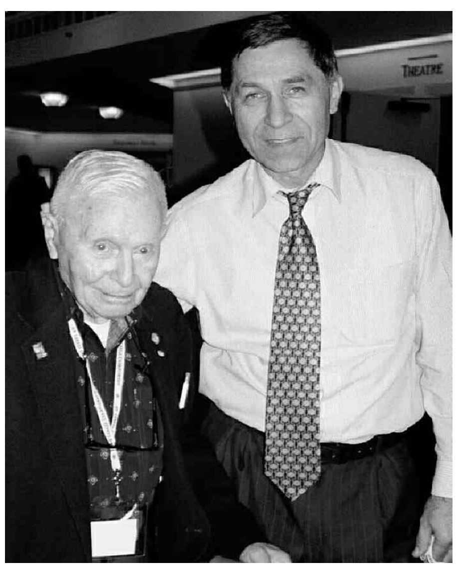
In May 1997, the U.S. Congress recognized the then 95-year old aviation safety innovator by bestowing upon Jerry the title "Father of Aviation Safety" and presenting him special congressional recognition for his numerous achievements and outstanding service toward the improvement of aviation safety for all Americans.

But if the Father of Aviation Safety, with all he accomplished, didn't believe that title described him, what did he think did? He once said that the following words from an FSF Distinguished Service Award, which he received in 1967, best defined his career: "For pioneering the flight safety discipline at a time when it was all but unknown, and for pursuing the objective of safer flight with a singular dedication, wisdom, and courage. His belief in, and application of, the sharing of flight safety information and experience formed the cornerstone of the effort." ◆

Jerry is survived by his wife, Sarah; two daughters, Susan Lederer of Santa Rosa, Calif., and Nancy Cain of Oklahoma City, Okla.; and two granddaughters, Melissa Cain and Bryn Cain, both of Oklahoma City. The family has asked that in lieu of flowers, contributions may be made to the ISASI Rudy Kapustin Memorial (Scholarship) Fund. At press time, contributions from the following have been received: John X. Stefanki, Theodore J. Banick, Association of Professional Flight Attendants, John W. Purvis, Rebecca Finnerty, Stephanie A. Moray (CPA), and the ISASI Mid-Atlantic Regional Chapter. ◆

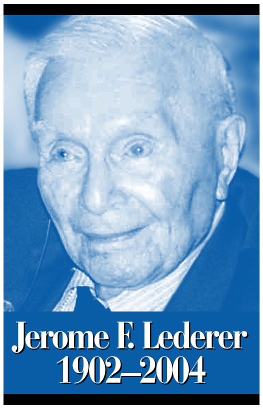
Singular dedication, wisdom, and courage—Jerome F. Lederer (1902-2004).

PHOTOS: E. MARTINEZ, EDITOR



Jerry and ISASI Moments

Intermixed in this montage are scenes of Jerry participating in some recent ISASI annual seminars. He always took a front-row seat, peppered questions at speakers and panel members at appropriate times and addressed the delegates when the need arose. He delighted in meeting and posing with members who spoke with him. When in attendance he always participated in the presentation of the Jerome F. Lederer Award, speaking knowing words of the recipient's deeds and retelling in a light manner some of his experiences related to the subject of the award.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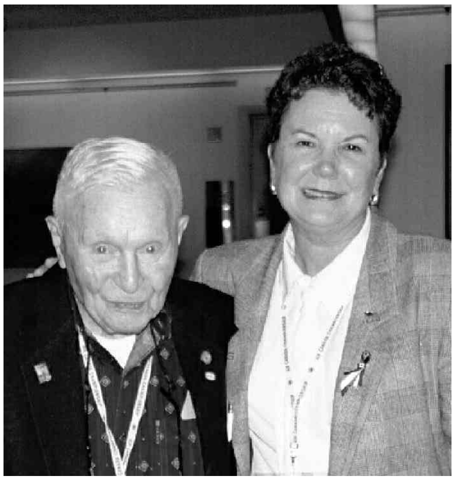

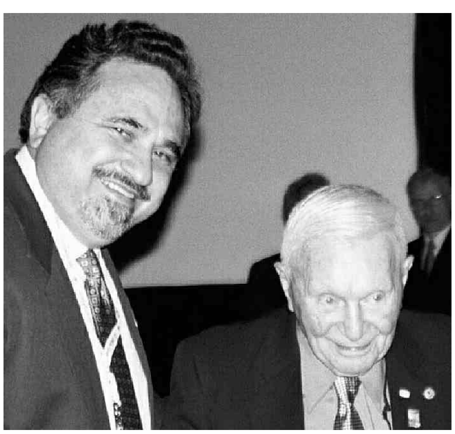

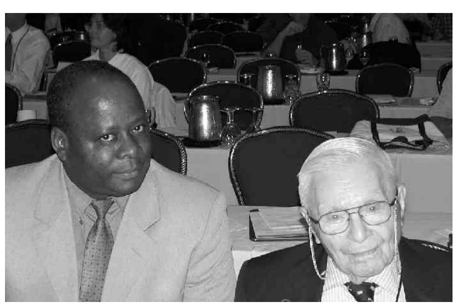

Safety Innovations, Solutions Show Contemporary Relevance

Excerpts from some of his best-known writing provide insight into the concerns and perspectives of Jerome F. "Jerry" Lederer.

By the FSF Editorial Staff

(This article in tribute to ISASI's President Emeritus is adapted and reprinted with permission from the Flight Safety Foundation's Flight Safety Digest, Special Issue: Jerry Lederer—Mr. Aviation Safety, *August-September 2002.—Editor)*

Jerome F. "Jerry" Lederer, president emeritus of Flight Safety Foundation (FSF), envisioned solutions to aviation safety problems throughout his career and retirement years. In speeches and articles, he suggested methods for worldwide exchange of aviation safety information, for counteracting complacency among pilots of highly automated aircraft, for real-time remote monitoring of pilot/aircraft performance via telemetry, and for alerting flight crews to signs of fatigue—to name a few examples. Following are excerpts from some of Lederer's papers, articles, stories, and solutions, and a few comments by others about him.

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In "Loss Prevention in Non-scheduled Civil Aviation"—presented to the National Aircraft Production Meeting of the Society of Automotive Engineers in Los Angeles, Calif., Oct. 13-15, 1938—Lederer said, "Human nature is so constituted that improvements in design are employed not to achieve safety but to take advantage of the greater utility which such improvements usually afford. A pilot may obtain an airplane with which it is possible to get in and out of a very small airport. Instead of considering this an emergency operation, he takes advantage of the design to actually operate regularly from such airports. This is a foible of human nature and is very much to be commended for its effect on design but its effect on accidents is not favorable, except indirectly. Improvements in design usually make flying easier or make it more useful, thus inducing more people to fly. The mileage flown per accident seems to increase with greater use; hence the indirect influence of improvements on safety records. However, on the basis of number of airplanes per accident, the future seems pessimistic. It must be admitted that the human element creates a greater hazard than the airplane itself."

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"Strange as it may seem, a very light coating of snow or ice, light enough to be hardly visible, will have a tremendous effect on reducing the performance of a modern airplane. Although this was known in Canada for many years, only in the last three years has this danger been recognized here. It occurs only when the ship is on the ground, and makes takeoff dangerous. To avoid this danger, the airlines cover the wings with tarpaulins, or they make certain that all ice is off before the airplane is allowed to depart." (From "Safety in the Operation of Air Transportation," a lecture under the James Jackson Cabot Professorship of Air Traffic Regulation and Air Transportation at Norwich University, April 20, 1939. Quoted in U.S. National Transportation Safety Board [NTSB] *Aircraft Accident Report NTSB/AAR–93/02, Takeoff Stall in Icing Conditions, USAir Flight 405, N485US, La Guardia Airport, Flushing, New York [U.S.], March 22, 1992.)*

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Lederer's 1939 book *Safety in the Operation of Air Transportation*—published by Norwich University, Northfield, Vt.—was written to show the relationship between technological developments and safety at a time when other books in the field focused on advances in aircraft speed, payload, range, and efficiency. The following examples in the book reflect timeless safety principles or show how far aviation safety has evolved:

- "To discuss safety in air transportation is difficult because it is so intimately connected with human nature and weaknesses.… It is unfortunate for the sake of safety that human nature is so constituted that instead of using a device as a safety measure we like to use it to increase our efficiency."
- "Undoubtedly, our airlines are not yet as free from danger as are our railroads, and it may be some time before they are. But, on the basis of passenger miles flown, it is safe to say that traveling in an airplane operated by one of the airlines approved by the Civil Aeronautics Authority is no more hazardous than traveling in the ordinary passenger automobile."
- "There is, therefore, an economic limit to safety in terms of equipment. But we are willing to risk riding in these [twin-engined transport] airplanes because we believe that the airplane personnel is so organized as to take every reasonable precaution to see that the engines will not fail on the takeoff, that the airplane is taken off in such a way as to reduce that critical period [of risk of failure of one engine] to a minimum, and, if any doubt exists regarding the safety of the flight, the airplane will not be permitted to take off at all.… Whatever the equipment lacks in safety is assumed to be restored by adequate organization and managerial policy to achieve safety.… The ability to maintain altitude with a full load on one engine was probably the greatest factor in advancing the safety and reliability of the modern airplane.… Since there were 1,246 powerplant failures of minor and major degree in 1936 and 1937, the need for multi-engined equipment for safety is obvious."
- "With the introduction of high-speed ships [aircraft] came the necessity of

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more thorough training of pilots because less time was left to think or to react in emergencies."

• "In the early days of scheduled transportation from 1922 to 1925, one pilot was killed for every 10,000 hours of flying. Most of the fatalities were caused by bad weather. The pilot would take off ignorant of the weather ahead because of lack of adequate weather stations. If the weather at his point of departure and at a few points along the route happened to be good, he would risk the flight. In fact, in the early days the airmail operations were based on the slogan, 'The mail must fly.' This slogan probably caused more deaths than any other policy in aviation."

• "Although pilots are able to fly successfully by instruments in bad weather, the airlines have mutually agreed that no such flying should be undertaken, either over the top or through clouds, if the distance between available landing areas is greater than 100 miles. This means a maximum of about 40 minutes of flight on instruments. If there is any indication that the pilot will have to fly on instruments greater than this distance with unlandable weather below him, the flight is not undertaken. This is a safety policy of the first magnitude, which should be credited to conservative and cooperative airline executive policy."

• "The flight analyzer, a recording barograph which automatically records altitude, the operation of the automatic pilot, the time and frequency of radio transmission, and vertical acceleration, is another aid which standardizes and controls flight operations, supplies proof that the trip was flown as planned, and indicates proof of the rate of climb and descent in case passengers complain. It can be made to record many other flight factors."

• "Initial developments inside laboratories with a few months in the field on experimental airplanes cannot possibly compare with practical tests made on rigorous airline schedules day in and day out through all four seasons."

• "Safety is defined as freedom from danger or risk, but wherever people come in close contact with an object which under human control moves fast, or is associated in any way with kinetic or potential energy of high value, such as an automobile, a train, or an airplane, the public must realize that it is practically impossible to achieve absolute freedom from risk. Conversely, whatever freedom from danger does exist is obtained through careful maintenance to preclude failure of material and through a high degree of control while the vehicle is in motion. No matter how many safety devices are installed in a machine, adequate maintenance and proper control achieved by organization remain the essence of safety."

• "It is unfortunate that much of the necessary, careful maintenance procedure and flying control has been obtained only through sad and costly experience. The lessons from these had to be, and continue to be, intelligently and immediately applied to avoid recurrences [of accidents]."

• "Another instance, also in the early days of the airmail, is worth noting. A steady series of accidents had occurred, in every case the pilot being killed and the ship destroyed without leaving clues as to the cause. Finally, one crash occurred in which the investigators found that the pilot had inserted a metal pencil of the common automatic variety through a bolt hole in a fitting which connected the control stick to the control assembly. The investigators concluded that the bolt which had been there had sheared in flight and the pencil was the only object that the pilot had to replace it. The pencil, too, broke off and fell out while the pilot was too low to adjust [for] the trouble again, and he crashed. Evidently, the cause of this accident and of the previous similar accidents was the weakness of that bolt attaching the control stick to the control assembly. When this was discovered, the bolts in every plane were increased in size, eliminating [that] bolt failure as the cause of [other] accidents. It is unfortunate that many pilots had to lose their lives before this weakness in equipment was discovered."

• "Standardization of equipment reduced the maintenance problems and created greater opportunities for the airlines to exchange mutually useful information regarding the safe operation of their ships. The establishment of semi-annual maintenance meetings to which all the airlines sent representatives to discuss maintenance problems was one of the greatest cooperative ventures for safety in the recent history of transportation."

• "Another airline is studying methods of reducing danger from birds striking the windshields in flight. Following several cases of considerable damage from striking birds, reinforcements in the windshield posts were made to reduce the seriousness of these collisions. Another airline is using bullet-proof glass."

• "The gradual adoption [by airlines] of conservative practices by mutual agreement, coupled with more certain methods of forecasting weather, has enormously stimulated safety, especially in winter."

• "Serious accidents, especially if they cannot be adequately explained, awaken the fear against flying which is inherent in most of us. This means loss of passenger revenue, idle airplanes, and curtailment of business growth. Furthermore, the investigation to determine the cause of a serious accident may often cost more money than the value of the equipment lost."

• "Accidents are costly because they involve loss of personnel, loss of equipment, discouragement of passengers, expensive investigations, the threat of idle equipment, and higher insurance costs. Conversely, an airline that builds a reputation for safety and dependability will find its costs lowering due to greater use of equipment and personnel, and in every way stands to gain economically through safety."

• "To overcome this dangerous tendency [paying pilots for each hour flown], the airlines, in the bad winter months, pay the pilots according to a fixed scale regardless of the amount of flying they do. They have thus, through economic means, eliminated the psychological pressure to go through bad weather. The psychological aspects of safety are as important as maintenance and operations."

• "Besides experience, the pilot should have a clean record, with no accident of a serious nature within the previous five years, unless the accident could not be attributed to him. But even if he should be the victim of a series of accidents through no fault of his own, he would probably not be hired. There is no reason for denying him a position except that he is running in bad luck, and why take a chance?"

• "Forms fix responsibility. The fixing of responsibility is as important for safety in airline operation as are good equipment and trained personnel. In a well-operated airline, no move is made without having it recorded on a form. … Verbal orders can be forgotten, there is no verification of their issuance, and they reach only a limited number of people."

• "The meteorologist assumes that the worst conditions will prevail and so informs the pilot and dispatcher. This philosophy of preparing for the most unfavorable conditions in doubtful weather, being humble in the face of uncertainty, is highly important in achieving safety."

• "The recently established [Air] Safety Board should also have a marked influence in spreading the gospel of safety by reason of its independent studies of accidents and the recommendations which follow."

• "The future should bring an accelerated record for safety because of refinements in powerplant construction, such as direct-injection carburetion; improvements in cowling and in fuel and oil installations to reduce fire hazards; stall warning indicators; use of anti-stalling devices; improvements in wing sections; improved performance with partial powerplant failure; better undercarriage structures; more accurate altimeters or terrain clearance indicators; radio static elimination; larger airports with clearer approaches; advances in our knowledge of vibration prevention; continuous research in structures, aerodynamics, meteorology, and metallurgy; improved methods of orientation and navigation; and especially study of pilot psychology and fatigue."

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In "Loss Prevention Programs in Civil Aviation"—presented to the Air Transport Design Session of the 16th annual meeting of the Institute of the Aeronautical Sciences, New York, Jan. 26-29, 1948—Lederer said, "The airline safety record by any yardstick appears well within magnitudes of safety acceptable to the public. Nevertheless, the airlines have a moral obligation and, as long as there are newspapers, a financial incentive to continue to make it safer.… An immense amount of aviation safety literature has been prepared. There are pamphlets, posters, motion pictures, safety codes, and books. They are almost always directed at the pilot. He is subjected to a continuous bombardment of safety signs and slogans. By and large, they reflect the weaknesses and deficiencies in design or especially training which he is asked to overcome.… Perhaps some of the money and energy being spent on improving the pilot might give greater value if directed toward the design engineers, the instructors, and even management. They certainly are no less human than pilots and therefore should eventually succumb to a safety program directed at them."

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Around 1950, Lederer wrote the Pilot's Code and the Mechanic's Creed to embody values and responsibilities of the two professions. He later wrote in an Air Mail Pioneers publication, "The creed was adopted by the U.S. Air Force Military Air Transport Service and was posted on cockpit doors and pilot ready rooms."

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In "Observations on Flight Safety"—presented to the Society of Automotive Engineers Annual Meeting in Detroit, Michigan, Jan. 8-12, 1951—Lederer said, "Our answer to the problem of securing information on near-accidents is to have a place where personnel can confess without being ridiculed or punished or [required to] publicly cast [a negative] reflection on fellow workers. A flight engineer not so long ago related how the pilot and copilot, in using the checklist preparing for an approach, had neglected to read the gauge to get the hydraulic pressure. It was not the flight engineer's function to read the hydraulic pressure but as a matter of curiosity he did, because the gauge was of a new type; much to his surprise, it read zero pressure. He immediately informed the captain, who declared an emergency. A safe landing was made but the results could have been disastrous. He discovered that the captain was responding to the challenges on the checklist by habit rather than by actually checking the instruments and controls. He could not tell this to management without crossing the captain. The captain did not consider that it warranted further attention.

"… Pilots are hesitant to report near collisions with other aircraft for fear of the punitive action that might follow. But such statistics on near-accidents should be known if accidents are to be reduced. A way should be found to confess without jeopardizing one's career. Information on potential accidents is often obtained by casual gossip.… For example, a captain checking his [instrument landing system flight] path under [ceiling and visibility unlimited] conditions found that [the flight path] was considerably in error; the cause was determined to be some disturbance in the ignition system. At that time, few if any pilots realized that such disturbance could throw off the ILS [cause erroneous indications] even though the instruments would indicate normal functioning. In a casual way, he mentioned his trouble to a fellow pilot a few weeks later. Eventually, it got around to management. Such important information should not be allowed to migrate, it should be propelled.

"…The industry often prefers to move slowly in safety matters and for good reason. The government does not have to live with the safety measure as the airline does. The airline may not have the personnel required to service properly a safety device; it may have had unfortunate experience with previous hasty adoption of a safety measure; it may lack the manpower to study the numerous safety ideas that are always being advanced; it may have huge sums invested in the old way of doing things with a good record [so that] it may not be convinced on a safety measure; and there is always the point that if only limited funds are available for safety, who has the wisdom to decide with certainty where it should be spent most profitably to obtain the greatest safety."

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In handwritten notes after an address titled "Infusion of Safety into Aeronautical Engineering Curricula" before the Third International Conference of the Royal Aeronautical Society of Great Britain and the Institute of Aeronautical Sciences of the United States, Brighton, England, Sept. 3-14, 1951, Lederer wrote, "I had to show that mistakes in design were being made. I used topics from [Cornell-Guggenheim Aviation Safety Center] design notes. Nowhere did I use the word 'American,' but the *London Times* next morning published on page two 'American Engineers Make Mistakes,' in

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bold type. Christopher Clarkson, the British air attaché at the Washington [D.C., U.S.] embassy, offered to meet with the editor to make amends but I felt it would prolong the agony. It took two years for me to live this down! Very embarrassing!" In the address, he said, "Anyone venturing into this complex field should do so with great humility and restraint, but a beginning should be made if for no other reason than that others can either build upon it, or tear it down, and in doing so establish a science of accident prevention in aviation."

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In "Reduction of Aircraft Accidents"—presented to the Air Research and Development Command Flying Safety Conference, U.S. Air Force, Baltimore, Md., Sept. 15, 1954—Lederer said, "When an engineer comes across a design problem that might, with further attention, be made functionally simple to maintain or operate without the need for literature or extraordinary precautions, he is often prone instead to put another page in the operations or flight manual, hoping that it will be read. … If he drops a pencil [in the college laboratory], there is no danger of jamming a control. So that on top of being literate, the engineer is poorly oriented by his college training for an adequate appreciation for good human engineering. … The rapid growth of the aviation industry has required experienced talent to be spread very thinly [among] young engineers who have been brought in. It is hardly considered intelligent to repeat errors made in the past, but with pressure on the engineer to produce, [errors] may be excusable so far as the individual is concerned, but not from the standpoint of the organization. When the thoroughly competent designers who have learned their safety lessons by sad experience are moved up to higher administrative posts, they often leave a void in which the upcoming generation must learn again the sad way."

"Most flying operations involve routine procedures. This leads to the grave danger of complacency.… Safety is an outgrowth of good management. It requires active encouragement of the top echelon of management. Complacency is overcome by constant supervision, constant pressure. Therefore, it is better to stress the proper way to accomplish a job rather than to show mistakes; the positive approach, rather than the negative. The exception is where emphasis is needed to combat the special safety problems created by complacency. Because air safety is so complex and its problems are so changeable, this requires shifting emphasis by an alert management. The tools at hand may be humor, grim incidents, random checks by high authority, but most importantly, close, constructive personal contacts between well-qualified specialists (who may be supervisors) thoroughly sold on safety and the people with whom they are dealing."

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In "The Progress and Challenge of Air Safety"—presented Dec. 9, 1954, to the Nederlandse Vereniging voor Luchtvaarttechniek, Netherlands—Lederer said, "It is an honor for an American to be asked to speak on air safety in Europe, especially in view of your longer tradition of carrying passengers by air than ours in America. But safety should have no international boundaries.… I should like to say that I do not consider myself an expert in air safety and I believe there are no experts in this phase of aviation. Safety covers too broad a field, and the art of aviation changes too rapidly for any person to consider himself to be an expert. The best one can hope to be is a good student of the subject."

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In an undated paper (circa 1957) "Problems in Promoting Air Safety," Lederer said, "While in one way the threat of litigation tends to subdue the circulation of safety proclamations, in another way, litigation impels management to keep abreast with the state of the art. Backwardness and omissions in adapting safety measures furnish ammunition to the opposing lawyer for accusations of negligence. Judgments based on negligence can run into millions of dollars. However, some managements are more alert and progressive than others in seeking and accepting safety developments. The less progressive are often blamed for placing costs above safety. I am more inclined to feel that complacency or lack of information at the top management level is the cause of most deficiencies that may exist. I cannot bring myself to believe that responsible management is less morally conscientious than myself or this audience. I prefer to believe that where backwardness exists, it is due to either lack of recognition of the importance of adapting a safety development or honest differences of opinion of the kind that persist between pilots themselves as to standard color for lights to warn of propeller malfunctioning."

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In "Une Initiative Americaine," dated April 3, 1959, Lederer said, "As a member of the ICAO Jet Implementation Panel, the director of the Flight Safety Foundation was surprised at the progress that had been made to plan for and implement the elements necessary for safety in aircraft operation. Unfortunately, this was true mainly of the technically progressive nations that have always been so oriented. The governments of many technically undeveloped nations are properly concerned with providing minimum social services for their people —schools, highways, hospitals—but apparently fail to recognize that funds provided to facilitate air operations will enable them to accelerate their economy and thereby expedite the provision of improved social services to their people.… [The Foundation's] main objectives are to combat complacency (which often is the outgrowth of a good safety record), to refresh the memories of pilots and mechanics to safety lessons they may have forgotten, call their attention to new techniques, and plead with them always to remember their tremendous responsibility to their fellow men.… The fact that the Flight Safety Foundation has requests for one million bulletins per year from airlines indicates it fills an important gap. The Flight Safety Foundation enjoys a freedom of expression and a liberty of action which is often denied a government organization or an industry association."

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In "Observations on Safety"—presented to the Radio Technical Commission for Aeronautics Meeting, Atlantic City, N.J., Oct. 15, 1959—Lederer said, "A proximity-warning device or collision-avoidance system would be a partial antidote for the uncertainties of air traffic control, at least for enroute operation. Furthermore, in many parts of the world there will be no air traffic control complex for a long time; therefore, a proximity-warning system or a collision-avoidance device seems enormously desirable. The problems inherent in developing an anti-collision device are tremendous, especially if the perfect device is demanded. Perfectionists find no solution for any difficulties and find a difficulty in every solution. The search for perfection may lead to unnecessary development delay and to collisions. Only 8 percent of collisions are head on. Why wait to solve the head-on problem if 92 percent can be avoided? On the other hand, the device should not create more hazards than it eliminates."

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In "Airports and Safety"—presented to a symposium called The Issues and Challenges of Air Transportation, sponsored by Connecticut General Life Insurance Co. Nov. 1-3, 1961—Lederer said, "The number of landings per fatal accident has improved in the past 10 years about tenfold. The absolute number of fatal accidents, as distinct from the rate, continues to be serious because the number of landings in 10 years has more than doubled. In respect to the airport and the operators of aircraft, about 30 percent of all accidents in transport operations occur in the approach-and-landing phase. A very high percentage of these can be attributed to inadequate facilities at the airport.

"…The problem of the landing aircraft can be attacked by giving the pilot the aids he needs during the critical time of landing so that even if he is an expert, he will be less prone to undershoot or overshoot. As a body, the professional pilots indeed are experts, else they could not have established a safety record which provides life insurance at the same rate as a chess player. However, they represent a cross-section of the population, with all the human frailties this implies: Their competence will vary; they have good days and bad days. It is not sound to assume that all pilots are continuously at their peak performance. Automatic all-weather landing systems should improve the situation where airports and aircraft are equipped with these devices after their reliability is proven. Airports are also used by less-expert pilots flying without sophisticated instrumentation. Both the sophisticated [pilot] and the ordinary pilot will continue to depend on proven aids and flight-oriented [air] traffic controllers to reduce the possibility of pilot misjudgment."

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In 1962, Lederer presented the Daniel Guggenheim Award Medal Lecture during the American Society of Mechanical Engineers (ASME) Aviation and Space Conference in Washington, D.C, "Perspectives in Air Safety," which included the following excerpts:

- "Civil aviation cannot exist without being safe. … The worldwide air transport system is a technical triumph of the first magnitude."
- "Even in the case of a public carrier, however, the law cannot attempt to protect the passenger against every risk without closing the frontiers of progress. To encourage engineers and designers to exercise their imagination and ingenuity in the design of aircraft, the civil air regulations are phrased in broad objective terms. This provides considerable latitude for the designer and results in variations in safety. By and large, the industry continues to offer improved aircraft and equipment. Many manufacturers and airlines are not content to comply with the letter of the law; they go far beyond it voluntarily, to follow the 'intent' of the law in adopting safety devices and procedures. Others hew strictly to the letter of the law or regulation.

"Because of this, one may find that designers have improved safety in one respect and not in others. An example is the regulation that requires that passenger emergency-exit markings shall be illuminated with an emergency power supply independent of the main electrical system. This is done to [en]sure that if a crash occurs in darkness, the occupants have an independent source of light. In most air transports, each light has a separate battery to power it, but the regulation does not specifically demand this discrete protection, so one may find only one battery supplying all the emergency lights—and this one battery located in the nosewheel well of the airplane, the place most likely to suffer disintegration in a crash! The letter of the regulation but not the intent of the regulation has been satisfied in this case."
- "People will live or die on the basis of decisions made by engineers or by the superiors to whom they submit their plans. The pressures which militate against safety, the urgency to meet a design deadline, fear of competition, production problems, and financial commitments tend to distract the engineer from his responsibility for the safety of the public. The engineer with a conscience and a sense of public responsibility will meet many occasions and situations where his convictions and principles will be put to the test. A thorough study of the total cost of risk in terms of insurance, lost revenue, legal expenses, public acceptance, and other losses has never been made. It might help alter the emphasis on performance and assist the engineer in resolving his dilemma."
- "The infrastructure of aviation never seems to catch up with the needs of the aircraft. It has been common in the past for each new generation of aircraft to be operated under conditions not even entirely satisfactory for the aircraft they replaced.… The personnel and financial requirements of the aviation infrastructure compete with roads, schools, hospitals, housing, and industry. Operational efficiency and safety suffer as a result. … The civil airspace is not a fitting place for political antagonism, rather it is a place for harmony, cooperation, and coalition."
- "The Flight Safety Foundation expects to revive its dissemination of specific information on lessons learned. It started this in 1948 but had to abandon it because some felt its reports might fall into hands that would use them against the organizations which supplied the information."
- "It is not unusual for many years to pass before a proven safety device is adopted.… These lags perhaps result from the need for technological statesmanship, for the ability to recognize the total value to the industry, and society of accelerating the adoption of a seemingly costly device or standard procedure. This is a more charitable view than ascribing lag to the egocentric attitudes of decision-makers."

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In "Reflections on Human Factors"—presented to the Aviation Contractors Safety Conference Jan. 28-30, 1964, in Virginia Beach, Va.—Lederer said, "My reactions to the material I scanned [in preparation for this presentation] was first a feeling of inadequacy to deal with the subject of human factors in view of the massive tomes

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of knowledge which have been produced especially in the last few years, and secondly, a feeling of satisfaction that so many fresh, capable thinkers were devotedly engaged in this field, producing much more information than I had time to read.… Then I reflected on my slowness in helping to spur the development of human factors as such and this line of thought led to other opportunities I have missed in the development of air safety.… In regard to other fields of human factors which I missed, I reconcile my conscience and my pride by rationalizing that a large part of my efforts from the late 1920s up to the war [World War II] were devoted to trying to influence men's attitude towards safety in design, operations and maintenance; to show them that skill alone will not save them from trouble; that judgment, alertness, apprehension, or foresight are also necessary, and especially a sense of responsibility to one's fellow men. This is dealing in human factors in a broader sense than what we have in mind today when human factors is mentioned."

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In "Safety Briefs on SST [Supersonic Transport]"—presented to the Society of Automotive Engineers National Aeronautic Meeting, New York, N.Y., April 27-30, 1964—Lederer said, "To this day it has been estimated that fewer than 15 percent of the world's airways are geared to jet requirements. The funds to install, maintain, and operate ground support equipment have not been made available. Jet aircraft are flying in some areas of the world where ground support is barely good enough for DC-3s. Jet pilots are required to orientate themselves on approaches to airports by nondirectional beacons. Folios of reports are available which list the deficiencies of ground support in all areas of the world. The problem is mainly one of economics for the less wealthy nations of the world. Hospitals, roads, schools, and other social services have priority over aviation.… A considerable number of jet accidents have remained unexplained. In some cases, the reasons may be known to the bureaucracy of the nation where the accident occurred. The information has been withheld, perhaps, for political purposes, for pride, or for some other reason of policy.… The huge investment, the many innovations in SST, the unexplained subsonic accidents support the need to improve methods to determine accident causation.… Essential information should be obtainable, not only by flight [data] recorders alone but, as in missile flight, by telemetering the data to the ground. The vast amount of telemetered data need not be retained more than a brief period unless an accident occurred. The data then would be available for accident analysis. Satellites might be used to transmit telemetered data."

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In accepting the Wright Brothers Award from the U.S. National Aeronautic Association on Dec. 17, 1965, in Washington, D.C.—Lederer said, "The outstanding lesson to be learned from the open-mindedness of the Wrights is that civil aviation should not arbitrarily reject a proven device or technique. Aviation history is studded with ideas that were not accepted, later to be regarded as indispensable. The flight data recorder is a good example.… In brief, expeditious recognition of proven techniques or devices and a means for monitoring discipline will accelerate a rise in the level of safety. A corollary to this is to expedite the exchange of accident prevention information, especially the information learned from incidents.… But there are several developments on the horizon which promise to improve transport safety by several orders of magnitude: the installation of modern navigation and approach aids in underdeveloped areas; and automatic approach devices, if successful, should reduce the fatal accident rate by perhaps 30 percent. The prospects of preventing fires following a survivable type of crash are good, and they should cut fatalities at least another 50 percent."

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In an untitled paper presented during the Canadian Industrial Safety Association Conference in Toronto, Ontario, Canada, Sept. 18-19, 1967—Lederer said, "In my position [as director of manned space flight safety for the U.S. National Aeronautics and Space Administration (NASA)], I must attract scores of technical specialists to help with the complex problems of space. Specialists in structures, chemical engineers, civil engineers, reliability experts, test pilots, and many others. The word 'safety' carries no romance; it is the absence of danger or risk, and as I said before, it denotes only a small segment of the total problem—protective equipment.

"Furthermore, the word 'safety' implies protection of lives. Many activities involve great risks of prestige and resources with minimum or no risk to life. Unmanned space operations fall into this category. The phrase 'loss prevention' covers both life and property. But to attract the kind of required talent, and for logical reasons, the word 'safety' is being supplemented by the phrase 'risk control.' This rings with challenge, with measurement, with analysis, with action, with status. In discussing this concept with Dr. Wernher von Braun and his staff, the phrase 'risk management' was proposed as a better alternative. Either one is a more satisfying definition of the true responsibilities of a safety engineer than 'safety,' I feel."

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At the same conference, Lederer said, "[Systems safety engineers] must learn from the experience of others because they will not live long enough to make all the mistakes themselves. Preconceived opinions and intuitive judgments are often proven to be wrong when weighed against the cold hard facts of service experience."

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In "Ideal Safety System for Accident Prevention"—presented to the Symposium on Air Safety, sponsored by the Journal of Air Law and Commerce at Southern Methodist University, Dallas, Tex., April 22-24, 1968—Lederer said, "Negligence results from attitudes, the most important single factor in reducing losses. Complacency, carelessness, incapacity, arbitrary rejection of suggestions because of pride, apprehension, or suspicion, deliberate departure from accepted good practices (which occurs even in the face of excellent training), the nature of pressures exerted on management, and by management in design and operation hinge on attitudes—attitudes of individuals, attitudes of society, attitudes of the government, of shareholders or industry associations, of unions, and even of the man who sweeps the hangar floor.… Over the years which I have been engaged in aviation, nothing has given me more gratification than acceptance by mechanics and many pilots of codes prepared for them."

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In his keynote address to the Government-Industry System Safety Conference at Goddard Space Flight Center, Greenbelt, Md., May 1-3, 1968—Lederer said, "Several problems remain to be solved before a lunar landing can be made with reasonable chances of safe return to Earth. Longitudinal vibration, powerplant reliability, space suit modification, and lunar landing techniques are among the prominent subjects receiving concentrated attention. Time is a major factor. Once basic research is done, however, time schedules are not undesirable restraints if they are within manpower capabilities. Establishing a target date induces tight organization, drive, and spirit; it creates momentum and compels identification and attention to significant factors, establishes motivation. It acts as a goad to a goal. The target was set by the White House seven years ago and was recently reemphasized in a presidential address at Houston [,Tex.]. However, the loss of time as a result of the [fatal Project Apollo space-capsule] fire of Jan. 27, 1967, has left its mark. The lessons of the fire have, of course, been learned. Corrective action has added some 2,000 pounds to the weight of the spacecraft and this, too, creates problems. Apollo will be operated with reasonable assurance of success even if a new target date has to be set."

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On March 16, 1969, Charles A. Lindbergh, known worldwide for his 1927 solo flight from New York to Paris, France, wrote the following letter to Lederer, who was then director of manned space flight safety for NASA: "You have written that I should not bother to acknowledge the items you send from time to time, and probably I will usually take you up on this (with many unstated thanks) because my mail piles up in amounts that I simply can't cope with in the hours I devote to it. But I am so impressed by, and interested in, your paper on 'Risk Speculations of the Apollo Project' that I can't resist writing and telling you so. Anne and I have both read it with fascination. I have always felt that risk should be related to objective, and you have handled this relationship beautifully."

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In "Human Error Will Persist—Can Its Effects Be Minimized?" (Flight Operations, 1976)—Lederer said, "Management is monitored. Congressional oversight committees monitor the [U.S. Federal Aviation Administration (FAA)], the FAA monitors the airlines, the media also monitor the aviation industry by publicity given to accidents. But day-to-day cockpit performance has not been monitored until fairly recently. Several airlines now use flight [data] recorders for this purpose. It is done with the consent of the flight crews under carefully controlled conditions which accentuate lessons learned while punitive measures are eliminated. The results have benefited safety.… It is a tribute to the cooperative attitude of managers of aircraft (pilots) that a form of acceptable flight monitoring has been evolved on several airlines. It would appear to be the way of the future to intercept unaware, unintentional, or deliberate departures from good practice before they become fatal. Incidentally, this was proposed at an air safety conference way back in 1937."

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In a January 1978 paper, "The Flight Safety Foundation: Early History," Lederer said, "At its peak, the Flight Safety Foundation had 65 employees." He said that the Foundation's accomplishments to date included the following:

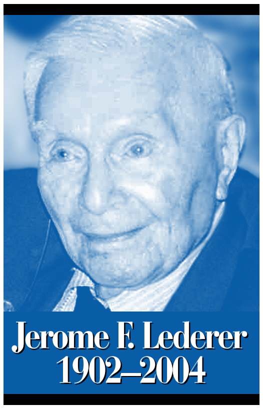
- "The Foundation initiated collection and dissemination of mechanical-malfunction reports in 1947, now accomplished by the U.S. Federal Aviation Administration;
- "Spurred the acceptance of flight data recorders, anti-collision lights, crash/fire/rescue training, use of simulators in accident investigation, and standardization of pilot training;
- "Initiated an anonymous pilot reporting system in 1964; [and]
- "[The FSF] staff has received more than 50 individual awards for contributions to aviation safety. FSF has been called the 'conscience of the industry' for quietly disseminating aviation safety imperfections and uncertainties with remedial suggestions."

Lederer said, "The Flight Safety Foundation has a long history of safety research and investigation, both under government grants or contracts and confidential projects for its members. A unique research and study capability exists because the Foundation enjoys its freedom of action and of communication in a completely independent and objective environment. Some of the past-funded research activities of the Flight Safety Foundation are

- "Crew complement evaluation (CAB);
- "Cost of general aviation accidents (FAA);
- "Weather as a contributing factor in air transport accidents (U.S. Weather Bureau);
- "Synthesis of aircraft crash/fire/rescue and evacuation technology (FAA);
- "The communication of weather intelligence to general aviation (U.S. Weather Bureau);
- "Survey of occurrences involving loss of control of swept-wing aircraft (FAA);
- "Economics of safety in civil aviation (FAA);
- "Cost effectiveness of using arresting gear for air transports (FAA);
- "Revision of medical standards for airmen (FAA);
- "Psychological requirements for air traffic controllers (FAA);
- "Near-collision study—Project SCAN (FAA);
- "Project GAPE—General Aviation Pilot Education (FAA);
- "Technology for detecting clear air turbulence (FAA);
- "CAPTACS—terminal area traffic control (FAA);
- "Effect of runway grooving on general aviation aircraft (NASA);
- "Study on cabin evacuation (FAA); [and]
- "Safety aspects of operating passenger helicopters from the roof of the Pan American building (New York Airways)."

"Flight Safety Foundation publications [11 scheduled periodicals at the time] are designed to enhance the effectiveness of the safety efforts of its members," he said. "Information contained in these publications supports management safety programs. Publications offer both original and reprint material, and are themselves reprinted in magazines and flight operations publications throughout the world."

The Foundation's two annual meetings—the International Air Safety Seminar and the Corporate Aviation Safety Seminar—"bring together world leaders in aviation to share and exchange the best and latest operational and technical information relating to aviation safety," Lederer said. "In addition to the annual seminars, the Flight Safety Foundation also holds a number of workshops for



pilots, flight crews, and flight attendants. Notable among these recently was a four-course workshop dealing with approach-and-landing accident prevention, aviation safety program management, aircraft accident investigation, and human factors in accident prevention."

Advocating "positive safety management," the Foundation offered aviation safety assistance programs (ASAP), which comprised "operations and safety surveys to provide management with a confidential appraisal of the performance levels of safety and efficiency in its aircraft operations," he said. "By sending highly qualified review teams to those companies requesting such a survey, the Foundation helps to uncover major and minor deterrents to safe operations and offers suggestions as to how to rectify them and prevent recurrence."

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On April 21, 1982, Lederer presented a Wings Club Sight Lecture in New York, N.Y., "Aviation Safety Perspectives: Hindsight, Insight, Foresight." The following examples from the lecture were often cited in his articles and lectures:

• "[Aviation pioneers Orville Wright and Wilbur Wright] installed the first flight data recorder, automatically operated, on the first [powered aircraft] flight [on Dec. 17, 1903]. It recorded engine revolutions, distance through the air, and duration of flight.… Several airlines have used [flight data recorders] to detect departures from good practices before they result in an accident, a very important safety measure."

• "One in every six airmail pilots was killed in the nine-year history of the U.S. Air Mail Service.… From the standpoint of safety, the Air Mail Service showed among other lessons the danger of exerting injudicious management pressure on pilots, a lesson that needs reiteration. It also emphasized the differences in ability of pilots to manage risks.… Good airmanship was conceived as a combination of skill and judgment. Now it embraces resource management."

• "Incidentally, two members of the Wings Club were involved in the very first formal course in aircraft accident investigation. This was conducted by the Flight Safety Foundation at Mitchel Air Force Base [Hempstead, N.Y.] in 1948. R. Dixon Speas was one of the lecturers; Gloria Heath was the project manager."

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In "Safety Science in Aviation"—presented during the First World Conference on Safety Science in Cologne, Germany, Sept. 24-26, 1990—Lederer said, "Safety could be strengthened, in my opinion, if the presidents of the airlines involved in an accident would be required to describe in person their safety policies and their implementation [of policies] at the hearings of the accident investigation."

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In 1995, NTSB Chairman Jim Hall closed his speech during a seminar of the International Society of Air Safety Investigators by paraphrasing the following ideas, which he attributed to Lederer: "It is impossible to say that safety in air transportation is, has been, or will be achieved by any one specific piece of equipment, by experience alone, solely by conservative [investigative] policy, by [solid] research, by virtue of good organization, or because of government regulations. All these elements, cemented together by [investigators] imbued with a spirit of apprehension combined with a deep sense of responsibility for the safety of the flying public, have brought about our present laudable air safety record and will continue to improve on it."

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Congratulating Lederer in 1997 for receiving the Aerospace Life Achievement Award of the American Institute of Aeronautics and Astronautics, U.S. Rep. Randy "Duke" Cunningham of California said, "You have made outstanding contributions to your industry and to the welfare of the people of the United States of America, and have truly earned the title, 'Father of Aviation Safety.'"

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In another congratulatory letter for the award, U.S. Rep. Brian P. Bilbray of California said, "As an aerospace pioneer, you have demonstrated the American spirit to create a world that is safer for everyone. As an engineer, you have transformed the unimaginable into the standard. Your determination and dedication reflect your allegiance to the highest standards of public service."

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Dr. Assad Kotaite, president of the Council of ICAO, said while presenting the 1999 Edward Warner Award to Lederer, "Safety has been the primary goal of ICAO since 1944 and it has also been the fundamental goal of Jerome Lederer, who has often been referred to as 'Mr. Aviation Safety.' From the very beginning of his career with the U.S. Air Mail Service in 1926 until now, Mr. Lederer has spared neither his time nor his efforts to make aviation safer."

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In 2002, Lederer said that 14 million Americans have Alzheimer's disease, and he wondered about their safety when flying. "How do you remove them quickly from an airplane involved in an accident?" he said. "They quickly forget instructions."

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The Skygod.com Internet site, on its page of great aviation quotes, in 2002 quoted Lederer as saying the following:

• "Every accident, no matter how minor, is a failure of the organization."

• "The alleviation of human error, whether design or intrinsically human, continues to be the most important problem facing aerospace safety."

• "Of the major incentives to improve safety, by far the most compelling is that of economics. The moral incentive, which is most evident following an accident, is more intense but relatively short-lived."

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In 2003 at the conclusion of her presentation to the International Society of Aircraft Accident Investigators annual seminar, FAA Administrator Marion Blakely made a surprise and special presentation. She told the assembled 350 accident investigators: "As you think about how you can become more prepared, here is a role model for you…Jerry Lederer… a man who has spent three-quarters of a century finding the right solutions to make aviation safer. In 1948 he organized the Flight Safety Foundation's first accident investigation course. And I think it is fair to say that if there is one person who can be credited for creating an outstanding safety record in the first century of flight, it is Jerry Lederer." ◆

Root Cause Analysis with REASON®

Root Cause Analysis (RCA) is commonly used in engineering and reliability programs, but is not always emphasized in accident/incident investigations. RCA can lead to changes in procedures, processes, manuals, oversight, and training.

By Jean-Pierre Dagon (CP0204), Director of Corporate Safety, AirTran Airways

(This article was adapted, with permission, from the author's presentation entitled The Practical Use of Root Cause Analysis System (RCA) Using REASON®: A Building Block for Accident/Incident Investigations *presented at the ISASI 2003 seminar in Washington, D.C., USA, August 2003. The full presentation is available on the ISASI website at* www.isasi.org. *REASON®, is a trademark of DECISION Systems, Inc., which is located in Longview, Tex., not to be confused with Dr. James Reason.—Editor)*

The defense in-depth strategy is common to all safety prevention doctrine. The Swiss Cheese Theory commonly illustrates successive layers of protection, one behind the other, each guarding against the possible breakdown of the one in front. According to the originator of the theory, Dr. James Reason, each layer has weaknesses and gaps akin to a Swiss cheese. The Swiss cheese metaphor is best represented by a moving picture, with each defensive layer coming in and out of the frame according to local conditions.

The theory holds that these holes are created by a combination of active and latent failures. The active failure consists of errors or violations committed at the sharp end of the system. A latent failure stems from poor design, a shortfall in training, inadequacy of tools, and equipment, which are present for sometimes years before these conditions combine with local circumstances and active failures to penetrate the system's many defensive layers.

As such, the rare conjunction of a set of holes in successive defenses allows hazards to come into damaging contact with people and assets, according to Dr. Reason as he defines the accident trajectory. To date, however, accident/incident investigations point many times to causal factors (i.e., bringing forth the facts), but leave it up to the recipient of the report to determine root causes.

This approach offers an opportunity to examine root causes and bring forth some measurable indicators of the likelihood of reoccurrences. It may offer an avenue to the question: "What latent conditions led to the accident?" Root Cause Analysis (RCA) is commonly used in engineering and reliability programs but is not always emphasized in accident/incident investigations. RCA can lead to changes in procedures, processes, manuals, oversight, and training.

RCA using Reason®

In Root Cause Analysis, one recognizes three basic elements that built causal patterns:

- *A change or changes:* An action that triggered another step in a problem. The initial change comes from the problem statement. For example: Aircraft ship number 123, Flt. 456's left wing collided with a parked fuel truck. This is a change—something happened that caused the end result, a collision.
- *A condition*: A state of being that existed within the environment over some period of time, i.e., it was dark. The ramp was wet. The fuel truck was parked on the safety zone. The pilot's scan was poor.
- *An inaction*: Is there anything that could have or should have occurred to prevent the next step in the problem but did not. The inaction is akin to allowing the chain of events to continue unchallenged. For example, the pilot did not stop when confusing marshalling signals were present. The airplane was allowed to continue with a high rate of descent. The flight crew did not react to a GPWS pull-up command, and so forth.

A set of facts identifies all of the factors that are essential for one step to occur within one chain within the REASON® model. As a person lists the component factors that explain why a particular step in the event occurred, a set of factors is built. Each set must contain only factors that are necessary to explain the consequence of that set and nothing more.

Certain rules have to be met in order for the system to work:

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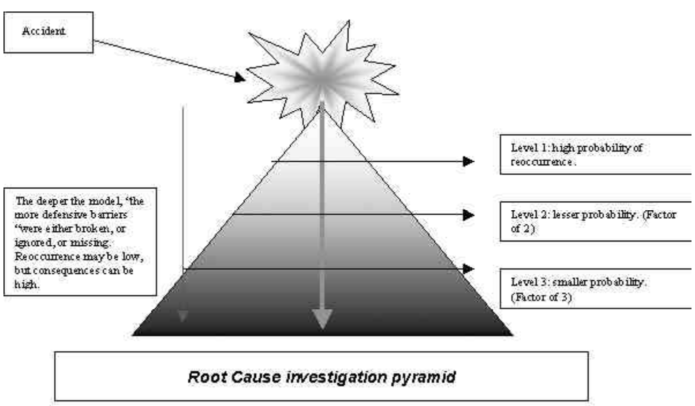
A set is a group of factors that causally account for the next higher step (their consequent) in the model.
1. There can be only one change in a set (a group of answers that explains one cause, or one change for any level).
2. Change is produced by change.
3. Inactions are always brought about by inactions; therefore, you cannot have a change answer in an inaction set. (Something didn't get done, or didn't happen, either due to a lack of plan, or the plan did not work.)
4. Conditions can occur in any set, but it is not necessary to have a condition in every set.

There are two types of conditions: those that are brought about by change and those that are brought about by a lack of change. The Reason® software will ask you to designate which type of condition you are dealing with before its "Advice Area" activates the questions for the set. (Note: The software stringently enforces these four rules.)

Building steps for RCA

The building steps start with a change (which may be a summary of the incident broken down in simple building blocks). That change is developed with a sets of factors, which contributed to the initial event. This allows the investigator to retrace steps that came into effect to bring about the changes. In this process, one will find repeating patterns that can be looped and thus connected to one factor that accounts for several of these event sets leading to the accident. The process is basically structured around a pyramid:



Upstream risk analysis—Upstream (top of pyramid) accounts for critical steps prior to the event (the last chain of the event chain). As you move down, the values are becoming smaller; it lends a predominance of weight at the top of the model.
Downstream analysis—A longer chain of events, as analyzed downstream (or at the bottom of the pyramid), would indicate a bigger problem, for there were many opportunities to break the chain of events from unfolding, yet these opportunities were either ignored or unknown. It is likely that latent effects would be best described by downstream analysis, whereas active failures would more be consequential at the top of the pyramid.

If one assumes a single level of events caused the accident, than one has a typical active failure model (a virtual impossibility).

Differing fixes

The engineering fix versus organizational fix approach offers an alternative to eventual costly engineering changes, which may not be necessary given the propensity for the event to reoccur. Engineering safety brings forth a comprehensive and permanent fix; however, engineering safety can have alternative drawbacks:
- It can be impractical or hard to market for the industry at large. Example: Considering an initiative to equip passenger aircraft with aft-facing seats. Although used extensively in the military, a proposition for aft-facing passenger seats could be interesting if one considers the flying public's likely distaste for flying "backwards."
- It can introduce new threats because of the fix itself. An example is the automation introduced in modern jets, which is intended to alleviate the workload and monitor parameters. If the automation fails, it relies on intuitive knowledge by the pilot who is not cognizant at first of a failure in automation, or a failure in programmation that could lead to a catastrophe. Example: the Air Inter A320 crash in Strasbourg, where a vertical speed of 3.3 (as in 3,300 fpm down) [VS/HDG combined mode] may have been left, or erroneously selected by the pilot in command (PIC) in lieu of the track/flight plan angle mode or 3.3° [TRK/FPA mode] desired, leading to a controlled flight into terrain against Mt. St. Odile.
- It brings forth a bulldozer approach to level an ant hill—a disproportional fix to a single and remote possibility of a failure.

Root Cause Analysis is a process designed to discover both an engineering solution and organizational alternatives. In the REASON® system, these controls can be compared for effectiveness for prevention of a certain event. This effectiveness comparison, coupled with an understanding of the propensity for the specific event to recur, provides decision-makers with important information to aid them in deciding whether engineered controls are preferred.

Root causes division

A root cause can be categorized in the following hierarchy:
A. Management-Level Action Required—Management principles must be first considered to ensure a policy is in place, is enforced, and controls are established. Management-level statements included are that management did not
- *communicate* this requirement.
- *designate* that this policy apply to this specific situation.
- *establish* a means to *monitor* compliance with this policy.
- *communicate* how it was *monitoring* for compliance.
- *enforce* the policy when an infraction was found.
- *establish* a policy to control this.

The point at which the statement can be affirmed as true is the point of breakdown in the organizational principles of control. If the statements are not applicable, the next step is analyzed.
B. Supervision-Level Action Required—At this point, the Reason® software offers supervision principles to consider in each of the following statements:
- Supervision did not *communicate* what was wanted.
- Supervision did not *provide* the things necessary in order to comply with policy.
- Supervision did not *follow* the policy in the past.
- Supervision did not *enforce* the policy in the past.

The point at which a statement can be affirmed as true is the point of breakdown in the organizational principles of control. After looking at a failure at the management level, filtering down to the supervisory level, the individual performance may be examined:

C. Individual-Level Action Required

- The individual's incorrect action is now acceptable and the policy can be *changed*.
- The individual's incorrect behavior can be *modified*.
- The individual's incorrect behavior cannot be changed, and the person must be *removed* from that particular environment.

The software is diligent in giving this as a last-resort option stating: "Selecting an individual root cause (RC) is a serious and rare decision. Using the RC wizard will help to avoid missing the systemic portion of a RC where the individual(s) shares responsibility." Often, an organization will resort to disciplinary action, at the expense of finding a systemic problem to an incident/accident, thus going against the accepted proposition that individuals for the most part have an innate desire for self-preservation and, in high-consequence environments, seldom create intentional accidents.

Application of RCA

Here is a practical application of Root Cause Analysis using REASON® in an actual case of simple ground damage.

Problem statement—Aircraft # 123 arrived at destination as Flight 456 from Philadelphia on June 14 with 59 customers and a crew of five, and was assigned to Gate C-3. The ramp crew was at another gate and not in position for an arrival at C-3, but ran to their positions when notified of the waiting aircraft. As the aircraft moved forward into the gate, it struck an unattended fuel hydrant truck left inside the containment zone, damaging the leading edge and underside of the left wing.

Narration obtained by the Reason®-software—Because the fuel vendor's supervision did not enforce the policy of parking fuel trucks in designated areas only and the individual(s) did not comply on their own with the established business process, the fueler did not park the vehicle in a designated parking area. Additionally, because the customer service organization did not establish a policy to advise fuel company personnel about the importance of safety zone lines, the fuel company did not stress to its truck drivers the importance of not parking in safety zones. So, the fueler was not attentive when he parked the vehicle.

Also, because the fuel vendor did not establish a policy to park vehicles only in designated parking spots, the fuel company did not have a prohibition against parking in the safety zones for office business. Since the fueler was not attentive when he parked the vehicle and because the fuel company did not have a prohibition against parking in the safety zones for office business, the fueler did not park outside of the safety zone line. So, when the fueler parked the truck to deliver a bill to the fuel vendor's office, and because the fueler did not park the vehicle in a designated parking area, and because the fueler did not park outside of the safety zone line, a fuel truck was parked in the safety zone.

Moreover, because management did not establish a policy to repaint the lines periodically due to wear, the safety zone

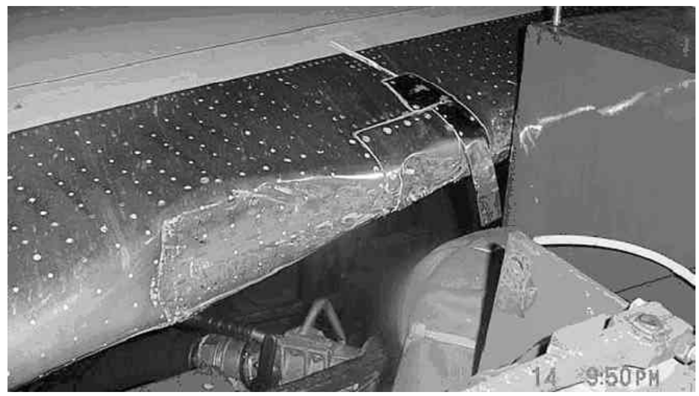


Figure 1 (top): Leading edge slats 4 and 5 damaged.
Figure 2 (above): Detailed view of the damage with fuel truck.

line was not visible from the marshaller's position. As the ramp was wet, and since the safety zone line was not visible from the marshaller's position, and because the fueler did not park outside of the safety zone line, the fuel truck's position relative to the safety zone line was unclear to the marshaller.

In addition, because the C-3 gate required a high-angle turn, the pilot had to turn more than a 135-degree angle to park. So, the pilot's scan was poor. Furthermore, because the marshaller did not have adequate on-the-job experience, she did not follow her training.

Then, because the customer service organization did not monitor the marshalling policy and the individual(s) did not comply on their own with the established business process, the marshaller did not follow established signal procedures but instead used her wands to signal to her wing walkers.

Meantime, the marshaller was under stress, and the marshalling agent was not following her training, and ramp supervision did not enforce the illustration of hand signals (SP6720.3). The individual(s) did not comply on their own with the established business process, and the marshaller did not follow procedure in communicating with wing walkers. Then, because the marshaller needed the wing walkers in position to guide the aircraft in, the marshaller was trying to communicate the need for the wing walkers to get into position by using her wands.

Additionally, as several ramp workers were sick that day, and the customer service organization did not monitor the staffing level to ensure adequacy and the individual(s) did not comply on their own with the established business process, the ramp did not have adequate staffing that day. Consequently, as the wing walkers were busy loading a cargo bin at an adjacent gate, the wing walkers could not take their position in a timely fashion. Since the marshaller was trying to communicate the need for the wing walkers to get into position by using her wands, and because the wing walkers could not take their position in a timely fashion, the marshalling agent did not stay in position with her wands crossed. Since the marshalling agent was using her wands to signal to her wing walkers, and because the marshalling agent did not stay in position with her wands crossed, the marshaller's crossing signal was not constant.

Also, because the pilot in command (PIC) would not comply with the policy requiring safe practices when unclear signals are received, the PIC did not follow safe practices. Since the marshaller's crossing signal was not constant, and because the PIC did not follow safe practices, the PIC did not stop the aircraft when confusing signals were received. As the fuel truck's height was above the wing's leading edge, and since a fuel truck was parked in the safety zone, and since the fuel truck's position to the safety zone line was unclear to the marshaller, and since the pilot's scan was poor, and because Flt. 456 taxied into gate C-3, and because the PIC did not stop the aircraft when confusing signals were received, aircraft 123, Flt. 456's left wing collided with a parked fuel truck.

Case interpretation

Analysis of this investigation shows that it is valid to compare the identified root causes to each other, given a calculated reliability of 100 percent. This event contains a typical mix of both conditions and actions.

The fuel vendor's supervision has the opportunity to enforce the policy of parking fuel trucks in designated areas only, and the individual(s) did not comply on their own with the established business process.

• In terms of preventing this problem, this is the 7th best option, removing 9 percent of this model.

The customer service organization has the opportunity to establish a policy to advise fuel company personnel on the importance of safety zone lines

• This is the best prevention option. It eliminates 22 percent of this problem.

The fuel vendor has the opportunity to establish a policy to park vehicles in designated parking spots only.

• Preventing this root cause is the 2nd best option, and will deal with 22 percent of the causes that produced this problem.

Management has the opportunity to establish a policy to repaint the lines periodically due to wear.

• This action, the 8th best option, will remove 7 percent of this problem.

The customer service organization has the opportunity to monitor the marshalling policy, and the individual(s) did not comply on their own with the established business process.

• This option is the 5th best available option. It will remove 13 percent of this problem.

Ramp supervision has the opportunity to enforce the illustration of hand signals (SP6720.3), and the individual(s) did not comply on their own with the established business process.

• This prevention opportunity is the 4th best, eliminating 14 percent of the process that produced this problem.

The customer service organization has the opportunity to monitor the staffing level to ensure adequacy, and the individual(s) did not comply on their own with the established business process.

• In terms of preventing this problem, this is the 3rd best option, removing 15 percent of this model.

The PIC has the opportunity to comply with the policy requiring safe practices when unclear signals are received.

Root Cause Analysis can give an approach to risk analysis, offering an insight in the likelihood of reoccurrence of an event, and encourage sharing of "best practices" in the industry in terms of procedures, processes, and gained knowledge.

• This is the 6th best prevention option. It eliminates 12 percent of this problem.

Tree model explained

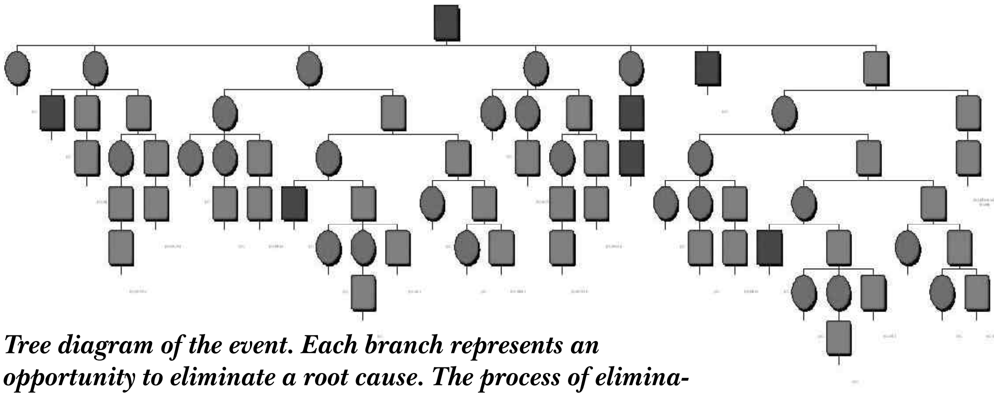
The following tree model illustrates a complete Root Cause Analysis on the aforementioned example. Changes are dark squares. Conditions are grey circles. Inactions are grey rounded squares. Root causes often happen as a result of inaction.

A level is best described as a collection of events occurring horizontally—henceforth, a set. Note that there is only one change per level. As the tree model builds up, consider the bottom as the flat portion of the pyramid. To understand how REASON® prioritizes actions (most effective action) to affect the outcome, one can look at the right identical branches of the 2nd and 3rd conditions (1st level of the model) following the initial change.

"As we eliminate one root cause, they are duplicated, i.e., the same root cause eliminates 22 percent of the model, henceforth the interpretation: "The customer service organization has the opportunity to establish a policy to advise fuel company personnel on the importance of safety zone lines." *This is the best prevention option. It eliminates 22 percent of this problem.*

However, also note that an active failure at the first level was an immediate contributor to the accident by looking at the far right-hand corner, 1st level: The pilot in command did not stop when signals where confusing (last line of defense). Hence this interpretation: "The PIC has the opportunity to comply with the policy requiring safe practices when unclear signals are received." *This is the 6th best prevention option. It eliminates 12 percent of this problem.*

By removing the PIC from the picture, we do not remove the conditions that exist, or could exist, for this accident to reoccur. Conditions are still present for another opportunity to damage an airplane. In the above two examples, we see a brief overview of a latent failure (systemic issue) and an active failure (individual failing to stop) as contributors to this event.



Tree diagram of the event. Each branch represents an opportunity to eliminate a root cause. The process of elimination produces the interpretation of the case.

REASON® Summary Sheet Chart

The Model is	Closed
Quantification Reliability	100.0%
Total Relative Causal Stress	29.3684
Total Proper Causal Stress	79
Causal Stress TTP	3.7176
Total Relative Generating Causality	22.4190
Total Proper Generating Causality	64
Generating Causality TTP	3.5030

Raw value of # Changes, Inactions and Conditions.

Same as above but weighted according to the level where it is

Raw value of # Changes, and Inactions.

Summary sheet interpreted

Since the model contains no insufficient data, it is 100 percent reliable (according to our inputs). The raw numbers include proper causal stress: the value of each changes inactions and conditions. Proper generating causality: The value of all changes and inactions (we subtract the existing conditions). Relative means the importance assigned depending on which level of the model these factors occur (the closer the event to the outcome, the heavier the weight). Proper means an equal number per level. Relative gives more importance and weight to factors occurring early in the model (i.e., top of the pyramid). The Causal stress TTP (tendency toward process) is interpreted to mean the relative number of all factors (including conditions) divided by the proper numbers of factors (discounting the level at which it occurs). Generating causality TTP is interpreted to mean the same, but we discount the existing conditions.

TTP interpretation

The tendency toward process (TTP) number is a metric calculated within the REASON® software that indicates the amount of "causal stress" present within a specific event model. Given that the discovered corrective actions are not put in place, TTP indicates how quickly and/or frequently the organization could anticipate a recurrence of the same event. In many ways, it is a measure of the potentiality of recurrence.

TTP is charted in a numeric range of 0-10. TTP scores of around 3.0 are normal. This particular case had a 3.7 TTP, which is slightly elevated yet indicates that the event is not prone to recur quickly or frequently. In the REASON® software, TTP indicates the degree of quickness and frequency related to an event's recurrence, and there are several reasons why it should be contemplated when prioritizing events for corrective action.

Often, after an organization experiences an incident with serious consequences, decision-makers proceed into the decision-making phase of corrective action with a mindset that often defaults to putting in engineered controls, even if solutions dealing with the organizational system seem to be equally effective.

Engineered solutions are indeed often effective, yet they often are the most costly options available for dealing with an event. Engineered solutions are sometimes quick—they are put in place and if designed correctly, they provide instant protection. Yet, if the TTP is low for an incident, the ***need*** for an expedient correction is not as great. Very often a discovered fix in the organizational system can be both more effective and more cost effective than the engineered solution.

Some unwanted events tend to happen over and over due to the repetitive nature of the specific business process associated with them. An example of this is the business process of boarding passengers on a plane, which is an extremely repetitive process. Due to its repetitive nature, if any problems exist in the "boarding passenger business process" one can expect those problems to happen again and again.

Such problem events tend to have high TTP scores in REASON®. Repetitious events, such as those noted, match well with the inherent advantages of engineered solutions because such solutions "dummy proof" the affected business processes, eliminating the need to rely on people-induced corrections. Relying on organizational systems and people to deal with voluminously repetitive problem issues is not going to be as consistent a control for these problems as will be an engineered solution.

But often the events encountered (serious or otherwise) are the exceptional, infrequent events associated with business processes that are not as repetitive. These types of events tend to have low TTP numbers. Thus, the TTP metric itself can serve as an indicator that assists a decision-maker in deciding between engineered solutions and/or fixes in the organizational system that often are as preventative and more cost effective.

In the "aircraft truck" case study, the TTP is 3.7, which is just slightly above normal. This score would tend to indicate that organizational fixes would be just as prudently chosen as any discovered engineered solutions.

REASON's® benefits

The root cause approach to incident /accident investigation using REASON's® software offers an additional facet to the accident investigation. It may assist at looking at a systemic failure (organizationally) leading to an accident; it also may help to answer the systemic "why" of an accident, complementing the "how" and "when." Hopefully this approach will provide additional weight in recommendations following investigations. In particular, RCA can give an approach to risk analysis, offering an insight in the likelihood of reoccurrence of an event, and encourage sharing of "best practices" in the industry in terms of procedures, processes, and gained knowledge. This tool also affords a framework for Root Cause Analysis investigations. Finally it preempts the old-fashioned approach of "remove the cause and the problem ceases to exist." ◆

Disseminating Safety Information

By Ron Schleede, Vice-President

I wish to add my thoughts and recollections to the extensive coverage of the passing of Jerry Lederer, who the Flight Safety Foundation referred to as "Mr. Aviation Safety," in its August-September 2002 *Flight Safety Digest*. His unparalleled contributions to aviation safety included excellence in aircraft accident investigation and prevention. I am proud and honored to have received the ISASI Jerome Lederer Award in 2002. During my tenure as chief of major aviation investigations for the NTSB for more than 10 years, Jerry would always call me to discuss recent accidents and to offer advice. He often sent me background material from his library that was relevant to the safety issues of the current accidents. I treasure the memory of those telephone conversations.

One of Jerry's many concerns over the years pertained to dissemination of safety information to prevent accidents. I raised this issue in my comments in the January-March 2003 *Forum*, primarily because of prompting by Jerry. I received some excellent feedback from ISASI members, which I summarized in the April-June 2003 *Forum*. Unfortunately, the feedback primarily addressed the problems and reasons for the problems, not solutions.

However, I believe that ISASI has developed an excellent solution that is definitively making a difference. Specifically, the ISASI Reachout seminars, nine of which have been held around the world and many more are in the planning stages. I participated in my third Reachout seminar last January in Mexico City, and it is obvious to me that ISASI is playing a major role in the dissemination of safety information and lessons learned. With the support of the International Civil Aviation Organization and ISASI corporate members, we have reached well over 1,000 delegates from dozens of countries. I believe Jerry Lederer would be proud that ISASI has developed this program that is directly addressing one of his concerns.

On a similar note, I believe one of the other solutions to the safety information dissemination problem is the developing use of Internet websites by independent accident investigation authorities. The timely posting of objective, factual information in proper context on such websites during the course of investigations provides direct access to those persons and organizations with the most need for such information. This also prevents the "spinning" of the information and incomplete or erroneous reporting by third parties whose interests may not be solely for the prevention of future accidents. I believe more investigation authorities should adopt the use of the Internet to fulfill the goal of timely and accurate dissemination of safety information. I am sure that "Mr. Aviation Safety" would agree. ◆

2003 Annual Seminar Proceedings Now Available

Active members in good standing and corporate members may acquire, on a no-fee basis, a copy of the *Proceedings of the 34th International Seminar*, held in Washington, D.C., Aug. 26-28, 2003, by downloading the information from the appropriate section of the ISASI web page at http://www.isasi.org. The seminar papers can be found in the "Members" section. Further, active members may purchase the *Proceedings* on a CD-ROM for the nominal fee of $15, which covers postage and handling. Non-ISASI members may acquire the CD-ROM for a US$75 fee. A limited number of paper copies of *Proceedings 2003* are available at a cost of US$150. Checks should accompany the request and be made payable to ISASI. Mail to ISASI, 107 E. Holly Ave., Suite 11, Sterling, VA USA 20164-5405.

The following papers were presented in Washington, D.C.:

- **SESSION I Keynote Address Human Spirit and Accomplishment Are Unlimited** *by Ellen G. Engleman, Chairman, NTSB, USA*
- **The Practical Use of the Root Cause Analysis System(RCA) Using Reason ®: A Building Block for Accident/Incident Investigations** *by Jean-Pierre Dagon, Director of Corporate Safety, AirTran Airways*
- **From the Wright Flyer to the Space Shuttle: A Historical Perspective of Aircraft Accident Investigation** *by Jeff Guzzetti, NTSB, USA, and Brian Nicklas, National Air and Space Museum, USA*
- **The Emergency and Abnormal Situations Project** *by Barbara K. Burian, R. Key Dismukes, and Immanuel Barshi, NASA Ames Research Center*

SESSION II

- **Accident Reconstruction—The Decision Process** *by John W. Purvis, Safety Services International*
- **CI611 and GE791 Wreckage Recovery Operations—Comparisons and Lessons Learned** *by David Lee, Steven Su, and Kay Yong, Aviation Safety Council, Taiwan, ROC*
- **Application of the 3-D Software Wreckage Reconstruction Technology at the Aircraft Accident Investigation** *by Wen-Lin, Guan, Victor Liang, Phil Tai, and Kay Yong, Aviation Safety Council Taiwan. Presented by Victor Liang.*
- **CVR Recordings of Explosions and Structural Failure Decompressions** *by Stuart Dyne, ISVR Consulting, Institute of Sound and Vibration Research, University of Southampton, UK*

SESSION III Keynote Address Learning from 'Kicking Tin' *by Marion C. Blakey, Administrator, FAA, USA*

- **Investigating Techniques Used from DHC-6 Twin Otter Accident, March 2001** *by Stéphane Corcos and Gérald Gaubert, BEA, France*
- **Investigation Enhancement Through Information Technology** *by Jay Graser, Galaxy Scientific Corporation*
- **Historical Review of Flight Attendant Participation in Accident Investigations** *by Candace K. Kolander, Association of Flight Attendants*
- **Accident Investigation Without the Accident** *by Michael R. Poole, Flightscape*

SESSION IV Keynote Address Growth of ATC System and Controllers Union *by John Carr, President, National Air Traffic Controllers Association, USA*

- **Crashworthiness Investigation: Enhanced Occupant Protection Through Crashworthiness Evaluation and Advances in Design—A View form the Wreckage** *by William D. Waldock, Embry-Riddle Aeronautical University*
- **Enhanced Occupant Protection Through Injury Pattern Analysis** *by William T. Gormley, Office of the Chief Medical Examiner, Commonwealth of Virginia*
- **Forensic Aspects of Occupant Protection: Victim Identification** *by Mary Cimrmancic, Transportation Safety Institute, Oklahoma City, Okla.*
- **Aircraft Accident Investigation—The Role of Aerospace and Preventive Medicine** *by Allen J. Parmet, Midwest Occupational Medicine, Kansas City, Mo.*
- **Expansion of the ICAO Universal Safety Oversight Audit Program to Include Annex 13—Aircraft Accident and Incident Investigation** *by Caj Frostell, Chief, Accident Investigation and Prevention, ICAO*

SESSION V

- **The CFIT and ALAR Challenge: Attacking the Killers in Aviation** *by Jim Burin, Flight Safety Foundation*
- **Flightdeck Image Recording on Commercial Aircraft** *by Pippa Moore, CAA, UK*
- **Flightdeck Image Recording on Commercial Aircraft** *by Mike Horne, AD Aerospace, Ltd., Manchester, UK*
- **An Analysis of the Relationship of Finding-Cause-Recommendation from Selected Recent NTSB Aircraft Accident Reports** *by Michael Huhn, Air Line Pilots Association. Presented by Chris Baum.*
- **Ramp Accidents and Incidents Involving U.S. Carriers, 1987-2002** *by Robert Matthews, FAA, USA*

SESSION VI Keynote Address Accident Investigation in Brazil *by Col. Marcus A. Araújo da Costa, Chief Aeronautical Accident Prevention and Investigation Center (CENIPA), Brazil*

- **Airline Safety Data: Where Are We and Where Are We Going?** *by Timothy J. Logan, Southwest Airlines*
- **Use of Computed Tomography Imaging in Accident Investigation** *by Scott A. Warren, NTSB, USA*
- **Investigating Survival Factors in Aircraft Accidents: Revisiting the Past to Look to the Future** *by Thomas A. Farrier, Air Transport Association of America, Inc.*
- **The Accident Database of the Cabin Safety Research Technical Group** *by Ray Cherry, R.G.W. Cherry & Associates Limited, UK*
- **Search & Recovery: The Art and Science** *by Steven Saint Amour, Phoenix International, Inc.*
- **National Transportation Safety Board Recommendations Relating to Inflight Fire Emergencies** *by Mark George, NTSB, USA*

Australia Awaits ISASI 2004

The Australian Society of Air Safety Investigators reports registration for ISASI 2004 is progressing exceedingly well and that Australia's Gold Coast awaits delegates and companions. The 35th annual seminar, which the Society is sponsoring, will take place Aug. 30-Sept. 2, 2004, and carry the theme "Investigate, Communicate, Educate." It will be held in the ANA Hotel Gold Coast, Queensland, Australia.

Hotel registration forms are available on the ISASI 2004 website. According to the hotel, "A block booking of hotel rooms for seminar delegates is being held only until June 30, 2004. After that date, availability of rooms is not guaranteed." The hotel may be contacted at P.O. Box 93, Surfers Paradise, Qld 4217 Australia; telephone reservations: +61 (0)7 5579 1060; Fax +61 (0)7 5592 2908.

Registration for the seminar, tutorial, and hotel may be completed through the ISASI 2004 seminar website at www.asasi.org/isasi2004.htm. Registration can be done on line or by fax or mail. Alternatively, the registration from printed adjacent to this article may be completed and mailed to the indicated address. Registration costs will include breakfasts and social functions and (for companions) the day tours. Tutorial registrations and a Friday "wind down" tour will be optional extras.

Tutorial planning is done and calls for two sessions to be conducted: (1) interviewing and (2) communicating and educating. More information will be posted on the seminar website as it becomes available.

The ISASI 2004 Organizing Committee has been inundated with offers of quality papers for this year's seminar, with submissions outnumbering the available speaker slots by more than two to one. As a result, the ISASI 2004 program offers an enticing array of stimulating papers from a diverse range of distinguished and knowledgeable speakers. Investigation agencies represented within the program include the ATSB, BEA France, BFU Germany, the NTSB, TSB Canada, the UK AAIB, and the Directorate of Flying Safety, Australian Defence Force. Other well-known organizations represented include ALPA, CAMI, the FAA, and the Flight Safety Foundation, while industry manufacturers represented include Airbus Industrie, Embraer, Pratt & Whitney, and Rolls-Royce.

The range of interesting investigations covered within the program include the Flash Airlines B-737 accident at Sharm El Sheikh in the Red Sea, the Ilyushin IL-76 accident in East Timor, the A300 B4 loss of all hydraulics following a missile strike at Baghdad, ACAS/TCAS aspects of the TU154/B757 mid-air collision over Überlingen, Germany, the Shorts SD 360 double-engine flameout and fatal ditching in the Firth of Forth, Scotland, and the Ansett Class A maintenance safety deficiency investigation.

Other papers will cover a range of informative topics on investigation techniques, technologies, strategies, analysis tools, investigator training, and valuable lessons learned. Paper authors originate from a range of countries from across the globe.

The draft technical program for the ISASI 2004 seminar is now complete and further details are available from the seminar website: http://www.asasi.org/isasi2004.htm.

Social activities include a cocktail reception on Monday evening, an off-site dinner on Tuesday evening, and the Awards Banquet on Thursday evening. The companion program will include a full-day tour and a half-day tour. A Friday activity is also being planned as a seminar "wind down."

NEW MEMBERS

Corporate
UND Aerospace CP0221
Mr. Dana Siewert
Ms. Karen J. Ryba
South African Civil Aviation Authority CP0222
Mr. Gilbert Thwala
Dr. André L. de Kock

Individual
Boerboom, Ryan, C., ST5016, Prescott, AZ, USA
Bridges, Karl, ST5014, Cranfield, United Kingdom
Carlson, Brent, R., ST4999, Prescott, AZ, USA
Cheong, Kah, S., MO5019, Singapore
Culver, Frank, A., FO5004, Gilbert, AZ, USA
de Haas, Francisco, F., MO5013, Mexico City, Mexico
DeGuire, Jr., Arthur, H., ST5000, Chesterfield, MO, USA
Falsina, Alessandro, AO5027, Crema, CR, Italy
Fogg, Larry, L., MO5022, Los Angeles, CA, USA
Franklin, Bryan, S., ST5032, Glendene, Auckland, New Zealand
Graves, Nathan, B., ST5020, Daytona Beach, FL, USA
Hedlund, Lars, AO5029, Ljungbyhed, Sweden
Ingram, G. Michaelle, ST5002, Daytona Beach, FL, USA
Johnson, Clinton, O., MO5006, Anchorage, AK, USA
Kaltenegger, Jorg, A., AO5008, Coraopolis, PA, USA
Kyle-Issenman, Lois, I., MO5021, Gatineau, PQ, Canada
Langhof, Dietrich, AO5009, Henstedt-Ulxburg, Germany
Lin, Yang, AO5012, Beijing, Chaoyang Dist., P.R. China
McNease, William, L., MO5025, Fort Worth, TX, USA
Middlemass, Duncan, R., AO5024, Wellington, New Zealand
Mitchell, Simon, ST5015, Wavendon, United Kingdom
Noel, Ivan, MO5023, Calgary, AB, Canada
Olsen Deigaard, Lise-Lotte, AO5028, Vedbaek, Denmark
Pfarr, Robert, P., ST5007, Prescott, AZ, USA
Power, John, R., AO4996, Dublin, Ireland
Radford, Karrie, M., FO5010, Whitehorse, Canada
Rallo, Nicolas, MO5030, Montreal, PQ, Canada
Rynerson, Eric, A., ST4997, Prescott, AZ, USA
Sin, Hyon, S., MO5018, Chun Chon, Korea
Smith, Aaron, G., ST5001, Prescott, AZ, USA
Stahly, Joshua, R., ST5031, Grand Forks, ND, USA
Steel, James, F., ST4998, Prescott, AZ, USA
Tsachiridis, Paul, MO5026, Brossard, PQ, Canada
Vickers, Denise, A., AO5017, Prescott, AZ, USA
Westbrook, Matthew, B., ST5005, Hammondsport, NY, USA
Wischmeyer, Ed, AO5003, Prescott, AZ, USA
Yeroolt, Sedjay, AO5011, Ulaanbaatar, Mongolia

INVESTIGATE, COMMUNICATE, EDUCATE—2004

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Please check appropriate box *(Please note, all fees are shown in Australian dollars):*

	Registration by July 10		*Registration after July 10*	
Full Seminar & Function				
Member	❑ $625		❑ $700	
ISASI Student Member	❑ $500		❑ $550	
Non-member	❑ $750		❑ $800	
Single Day				
Tuesday	❑ $250	❑ Student $100	❑ $250	❑ Student $100
Wednesday	❑ $250	❑ Student $100	❑ $250	❑ Student $100
Thursday	❑ $250	❑ Student $100	❑ $250	❑ Student $100
Tutorials				
Interviewing	❑ $85		❑ $100	
Communicating and Educating	❑ $85		❑ $100	
Companion Program	❑ $350		❑ $400	
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For assistance, contact: **Lindsay Naylor** +61 2 6241 2514 E-mail: lnaylor@spitfire.com.au

Cancellations made before July 10, 2004, will incur a $10 processing fee

Cancellations made between July 11–August 10, 2004, will incur a $75 administration fee

There will be no refunds for cancellations after August 10, 2004

Reachout Reaches Mexico

Mexico City was the venue for the January ISASI Reachout program, which was hosted by ASPA, the Mexican Air Line Pilots Association. One hundred and thirty participants representing the full spectrum of civil aviation safety, including airline pilots, pilot association officials, air traffic controllers, airport managers, maintenance personnel, and flight attendant safety officials attended the workshop. The director of investigations for the Mexican DGCA and an ICAO Regional Office operations specialist also attended. Most of the representatives were from Mexico; however, there were several representatives from other countries, including Argentina, Belize, Costa Rica, and Trinidad, among others.

The program included a 5-day ISASI Reachout workshop consisting of accident investigation and prevention, and safety management topics. Instructors came from the United States and Canada. The deputy regional director of ICAO (Mexico City) made opening and welcoming remarks. Ron Schleede, ISASI vice-president, welcomed the participants on behalf of the president, ISASI, and introduced the Reachout workshop and instructors. Instructors were Caj Frostell and Ron Schleede for the two-and-a-half-day accident investigation session and Jim Stewart and Dick Stone for the two-and-a-half-day safety management system session.

Instructors prepared their own training materials consisting of paper handouts, CD-ROM libraries, and published manuals and booklets. ICAO provided numerous documents that were shipped from its headquarters in Montreal. These included Spanish-language copies of the latest accident prevention and investigation documents. Each participant received copies of documents and CD-ROMs with considerable background materials for future reference.

The hosts produced delegate products, such as nametags. The workshop certificate for each delegate was developed by ISASI Reachout and the hosts and was produced locally on high-quality manuscript paper.

Local sponsorship was provided and managed by ASPA, including most air travel for instructors, local ground transportation, instructor lodging, workshop administrative support, and refreshments. Sponsorship for ISASI Reachout was also obtained from Continental Airlines, which provided instructor travel, and by MAS Air, which provided financial support for the program. In addition, the Air Line Pilots Association, International provided staff time and administrative support as did ICAO. Because of the work of local hosts in obtaining sponsorship, no funds were expended from the Reachout account.

Once again, the support of ICAO was critical in establishing the credibility of the workshop. The ICAO Regional Office had distributed the notification and registration forms for the workshop to its mailing list in the region. ◆

José Diaz de la Serna, ICAO NACC Regional Office, addresses the group as Reachout team looks on. Shown, left to right, are Ron Schleede; Jim Stewart; Richard Stone; Capt. Carlos Arroyo, ASPA; and Caj Frostell.

Avis has opted for a sponsorship role and will offer ISASI 2004 participants discounted auto rental fees. More information about this can be found on the ISASI 2004 website.

The ISASI 2004 program will set the stage for a stimulating and rewarding professional seminar, and the Organizing Committee looks forward to welcoming you to Australia's Gold Coast this August. ◆

Lederer Award Nomination Deadline Nears

The ISASI Awards Committee Chairman Gale Braden reminds all members that the nominations for the 2004 Jerome F. Lederer Award must be received by the end of May. The purpose of the Jerome F. Lederer Award is to recognize outstanding contributions to technical excellence in accident investigation.

The nomination process allows any member of ISASI to submit a nomination. The nominee may be an individual, a group of individuals, or an organization. The nominee is not required to be an ISASI member. The nomination may be for a single event, a series of events, or a lifetime of achievement. The nomination letter for the Lederer Award should

IN MEMORIUM

Charlie Pocock (MO0257) reports the death of Gus Economy (LM2484) on Jan. 14, 2004. He was the 1997 Jerome F. Lederer Award recipient and is survived by his wife, Jane. Memorial services will be held Sunday, July 18, 2004, at the Cortner Chapel on Brookside Avenue in Redlands, Calif. Gus was an acknowledged expert in fire and explosion investigations. He was untiring in his efforts to convince the Air Force (and the Army) to abandon JP-4 in favor of the much-less-hazardous JP-8 jet fuel (very similar to Jet A). He also spearheaded the development, testing, and eventual adoption by the U.S. military of Mil H-83282 (less flammable) hydraulic fluid instead of Mil H-5606. The value of his work is evident as scenes of Army helicopters, shot down or crashing in Afghanistan and Iraq, show the helicopters not burning on impact, as in previous wars. This dramatic difference is due in very large measure to the use of less-flammable fuel and hydraulic fluid pushed so hard by Gus and also to the Army's adoption of the crash-worthy fuel systems pioneered by Dr. S. Harry Robertson (MO0262), Lederer Award winner in 1981.

Other ISASI members who have made the final flight west include:

Dr. Lothar v.B. Schmidt (LM0189), March 6, 2003, Los Angeles, Calif., USA

Richard Ross (AO3318), June 25, 2003, aircraft crash, Sedgwick, Kans., USA

George I. Whitehead, Jr. (LM0603), Sept. 14, 2003, Conroe, Tex., USA

Najeeb E. Halaby (HO0002), July 2, 2003, McLean, Va., USA ◆

be limited to a single page.

Nominations should be mailed or e-mailed to the ISASI office, 107 Holly Ave., Suite 11, Sterling, VA 20164-5405 USA; e-mail address: isasi@erols. com; or send directly to the Awards Committee Chairman, Gale Braden, 2413 Brixton Road, Edmond, OK 73034 USA; e-mail geb@ilinkusa.net. ◆

Election Nominations Closed; Most Incumbents Nominated

The ISASI Nomination Committee announced that Call for Nominations for the ISASI Executive Officer and Councillor positions for the years 2005-2006 closed on April 1, 2004. The positions to be filled are president, vice-president, secretary, treasurer, U.S. councillor, and international councillor. All incumbents except Secretary Keith Hagy have expressed a willingness to serve another term and have been nominated. Other nominations include for vice-president, Capt. John M. Cox (MO3291) US Airways (ALPA). ◆

PNRC, NAIA Hold Joint Meeting

The Pacific Northwest Regional Chapter had ISASI member Chuck Foster, a former FAA associate administrator, speak at a February joint meeting with the Northwest Aviation Insurance Association. The meeting was held at Seattle's Museum of Flight, which recently received a Concorde as a donation from British Airways. This aircraft is one of only 20 ever built and is the only one on display on the West Coast.

The meeting was well attended by both members and guests of both organizations. Chuck, who was heavily involved in the United States certification efforts when the Concorde was first introduced into the United States, provided an excellent overview of that process.

The PNRC will be continuing its technical meetings on alternate months throughout 2004, except for August and December. Guests from other regions or individuals interested in aviation safety are always invited to attend any of the Chapter meetings. Details on the exact times and locations for these presentations can be obtained directly from Chapter President Kevin Darcy at kdarcy@safeserv.com or from Leo Rydzewski at leo.j.rydzewski@boeing.com. ◆

MARC Donates to Scholarship Fund

As the result of the exceptional support of ISASI corporate members and the excellent turnout of delegates for the ISASI 2003 international seminar, MARC was able to donate $6,000 to the ISASI Rudolf Kapustin Memorial Fund, reported Ron Schleede, Chapter president. He said, "Rudy kept MARC viable for many years and he would be proud that our Chapter was able to provide support for the promotion of accident investigation education for students, who receive the scholarship support to attend annual seminars. Hopefully, other organizations and ISASI members will consider contributions to this very worthwhile program." Continued funding for the Memorial Fund is through donations, which in the United States are tax-deductible. Contributions may be sent to ISASI, 107 Holly Ave., Suite 11, Sterling, VA 20164-5405 USA.

Schleede also reported that MARC will be hosting its annual dinner/meeting on May 6, 2004, to coincide with the International Council meeting being held on May 5, 6, and 7. MARC officers and others are planning to convene additional Chapter meetings in the future; however, volunteers are needed to assist with the planning and organization, he noted. ◆

ATSWG Sets Agenda for Australia Meeting

The Air Traffic Service Working Group continues to quietly develop cooperative networks around the world. For the first time in many years it will hold a group meeting in Australia during ISASI 2004. "This 2004 conference represents an opportunity for reassessment of the ATSWG objectives and the chance to realign the group's targets for the coming year," said Group Chairman John Guselli.

He added, "The fundamental component of any progressive safety program is one of ongoing professional development. For this reason, we are fortunate that Vice-Chairman Ladislav Mika has commenced the planning of a review of the peculiar skills required by an ATS investigator. The review of these skills will form the basis of our collective presence at ISASI 2004. It will also enable the whole group to become familiar with contemporary developments in the field of ATS investigation with inputs from the broad membership."

ATSWG seeks any constructive advice from any ISASI members prior to the meeting at ISASI 2004. ◆

New Investigation Tool Becomes Available

Ludwig Benner (WO2202) has been instrumental in the software development of new investigation-support software that is based on his more than 25 years of investigation process research. His work incorporated into Investigation Catalyst is a set of self-directing software tools and procedures that enable investigators to improve the efficiency and value of investigative tasks, such as the development of process hazard analyses; accident and incident investigation; investigation quality assurance; change management; and recommendation development, evaluation, documentation, and communication. Outputs have multiple uses in organizations. Starline Software, Ltd., has released the new product. A preview of the main features and trial version of the software for Macs is available online at http://www.starlinesw.com. ◆

UPCOMING EVENTS

- **ISASI 2004** Gold Coast, Australia, Aug. 30-Sept. 2, 2004
- **ISASI 2005** Ft. Worth, Tex., USA
- **The University of North Dakota (UND)** and ALPA present a 3-day aircraft accident investigation course to be held June 14, 15, 16, 2004. Location: Grand Forks International Airport, 5 miles west of Grand Forks, N.D. Further information: www.aero.und.edu/AccidentCourse/Index.htm.
- **Annual Flightscape Users Conference** June 23-24, 2004. Location: Ottawa, Canada. Further information: www.flightscape.com.
- **Embry-Riddle Safety Symposium**, July 14-15, 2004. Theme—"Lessons Learned from Safer Skies: Enhancing Safety Above and Below the Wing." Location: American Airlines Training and Conference Center, Dallas, Tex. Further information: www.avsaf.org.
- **57th Annual International Air Safety Seminar**, Nov. 15-18, 2004. Location: Pudong Shangri-La Hotel, Shanghai, China. Further information: Ann Hill hill@flightsafety.org or 1-703-739-6700. ◆

Aviation Week Awards NTSB 2003 Laurels

John J. Goglia, a long-term ISASI member, was honored by *Aviation Week and Space Technology* magazine for his contributions to aviation safety as an NTSB member from 1995-2004. His association with the NTSB will halt with the end of his term next month. Goglia was indefatigable in raising industry awareness to the importance of maintenance in air safety, as evidenced in the Board's investigations of the January 2003 crash of Air Midwest Flight 5841 in Charlotte, N.C., and the January 2000 crash of Alaska Airlines Flight 261 off the coast of southern California. He was also instrumental in the painstaking reconstruction of the wreckage of TWA 800, which exploded in July 1996 off Long Island, N.Y. The reconstruction will be used to teach accident investigation techniques to students at the NTSB Academy in Ashburn, Va. Goglia's NTSB safety legacy also includes leading a drive for more-compassionate treatment of the families of victims of air accidents.

NTSB Chair Ellen G. Engleman was honored for implementing a SWAT ("Safety with a Team") effort aimed at quickly closing a long list of safety recommendations. In December 2003, the Board reported that the number of open recommendations had dropped to below 1,000 for the first time since 1975.

Shortly after Engleman was appointed in March 2003, she led a critical agency self-analysis focused on finding improved efficiencies, including "cleaning up our recommendations." To that end, the SWAT strategy was applied. The Board and the FAA joined forces, and now periodically the Transportation Department and industry representatives address open recommendations. ◆

Benefits of Individual ISASI Membership

About You

You are an air safety professional. You may work for an airline, a manufacturer, a government, the military, an operator, or on your own. But you are a person who is dedicated to improvement of aviation safety and you joined ISASI with the expectation of enhancing the achievement of that goal.

About ISASI

ISASI is the only organization specifically for the air safety investigator. Our motto is "Air Safety Through Investigation." We are a growing, dynamic organization with a full range of membership.

Why Join? Lots of reasons—activities, education, services, and networking

• The yearly ISASI seminar has become a focal point for aviation safety professionals throughout the world. Attendance has steadily grown and the presentations are state of the art and meaningful. The 2002 seminar was held in Taipei, Taiwan, and the 2003 seminar was held in Washington, D.C., celebrating the 100th anniversary of flight.

• The new *Reachout seminar program* was instituted to provide low-cost, subject-oriented seminars in regions of the world with higher accident rates. Since the first *Reachout* held in Prague, Czech Republic, in May 2001, there have been nine Reachout seminars, some of which were held in Lebanon, Chile, India, Sri Lanka, Tanzania, and Costa Rica. All have been an unqualified success in attendance and content. These mini-seminars provide our corporate members an opportunity to directly affect safety in those areas where it will have the greatest return.

• The ISASI publication, *FORUM,* is a first-class magazine, published in color four times a year. Its editorial content emphasizes accident investigations findings, investigative techniques and experiences, regulatory issues, industry accident prevention developments, and member involvement and information. Each issue also features one of our corporate members in a full back-page "Who's Who" article.

• The annual seminar-published *Proceedings* are provided to individual members at no cost on line.

• Individual members have access to past ISASI publications, our library, and accident database.

• ISASI now has an easily accessible website, www.isasi.org, with an extensive "Members Only" information section and a limited general public area.

• Our corporate and individual members are a large and diverse group working in all facets of the industry worldwide. This presents a unique opportunity for personal and on-line networking.

ISASI is the place for those dedicated to improving aircraft accident investigation and aviation safety.

PREAPPLICATION FOR INDIVIDUAL MEMBERSHIP

(Cut and mail to the address below or otherwise contact ISASI to receive a full membership application.)

PLEASE PRINT

Name (last, first) ________________________________

Date of birth ________________________________

Home address ________________________________

City ________________________________

State, district, or province ________________________________

Country ________________________________

Postal zip/zone ________________________________

Home telephone ________________________________

Citizen of (country) ________________________________

E-mail address (optional) ________________________________

I AM INTERESTED IN APPLYING FOR SOCIETY MEMBERSHIP IN THE MARKED MEMBERSHIP CLASSIFICATION. PLEASE FORWARD TO ME A FULL MEMBERSHIP APPLICATION.

❑ **Member**—A professional membership class requiring at least 5 years' active experience as an air safety investigator.
❑ **Associate Member**—A professional membership class for air safety investigators who do not yet fulfill the requirements for member.
❑ **Affiliate Member**—A public, non-professional membership class for persons who support ISASI's goals and objectives.
❑ **Student Member**—A membership class for students who support ISASI's goals and objectives. (If student, list name of institution where enrolled________________________________.)

Present employer ________________________________

Employer's name ________________________________

Address and telephone ________________________________

Did your position involve aircraft accident investigation? ❑ Yes ❑ No

Your title or position: ________________________________

Dates: from:________________ to ________________

INTERNATIONAL SOCIETY OF AIR SAFETY INVESTIGATORS
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Flight Safety Foundation's Role in Aviation Safety

(Who's Who is a brief profile on an ISASI corporate member to enable a more thorough understanding of the organization's role and function.—Editor)

Since its official founding in 1947, the Flight Safety Foundation (FSF) has been a catalyst for the continuous improvement of aviation safety. The Foundation is an independent, nonprofit international organization that provides a neutral forum in which the aviation industry can meet in a noncompetitive environment to identify safety concerns, determine solutions, and implement ideas and actions to improve safety.

Often referred to as the "conscience of the industry," the Foundation has contributed significantly to the evolution of aviation safety and the saving of lives. The Foundation occupies a unique position among the many organizations that strive to improve aviation safety standards and practices throughout the world. Effectiveness in bridging cultural and political differences in the common cause of safety has earned the Foundation worldwide respect. Engaged in research, auditing, education, advocacy, and publishing to improve aviation safety, the Foundation currently has about 900 members from more than 145 countries. The FSF membership roster represents a "who's who" of industry leaders from airlines, airframe and engine manufacturers, corporate operators, suppliers, insurance companies, regulators, and many other organizations.

Aviation professionals, the aviation press, and respected mainstream newspapers and magazines rely on FSF publications for clear and accurate information on aviation safety. Member airlines often reprint FSF articles for distribution to their management, flight crews, cabin crews, and maintenance personnel; and government authorities cite FSF reports as background for official accident investigation reports. The seven regularly published FSF periodicals contain no paid advertising, and the material they present is prized because readers rely on the publications' accuracy and objectivity. Original articles in these periodicals provide in-depth examinations of important aviation safety issues and are based on the most current information from a variety of resources, including aviation specialists, government reports, independent research, and academia. To ensure wide dissemination of this information, FSF publications, since 1988, are available to everyone at the Foundation's Internet site, www.flightsafety.org.

Flight Safety Foundation

Perhaps the best known among the Foundation's activities are its three annual safety seminars. These seminars constitute major gatherings of aviation professionals and are designed for decision-makers in government, industry, and academia—people charged with the responsibility to influence safety in design, manufacture, development, training, maintenance, and operations. In the informal and neutral environment of the seminars, the best minds in aviation can exchange information and provide clear direction for the further reduction of risks in aviation. The Foundation publishes proceedings of its seminars so that aviation professionals worldwide can share the valuable information and ideas exchanged at these meetings.

The International Air Safety Seminar (IASS), begun in 1947, is held in selected cities worldwide to ensure contact with the international aviation community. The IASS typically draws as many as 600 representatives of organizations from 50 or more countries. Since 1992, the IASS has been conducted as a joint meeting with the International Federation of Airworthiness (IFA). Since 1995, the meeting also has included the International Air Transport Association (IATA).

The European Aviation Safety Seminar (EASS) was established in 1989. Similar in format to the IASS, it addresses the safety challenges of aviation growth in Europe. Since 2000, the EASS has been co-presented by the European Regions Airline Association (ERA) in different cities throughout the continent.

The Corporate Aviation Safety Seminar (CASS) is held annually in North America. ◆

AIR SAFETY INVESTIGATORS
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