The Leading Edge
The newsletter of the MIT Soaring Association
February 1998

Contents

News briefs

Mark Tuttle

Annual meeting: The annual meeting is a time for club members to get together for a good dinner and a good time, and to sharpen their bragging skills for the next season. This year's meeting will be held on Sunday evening, March 15, from 5:00 to 9:00 PM at the Papa Razzi restaurant on Route 16 in Wellesley. There will be a cash bar at 5:00, with dinner starting at 6:00. Papa Razzi is a family-style Italian restaurant, and we'd like this to be a family event, so tickets will be $25 with kids 10 and under free. Make your reservation by returning the reservation form included with this newsletter to Carl Johnson before March 11. Carl Johnson is organizing the party.

Papa Razzi
16 Washington St (Route 16, westbound)
Wellesley, MA 02162
(781) 235-4747

Reservation deadline: March 11

Election: It's also time for us to vote in the next board of directors. Please return the ballot included with this newsletter to Carl Johnson by March 11.

New certificates: Jeff Landsman earned his private certificate this winter. Jeff (jlandsma@ipdinc.com) writes, "Although I've been a member of the club, I have not had a chance to get up to Sterling this past year due to work and travel. During my travels to Cape Cod, I was able to break away and get my private glider rating flying at Cape Cod Soaring. I took my test with Tom Sommerville in November. Thanks for sending me the newsletter, I enjoy the updates. I hope I can get back with the club in 98, to fly and assist with some of the duties."

The Hindenburg explained

Mariette DiChristina

This article is a condensed version of an article titled "What really downed the Hindenburg" by Mariette DiChristina that appeared in the November 1997 issue of Popular Science *sent to me by my father, Morrie Tuttle. —Editor*

Six decades after the infamous Hindenburg disaster, when 36 of 97 aboard died during the horrific blaze that halted rigid-airship travel, Addison Bain has revealed a stunning new explanation for what started the fire. Bain, a recently retired engineer and manager of hydrogen programs who spent more than 30 years at NASA, has recently concluded several years of scientific sleuthing work in search of the culprit behind the conflagration. He combed through thousands of pages of original testimony and materials at four archives in the United States and one in Germany, interviewed survivors and airship experts, and ultimately tested original materials from the model LZ-129 Hindenburg and its contemporaries. Contrary to what the investigators ruled at the time, asserts Bain, the fire did not start with free hydrogen lit by natural electrical discharge or sabotage.

Bain had seen the famous photos of the Hindenburg's bright, blistering hot fire and knew that hydrogen doesn't burn that way. A hydrogen fire radiates little heat and is barely visible to the unaided eye. Bain had also visited the National Air and Space Museum and seen a model of the Hindenburg with a plaque that saying something about how the hydrogen exploded. As a hydrogen expert, he knew that the pure gas doesn't just explode. That was enough: tracking down the source of the fire became something of a part-time obsession for Bain over next few years.

Eventually, in 1994, Bain ran into Richard van Treuren, a space shuttle technician, at a conference on hydrogen. Van Treuren, a self-avowed "helium head" and member of the airship aficionados called the Lighter-Than-Air Society in Akron, Ohio, was seeking Bain to talk about hydrogen. Through van Treuren, Bain learned that pieces of the Hindenburg's skin still existed. Bain traveled around the country to procure them, spending hundreds of dollars buying original materials, books, and papers from collectors. “What I was trying to find out is, what did they use specifically in the coating?” he says.

Hepburn Walker, who had been stationed at Lakehurst in the early ’40s, was among those in possession of pieces of the Hindenburg; Walker had found them in the soil. Another sample, a part of the swastika painted on the Hindenburg’s side, was kept in a safe by Cheryl Gantz, head of the Zeppelin Collectors Club in Chicago.

Bain remembers meeting Gantz. “May I have a little clipping, just anything to take to the lab?” he begged. Gantz was willing but wanted to impress upon Bain the fabric’s value to her: “How much do you value your first-born?” she asked. Bain laughs: “I got the message!” Bain also located fabric samples in Germany that were representative of the top of the Hindenburg, where the fire started.

What was in the fabric? A startling variety of highly flammable compounds proved to have been added to the cotton fabric base. “They used a cellulose acetate or nitrate as a typical doping compound, which is flammable to begin with — a forest fire is a cellulose fire,” says Bain. “OK, you coat that with cellulose nitrate — nitrate is used to make gunpowder. And then you put on aluminum powder. Now, aluminum power is a fuel used in the solid rocket boosters on the space shuttle.” The wood spacers and ramie cord used to bind the structure together, along with the silk and other fabrics in the ship, would also have added to the fuel-rich inferno. Even the duralumin support framework of the Hindenburg’s rigid skeleton was coated with lacquer, ostensibly to protect it from moisture.

In a flame test, a fabric section ignited and burned readily. The arc test, in which 30,000 volts were zapped across a piece of fabric several inches long, was even more revealing: “Poof, it disappeared. The whole thing happened faster than I can explain it,” Bain says. “ I guess the moral of the story is, don’t paint your airship with rocket fuel.”

Bain is quick to point out, however, that it’s not that the Germans and other airship and aircraft makers of the era were simply foolish in doping the fabric the way they did. They had a number of technical problems to solve using the materials of the time. Today’s synthetic fabrics, with their range of properties, did not yet exist. The cotton or linen fabric skin was swabbed with the chemicals to make it taut and reduce flutter for aerodynamics, and then painted with the reflective red iron oxide and aluminum so the sun’s heat wouldn’t expand the gas in the cells, to help prevent gas from escaping. The skin had to be protected from deterioration from sunlight and rot from moisture. When engineers changed one part of the formulation to address flammability concerns, the mixture might not have adhered well or other problems would crop up.

What is perhaps most stunning about Bain’s research is that what he has discovered comes 60 years after some German airship experts already knew it. While visiting an archive in Germany, he copied two 1937 letters handwritten in German that had not been seen by earlier investigators. Their shocking contents were revealed to Bain only after he returned to Florida and had them translated. They were written by an electrical engineer named Otto Beyerstock, who had incinerated pieces of Hindenburg fabric during electrical tests conducted at the behest of the Zeppelin Company. In the notes, Beyerstock testily dismissed the idea that hydrogen could have started the fire, stating with certitude that it could only have been caused by the fabric’s flammability in a charged atmosphere. In a similar craft flying under the same atmospheric conditions that the Hindenburg faced in Lakehurst, the same sort of conflagration would occur, even if noncombustible helium were used as the lifting gas. (In fact, notes Bain, such a fire did take place in 1935, when a helium-filled airship with an acetate-aluminum skin burned near Point Sur, California.)

“I beg you to kindly inform me about the corrective measures to be taken or that have already been taken,” Beyerstock wrote to Zeppelin. Some modifications were made in a subsequent airship plan, such as the addition of a fire retardant. “They knew,” Bain says simply. But shortly after the Hindenburg disaster, and probably because of it, the great Zeppelins were removed from service.

None of what Bain has learned has diminished his admiration for the engineering achievement in creating the great airships. “With all due respect,” he says, “the Germans did a fantastic job. I admire their technology. It was just an unfortunate little flaw, just like the flaw on the Titanic and the flaw in the Challenger,” he says, referring to the “unsinkable” ship’s sulfurous, brittle steel and the space shuttle’s O-ring — both of which failed under the prevailing weather conditions. “You never know what Mother Nature is going to do to you.”

Flight psychology

Mike Baxa

Safety: First…middle…and last

Psychology, Flight Surgeons, and Old Pick Up Trucks

Without really knowing what I wanted to be when I grew up, I pursued a liberal arts degree with a major in psychology and a minor in life sciences. I became so engrossed in my studies that I was ready to enter a graduate program that would lead to a Ph.D. I was convinced that I was destined to become a clinical psychologist. I especially enjoyed abnormal psychology as I could personally relate to each disorder I studied. Clinical psychology was less boring and faster than the medical school route I was considering. Besides, my level of partying did not permit anything too academically laborious. It was about this time I read a blind study documenting that about half the people requiring counseling for disorders would get better on their own over time with or without professional help. I was stunned. So much for that career option. I haven't picked up, read, or put much validity in any psychology related article since. Until, that is, I became intrigued with pilot judgment issues.

FAR 1.1 defines the pilot in command as being responsible for the operation and safety of an aircraft during flight. Where does the pilot's own emotional or psychological state of mind enter into safely operating his aircraft? What are the factors that contribute to impairment? Who is responsible for determining mental fitness before a flight? The following is intended to at least get you thinking about your own mental state before flying and review some of the physiological aspects affecting our mental and motor skills. There are various judgment training manuals on the market and I have reviewed some of them. These may be of help to a pilot.

First, there are many external factors that can affect our flying judgment such as prescriptions and over-the-counter medicines that may make us drowsy or feel light headed. FAR 91.17 states that no person may pilot an aircraft within eight hours after the consumption of any alcoholic beverage or use any drug that affects a pilot's faculties in any way contrary to safety. It is also possible that a person could have stopped drinking eight hours ago and still be intoxicated. The FAR's further define intoxication as having .04 per cent by weight or more of alcohol in the blood. Some people metabolize alcohol more slowly, and if they drank sufficiently the night before, they could wake up still legally intoxicated. After drinking eight drinks, most of us will still have measurable alcohol in our system even after 16 hours. Caffeine in the form of coffee or caffeine stimulants have no effect on metabolizing alcohol. If you drink alcohol and then coffee with the hope of sobering up, it won't work. The best outcome is that you will be an alert drunk.

An equally important outcome or factor of heavy alcoholic consumption is the hangover. Everyone is familiar with the associated headaches but few realize it can affect one's body chemistry. Alcohol dehydrates an individual and that is why people are thirsty the day after a binge. A pilot should ground himself the day after a night of heavy partying. A good hard work out with a large quantity of fluids will go a long ways in overcoming the hangover side effects of heavy drinking and restoring a clear head. For those of us over 40, "partying" is no longer in our vocabulary and we usually select the evil that will have us home by 9:00 pm and in bed by 10.

Dehydration affects judgment and thinking. One should always carry water and force fluids on extended flights or high-altitude flights. A reason for this is an often forgotten and misunderstood component of human physiology, the respiratory system. The surface area in the pulmonary alveoli (little sacks within the lungs) of a 155 pound man is roughly equivalent to that of two tennis courts. At altitude in the dry air you have two wet tennis courts giving up a lot of moisture via evaporation. The moist membranes of your lungs can quickly diminish your body's fluid level. Unless you can figure out how to carry a humidifier in your cockpit, drink fluids.

Other factors affecting thinking and judgment include hypoxia (lack of oxygen at the cellular level), and smokers are more susceptible to hypoxia at lower altitudes than nonsmokers. If you smoke one pack a day, you need to go on oxygen at 10,000 feet msl versus a nonsmoking pilot who must go on O_2 at 14,000 feet msl. General hypoxia symptoms vary and range from euphoria to dull headaches. However, we each have our own individual and unique symptoms of hypoxia. It might be a tingling in the feet, the smell of oranges, a numbness, or anything. Vertigo or disorientation has killed pilots and is not to be underestimated. Once you lose your focus on the horizon, it is difficult to tell which way is up. This may occur on a hazy day, flying in rain, snow, or clouds. Fatigue is another big factor we each need to monitor. Whether a competition pilot or a new private, we are most susceptible to not thinking clearly and making mistakes after a long day of flying. Thus, landings can become higher risk events than when we are refreshed. At the end of a long flight and if you are beginning to feel fatigued, a chocolate bar will give you a short burst of energy due to the sugar hitting the blood stream in combination with the caffeine in the chocolate. Hypothermia directly affects judgment, visual acuity, depth perception, and reflexes. When extremely cold, any activity becomes very difficult including concentration. Hyperventilation is caused by rapid breathing with excessive CO_2 being blown out or extracted from the blood stream. The results may include feeling cold, sleepy, or dizzy, and may even result in unconsciousness. The prevention? Breath normally.

Performing positive G maneuvers causes a pooling of blood in the lower extremities and in high G's a pilot may pass out. Passing out tends to directly affect judgment. G-suits are effective for fighter pilots who routinely perform abrupt and extreme maneuvers. The G-suit is nothing more than a giant blood pressure cuff encasing the abdomen and legs electronically connected to the flight systems. In high G's they automatically inflate air bladders keeping blood from pooling in the lower body. For glider pilots experiencing high G's as in fast steep turns, we are at more risk of over stressing the design limitations of our aircraft than blacking out. However, it is possible, as each of us are susceptible to varying G force levels depending on our physical condition. One effective step we can take is to do what the fighter pilots do when pulling G's. They use the "L-one maneuver" which is simply bearing down as if you are forcing a bowel movement. Doing so forces blood up the carotid arteries and into the brain. A trained and conditioned fighter pilot can withstand 8-9 G's. For us mere mortals we become at risk in the 5-6 range. As an aside, the space shuttle astronauts will only experience 2-3 G's at lift off.

There are those earth-bound folk who really can't comprehend what we do and would say that a sane or rational glider pilot is an oxymoron. Seriously though, there are very few pilots flying that suffer from serious psychological abnormalities. Students with real mental disturbances are not signed off by instructors, as the FAA places legal and moral obligations on the instructor to stop the certification process and, if necessary, to notify the local Flight Standards District Office. However, one temporary mental threat to all of us is that of anxiety. Anxiety is defined as a "painful or apprehensive uneasiness of the mind over an impending or anticipated ill" with physical symptoms of sweating, tension, and increased pulse. For the pilot suffering from anxiety the result may be a wide range of actions from an inability to act to an impulse to do something, even if its wrong.

The rule is not to bring your worries, fears, or anxieties to the field. This sounds pretty simple but more difficult to practice. If your mind is preoccupied or if your emotional/mental state is not stable, you should not be flying. You have to police and monitor your own anxiety levels or mental state when there is turmoil at home, work, or within yourself. If anxiety levels are high, if you are depressed, or if you are not mentally sharp or physically fit, feel free to come to the field to help out, but *don't fly*. You may find that coming to the field to fly is an "escape" from your problems and you are able to disassociate yourself from your worries. If this is the case, fine. When I have work pressures on my mind, I look forward to my flying "fix" or escape. I use the time on the drive to the airport to relax, clear my head, and focus on the day's flying task. For me this is equal to a week of vacation in the Caribbean... NOT, but you know what I mean. I usually feel mentally refreshed for several days and I am able to concentrate better at work. The key is to remember that when you walk on the field *you have to have your head on straight*, period.

One technique an advanced student or private pilot might try is to get a note pad and write down a sequence and/or list of safety aspects or procedures and then translate it to an audio cassette. Get out your old textbooks and jot down what you think you need. You play the cassette to yourself on the way to the airport. It might cover checklists, tow signals, emergency release procedures, flying speeds, stall/spin recovery, pattern procedures, etc. Make it as long as you like. When playing it on the drive to the field, try to visualize what you are telling yourself. I promise you that a) your mind will be 100% focused on safe flying when you get to the field, b) you will react faster in emergency situations as it will be ingrained in your mind, and c) you will fly with more confidence.

In some cases the pilot may place unrealistic expectations and excessive pressure on himself for achieving a specific flight objective or goal. This might be anything from a "must do" cross-country flight, "got to have" badge flight, or a "must have" sign-off from an instructor. Type A personalities (however that is defined) are especially prone to this way of thinking. Keep in mind, one of the appeals to our sport are the numerous and changing variables which make each flight a challenge and always different. There is always a level of uncertainty or unpredictability with soaring, such as the weather, field conditions, pilot performance, etc. That is part of the fun and excitement inherent to what we do. It doesn't make sense to approach soaring with a "must do" attitude. Yes, prior to a flight it is very positive and desirable to have a goal or objective in mind. Flying to keep your current skill set sharp is also a positive. However, we all need to be realistic and use common sense in balancing our goals and the timeline for achieving them. If the result of not achieving your soaring goals is anxiety, depression, or anger, something is not right and not in balance.

I personally believe the single greatest threat to "mentally healthy" pilots which prevents the exercising of good judgment is that of panic. I suspect one of the leading reasons newcomers or experienced pilots drop out of soaring is because they have found themselves in a situation where they panicked and/or scared themselves to death. If one were to study the characteristics of the successful competition glider pilot, "calmness under fire" would be a distinguishing trait that stands out. These people by either good brain genes, brain chemistry, or self-discipline have the ability to keep thinking clear and straight when in difficult or extreme situations.

I am equally convinced almost all glider pilots can train themselves to think more clearly under pressure. To do this in soaring we should:

1. Be in a mind set of continual learning with a sincere desire to learn. By learning we get exposed to new and different concepts or ways of thinking which push forward our knowledge boundaries. Knowledge is powerful in overcoming fear.

2. Have a firm understanding of our strengths and weaknesses as they relate to our flying skills. Pilots panic or scare themselves when they exceed their skill level and do not realize it until they are in too deep. We

each need to realistically assess and appraise our individual skill mix before we get into trouble.

3. Possess sound mental stability with an emphasis on trying to consistently exercise sound judgment. If we are in internal turmoil, we shouldn't be flying. Plus, sound judgment begins with exercising common sense. Before finding yourself in a panic situation, ask yourself, "Does what I am doing or about to do really make sense?"

4. We need to continually build on our prior experiences as we cautiously "push the edge of envelope" to higher levels of competency with safety always in mind. In this process an individual builds confidence in their thinking and skill ability, and in turn is less likely to panic. Guess what, guys? This is how we grow as people and grow as pilots. If you are not continually learning, assessing your skills, pushing yourself for skill improvement, or exercising common sense, you will not excel as a pilot.

We must have the mental capacity to logically sort through the factors of an unfamiliar situation searching for the most appropriate action or response. In other words, train your brain to think in difficult situations versus panicking. Remember, *fear is normal* and is a healthy self-protective response. *Panic is an abnormal reaction to fear.* If you think or believe you might be prone to "panic" in flight, I would suggest you quietly pull an instructor aside and ask for his assistance and guidance. There is no overnight cure, but you will have taken the first step. Carefully reviewing what leads up to the "panic" and the pilot's approach to such situations will hold the answer. The alternative is to seriously reconsider the pursuit of soaring.

What are the characteristics of a mentally healthy pilot? Hell if I know. I am not a psychologist and I don't even play one on TV. However, common sense and logic might dictate the following:

- high level of maturity with a respect for the rules.
- self-disciplined and able to stay focused.
- emotionally-stable including the ability to get along well with others.
- able to find balance in life and find a level of overall contentment with oneself.
- ability to distinguish between pushing oneself to higher levels versus blindly trying something.
- able to control one's emotions and reactions to situations.
- ability to set realistic goals and take steps in working towards those goals.
- desire to learn more while recognizing one's own weaknesses and working to improve.
- ability to differentiate between levels of risk and make safe decisions or prudent judgments.
- able to objectively assess failures and learn versus making excuses or assigning blame.
- being "tough-skinned" enough to take constructive criticism without taking it personally.
- sensitive enough to appreciate another's perspective but strong-willed enough to know when one is right.
- a very strong sense of responsibility and commitment.
- positive attitude with a healthy ego but not overly egotistical.

We all view "mental fitness" differently and we each have different backgrounds, life experiences, and our own individual perspective on things. It is a bit like the farmer from Massachusetts visiting in Texas. He missed a turn and collided with a Texas rancher. They started talking and the rancher offered him a ride into town. On the drive the Texan thought he would brag a little and said, "You know, I can start in the morning and drive all day long trying to get from one side of my ranch to the other and not be able to do it." The Massachusetts farmer thought about this from his perspective and said, "Yup, I got an old pick up truck just like that."

My brother relays the story of being at Brooks Air Force Base in San Antonio, Texas, completing his training as an Air Force Flight Surgeon several years ago. The Chief of Aerospace Medicine and he stopped by the officers club one evening for a drink. They encountered the "top guns" of this country rolling on the floor in a drunken stupor acting like misfit school children. They had been playing some pool game without sticks but involving shots of tequila. My brother remarked, "It is hard to believe that any of America's best and brightest on the floor are mentally or psychologically normal." The Chief of Aerospace Medicine turned serious and replied, "Who said they were?" He went on to say that "normal" people do not wake up in the morning and go to a job where they push themselves and their machines to the maximum each day, walking the very fine line of life and death.

How you define mental health is most likely different than how I define it or how the psychologists define it. Regardless, we are each responsible for assuring we have our act together when we walk on the field. We owe it to ourselves, our loved ones, and our fellow pilots. It is up to the individual pilot to determine if he is fit to fly. *You are your own best flight surgeon* and you need to ground yourself when it is appropriate. Give this matter some thought before each time you fly, and in rephrasing the old police sargent from *Hill Street Blues*, "Hey guys, let's be careful out there."

Special thanks to my younger (but not as good looking) brother, Dr. Mark D. Baxa, for his insights and for reviewing this article for medical accuracy. After years of *being a flight surgeon, he is now a very successful cosmetic surgeon in Charlotte, North Carolina. I was going to offer him a few glider rides in exchange for some cosmetic stuff, but he suggested what I really needed was a surgeon specializing in cranial extractions.*

Duty schedule

Al Gold

Date	DO	Instructor	AM Tow	PM Tow
2/14	Koepper	Wren	Easom	Clark
2/15	Kucan	Rosenberg	Dershowitz	Easom
2/21	Kwasnik	NA	Fletcher	Friedman
2/22	Loraditch	Rosenberg	Gammon	Gassett
2/28	MacMillan	Bourgeois	Hollister	Kazan
3/1	Marter	Baxa	Proops	Easom
3/7	Nordman	Wren	Clark	Dershowitz
3/8	Tuttle	Rosenberg	Easom	Fletcher
3/14	Sovis	Moysey	Friedman	Gammon
3/15	Bleiden	NA	Gassett	Hollister
3/21	Stewart	Baxa	Kazan	Proops
3/22	Timpson →Wong?	Rosenberg	Poduje	Poduje
3/28	Tsillas	Bourgeois	Eason	Clark
3/29	Welles	NA	Dershowitz	Easom
4/4	Wong? →Timpson?	Baxa	Hollister	Friedman
4/5	Brine	Rosenberg	Gammon	Gassett

Minutes of the Board of Directors

Phil Gaisford

These minutes have been edited for publication in the newsletter. —Editor

February 12, 1998

Directors present: Bruce Easom, Jim Emken, Phil Gaisford, Steve Glow, Al Gold, Carl Johnson, Joe Kwasnik, and John Wren.

Annual party: Carl Johnson has arranged for the annual meeting to be held on March 15 at the Papa Razzi restaurant on Route 16 in Wellesley. The board discussed candidates for the annual awards presentations.

Annual reports: Steve Glow reported that he has the annual paperwork to the IRS, Attorney General, and Secretary of State under control.

Annual dues: The dues for the coming year will be the same as last year. The dues collection notices will go out soon.

Field operations: The Greater Boston Soaring Club has discussed in its recent newsletter the option of moving to Sterling. The board had a lengthy discussion of the implications of such a move for glider operations at Sterling.

Maintenance: The wing tie downs have been replaced with chain, and the board is grateful to Bruce Easom for seeing this project through to the end. The Blanik tailwheel maintenance is done, with thanks to Ian Clark for coordinating the maintenance.

Next meeting: Thursday, March 5, 1998.

Ballot for the board of directors

Vote for one person for each position:

- President:
  ____ Phil Gaisford
- Vice President:
  ____ Carl Johnson
- Treasurer:
  ____ Steve Glow
- Secretary:
  ____ Walter Hollister
- Membership:
  ____ Joe Kwasnik
- Operations:
  ____ Al Gold
- Maintenance:
  ____ Jim Emken
- Logistics:
  ____ Bruce Easom

Sign your name:

- ______________________________

Print your name:

- ______________________________

Mail this ballot to Carl Johnson, 150 Islington Rd, Newton, MA 02166. Carl must receive this ballot on or before March 11, 1998.

Reservations for the annual meeting

Reservations requested:

____ Number of adults and teenagers ($25 each)

____ Number of children 10 and under (free)

Total amount: $ ____________

Your name: ________________________

Mail this form and a check made out to MITSA for the total amount to Carl Johnson, 150 Islington Rd, Newton, MA 02166. Carl must receive this form on or before March 11, 1998.

Remember: the annual meeting will be held on Sunday evening, March 15, from 5:00 to 9:00 PM at

Papa Razzi
16 Washington St (Route 16, westbound)
Wellesley, MA 02162
(781) 235-4747