Flying Safety

Hyperbaric Medicine

Laser Eye Protection

Advanced G Technology

Our Blood Supply

SEPTEMBER 1993

Human Systems

THERE I WAS

■ There I was . . . Red Flag in June, my third trip there, and my hair was itching to burn. I'd seen the crash tapes both times before and acknowledged the possibility. But I also came to Nellis bent on having a good time in the Hog. Third time's a charmer, right? No complacency on my part. You don't raise Hog-drivers on afterburner lifesavers and "gee whiz" geometry. You use basic tactics at home, refine them at Red Flag, and inhale gun gas whenever you get the chance.

The mission was a two-ship, afternoon go, during the second week. The Navy had arrived in adversary Tomcats, and the skies were usually one war zone after another as we would ingress into Kawich Valley. This particular ride was no exception. But you figure, after the first week, nothing ould come as a surprise. You've t the lay of the land down, you w where every little hill and is, and even the hair on the of your neck stands up at the time when you get near "the

as flying as No. 2, and the was the industrial complex valley. The route jumped udent Gap, past the farms, e ridge north of Black , past Belted Peak, and valley. We had just ack Mountain ridge, the sky was around 12,000 feet overcast, the air was somewhat clear, and we were cruising at 500 feet AGL and doing 275 KIAS.

My lead and I had been trading off lead and wingie all week, and we were pretty well versed on each other's quirks. No one had scoped us yet, and the way looked clear. Coming off the ridge, with lead on the right, and me out about 6,000 feet, I happened to check my 10 o'clock position. What a sight! An F-14 was attempting to chase an OV-10. The Bronco was holding his own, though the Tomcat was clawing to stay in the sky.

Lead called a radar strobe from the 4 o'clock area, and I scanned that area even closer. The airwaves were starting to clutter up with air-to-air chatter and bogie calls, and you could feel the proximity of the bad guys. Just yesterday, we'd been picked on by an F-5, and I had vowed we wouldn't get caught this time. My eyes were peeling apart the sky for anything which moved. And like a good wingman, I was spending a lot of time flying 300 KIAS, 500 feet, looking backwards.

In the transition from the Bronco-Tomcat fight to the possible threat on my right, my eyes momentarily hesitated at 11:30, and I remember thinking, "There's a peak at 12, 2 miles—we're right on the route!"

The strobe again, this time closer to 6 o'clock. I started swaying in the saddle to get a real good look at deep 6 o'clock—it helps to clear behind the tails, and you don't have to raise the seat all the way up and cock your head 180 degrees out to scan between the A-10's tails. Still nothing—no glints, no speck moving, nothing. (Meanwhile, we're still doing 5 miles a minute forward.) I glanced back at lead, still at 3 o'clock, and no threats in sight.

Then my peripheral vision kicked into high gear—I mean real high gear—and I sensed something mammoth off to my left. My head cranked into overdrive, and my eyes widened to saucers as I saw mountain pass off my left side—close, very, very close— and I was not above it, or level with it, but rather, looking up at it. I could have been flying fingertip.

I felt frozen as I passed this mountain. I finally started breathing again after what seemed like an eternity. My mind jumped to the thought, "What if you had rocked your jet a little more to the left when checking 6? You'd never have seen it coming!"

Complacency? Me? Never happen. I'm too good at what I do. Period. That would have made a great saying on my headstone. ■

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SPECIAL FEATURES

REGULAR FEATURES

CONTRIBUTIONS

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HYPERBARIC Medicine

The Davis Hyperbaric Laboratory is internationally recognized as a leading center in patient care and research using hyperbaric medicine.

CMSGT ROBERT T. HOLRITZ
Technical Editor

■ More than 60 years ago, medical researchers theorized oxygen under pressure was a treatment for decompression sickness. The "bends," or "Caisson Disease," as decompression sickness was known, was taking a serious toll on hard hat divers and underwater tunnel construction workers.

By the early '60s, Dutch researchers found administering oxygen under pressure was also a viable method of treating other diseases such as gas gangrene, burns, radiation tissue damage, and healing selected problem wounds.

In 1974, the Armstrong Laboratory at Brooks Air Force Base, Texas, opened the Davis Hyperbaric Laboratory (DHL) to study the treatment of aviators suffering from decompression sickness. Today, the DHL is internationally recognized as a leading center in patient treatment, facility requirements, safety standards, and research using hyperbaric oxygen.

The Mechanics

While the term hyperbaric sounds rather complex and scientific, the mechanics are actually simple. The patient is placed in a chamber similar to the type used to recompress divers, then compressed to a pressure equal to 45 feet below the surface of the ocean or to 2.4 atmospheres. The patient then breathes 100 percent oxygen through a hood or mask. This increases the partial pressure of oxygen which virtually forces the gas into the blood plasma. In a pure oxygen environment, the pressure is critical. Too much, and the patient could develop fatal oxygen poisoning. Not enough, and the therapy might not be effective. The result of this therapy is a highly oxygenated blood supply.

The Therapy

Problem wounds which occur during battlefield conditions, or even in the home environment, can be treated by hyperbaric therapy. Nonhealing tissues often result from a lack of oxygen needed to promote healing. Raising the partial pressure of oxygen in these wounds can often promote a dramatic increase in healing. Further, the ability of white blood cells to kill infection can be greatly enhanced by simply increasing the amount of oxygen in the blood.

It has also been determined exposure to oxygen at pressure results in a 15 to 25 percent reduction in bloodflow which reduces bleeding in areas of capillary damage. And evidence shows certain antibiotics may be more readily transported through the bacterial cell wall in the presence of elevated oxygen pressure.

Gas Gangrene

Gas gangrene is one of the fastest spreading and potentially deadly infections. If not quickly diagnosed and treated, it usually results in the amputation of a limb or the death of its victim. It is caused by a number of pathogenic organisms which multiply, producing toxins and killing tissue. It is characterized by swelling, fever, and severe pain. Until the early '70s, it was treated only with intravenous antibiotics. By 1972, researchers realized the organisms which caused the disease could not survive in an oxygen environment. They also found the ability of white blood cells to kill these hostile organisms was greatly enhanced in an oxygen-enriched environment. As a result of this research, in 1974, the folks at the Hyperbaric Medicine Division of the Armstrong Lab began treating gas gangrene patients with pressurized oxygen. Since then, hundreds of people have been treated for this infection and recovered with no lasting effects.

To highly oxygenate blood supply, the patients are placed in a chamber and then compressed to a pressure equal to 45 feet below the ocean surface. As they breathe 100 percent oxygen, the partial pressure of oxygen is increased which literally *forces* the gas into the blood plasma.

The Hyperbaric Medicine Division

The Hyperbaric Medicine Division of the Armstrong Laboratory is staffed by physicians, physiologists, and nurses specially trained in the medical and physical aspects of hyperbaric medicine. Typically, the staff physicians and

continued

physiologists attend 40 to 50 weeks of specialized training before being certified in hyperbaric medicine. Nurses attend a 16-week course and technicians attend 8 weeks of intensive training.

The folks at the Hyperbaric Laboratory are on the forefront of research on recompression therapy, crush injuries, NBC combat casualty care, nonhealing wounds, and burns. Their goal is to broaden the understanding and acceptance of Hyperbaric Oxygen Therapy.

The Division is working with private and government organizations and has assisted NASA in developing specifications for hyperbaric experiments aboard the US space station, Freedom.

The Chamber Complex

The Hyperbaric Division has two clinical chambers. The large chamber is capable of treating up to 10 patients per "dive." The smaller chamber has the capacity to treat three additional patients. All treatment dives, as they are called, are staffed inside by specially trained medical technicians and are monitored by both a physician and a physiologist via a video and audio communications link.

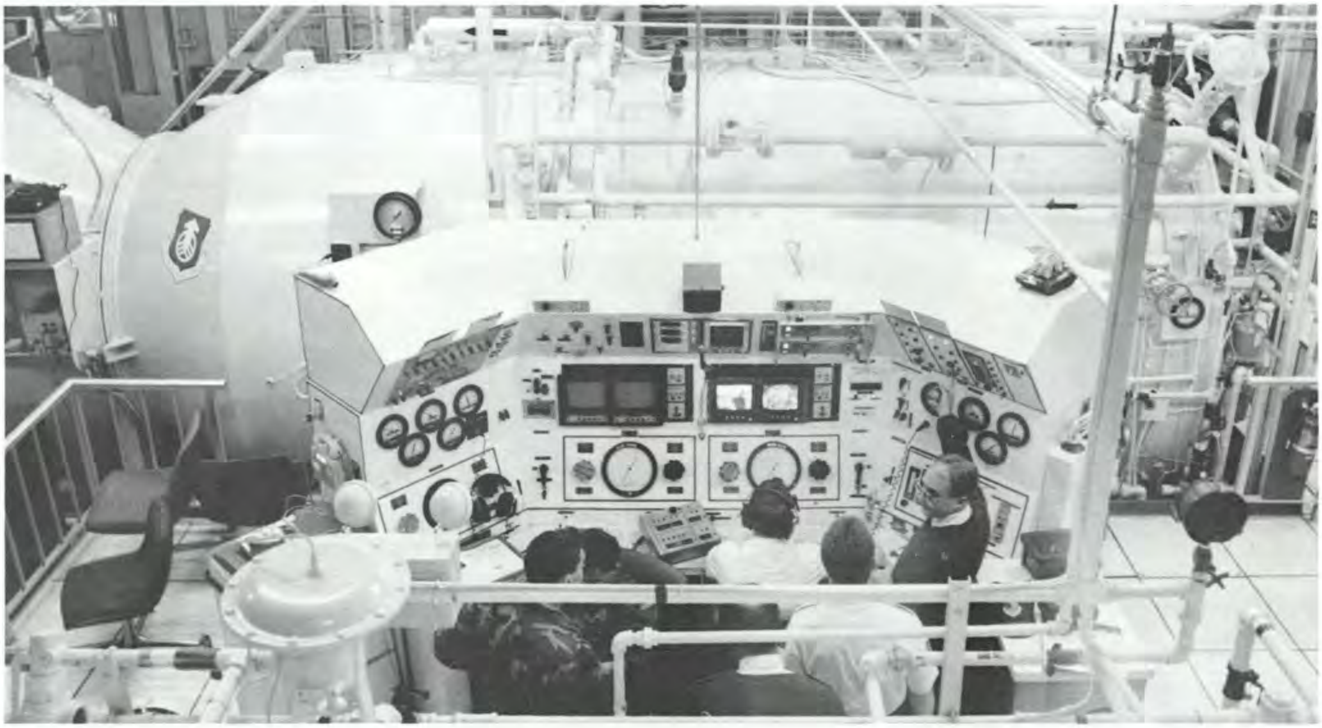
The Davis Hyperbaric Laboratory leads the way in hyperbaric chamber design and fabrication. Efforts are underway for improved design and construction of facilities, including the world's first concrete hyperbaric chamber. Hopefully, the evaluation of new construction strategies will result in greatly reduced construction costs and increased transportability. In the near future, it may even be possible to mobilize a hyperbaric chamber into the combat theater.

Other Facilities

In addition to the facilities at the Armstrong Laboratory, the Air Force operates two other hyperbaric clinics—the David Grant Medical Center at Travis AFB CA and the USAF Medical Center at Wright-Patterson AFB OH.

The Payoff

The primary payoff for hyperbaric medicine is improved overall healing time for many debilitating conditions and the successful treatment of diseases which, in the past, may have been fatal. Hyperbaric medicine also translates into reduced hospitalization time and lower medical costs for the DOD. It is estimated hyperbaric treatment reduces the costs for treating burn patients by as much as 30 percent. To date, the Air Force hyperbaric program has treated over 3,500 personnel, improving the quality of life for many patients who would otherwise face amputation of limbs or continuation of longstanding medical problems. ■



The Hyperbaric Division has two clinical chambers. The large chamber is capable of treating up to 10 patients, and the smaller chamber has the capacity to treat 3 additional patients.

COMBIMAN & CREW CHIEF

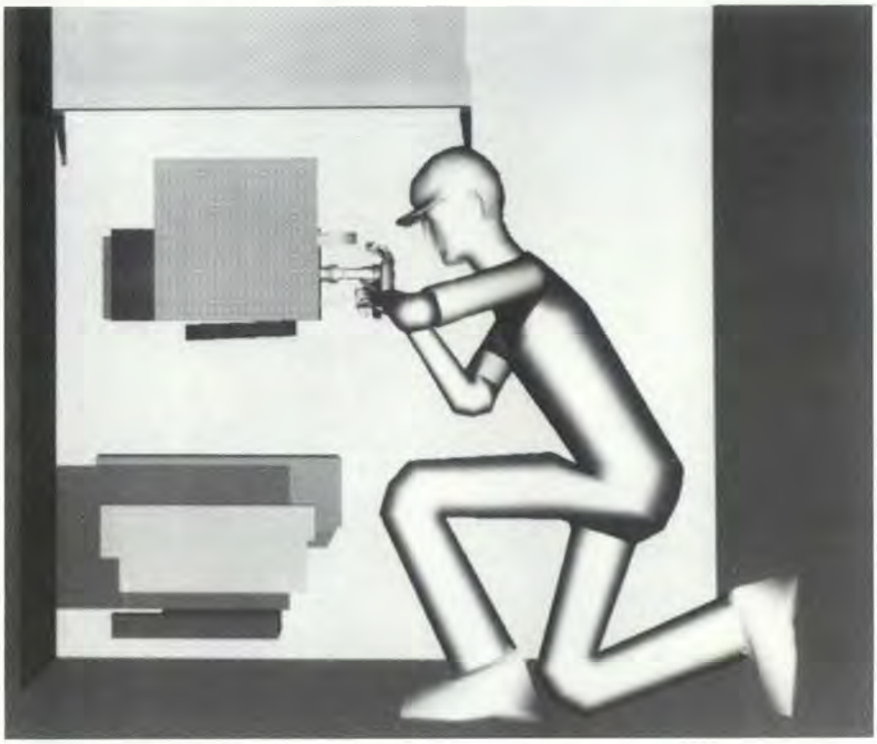
CMSGT ROBERT T. HOLRITZ
Technical Editor

■ Ensuring new weapon systems are compatible with the ability and limitations of the humans who use them represents a significant part of the development costs. Previously, it was not until a mockup of the system was developed that a design problem surfaced. And, as a result, systems often had to undergo expensive design changes.

The folks at the Human Systems Division at Brooks AFB, Texas, have come up with a way to identify design-induced maintainability and operations problems before time and money are spent for mockup, fabrication, and production. Using the latest in computer technology, they have developed software which produces computer models of human functions.

The programs, named COMBIMAN and CREW CHIEF, actually allow the user to perform the functions of an expert ergonomist. Using these programs, the designer can call a 3-D human model into a design created on a computed-aided design (CAD) system. Using the 3-D drawing as an electronic mockup, the designer can determine if a task is physically possible.

The software automatically creates a range of accurate body sizes and proportions for both men and women, the encumbrances of clothing, personal protective equipment, and mobility. These models reduce the incidence of design problems by allowing the designer to perform physical analysis and correct design-related defects. As a result, development engineering costs and acquisition time are considerably reduced. In addition, life cycle costs and maintenance time are also lowered while system availability grows.



The Human Systems Division can identify design-induced maintainability and operations problems *before* time and money are spent for mockup, fabrication, and production--the programs are **COMBIMAN** and **CREW CHIEF.**

COMBIMAN

While the programs are similar in many ways, they are designed for different purposes. COMBIMAN—Computerized Mechanical Man-Model—is a computer graphics model used to evaluate the physical accommodation of a seated vehicle operator in either existing or conceptual 3-D designs. It performs four types of analysis: fit, visual field, strength required to operate controls, and the reach capability of arms and legs. It has been used extensively to test mobility of the model wearing different types of clothing and while using protective equipment such as helmets, shoulder harnesses, and lap belts.

CREW CHIEF

The second program, "CREW CHIEF," as one might expect, is a computer graphic model of an aircraft maintenance technician. It is used to simulate the ergonomics of a person doing a maintenance task. CREW CHIEF automatically analyzes physical access for reaching into confined areas with specific tools or objects. It also studies visual access and the strength required to perform a maintenance task. CREW CHIEF even comes programmed with its own 222 piece set of common tools. And, the designer can even add special tools as required. These programs are being used by major aerospace companies to support both military and commercial research programs.

CREW CHIEF and COMBIMAN are only two of many innovative ways the folks at the Armstrong Lab help "ensure the human is the enabling factor, not the limiting factor," in new weapon systems. ■

Laser Eye Protection

The following is adapted from a paper prepared by Shari R. Thomas, PhD, Occupational and Environmental Health Directorate, Armstrong Laboratory, Brooks AFB, Texas.

■ Ocular exposure to laser radiation can result in profound losses in vision. These losses in vision can be temporary or permanent, or both, depending on the energy and other physical characteristics of the laser, the environmental conditions (e.g., day/night, weather conditions, etc.), and the intervening transparencies (e.g., canopies, head-up display (HUD), binoculars, etc.) between the laser and the observer's eye.

The effects of ocular exposures to laser wavelengths absorbed by the retina of the eye, which are primarily in the near infrared (NIR) and visible portions of the electromagnetic spectrum, can be separated into four categories: glare, flashblindness, thermal lesions, and hemorrhagic lesions.

■ **Laser glare** can be more intense than glare from the sun, and it can cover the entire canopy, especially at night. Laser glare occurring during critical tactical maneuvers or when the aircraft is at an unusual attitude could result in mishaps since out-of-cockpit viewing can be either partially or completely obscured.

■ **Flashblindness** is similar in effect to having your eyes exposed to a camera flashcube. An afterimage, which moves the eye, persists from several minutes to several seconds after the laser is turned off. This afterimage produces a blindspot in the visual field in which targets are partially or completely obscured.

■ **Thermal lesions** are burns to the retinal tissue which also produce scotomas.

■ **Hemorrhagic lesions** result from a "shock wave" being created in the eye from the laser pulse. The shock wave ruptures the retinal or subretinal blood vessels, which then bleed within the layers of the retina or into the vitreous humor of the eye.

Military Laser Systems

Laser sytems are presently used extensively by the U.S. military as integral components of rangefinders, target designators, and smart bombs. USAF aircrews and ground personnel are at risk to ocular exposures to these systems during training, tactics development, and maintenance procedures, as well as during combat operations.

Pave Tack and LANTIRN target designating lasers have the potential of causing thermal and/or hemorrhagic lesions. NIR lasers such as these are invisible to the human eye, so retinal damage could occur before the aircrew members "knew what hit them."

In addition, antipersonnel laser weapons systems pose a current and mounting risk to USAF aircrews and ground personnel. Manufacturers of hand-held laser guns have demonstrated it is easy to train an inexperienced user to accurately track the canopy of an F-4 aircraft flying tactical maneuvers at tactically relevant ranges (2-14 kilometers). Future antipersonnel laser weapons, called agile lasers, are expected to be capable of rapidly tuning to multiple visible and NIR wavelengths.

Air Force Laser Eye Protection and Safety

The continual proliferation of laser systems on the modern battlefield accentuates the need for laser eye protection use by aircrews in training and combat operations. Currently, the only eye protection which is mass-producible at a reasonable ($500 per visor) cost as a visor is based on absorptive dye technologies. The eye protection provided for USAF aircrews must provide adequate protection without hindering the aircrew members' abilities to perform their jobs. Cockpit, aircraft, and runway lighting as well as out-of-cockpit objects must be visible while the LEP is worn.

Currently, the USAF has only one laser eye protection visor, which protects against some NIR and two visible laser wavelengths.

Armstrong Laboratory Laser Eye Protection Program

The Optical Radiation Division of the Armstrong Laboratory currently has two laser eye protection research programs. In the first, they conduct testing on devices which are based on new technologies. Testing of these advanced visors includes assessing their protection capabilities, their optical quality, and their impact on visual function. The research program is geared at producing LEP devices that have visible wavelength protection and little or no aircraft lighting incompatibilities.

The goal of the second program, Advanced Aircrew Vision Protection, is to provide near-term daytime and nighttime visors for high-G fighter aircrews, to be mass producible at a reasonable unit cost. This program was derived from a request by HQ TAC (now HQ ACC) during Operations Desert Shield and Desert Storm for a laser eye protection visor which could be used for nighttime operations by A-10, F-15E, and F-16 aircraft.

The goal was to provide protection against lasers of which aircrews have little or no situational awareness while transmitting as much visible light as possible to maintain good nighttime vision. Limited flight testing of this prototype nighttime visor, called the FV-6, was conducted during Operation Desert Storm using A-10, F-15E, and F-16 aircraft. The new visor was rated acceptable for nighttime air operations for the A-10 and F-16 aircraft.

Extensive Weapons Systems Trainer and ground tests of these prototype visors with the F-15E squadrons of the 58th Fighter Wing at Luke AFB, Arizona, has been conducted. The 555th Fighter Squadron assisted researchers in performing ground tests. The F-15E was selected as our test aircraft because it has both mono-chromatic and color-coded cockpit displays, and it has a dual-role capability. We believe that if these new visors are compatible with F-15E aircraft, they will be compatible with all other aircraft in the USAF fleet.

Prototype visors are currently being flight tested to determine if the incompatibilities noted from early field investigations are operationally significant. One model is being flight tested by students of the USAF Test Pilots School at Edwards AFB, California, on F-15A/C, F-16B, and T-38 aircraft. Both prototype visors are being tested by members of the 40th Test Squadron at Eglin AFB, Florida, on F-111 and F-15E aircraft. Tactical combat maneuvers and flight profiles are being used for these tests.

If the necessary mission need statements and operational requirements documents are in place, the Human Systems Center Life Support Systems Program Office will run the newest program. If everything goes well and on schedule, a sunlight and a nighttime laser eye protection visor could be procured by fiscal year 1996. ■

We must provide adequate eye protection to our aircrew without hindering their abilities to perform their jobs.

A WINTER'S TALE

BARRY KING
Reprinted courtesy of AOPA Safety Foundation and Mr Barry King

How often have you heard stories of pilots who fudged on safe flying practices and got away with it? But every once in a while the law of averages plays catchup.

■ I am a charter pilot in western Alaska. My job involves regular visits to a number of Eskimo villages along the coast which have no roads. Besides flying, the only ways to get there are by boat during the brief summer season, or by dogsled or snow machine the rest of the year.

In May, the land and the sea are still locked in a frozen mantle of white, and the last storms of the long winter are moving across the Arctic. It was one of those storms which caused the incident in this story.

I was trying to fly from Golovin to Elim, two coastal villages separated by Cape Darby, a mountainous peninsula jutting about 15 miles out into the frozen waters of Norton Sound. The straight line route is a short one, but when the mountains are covered with clouds, one must follow the shoreline all the way around the end of the cape. Earlier in the day, I had attempted the flight and found both routes obscure by snow and fog, and I had turned back to Golovin to have lunch and wait for the weather to improve.

By 1:30, the clouds on Golovin's side of the mountains had lifted, and the end of the cape could be seen. My passengers were three Eskimo women, one of them with a 5-year-old boy. I climbed up near the base of the clouds and headed toward the cape, expecting to fly all the way around the end of it, but watching to my left to see if any of the passes through the mountains were clear enough to permit a more direct route.

About two-thirds of the way down the cape, we came abeam a saddle in the ridgeline which was clear of clouds. Looking through it, I could see pack ice on the sea on the other side of the cape. It was a marginal opening, at best. The clouds were low and turbulent as they came through the pass toward us, with wisps of snow hanging down from them. But in my 14 years of flying, I had been through worse and had never had an accident. After a moment's hesitation, I made my decision and turned into the pass.

For a minute or two, things went well. Then, suddenly, a shower of snow came down around us like a curtain, and my view of the pass ahead was lost. I kicked myself mentally for making the attempt in the first place. I struggled to decide whether, from that point, it would be safer to make a turn back the way I had come or to press on through in hopes of bursting out of the snow into the clear air I had seen only moments before.

For too many agonizing seconds, I waited, trying in vain to regain my view of the pass ahead. The plane was buffeted by turbulence and downdrafts in the thick snow. Too late, I realized the storm had set in in earnest, and the pass would not open again. I guessed our best chances lay in a turn to the left, and as I began the turn, we struck the side of the mountain, a featureless wall of snow, invisible in the white sky.

There was a single tremendous impact, followed by a moment of sliding ahead and upward. Then—the howl of a fierce wind blowing stinging particles of ice through numerous openings in the twisted and broken wreckage

of our plane. Through the agony of my guilt and self-incrimination, a single thought emerged: "My God, I'm still alive! But what can I do now, and what will become of us?"

My windscreen was gone, and through its opening, I saw Rodney, the 5-year-old boy who had been riding in the back. He was out on the snow, ahead and to the left, lying motionless. My first task was clear enough—go to him and bring him back to the plane. My own legs were pinned under a crumpled instrument panel. I later found out both of my ankles were broken, and after getting out of the hospital, I was unable to walk for 2 months. But there on the mountain, something kept them working well enough for me to get around quite well. As a child, I had a habit of emerging unscathed from falls out of trees, bicycle crashes, and mishaps of all kinds. My parents always said, with sincerity, I had a special guardian angel. Now I began to think about what that meant.

It took me a while to extract myself from the wreckage, maybe 5 minutes, maybe 15. The left door of the plane was gone as well, and I went out through its opening to get to Rodney. He had taken a blow to the side of the head and had blood coming from his ear, his nose, and his mouth. But the bubbles on his nose and mouth showed he was still breathing. I carried him back to the plane, laid him across the two front seats, and covered him with some pieces of clothing from a broken suitcase. I have a 5-year-old of my own. He is the namesake of my older brother, Virgil, who died in a plane crash. The Eskimo boy who lay dying in the wreckage of my plane became a son and a brother to me, even though I had never met him before that day.

I moved back through the plane to tend to the others. In the second row were Lillian, a single girl, and Nora, Rodney's mother. Lillian had only superficial cuts and bruises, but Nora had a badly broken leg where it was crushed under the seat ahead of her. Both of them were conscious and calm. Nora was obviously in great pain, but she was more concerned for Rodney than for herself.

In the third row was Marlene, a wife and mother of four, a little younger than my own wife. She was nearing full term with another child. She was sitting in a normal position in her seat with her seat belt fastened and without visible injuries, but she was dead.

There was some fresh fruit and canned milk and a few changes of

continued

A WINTER'S TALE

continued

clothing among the women's luggage. The plane's emergency and survival gear included thermal blankets and rations. When I had distributed and arranged these resources as well as I could, I returned to my own seat, wrapped Rodney in the remaining items of clothing and a space blanket, and held him in my arms.

Since the flight was such a short one, I knew we would be missed almost immediately. I reckoned we were no more than 15 miles from Golovin and 20 miles from Elim. We could conceivably be rescued in a few hours by men on snow machines from either village. What we didn't foresee was the severity of the storm which had set in. I estimated the wind speed at about 45 miles per hour. Visibility in the blowing snow was less than 50 yards most of the time. Soon we began to hear search planes in the clouds overhead and the occasional snarl of snow machines along the ridge, just barely audible over the howl of the wind.

Twelve hours later, Rodney was frozen stiff in my arms. A snowdrift had formed through the left side of the plane, up over Rodney's legs, and onto my lap. An inch of hoary frost made the instrument panel in front of me look like a freezer long overdue for defrosting. The surviving women were huddled inside an igloo of space blankets in the seats behind me, covered with snow on the outside. We talked and prayed to keep each other awake and alive. I recited Psalm 23, the Shepherd's Psalm. My faith in God was a source of comfort, but I wondered: Could the Shepherd find His sheep in conditions like this?

My employers share my faith in God, and I sensed the strength of their prayers, offered blindly and in ignorance of our condition. I was aware they knew the search area as well as anyone. I also knew they were giving their utmost to the search for us, combining their skill as pilots and the survival and navigation instincts of their Eskimo heritage with their prayers. Their hopes for finding survivors under the circumstances would be small to start with and would fade rapidly with each passing hour of fruitless search. But I was confident they would continue to search until we were found, even as they had searched for their own father when his plane disappeared in a storm 6 years earlier. They had continued to search long after the official efforts were called off, long after all hope of survival was gone, until the wreckage was finally found after the snow melted the following summer.

Such was the caliber of our would-be rescuers, but still there is a limit to what is humanly possible. I finally set aside Rodney's body and left the wreckage to climb uphill toward the sound of passing snow machines. About a hundred feet away I turned and looked back. The dark blue wreckage might have been visible from that distance 12 hours earlier, but it was not visible now.

The wings and the left side were completely white with ice from the storm.

I found the tracks of a snow machine, followed them fruitlessly for a while, and finally retraced my own tracks back to the wreckage.

In the Arctic, in May, there is very little night and no total

darkness. At about 2 a.m., we were in a deep gray twilight which gradually began to brighten into the whiteness of the next day.

In the late afternoon of the second day, there was still no letup in the intensity of the storm. I returned from another excursion away from the wreckage to find the women talking excitedly, "Two men climbed up from below us! They saw the plane and turned back!" I climbed down where they indicated and found footprints which confirmed what they had said. No doubt the men had gone to seek help from others or, perhaps, to bring up their snow machines. I went back to the plane and sat waiting under the left wing.

In about 15 minutes, a single figure came climbing through the snow.

"Hello," I said. "Who are you?"

"I'm searching for you."

I found out later it was Wayne

Henry of Golovin, a man of few words.

I gathered he could get his snow machine no closer than 200 yards downhill from us because of the steepness of the slope. I sent Lillian down with him. Nora and I stayed with the wreckage to await the arrival of other searchers, including a medical doctor.

In a few hours, we three survivors were all safely in the hospital in Nome.

Several days later, I flew to Elim in the bright sunshine of a crystal clear spring day to attend the funeral of Marlene and to share the grief and pain of her loss with her immediate and extended families. In the villages, nearly everyone is related.

My wife and I are newcomers among the Eskimos, and I was uncertain what to expect from them. I had caused the death of two of their number, yet they had saved my life. Their response was more generous than I could have imagined. I felt unqualified forgiveness, love, and support from everyone present.

There remained one question which had been in the back of my mind since the moment of our rescue. I asked it of my hosts there in Elim, the family of Marlene. "Who were the two men who spotted us, and where were they from?"

"It was Morris Ivanoff and Marlin Paul, from here in Elim."

"In all that wilderness, how did they find us?"

"They said they heard your voices calling them and went toward that."

I asked no further questions. We survivors had hoped and prayed for rescue but never tried calling for help. ■

It's unfortunately true the more experience we have, the more likely we are to make small errors in judgment which can lead to disaster. Past performance and an expectation of success have lured many an aviator into a trap. This is the type of tale, simply and eloquently told, many of you will want to keep and reread. We encourage you to share it with your friends. —Ed.

INFRARED COMMUNICATIONS

Aircrew work in an environment that is often very noisy . . . and in an environment where it is critical to their safety they *hear* all activity on the flight line. What are we doing to help them?

The people at the Air Force's Armstrong Laboratory are developing an infrared voice communications system to provide clear, high intelligibility in even the most noisy environments.

CMSGT ROBERT T. HOLRITZ
Technical Editor

■ Noise can be a serious problem for Air Force personnel. Maintenance personnel performing aircraft quick-turnaround operations often have difficulty communicating with each other over the noise of nearby jet engines. Donning chemical defense gear also all but eliminates the ability of ground personnel to converse.

The Crew Systems Directorate of the Air Force's Armstrong Laboratory is developing an infrared voice communications system to provide clear, high intelligibility in even the most noisy environments.

The system provides line-of-sight communications with others wearing like systems in high noise environments. The lightweight transmitter/receiver mounts on top of existing headsets and uses standard microphones already in the Air Force inventory. The walkie-talkie-sized electronics and rechargeable battery are carried on the individual's belt.

There are many advantages to this new system. For one, it doesn't interfere with radio frequencies. It does not present an RF hazard during munitions loading and refueling operations. And it is inherently jam resistant!

The directional transmission range of the system is approximately 150 feet. However, the full design system will include an omnidirectional capability which will allow personnel to communicate at close range without having to aim the infrared beam. The directional transmission capability uses a repeater system to retransmit infrared signals for extended range and would allow communications around objects which would normally obstruct the infrared transmission path.

The development of the infrared communication system will not only provide communications for personnel in high-noise environments, but the technology can also be applied to low-noise environments such as military police and surveillance, where portability and detection avoidance are required.

In conjunction with the infrared communications media, the system is also equipped with a noise attenuation system provided in the headset. The noise attenuation system works on an electronic technique called "noise phase reversal."

This system, which is already used widely by civilian aviators, creates an out-of-phase signal which acoustically cancels the noise within the earpiece, electronically eliminating unwanted sound. Known as the Active Noise Reduction (ANR) System, it has several advantages over conventional ear defenders. It reduces fatigue and suppresses only unwanted noise. ANR will also be incorporated in future aircrew helmet and headset designs and will help reduce the number of aviators grounded due to hearing loss.

The development of infrared communication and ANR will result in safer flight line operations by providing better and safer communication for maintainers. ■

Advanced G Technology

CMSGT ROBERT T. HOLRITZ
Technical Editor

■ Today's high performance aircraft, such as the F-15 and F-16, are capable of performing maneuvers which far exceed the pilot's physiological tolerance. As a result, aviators suffer visual difficulties and temporary loss of consciousness, commonly called G-LOC. The symptoms are the result of blood pooling in the lower body and difficulty of the heart to pump blood to the brain during high-G maneuvers.

Current acceleration protection strategy depends on the anti-G straining maneuver and the 5-bladder anti-G suit, which has not changed significantly since the 1940s. Now the folks at the Armstrong Laboratory at Brooks Air Force Base, Texas, are working on new systems to improve an aviator's ability to perform during high-G maneuvers.

One concept, called COMBAT EDGE, helps ease the pressure drop between the heart and the brain. Under rapid Gs, oxygen is forced under pressure into the pilot's lungs through a special mask. The straps of the mask automatically tighten to maintain the face seal and positive pressure in the pilot's lungs. At the same time, a counterpressure vest inflates, applying pressure to the pilot's chest, achieving the same effect as the G-straining maneuver.

The Brooks people have also completed development of the Advanced Technology Anti-G Suit. The new suit incorporates a fuller coverage of the lower body with uniform pressure application and an improved abdominal bladder for greater comfort and ease of vigorous breathing motions. It even has the capability to apply pressure to the aviator's feet!

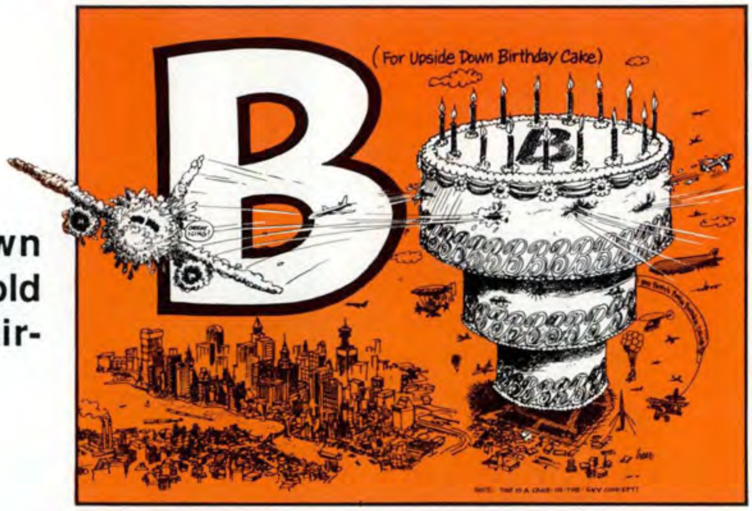
The new suit can be worn with or without COMBAT EDGE but is most effective when the two systems are combined. According to Lt Col Ronald Hill (PhD), Chief of the Flight Motion Effects Branch of the Armstrong Laboratory, "The Advanced Technology Anti-G Suit increases a pilot's endurance by 60 percent over the old anti-G suit and, when used in combination with COMBAT EDGE, it improves endurance by as much as 350 percent."

The high-G environment is extremely fatiguing for the pilot. A combination of effective training and systems such as COMBAT EDGE and ATAGS decrease this fatigue. The pilots are then better able to perform their primary job of flying and fighting. Each sortie is more effective and more sorties are generated. ■

COMBAT EDGE enhances endurance and reduces fatigue, but it *does not* prevent G-LOC. Although aircrew have G-LOC'd during centrifuge training while wearing COMBAT EDGE and it does not replace the straining maneuver, it certainly gives a fighter pilot the "edge" during combat.

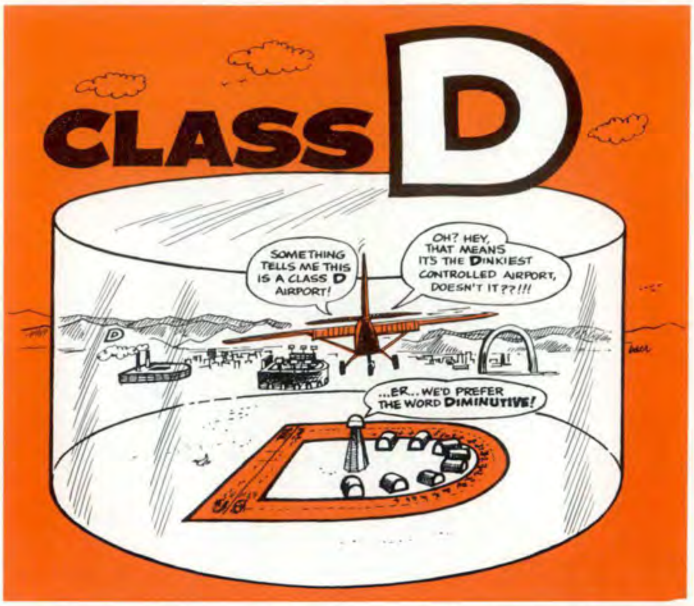
Now, one more time...

A is for Airspace Above Everyone Else (the old Positive Control Airspace).



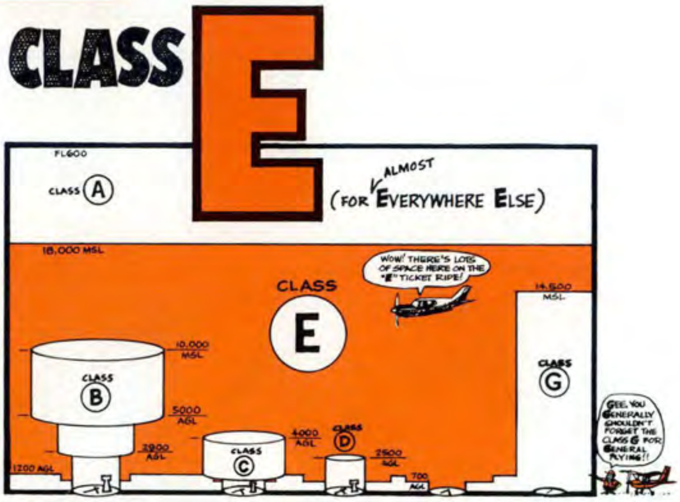
B is for upsidedown Birthday Cake (the old Terminal Control Airspace).

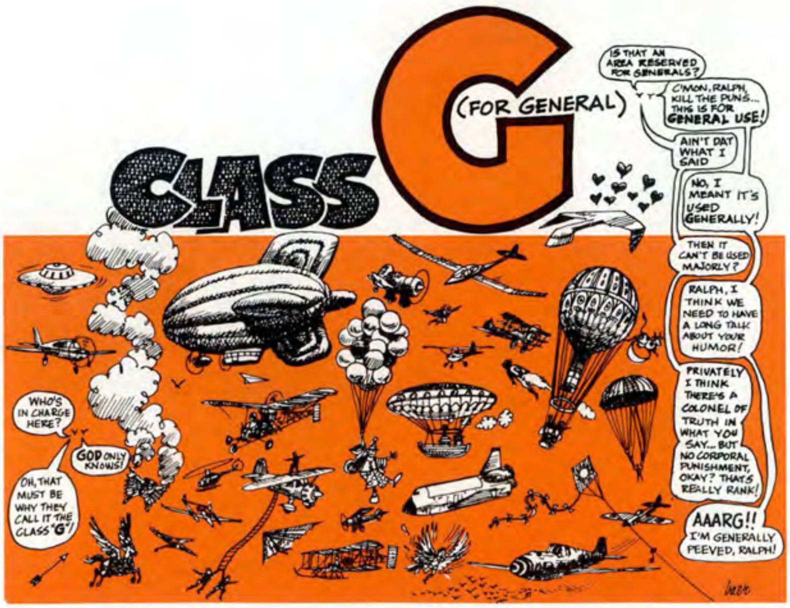
C ? Not so confusing. It's between B and D (C is the old Airport Radar Service Area).



D is the airspace you drop into (the old Airport Traffic Area).

E is Easy to use. E for almost *everywhere* else (controlled airspace).

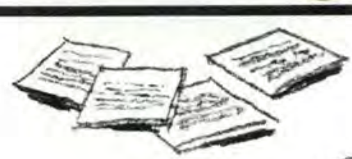




G is for General. Gee, it's uncontrolled (all the brown-colored airspace on your IFR en route charts).

Ralph's Four Napkins: Worth Reading

ROBERT R. SINGLETON
55 ARRS
Eglin AFB, Florida



■ Friday, 14 August, another night in the spirit world's "Aircrew Lounge." I slowly wound my way over to the giant screen TV. Tonight's show featured live coverage of in-processing at an aircrew training course. I don't think any of us watching were at all concerned with whether it was an Air Force, Navy, or Marine school; whether it was an F-18, C-130, or B-1 class; or whether those in-processing were pilots, navs, loads, or any other particular crew position. They were aircrew, that was enough for us.

I took a seat on the nearest empty stool and turned to Doug. He had been a C-130 loadmaster, and a good one. Without giving it much thought, I asked him, "Say, Doug, what would you tell them (nodding my head toward the TV screen) if you had the chance?"

"That's a good question, Robbie." He thought a minute, and continued, "Whatever it was, I'd want to make sure it was the best piece of advice I could possibly offer. Being a spirit is nice, but no sense becoming one any earlier than necessary."

It didn't take long before a few of us had a real good discussion going. If there was one thing we'd pass on that would apply to all aircraft, all crew positions — what would it be?

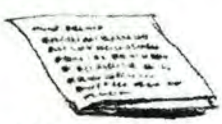
Would we emphasize procedures? Would we emphasize systems knowledge, proper crew rest, the hazards of IMC and spatial disorientation, alcohol, or visual illusions, particular techniques, or tactics? The consensus was a negative to all the above. They were all either adequately covered in earth-bound guidance, or not applicable to all aircraft, all crew positions.

Steve, an old C-130 nav, began to vent some frustration. "There is no way we can provide a one-liner to *all* aircraft, *all* crew positions. Those people have systems, technology, procedures, and missions we don't even know about. The only thing we have in common with them is people, and even they have changed. Any advice we might give would be outdated, obsolete."

"People," I had stopped listening after "people." Without knowing it, Steve had hit the nail on the head. What did *we* have in common? I looked about me — Doug, the C-130 load; Dale, the Eagle driver; Steve, the C-130 nav; JJ, the Marine pilot; and Ralph, the H-60 driver. What did we have in common? People.

Every preflight, every flight, every postflight — every flight planning session, every debrief — People. We should tell them about people. But what to tell them? Steve had stated that the aircrews of today were somehow different, with a lot more technology and sophistication. "That might be true," I thought, "but regardless of aircraft or crew position, people are people; always have been, always will be."

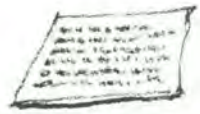
A few of us retired to the bar, refilled our glasses, grabbed a napkin and began jotting down ideas. Some early agreements came to the fore; a lot of it based on experience. After all, we were all spirits. How do you get to be a spirit — you die — a number of us had done so in airplanes. We knew what we were talking about.



The First Napkin

The napkin began to take on a life of its own . . .

- Truth: Often the younger fliers knew something the older fliers didn't know.
- Truth: Often the less experienced fliers knew something the more experienced fliers didn't know.
- Truth: Often the copilot knew something the aircraft commander didn't know.
- Truth: Often the navigator knew the aircraft systems answer that the flight engineer didn't know; or the radio operator knew the flight procedure answer that the pilot didn't know.
- Truth: Often the ground crew knew something the aircrew didn't know.
- Truth: Often the HH-53 crews knew something the C-130 crew didn't know.



The Second Napkin

On to the second napkin for the "Findings . . ."

- Finding: Often the one who knew the answer wasn't asked.
- Finding: Often the one who knew the answer didn't speak up.
- Finding: Often the one who knew the answer *did* speak up and wasn't listened to.
- Finding: Often the one who knew the answer, who did speak up, who was listened to, was subsequently ignored.
- Finding: Often if the one who knew the answer *had* been asked; if the one who knew the answer *had* spoken up; if the one who had spoken up *had* been listened to — the aircrew would have lived to fly again, rather than scribbling on napkins in the Spirits' Aircrew Lounge.

The Third Napkin

It was time for the third napkin. We put the heading "Why" at the top of this one.

- Why: People assume the older know, the younger should learn. Why ask the younger? Why listen to the younger?
- Why: People assume the experienced know, the inexperienced should learn. Why ask the inexperienced? Why listen to the inexperienced?
- Why: People assume qualification equals knowledge and judgment; the higher have it, the lower don't. Why ask the less qualified? Why listen to the less qualified?
- Why: People assume knowledge is area specific. Why ask the radio operator a pilot question? Why listen when the radio operator gives a pilot answer? Why ask the navigator an aircraft systems question? Why listen when the navigator gives an aircraft systems answer?
- Why: People can be reluctant to speak up if younger, less experienced, possessed of lower crew qualification, or operating out of their area.
- Why: People will *choose* to *not* listen, acknowledge, or act upon the thoughts of another crewmember.

Three napkins. The crowd was thinning. We topped off our glasses, kicked back, and reflected a while. We had all experienced each of these truths at one time or another. Each of us knew someone in the Spirits' Aircrew Lounge who had come to be here as a result of one of these truths. We had stumbled on something big; we could *feel* it.

"OK, we have identified some 'truths' and some 'whys,' what now?"

The Fourth Napkin

The *last* napkin — *our* message to those folks on the TV screen; the *one* message we could give:

- Make *no* assumptions regarding what the people around you can contribute.
- If you *must* make an assumption regarding what the people around you can contribute, assume they have an unlimited potential to contribute in a positive manner.
- Remain blind to age, experience, qualification, and area of expertise.
- Focus on, and listen to, *what* is being said, *not* on *who* is saying it.
- Know, and never forget, that *everyone* knows *something* about *everything*. They just may know the missing piece to your puzzle.
- Know, and never forget, that while being a free-floating spirit may be nice, life is worth living. It is worth the moment to ask. It is worth the moment to listen.
- Know, and never forget, that ego and pride can kill. The other person may be right, you may be wrong. The other person may know more than you. Accept it, be thankful, learn from it.
- In all your words and actions, demonstrate your belief in the above, *and live to fly again.* ■

Automated Surface Observing Systems

ERNEST J. SESSA
AAI/SMI
Automated Surface Observing System Program Engineer

■ "Everybody talks about the weather, but nobody does anything about it." At an increasing number of airports throughout the U.S., the National Oceanographic and Atmospheric Administration, in partnership with the National Weather Service, the Federal Aviation Administration, and the U.S. Navy, are doing something to improve the process of generating surface aviation observations.

The National Oceanographic and Atmospheric Administration is in the process of installing the Automated Surface Observing System at over 1,000 airfields. This is part of the National Weather Services' modernization and restructuring program and the FAA's national airspace plan.

The Automated Surface Observing System, as its name implies, will automate the process of taking weather observations at all existing stations and at 500 new stations which are currently without full-time weather information. Current part-time stations will become 24-hour-a-day operations following the installation and commissioning of this system.

An Aviation Weather System

There have been a number of automated weather systems designed and procured by the federal government in the past, some with similar sounding names, some with similar missions. Research projects and studies on the feasibility of automating the observation process date back to the 1960s. These early programs gained valuable experience for the National Weather Service and FAA, but it was not until 1981 when the Joint Automated Weather Observing System study concluded the sensor and computer technology was mature enough to go forward with automation at airports.

As a result of the Joint Automated Weather study, it was decided the time was right for automation, and the *Automated Surface Observing* Program was begun under the lead of the National Weather Service. During the development phase, the FAA determined a critical need for weather information at up to 200 sites which could not wait for the full-scale observing system production to begin.

As a result, the *Automated Weather Observing System* Program was begun. The systems were to be commercial weather systems adapted and modified to meet the FAA's specifications and to function in the interim while the automated weather observing system development, testing, and limited production phases were completed.

Perhaps because of the similarity in the nomenclature, there has been some confusion regarding the relationship between the Automated *Weather* Observing System and the Automated *Surface* Observing System. It is important to understand the systems are not evolutions or outgrowths of each other. They are, in fact, completely separate programs, sharing nothing except a similar name and mission.

The Automated Surface Observing System (ASOS) was designed specifically for use at airports with aviation safety the foremost consideration. All of this system's major design goals involved achieving high levels of data quality, high reliability, and high availability figures. In fact, the Automated Surface Observing System's requirements for error-free data availability goes as high as 99.99 percent for some critical parameters.

ASOS incorporates built-in backups for all critical data collection/processing subsystems and has provisions for redundant sensor subsystems where required. The system was designed and tested to operate in the most extreme environmental conditions such as temperatures from -80°F to 140°F, in desert conditions with high levels of dust and in coastal conditions with salt fogs and sprays; and, in 120-knot winds with 3 inches of ice, plus a host of other environmental extremes.

The systems also incorporate extensive shielding and filtering to insure reliable operation in the electromagnetically dense environment of major airports or military airfields. The units feature extensive grounding and lightning protection systems so critical real-time meteorological data will be available when it is needed most during severe weather events.

Automated Surface Observing System in Operation

This system is designed to operate continuously. In normal mode of operation (the system also has manual modes, but these are used only under special circumstances), the data collection package makes data requests and diagnostic requests of each sensor at a predetermined rate (e.g., every 5 seconds for wind data, every 10 seconds for temperature, 30 seconds for ceilometer, etc.). The Data Collection Package collects the data and test results from the sensors and periodically runs internal tests on itself. All of this information is then compressed for transmission to the Acquisition Control Unit.

The Acquisition Control Unit polls all of its data collection packages and retrieves weather data and diagnostic test results at a preset rate. The control unit also retrieves additional information from other systems to which it is connected.

The Automated Surface Observing System, when connected to a Runway Visual Range computer, will collect the runway product and automatically update the observation and the user displays with this information.

When the ASOS is interfaced to the FAA's Automated Data Acquisition System, the surface observing system will not only provide the data acquisition system with minute-by-minute updates of weather conditions, but it will also retrieve lightning data from the National Weather Service's nationwide lightning detection network via the Automated Data Acquisition System.

ASOS is then capable of automatically updating its observations and displays with appropriate thunderstorm

continued

Automated Surface Observing System

continued

information.

Once the system has collected the data and evaluated the diagnostic test results, the Acquisition Control Unit will run the raw sensor data through its algorithms and data quality checks. If the control unit detects a failure in either the hardware test results or in the data quality checks, a maintenance technician is automatically notified.

The failure will also be indicated clearly on the maintenance status pages. The control unit will then update its displays, outputs, and archives with the new information. Displays are typically updated once a minute with the exception of the controller video display which is updated with 5-second wind information and the voice output which is either updated each minute or only with hourly and special observations as selected by the operator.

Every hour, or whenever a parameter crosses one of the special criteria thresholds, the Automated Surface Observing System will automatically generate an observation. When this occurs, the operators are notified via visual and audio cues a new observation is pending. The system will automatically update its displays and outputs with the new observation and transmit this observation to the various weather information networks.

There are also provisions for the operators to generate specials or urgent specials as required. ASOS also composes observations every 5 minutes to be used for incident investigation and reporting. These 5-minute observations are not normally displayed or transmitted but are archived for later retrieval.

The Automated Surface Observing System in the Field

There are over 250 Automated Surface Observing Systems installed and accepted, and 12 are fully commissioned. Installation is accomplished at each airport by the system contractor's electronic technicians and involves assembly and placement of the system components, calibration, and checkout of all the sensors and completion of a burn-in period for the entire system.

Automated Surface Observing Systems have been installed from Alaska to Florida and from Maine to California, and have so far performed up to expectations. Over 50 systems in the West and Midwest have been operating for more than a year and throughout a complete thunderstorm season. Initial reports from the field indicate the systems have experienced no upsets or failures due to nearby lightning strikes.

The Automated Surface Observing System unit at Concordia, Kansas, survived a severe gust front featuring peak wind gusts to 110 mph. The unit continued to operate and report normally throughout the event, switching onto its internal backup power when facility power was lost. The only damage sustained was attributed to flying debris. Automated Surface Observing Systems in the field are already exceeding their required reliability numbers by more than a factor of 2.

To best satisfy needs of the air traffic control community, FAA headquarters, together with the National Oceanographic and Atmospheric Administration's program office and the Automated Surface Observing System's contractor have begun a rapid prototyping effort to redesign the Controller Video Displays to be similar to display systems already accepted and in use in ATC facilities.

The Automated Surface Observing System is being modified to allow it to automatically update the weather portion of the Automated Terminal Information System. This will eliminate the need for ATC personnel to update the Automated Terminal Information System with each new observation. ■

Courtesy *Journal of ATC*, April-June 1993

Our Blood Supply

CMSGT ROBERT T. HOLRITZ
Technical Editor

■ Military folks have always been generous when it comes time to donate blood. Our reasons are not necessarily altruistic. Most of us who have been around the camp a while have seen a situation occur in which the demand for blood exceeds the supply. In 1965, the entire flight line of Bien Hoa Air Base in South Vietnam was destroyed by fire and explosion for a still unknown cause. During Desert Storm, a military dormitory took a direct hit from an Iraqi SCUD missile. In Beirut, Lebanon, a truck bomb destroyed a military complex, killing nearly 250 Marines.

In all these disasters, military folks were required to donate blood, sometimes even required to undergo direct transfusions in order to save the lives of a fallen GI. During the Vietnam war, thousands of GIs' lives were saved by battlefield blood donations.

Since blood donated in the field could not be tested adequately, there was always a chance, though slim, of contracting a disease from the donor. There were several cases of diseases, some serious, being contracted as a result of a transfusion, but these were rare, and when weighed against the probability of bleeding to death, were totally acceptable risks.

In the early '80s, the outbreak of AIDS caused great concern for the military blood supply, and receiving human immunodeficiency (HIV) tainted blood was tantamount to a death sentence. So, in 1985, the Department of Defense directed the screening of all military personnel for human HIV and the medical status of those infected.

In response, the Armstrong Laboratory's Epidemiologic Research Division began a 2-year screening of USAF personnel in August 1986. In October 1988, another 2-year study was conducted to calculate the incidence of new infections.

In the early '80s, the outbreak of AIDS caused great concern for the military blood supply and the potential for receiving HIV-tainted blood. So, in 1985, DOD directed the screening of *all* military for HIV.

The first test, which ended in 1988, showed a prevalence of .95 infections per 1,000 individuals. The second test, which ended in September 1990, revealed an HIV infection rate of .21. This was, by far, the lowest in the entire DOD and infinitely lower than the civilian population. Because of the extremely low incidence rate, the Air Force now conducts tests at a 5-year interval.

In spite of the fact the civilian rate of HIV infections is on the increase, the DOD rate has not increased significantly over the last 6 years. There is no doubt HIV screening programs have contributed to the low infection rate. However, there is more than a little evidence to support the military lifestyle, which discourages promiscuity and the UCMJ, which prohibits certain sexual activity, have a lot to do with the rate. As it stands now, the odds of becoming HIV positive by receiving a transfusion from another member of the Air Force is less than 1 in 5,000. And the chance of contracting the disease from Air Force-donated blood banks is almost zero.

The next time you find yourself being tested for HIV, consider the peace of mind you can have if you are required to receive a transfusion under battlefield conditions. ■

IFC APPROACH

By the USAF Instrument Flight Center, Randolph AFB, TX 78150-5001

CDI Centered?

LT COL RIC THIELE
MAJ PETE KATSUFRAKIS

Air Force Flight Standards Agency
The Instrument Flight Center

■ One of the most common questions we get here at the Instrument Flight Center (other than, "Can I get a pony to the IRC test?") is "What is the definition of on course?" The easiest answer to this is, "CDI centered." However, our answer usually gets numerous comments about our parents or lack thereof from the person asking the question. Needless to say, the answer is more complex than "Keep your posterior on centerline!" but it's not really tough to learn.

If you use the strict rule of "CDI centered," you may be unnecessarily delaying your descent to a point where it is difficult to safely fly an approach. There may be cases where it would be better to be descending to the appropriate altitude as you join the course.

The current AFM 51-37 (soon to become AFI 11-203) does have some helpful guidance. Once a lead point is reached and you START a turn to the next segment of the approach, you may descend to the next applicable altitude restriction. This is especially important if you try to make a reasonable descent rate to the FAF. It is always important to remember maximum obstacle clearance is based on your attempt to maintain centerline.

Now a lot of you may say, "Well, that's easy! CDI off the wall and I'm okay to descend." This is not only wrong, but it could be dead wrong. If you were taught "CDI off the wall," unlearn it. If you are teaching "CDI off the wall," DON'T! There is more to a lead point than that.

For example, you're being vectored to the TACAN final approach course. You are out at 30 DME (TACAN is not on the field) and the CDI comes off the wall so you start down. Are you safe? Maybe not. At 30 DME, there are two radials per mile, so CDI off the wall means you are 5 nm off centerline. At this point on an approach, you may not be protected by TERPs and you could unknowingly descend into an obstacle.

However, if you calculate a lead point based on the speeds we normally fly, you are guaranteed to be inside TERPs protected airspace. By the way, lead radials are required when there is more than a 90-degree turn to final. These lead radials are also based on a minimum lead point of 2 nm. If you are flying the turn to final at less than 240 KTAS using the instrument plate's lead point, you will undershoot. You are going to need to calculate a lead point. Now, I'm not going to put you to sleep with a lesson on how to calculate a lead point. You are professional pilots and should know how to do so already. You will fly a more accurate and a safer approach if you calculate your own.

Let's take a look at a couple of situations.

1. If there is a procedure turn altitude depicted, when can you descend from the procedure turn altitude? AFM 51-37 says, ". . . when the aircraft is established on the inbound segment of the

published approach." Great, sounds like "CDI centered" to me. If descent rate is not a problem, then "CDI centered" is the answer. But if waiting 'til the CDI is centered will leave you too steep, then the earliest you should descend is halfway through the inbound turn. This will equate to the lead point for a 90-degree turn inbound.

2. How about if you're being radar vectored to final? Once cleared for the approach, you are supposed to maintain the last assigned heading and altitude until established on a published segment of the approach. If, by waiting for "CDI centered," the descent gradient will be too excessive, start your descent when you reach your normal lead point.

You see, the bottom line on the whole shootin' match is you are safest with the CDI centered. However, if you have to get down because you're too high, descend when reaching your calculated lead point.

That's all there is to it. It's very simple, unless you have forgotten how to figure a lead point. If so, ask your friendly IRC instructor for a quick refresher on the subject. Do it before your next turn to "on course."

Can't locate a friendly IRC instructor? Can't locate an IRC instructor? Well, some people say I qualify on at least one criteria. Give me a call at DSN 487-3077 and we'll talk lead points. ■

Will declaration of an emergency help you or just increase your paperwork after landing?

"Uh...we might have a problem here."

With global reach becoming integral to Air Force flight operations, nearly every pilot will soon encounter International Civil Aviation Organization (ICAO) rules. Perhaps most important to a safe conclusion of an in-flight situation is effective communication.

The following article illustrates the importance of understanding ICAO procedures which will provide the emergency support you need.—Ed.

Incident One

■ On a dark and stormy night (well . . . blustery, anyway) in November, a crew was tasked to ferry an empty passenger twin jet from a Southern UK airfield to one in the Midlands. The fuel load was light, resulting in the aircraft operating close to the aft C of G limit.

During departure, severe turbulence made control of the aircraft very difficult, resulting in an "altitude bust" of the climb clearance. When challenged by air traffic control about the "bust," the crew advised the controller about their handling difficulties due to the adverse weather.

Later, when the aircraft was established in the cruise, Approach Control began passing the crew arrival procedures together with frequency changes as the aircraft was passed from sector to sector in busy congested airspace. The workload on the flight deck, which was already high due to the short nature of the flight, began to increase.

This led to navigation errors by the crew and additional calls from Approach. It reached a point where the crew began to struggle to keep in touch with the situation. Yet, at no time did they declare an emergency.

At the control center, the apparent inability of the crew to conform to instructions led to increased controller workload and resulted in the controlling agency raising a safety report concerning the noncompliance with procedures. Afterwards, the crew stated in their company report the flight had been a very unpleasant experience. With hindsight, they should have declared an emergency. Indeed, such action would have relieved the pressure on radio communications and alerted Approach Control to the problem and enabled them to provide the crew with the appropriate assistance to achieve a safe and less stressful arrival.

Would you declare an emergency in a similar situation? You should, but would you know what to say?

Proper declaration of an in-flight emergency is important.

Another occurrence recently reported highlights reluctance among some pilots who, having made a decision to tell air traffic control about a serious problem, do not use the standard ICAO phraseology for the formal declaration of an emergency.

Incident Two

In this case, the aircraft involved was another medium-sized twin jet airliner operating on a scheduled IFR flight between two major UK airfields. During the climb, passing FL 200, the crew advised air traffic control they had suffered a complete left-side hydraulic failure and wished to turn back to their departure airfield. The controller, quite rightly wishing to know the seriousness of this aircraft's situation, asked the pilot if he wished to declare an emergency. The pilot's reply was very cool: "Yes, I would like the emergency vehicles available."

continued

"Uh...we might have a problem here."

continued

Although the crew selected transponder code 7700 (the emergency squawk valid in both Pan and Mayday situations), the air traffic control system accorded the flight "MAYDAY" status, and it landed safely back at its point of departure. However, did the pilot consider whether his emergency merited the declaration of distress, or was urgency a more appropriate category?

What lessons can be learned from these incidents? The following are worthy of consideration.

1. Let us begin with some emergency definitions.

DISTRESS—The aircraft is

threatened by serious or imminent danger and is in need of immediate assistance. Radio/Communication PRO-WORDS: **MAYDAY, MAYDAY, MAYDAY.**

URGENCY—The calling station has a very urgent message to transmit concerning the safety of an aircraft, someone on board or in sight. Radio/Communication PRO-WORDS: **PAN PAN, PAN PAN, PAN PAN.**

There are, for the reasons stated above, logical reasons for two ICAO grades of emergency. Normally, the individual best qualified to make that grading is the pilot. Nobody would argue that, if there is any doubt as to the seriousness of the situation, it is always better to declare a "MAYDAY." Subsequently (upon more measured assessment by the pilot), this can be downgraded to a "PAN." But the only way for air traffic control agencies to get a measure of the situation is for pilots to be familiar with and to use the correct emergency pro-words of PAN PAN or MAYDAY.

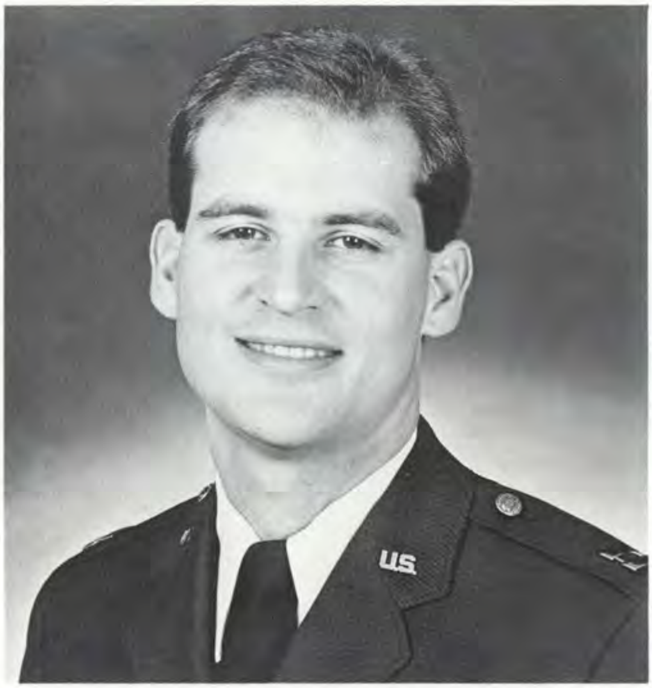
2. Declarations by default—it should not normally be the job of controllers to prompt the pilot into declaring an aircraft's emergency status. Of course, they may initiate such action if they have reason to believe (without formal notification) an aircraft requires special and urgent help or immediate assistance due to some grave and imminent catastrophe.

3. The use of the radio pro-words PAN PAN or MAYDAY is not just designed to get the attention of air traffic controllers. They are, of course, intended to alert all other pilots on whichever frequency is being used someone has a serious problem. They should expect the unexpected, maintain strict radio discipline, and be aware this emergency could have a significant effect on their own operation (e.g., blocked runway). The emergency might even require their active participation.

4. Examples of the type of incidents illustrated in this article raise the question of the manner in which these subjects are covered in pilot and air traffic controller training scenarios. For example, do the checkers and trainers insist pilots undertaking simulator exercises and controllers undergoing simulator continuation training utter the correct words into a microphone rather than "go through the motions" by informing the simulator instructor an emergency transmission would be made and then continuing with the checklist of actions?

The well-known adage is it's one thing to know the theory but it is quite another to put it into practice. Obviously, the nature of an emergency will determine the content of the transmission. However, a few moments spent thinking about this in a calm environment should pay dividends when faced with the pressure of a real emergency. ■

Courtesy *Flight Deck*, Summer 1993



LIEUTENANT COLONEL
Robert H. Schnick
347th Fighter Wing
Moody AFB, Georgia

CAPTAIN
Franklin M. Kirkpatrick
347th Fighter Wing
Moody AFB, Georgia

■ While flying an F-16 as number 4 in a 2 V 2 intercept sortie, Captain Kirkpatrick called a "knock it off" and reported the throttle stuck at about 90 percent. Lieutenant Colonel Schnick, flight lead, gave him the lead and directed a channel change. As Capt Kirkpatrick navigated to the divert base, Lt Col Schnick requested a runway change from Tower. They arrived overhead with 5,000 lbs of fuel. While orbiting over the field, awaiting for an extra BAK-9 cable, they investigated various configurations. They formulated three possible courses of action: a brute force pull on the throttle to idle and fly overhead SFO; a straight-in SFO in SEC; or allow the aircraft to flame out at "high key" and fly a flameout pattern.

Capt Kirkpatrick elected to attempt the SFO while trying to force the throttle to idle. He could not budge the throttle during the SFO and terminated it at low key. Lt Col Schnick then directed the flight to 10 NM final at 9,000 feet to try a straight-in SFO in SEC.

The first pattern was flown at about 9 degrees final approach descent angle, giving a fairly steady speed of 240 KTS. The approach was terminated, and the flight flew back out to a 10 NM final. Lt Col Schnick and Capt Kirkpatrick flew the next approach with a normal 2.5 degree glidepath. With 2,000 pounds of fuel remaining, Capt Kirkpatrick made the decision to land. He touched down at approximately 175 KTS, lowered the tailhook, and Lt Col Schnick confirmed it down. Capt Kirkpatrick engaged the BAK 14 at 90 KTS and came to a stop 1,000 feet from the end of the runway. Chocks were quickly installed but transient maintenance was unable to shut down the aircraft externally. Capt Kirkpatrick's F-16 flamed out approximately 35 minutes later.

Lt Col Schnick and Capt Kirkpatrick's prompt and professional execution of emergency procedures during a stressful and dangerous situation prevented the loss of a valuable combat aircraft.

WELL DONE! ■

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UNITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Mishap Prevention Program.

CAPTAIN
Mark C. Hiebert
48th Fighter Wing
RAF Lakenheath, England

LIEUTENANT
Matthew L. Young
48th Fighter Wing
RAF Lakenheath, England

■ First Lieutenant Young, F-111 Pilot, and Captain Hiebert, F-111F Weapon Systems Officer, were 4 hours into the flight over the North Atlantic ocean. Just prior to their fourth and final air refueling, a loud explosion was heard. Heavy vibrations from the right started to shake the aircraft. At this time, the right engine fire light illuminated, and a check confirmed the right engine was on fire. Lt Young immediately accomplished the critical action emergency procedures after which Capt Hiebert followed up with the appropriate checklist items. The right engine was shut down, the fire light went out, and the aircraft started a descent as one engine would not hold the aircraft level at flight level 270. While in the descent, the vibrations increased in intensity, and the fire light came back on.

Two hundred miles from land, on fire, and in the weather, Lt Young and Capt Hiebert were finally able to maintain level flight at flight level 170. Shortly after leveling off, the fire light went out. The fire system was checked and now showed inoperative. Lt Young and Capt Hiebert ran all applicable checklists as they navigated to an emergency divert base in Gander, Newfoundland. Lt Young accomplished a flawless single engine approach in the weather and brought the aircraft to a safe stop.

Lt Young and Capt Hiebert's outstanding airmanship and exceptional crew coordination under the most stressful of circumstances resulted in the successful recovery of a valuable Air Force asset.

WELL DONE! ■

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