The Leading Edge
The newsletter of the MIT Soaring Association
May 2000

Contents

Club news

Mark Tuttle

New pilots: Isabelle Judith Glow was born on April 12 to Steve and Krista Glow (photos at www.ollies.net). And Terry Wong and his wife Amy Sullivan are expecting a child any day now. Congratulations to all.

New members: Albert Gagnon joined the club on April 8.

Marissa Blieden, daughter of Ira Blieden, joined the club on April 2. Ira writes, "She came out on Sunday to join the club and start learning to fly sailplanes. She had two instructional flights with Carl Johnson, although the wind and turbulence made it challenging for both student and instructor. By the way, keep an eye open in *Soaring* magazine. Marissa just submitted a full-featured article on her involvement with soaring."

Steve Waitekaitis joined the club at the end of last year, and he writes, "It is a great feeling to get back into flying again. My flying started in high school learning to fly hang gliders at a little ski hill in Groton, Massachusetts. I flew hang gliders for a number of years until one day I happened by the Plymouth airport and saw gliders taking off, so I tried a demo flight and signed up that day. Geoff Love was my instructor. That was in 1983, and I flew until the end of the eighties. Then running my own construction business, meeting my wife, and having two beautiful children put flying on the back burner until last fall when I met a neighbor of mine, Bert Speranza, who was a member of the club for some time. He told me where to go to join up. After more than nine years away from flying, it came back quicker than I expected. I did my biannual flight review on my birthday with Andrew Watson, a most memorable day and a great birthday gift. I am looking forward to being a active, helping member in the club."

Don Flye joined the club in May of last year, and he writes, "All I wanted was one last ride, just to refresh my memories of my wonderful past flying experiences. Living in Petersham, Massachusetts, I had heard that the glider clubs at Sterling offered orientation rides, and May was one of the better times to pick up thermals. My love for flying came in my early twenties when we were flying tail draggers. While working as a mechanic for a crop dusting company, I had the opportunity to test-fly and ferry Stearmans. To rack up more hours, I volunteered to instruct and fly civil defense. When I was in Austria, I had a chance to go up in a glider. I was fascinated by the extra skill required, and by depending on weather conditions instead of an engine to remain in flight. Family life, raising children, both time and money, kept me grounded for sometime. During this time my interest was limited to studying military aircraft and being part of an air show at Rhinebeck Aerodrome. Intending to do my last ride only rekindled a greater interest. Somehow there seemed to be a hunger to understand the principles of depending on nature to keep airborne. My intended last flight turned into joining MITSA and my first lesson. I do find gliding more of a challenge than the power planes. It may be that I am now 64, not 21. I am also impressed with the dedication of our instructors who volunteer their weekends to make this possible."

Gliders sold: Bob Fletcher sold a half share of his ASW-24 (90) to Steve Paavola, and will probably sell the second half to Steve at the end of the summer when Bob takes delivery of his new ASW-28. Steve joined the Greater Boston club because he knew some of the members, and then discovered that he knows some people in MITSA, too. He has been out of the sport for nine years, but he flew with New England Soaring Association and even attempted to fly the regional contest at Sterling years ago (but arrived too late). Mark Evans sold his Grob 102 (3S) to a member of the Nutmeg Soaring Association in Connecticut and purchased a new glider.

MITSA needs your help: President Phil Gaisford writes, "High maintenance costs and poor weather at the start of the soaring season have adversely affected the club's cash flow. Your board of directors is watching the situation closely. While the balance sheet remains strong, should future expenses and income remain out of balance, options we may need to consider include raising dues and the disposal of underutilized equipment. While we hope that drastic action will not be required, you can act now to influence the course of events. Here is how our club secretary Walt Hollister puts it: 'Think of and act on ideas for advertising soaring to the general public. Reach out to your inactive soaring friends, and encourage them to reactivate with MITSA. Pitch in to do jobs that would otherwise cost the club money. These include maintenance items like an oil change for which we would otherwise have to pay a mechanic or glider repairs that would otherwise end up on the bill for an annual. Fly more often and take more tows to higher release altitudes. And don't forget that MITSA can accept monetary gifts which are tax deductible for the donor and could be matched by an employer who offers that option.' "

Field operations: Chief Instructor Phil Gaisford writes, "At a recent meeting with the Sterling airport manager, aviation safety councillors, and representatives from both soaring clubs, a number of safety and operational matters were discussed, and the following decisions were made:

- A displaced threshold will be marked on grass runway 34. The intention is to discourage potentially hazardous low flying through the busy staging and grid areas. Do not land short of the threshold. Do not indulge in low flying through the above mentioned areas.
- Gliders may not be parked off the taxiway beyond the hold line at the 34 end of the airport. Gliders should, generally, be parked in a staggered wingtip to nose configuration instead of the space-wasting wingtip to wingtip configuration.
- The asphalt tie downs at the 34 end of the airport are for power aircraft only and are not to be used for parking gliders.
- Cars may not be parked beyond the GBSC clubhouse at the 34 end of the airport, nor beyond the trailers at the 16 end of the airport. The only exception to this will be one vehicle belonging to the DO/FO of each club.
- In order to avoid conflict with traffic in the power pattern, thermaling below 1,500 feet in the active power pattern is not permitted.
- Tow ropes must not be permitted to remain on the main runway. If you see a rope there, remove it.
- Tow pilots will be receiving an update on towing matters from the chief tow pilot.
- There will be an open airport safety meeting at Sterling on June 29. Your participation is encouraged."

Batteries: Please leave the batteries in the gliders except to charge them. We need to get in the habit of charging a different battery each week. There are five identical batteries, one for each of the gliders, and they are labeled one through five. When you place a battery on the charger, leave it on the charger for at least twelve hours so that it will be fully charged. Once the charger fully charges the battery, it goes on a "float" mode, and it may be left in this mode indefinitely, so the battery will not be damaged. Once charged, a battery should be able to power the electric variometer for several months, provided the variometer is not left on overnight or all week! Each time you place a battery on the charger, record it on the battery charge sheet on the wall in the MITSA office above the desk by the battery charger. This way we can track when a battery was last charged and which battery should be charged next.

Ship captains: Four of the club's five gliders have new ship captains. Two of the volunteers are private owners who will not be flying these ships, so pilots actually flying them are encouraged to volunteer. The current captains are: Fred Looft, Blanik 118BB; Phil Rossoni, 1-34; Al Gold, 1-26; Bill Brine, L-33.

Blanik repairs: Both Blaniks have been down for maintenance recently. N117BB had a problem with its landing gear strut and N118BB had a problem with its tow hook. The gliders were repaired quickly due to heroic effort by a long list of club members including Ian Clark, Jim Emken, Richard Gammon, Matt Tadry, Ray Tadry, and Larry Timpson. The landing gear strut was damaged during launches from the pavement on 34, when the pilots repeatedly bounced the glider through the cut-out in the pavement at the intersection of the runway and the taxiway in front of the launch point. We have launched from this point for years in the past without incident. If we ever operate from the pavement again, please be sure *everyone* involved in the launch is briefed about how to keep the glider on the pavement, including both pilots and wing runners.

Names from the past: Ira Blieden writes, "Alex's RC Hobby Shop is owned and operated by Alex Lob, Walter Lob's son. The connection was made when he noticed my car with the MITSA sticker. Walter is quite fine, still plays the viola. We reminisced about the old times. When I mentioned people like Jim Nash-Webber, he commented that Steve Nash-Webber, Jim's son, frequents his store. A credit card from Jim's wife made the connection." Ira also writes, "At Harris Hill, while picking up my LS-3A from M&H Soaring last week, I stopped in at the National Soaring Museum. There I learned that Harris Hill is named after Lieutenant Henry Harris, a MITSA member who unfortunately died at the hill during the 1934 Nationals."

Minutes of the Board of Directors

Walt Hollister

March 2, 2000

Directors present: Jim Emken, Phil Gaisford, Steve Glow, Al Gold, Walt Hollister, Carl Johnson, and Joe Kwasnik. Mark Koepper and Peter Vickery were also present.

Operations: Phil Gaisford reported that he is planning to meet with John Bergeson, the new GBSC President, to discuss a number of topics. One is a proposal to have MITSA and GBSC adopt a mutual towing arrangement to promote a safe and expeditious operation at peak times. Under this proposal, any available tow plane from either organization would tow the next glider at the front of the queue, independent of the organization associated with the glider. The plan could expedite launch operations and reduce tow costs. Another is to put down a short strip of hardtop for the first portion of the launch from the grass on 34 to prevent further erosion of the turf in that high use area. Another is planning for greater social interaction, and yet another for cooperation on recruiting.

Maintenance: The Cessna 182 is now in check. Repairs are expected on the exhaust system and the brakes, new tires, new strobe light, and new alternator. A work party and cook out is planned for Saturday, March 11, with rain date Sunday, March 12. Jobs include washing and waxing aircraft, trailer repair, rock pickup, and rolling the grass runway.

MITSA Juniors program: Peter Vickery reported that the MITSA Juniors have been meeting during the off season. They will now be listed on the duty roster.

Annual party: The annual party will be held at 6 p.m. on Saturday, March 25, at the Dolphin Seafood Too restaurant in Natick center. Dinner, awards, announcements, a door prize, and a MITSA-oriented Jeopardy game will be featured.

Minutes of the Board of Directors

Walt Hollister

April 6, 2000

Directors present: Phil Gaisford, Steve Glow, Walt Hollister, and Peter Vickery.

Essentially the entire meeting was devoted to the recent financial pressures being brought to bear on the club, largely due to problems with the tow plane, where we have increased expenditures for maintenance and decreased income from tows because of the down time on the aircraft. Steve Glow reported that an unexpectedly-high bill for the tow plane annual last month came in at just under $8,000. Net income for the year is at about $2,700. We had already been in a weak position from the lost tow plane income last season. There is about $4,000 in accounts receivable, mostly for annual dues. A good operational season this year will be necessary in order for the club to stay in the black. Our fixed assets consist of the tow plane and five gliders. These currently carry about 20% of their total value in debt. Should the club be unable to operate in the black this season, then it would be necessary to increase the debt or sell a portion of the fixed assets.

A discussion of contingency plans in the event of the closure of Sterling Airport was cut short by the observation that it would not solve any of our financial problems. Combining MITSA and GBSC into a single soaring operation would improve the financial picture for both organizations by increasing the efficiency of the operation. So far, there has been no interest in that option on the part of GBSC. There were several anecdotal reports of persons expressing the opinion that it was absurd to have two separate gliding operations going on simultaneously at the same field. Despite our current shortfall in operating profits, the value of our fixed assets should still be attractive in a potential merger.

There are a number of things which can be done by the general membership to help our financial picture. The main source of operating income is from new students and demo flights. We do not have enough new students. We need to do a better job of attracting potential students to take demonstration flights and encouraging them to join the club. We also need a larger, more active membership. Think of and act on ideas for advertising soaring to the general public. Reach out to your inactive soaring friends, and encourage them to reactivate with MITSA. Pitch in to do jobs that would otherwise cost the club money. These include maintenance items like an oil change for which we would otherwise have to pay a mechanic, or glider repairs that would otherwise end up on the bill for an annual. Fly more often and take more tows to higher release altitudes. Help move toward a joint operation with GBSC through more cooperation with them on the field, and greater social interaction off the field. Talk up the idea that a joint operation would save everyone more money. And don't forget that MITSA can accept monetary gifts which are tax deductible for the donor and could be matched by an employer who offers that option.

Minutes of the Board of Directors

Walt Hollister

May 4, 2000

Directors present: Jim Emken, Phil Gaisford, Steve Glow, Walt Hollister, Carl Johnson, Joe Kwasnik, and Peter Vickery. Ian Clark and Ray Tadry were also present.

Finances: Steve Glow gave an update on our deteriorating financial outlook. He noted that most of the problem stems from the fact that we rely on the tow plane for a major source of our income. When the tow plane goes down, the cost of additional maintenance plus the lost income from towing both contribute to our financial difficulty. Last year the tow plane lost money. Already this

MITSA Duty Roster
April-June, 2000

Date	D.O.	Instructor	AM Tow Pilot	PM Tow Pilot	AM Jnr	AM Jnr	PM Jnr	PM Jnr
4/8	Blieden	Bourgeois	Gammon	Pugh	M.Tadry	L.Tadry	Cutler	Gagnon
4/9	Kaynor	Rosenberg	Easom	Clark	Marko	Cullen	M.Vickery	Saffron
4/15	Vickery	Watson	Gammon	Friedman	Cutler	Gagnon	M.Tadry	L.Tadry
4/16	Emken	Johnson	Easom	Clark	M.Vickery	Saffron	Marko	Cullen
4/22	Evans	Krueger	Gammon	Pugh	Marko	Cullen	Cutler	Gagnon
4/23	Gold	Rosenberg	Easom	Hollister	M.Tadry	L.Tadry	M.Vickery	Saffron
4/29	Brine	Watson	Pugh	Clark	M.Tadry	L.Tadry	Marko	Cullen
4/30	Wong	Krueger	Clark	Pugh	M.Vickery	Saffron	Cutler	Gagnon
5/6	Kwasnik	Bourgeois	Easom	Clark	M.Tadry	L.Tadry	Cutler	Gagnon
5/7	Looft	Rosenberg	Friedman	Hollister	Marko	Cullen	M.Vickery	Saffron
5/13	Loradich	Johnson	Gammon	Easom	Cutler	Gagnon	M.Tadry	L.Tadry
5/14	MacNicol	Krueger	Hollister	Friedman	M.Vickery	Saffron	Marko	Cullen
5/20	Rossoni	Watson	Gammon	Easom	Marko	Cullen	Cutler	Gagnon
5/21	Moysey	Johnson	Pugh	Clark	M.Tadry	L.Tadry	M.Vickery	Saffron
5/27	Nordman	Baxa	Hollister	Pugh	M.Tadry	L.Tadry	Marko	Cullen
5/28	Kaynor	Bourgeois	Poduje	Easom	M.Vickery	Saffron	Cutler	Gagnon
6/3	Sovis	Gaisford	Gammon	Hollister	M.Tadry	L.Tadry	Cutler	Gagnon
6/4	Timpson	Johnson	Friedman	Pugh	Marko	Cullen	M.Vickery	Saffron
6/10	Tsillas	Krueger	Hollister	Friedman	Cutler	Gagnon	M.Tadry	L.Tadry
6/11	Vickery	Rosenberg	Poduje	Easom	M.Vickery	Saffron	Marko	Cullen
6/17	Blieden	Johnson	Gammon	Clark	Marko	Cullen	Cutler	Gagnon
6/18	MacMillan	Watson	Clark	Pugh	M.Tadry	L.Tadry	M.Vickery	Saffron
6/24	Emken	Bourgeois	Easom	Poduje	M.Tadry	L.Tadry	Marko	Cullen
6/25	Evans	Gaisford	Friedman	Hollister	M.Vickery	Saffron	Cutler	Gagnon

year, tow plane expenses are about three times tow income. Since the discussion at last month's board meeting, the tow plane has again required unscheduled maintenance. In addition, GBSC, with a greater presence at the field, has taken the greater share of demo rides and new members. There is about $5,000 cash on hand and normal expenses run about $2,000 per month. Based on this situation the treasurer called for a plan of action to keep the club solvent.

Options: Several options for improving the financial situation were put forward and discussed. The first was to join with GBSC and merge the two clubs. This option makes the most fiscal sense, but has opponents in each organization who want the clubs to maintain their own autonomy. The second option was to sell the tow plane and contract for towing services, probably from GBSC. This would allow us to pay our debts, but would require us to charge an hourly fee for use of the club gliders. It was also felt that it would be difficult to attract and maintain members without our own tow plane. A third option was to go for a new, cheaper-to-operate, tow plane. After discussion of these options it was the consensus that we should go for more members, attempt to break even in May, and get more information on details of the other options for an evaluation at the June meeting.

Membership: Joe Kwasnik reported that he had already placed an ad in the Worcester Magazine that also might lead to a feature article about MITSA. It is important that when we attract new persons to the gliderport, we don't let GBSC steal them away. Joe will attempt to use a coupon only valid with MITSA to prevent the raiding of new prospects.

MITSA Juniors program: Ray Tadry reported there are seven Junior members working well. Wednesday evening instruction with Roy Bourgeois will start again soon.

Maintenance: Jim Emken reported that tie down cuffs for the Blanik wings were purchased and donated to the club by Bill Brine. They are being shipped by Blanik America. Jim, himself, has also purchased and donated new tires and parts for the tow hooks on the Blaniks. Do not use the c.g. hooks until further advised as those will not be installed until a later date.

Operations: Peter Vickery reported that a displaced threshold has been established for runway 34L (grass) which is slightly south of the threshold for 34R (hardtop). Radios for the Duty Officer have been purchased that will operate on the same frequency as GBSC. Peter is having coordination meetings with his GBSC counterpart.

Phil Gaisford reported that he is working with John Bergeson, the GBSC president, on two proposals. One is a mutual towing arrangement. Under this proposal, an available tow plane from either organization would tow the next glider at the front of the queue, independent of the organization associated with the glider. The plan could expedite launch operations and reduce tow costs. The other is to put down an 8x200 foot strip of hardtop for the first portion of the launch from the grass on 34 to prevent further erosion of the turf in that high use area.

Feeding the habit

Andrew Watson

I have to admit I'm a gliding addict. The symptoms are all there. This afternoon I went out to a movie and caught myself sizing up the clouds in the backdrop to the Columbia Pictures logo. Never noticed them? Well, trust me, they're there. A nice-looking street with firm, flat bases and probably working well, although with a hint of vertical overdevelopment, so I'm afraid the statuesque lady with the torch may get rained on in the near future.

There are other tell-tale signs too, like looking out for landable fields during train journeys, and practicing pilotage with the sectional during airline flights. Needless to say, winter is hell. After going cold turkey for a couple of snow-bound months, the withdrawal symptoms get pretty bad. Most winters I'm reduced to inventing plausible excuses for business trips to the UK, so I can spend a weekend getting a few short seven-minute fixes from winch-launches off a muddy English airfield. Sad, but it's cheaper than getting psychiatric help.

Happily, this winter I've been able to fend off the worst of the withdrawal with a couple of trips to the warmer bits of the United States, where gliding is possible year-round. In particular, mid-January saw me spending a week in Phoenix on business, and on a recommendation from Mike Baxa, I booked a day of glider aerobatic instruction at Estrella, a commercial gliding operation about 40 minutes' drive southwest of Phoenix, just outside the Class B airspace. Les Horvath, who seems to have more-or-less invented glider aerobatics in the USA, was based here and trained their aerobatic instructors before he moved on. They do week-long courses, but I only had a day, so I just booked three flights, which is reckoned to be the maximum safe dose for an *ab initio* aerobatics pilot.

From what I could gather during my week-long stay, in winter, Phoenix doesn't actually have weather in the accepted sense of the word. Instead, it sits under a semi-permanent anti-cyclone, which gives a succession of calm, blue, almost-cloudless days with temperatures in the low seventies, each day exactly like the last. The weather forecasters must go insane with boredom. However, this (lack of) weather is ideal for aerobatics, with no cloud ceiling to worry about and (at least on the day I was there) completely smooth air.

I arrived early on my appointed Sunday and stated with a thorough ground briefing from Jason, my instructor, on the maneuvers we were to attempt, assisted by what I can only describe as a anatomically-correct model of a Grob 103 Twin Acro. We then donned parachutes, climbed into the full-sized glider, and set about strapping in. This takes a while. With negative G maneuvers in prospect, the straps have to be tight and stay that way. The standard-issue adjusters in the Grob are notorious for working loose, so at Estrella they run the free end of the strap back through the buckle. Tightening these straps is a lengthy business, but once you're secured you know you aren't going to leave the aircraft unintentionally via the closed canopy. A comforting thought.

Aerobatics is a great way to lose lots of height quickly, so the tow is to 5,000 feet above the ground, certainly the highest I've ever towed. This takes about five minutes behind Estrella's re-engined, 250-horsepower Pawnees. Once off tow, we double-checked straps and cockpit security, performed a couple of clearing turns, and started work on the first and simplest maneuver, the loop. In Horvath's teaching syllabus this is done to a rigid recipe, beginning with a 45-degree dive to 100 knots. In a dive that steep, a quick glance out at a wingtip helps to confirm the angle, since the ground fills your field of view and it's easy to flatten out unconsciously. Once up to speed, one switches one's attention to the accelerometer and smoothly but rapidly applies up elevator to perform a 4G pull up, out of the dive, and into the figure. As the speed slackens in the climb, a continuous backwards movement is necessary to maintain 4G until the inverted horizon comes into view over the instrument panel. At this point, one relaxes the back pressure to let the glider fly over the top. As the horizon disappears and the ground once again dominates the view, one applies a lot of back pressure to regain 4Gs on the accelerometer, this time gently relaxing the pressure as the speed comes on to hold the acceleration past the vertical dive and level flight, into a pull up to regain some height. By the time I'd done three or four I seemed to have mastered it (the only tricky bit is judging the pause at the top), and on the last one we felt a distinctive double thump near the end of the loop: by keeping perfectly straight all the way round, I'd crossed the wake vortices the glider left 15 seconds before at the start. Very satisfying.

Next we moved on to inverted flight. There are basically two ways to get the aeroplane upside down: half-roll it or half-loop it. The half loop entry is the easiest, being exactly that: the first half of a loop. As before, at the top, one relaxes the back pressure as the nose passes the inverted horizon. However, as the nose drops below the horizontal and the speed builds back up to about 60 knots, one applies forward pressure to stabilize in inverted flight. Like most gliders, the Grob doesn't have enough trim range to hold the correct attitude, so even with the trimmer all the way forward, a fair amount of stick pressure is needed to keep the nose well above the horizon and the speed in a reasonable 60-70 knot range.

Maintaining inverted straight and level flight in smooth air turned out not to be too difficult, so we moved on to inverted turns. This is where life gets noticeably more complicated. An inverted turn is basically the same as any other: bank the aircraft to make the turn and compensate for the adverse yaw with rudder. As usual, the bank is towards the aileron that goes up, that is, away from the ground. However, because one is hanging upside down under the glider, that aileron movement is achieved by moving the stick away from the direction of the turn, while the rudder action is normal, with into-turn rudder usually necessary to keep the yaw string straight. This takes a bit of getting used to.

Recovery from inverted flight can again be via either a half-loop or a half-roll. We did the half-loop. The most important consideration is to avoid over-speeding in the dive, since the glider would certainly go past V_{ne} if one simply pulled back on the stick from inverted flight at 70 knots. The first stage is therefore to push the stick well forward to slow down and lift the nose towards an inverted stall. Once close to the stall, it's then safe to pull into the half loop, again aiming to maintain 4Gs all the way round to level flight.

On our third and final flight, we practiced the cloverleaf, which is basically a loop combined with a ninety-degree turn during the upswing, followed by a normal half-loop recovery. I found it quite disorienting at first, and my two efforts were both a bit shaky. Then for a final demonstration Jason showed me a couple of aileron rolls, where one banks the glider completely inverted and then carries on round back to non-inverted flight. This requires quite a lot of well-coordinated control inputs, and I decided to leave trying it myself for another day.

I highly recommend Estrella for glider aerobatics: the instruction was very professional yet friendly, and safety is clearly the number one priority. On that subject, it's worth saying that one shouldn't try to learn aerobatics except from a suitably-qualified instructor, and in any case very few gliders are built to withstand the stresses of fully aerobatic flight. In other words, don't try this at home, kids. However, I'd certainly like to go back to Estrella for another mid-winter fix next year. The high lasted about a week.

Annual party

Phil Gaisford

Thanks are once again due to Carl Johnson for organizing a successful and enjoyable annual meeting. The meeting was conducted in the pleasant and comfortable rooms of the Dolphin Too Seafood Restaurant in Natick, a new venue for us. After drinks and a little light socializing, a buffet dinner was served, featuring a choice of three very fine entrees followed by a selection of the sort of desserts that you are no longer allowed at home.

Official business was expeditiously dispatched, starting with Carl announcing the results of elections to the board of directors. Surprisingly, all nominees were elected unopposed, doubtless a ringing expression of the support of the membership for the policies both past and present of the candidates.

The President commenced his fourth term in office with a discourse both charming and witty as he proceeded to award the annual trophies, ably assisted by Erin who carefully read the inscriptions on each one so that no mistakes were made.

- Matt Tadry won the Nicki Velforth trophy as the "best student of the year."
- Bob Kaynor won the James Nash-Webber paddle as the "most enthusiastic new member."
- Mike Baxa won the Tommy Thompson trophy as the member "most likely to give something back to soaring."
- Andrew Watson and Phil Rossoni won the Charles Stark Draper trophy for the "best flight in a MITSA glider."
- Bill Brine won the Sam Francis trophy for the "best 100K triangle."
- Mark Koepper won the Eddie Allen trophy for the "best cross-country triangle or out-and-return."

Sadly not all awardees were present, so they missed out on their hard-won applause. Next time you see them, remember to congratulate Bob Kaynor for his enthusiasm, Matt Tadry for his great progress as a glider pilot, Andrew Watson and Phil Rossoni for exploits in MITSA gliders, Mike Baxa for handling the students so well, and state cross country soaring champions Bill Brine and Mark Koepper. Those present were also called upon to support the other volunteers who labor to keep the club functioning.

Thus concluding the official business, the stage was set for the entertainment of the evening, a repeat of last year's very successful Jeopardy!^{TM} game, adapted for the soaring community and produced by Carl Johnson and John Wren. So that guests could also participate, there were more non-gliding questions this year (gliding content probably no more than 95%), so those present who paid attention may now know a little more about medieval literature.

The meeting adjourned very late in the evening.

Mid-air collisions

Steve Moysey

Steve writes, "I'm in the process of finishing up my dissertation at Tufts, and this article was something that just happened to come together as part of a side project I was doing with a member of the psych department. I'm a hybrid, being a part of the management and *the psychology departments, but I will be taking up faculty post in the management group for this fall. I'm going to be spending more time at the field this season, so hope to see you there." —Editor*

During my years of gliding, I have been unlucky enough to witness one mid-air collision, and hope that I never have the misfortune to do so again. In August 1992, while flying in a nearby thermal at a higher altitude, I witnessed an in-flight mid-air collision between a Grob Astir 15-meter standard class glider and an ASK8 glider over Lasham Airfield, Hampshire, England. The ASK8 turned into the flight path of the Grob, striking the Grob's tail fin with its right wing. Both aircraft were observing the "turn in the same direction" principle while thermal soaring, but the K8 drifted from an adjacent thermal core into the path of the Grob.

The K8's wood and fabric starboard wing was partially destroyed by the impact, severing off five feet from the wing approximately one inch outside the aileron push rod. Both pilots elected to stay with their aircraft, despite the severe damage to the K8, which could have suffered structural failure before a safe landing could be achieved. The Grob landed safely with only minor damage, it being built like a bricklayer's chicken house. Visibility was clear, with the collision occurring at approximately 4,000 feet. The resulting investigation revealed that neither pilot had recognized the risk for a potential collision until the situation was unavoidable.

In order to understand the mechanisms of mid-air collision and air-miss incidents, and the role of pilot cognition as a contributory factor, several elements have to be examined to give us a clear picture of the current state of understanding of the problem. What drives pilots to spend less time looking for conflicting traffic than looking at their instruments? What role do the factors of experience and pilot complacency have to play in the problem? Is there any degree of cognitive visual illusion regarding the size, speed, and shape of potential conflicting traffic? Unfortunately, most of the material regarding visual cognition and pilots is found in the world of powered aviation, so I ask the reader to bear with me if this sounds more oriented to our petrol drive brethren, but the general principles apply to glider pilots too.

As air traffic continues its rapid growth, the airspace used by aircraft does not expand. With more aircraft flying more often in this finite airspace, advances in collision avoidance techniques are critical to maintaining adequate separation of aircraft. Advancement in technology constantly changes the way pilots fly their aircraft, as well as the presentation of flight information. In the general aviation (GA) category, increasing sophistication of the technology available to pilots, such as GPS moving map navigation aids, have placed more emphasis on the pilot's observing the increased amount of available data, while potentially reducing the required see-and-avoid visual scan for other air traffic to maintain separation. Uncontrolled airspace around some GA airports provides a potentially hazardous environment for collisions, as does non-IFR traffic incursions into controlled airport airspace.

Unfortunately, the desired separation of air traffic is not always achieved. The resulting events can be categorized as an air-miss, where the aircraft come into close proximity with each other but do not collide, or a mid-air collision, where the aircraft come into physical contact with each other. Collisions of this type are typically fatal to the occupant of both aircraft. Mid-air collisions between aircraft represent a significant threat to pilot and passenger safety. The number of fatal air collisions in preceding years has shown an increasing upward trend, as indicated by the National Transportation Safety Board report number ARG-99-01, despite an overall reduction in the number of aviation fatalities. Not all air-miss events are reported to the NTSB for various factors, so the true total of actual air-miss events is unclear, but is anecdotally higher than the officially-reported level, possibly due to reluctance among the aviation community to report near miss events, especially if it's your fault!

For a mid-air collision to occur, two aircraft have to arrive in the same space at the same time. This may sound like a blinding flash of the obvious, but the mechanics of the situation are worth reviewing. If two aircraft are on a collision course and these aircraft are flying on constant headings at constant horizontal and vertical speeds, then each aircraft has a constant relative bearing to the other right up until the moment of impact. The aircraft may have considerable differences in their airspeeds, but if their relative bearings are constant, the aircraft will collide. From the pilot's point of view, if the converging aircraft has no apparent motion, with respect to his or her aircraft, and stays at exactly the same point on the canopy, a collision is inevitable unless one or both of the pilots take avoiding action.

It is the timing and nature of the avoiding action that is crucial to the survival of the occupants of both aircraft. First, the time to recognize a potential collision may be limited, so early visual cognition of the target aircraft is vital if enough time is to be allowed to safely maneuver out of harms way. Second, there is the question of which pilot, in a converging flight path situation, should be responsible for taking the avoiding action. Finally, the issue of complacency and the relative positions of the aircraft to each other may contribute to a right-of way trap or the assumption that the other pilot is responsible for taking avoiding action.

The general principles governing collision avoidance maneuvers are outlined in the Federal Aviation Authority (FAA) Federal Aviation Regulations (FAR). Section 91.113 of the FAR directs that regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft to see and avoid other aircraft. When aircraft are converging at approximately the same altitude, except head-on, or nearly so, the aircraft to the other's right has the right-of-way.

When aircraft are approaching each other head-on, or nearly so, each pilot of each aircraft is required to alter course to the right. When overtaking another aircraft in the air, the aircraft that is being overtaken has the right-of-way and the pilot of an overtaking aircraft is required to alter course to the right to pass well clear.

Section 91.113 also governs the behavior of aircraft in the approach and landing phase and states: "Aircraft, while on final approach to land or while landing, have the right-of-way over other aircraft in flight or operating on the surface, except that they shall not take advantage of this rule to force an aircraft off the runway surface which has already landed and is attempting to make way for an aircraft on final approach. When two or more aircraft are approaching an airport for the purpose of landing, the aircraft at the lower altitude has the right-of-way, but it shall not take advantage of this rule to cut in front of another which is on final approach to land or to overtake that aircraft."

National Transportation Safety Board (NTSB) investigations of aircraft accidents for the year of 1996 identify one or more occurrences that describe the accident sequence of events. The first occurrence is the event that initiates the accident sequence. Collisions in-flight were the first occurrence in more than 25 percent of fatal accidents, and loss of control in 31 percent. Partial or total loss of engine power, for the power contingent, was the first occurrence in 29 percent of aircraft involved in all accidents. Loss of control, either in-flight (by 13 percent of the accident-involved pilots) or on the ground (by 11 percent of the pilots) was another prevalent first occurrence. Thirty-nine percent of accident-involved aircraft were on approach or landing, and 19 percent were taking off at the time of the first occurrence. In fatal accidents, the most frequently cited accident phases were maneuvering at 27 percent, approach and landing at 18 percent, and cruise at 30 percent (NTSB report ARG-99-01). Preliminary data for the years 1998 and 1999 show a total of 22 mid-air collision incidents with 30 resulting fatalities. I'm sure we are all aware of the recent spate of collisions that have been reported in the news.

Air misses can result in violent collision-avoidance maneuvering of the aircraft involved. This violent maneuvering can result in serious injury to passengers and crew and/or subsequent catastrophic failure of the aircraft structure, resulting in a potentially fatal flight termination.

As far as pilot visual traffic scan behavior is concerned, in a study conducted by Bellenkes, Wickens & Kramer (1997), 12 novice and 12 expert pilots flew a seven-segment simulation pattern under specific attentional constraints while cockpit instrument scan was recorded. Flight segments involved various combinations of maneuvering of heading, altitude, and airspeed. Expert pilots performed better than novices on vertical and longitudinal, but not lateral control. They accomplished their superior vertical tracking by allocating more control resources to the vertical control. Analyses of instrument scanning strategies revealed that experts had shorter dwells on each instrument with more frequent visits to most instruments. The experts adapted their visiting strategy more flexibly in response to changing task demands and demonstrated an overall better use of the scan time than did the novices. However, this study did not cross-reference the amount of time spent scanning the instruments with making an out of cockpit scan for other traffic. If the novice pilots had to spend more time on their instrument scan, then it is arguable that this left less time for traffic detection. While not directly relevant to glider pilots flying the pattern — not looking at the gauges, are we folks? — as they should be disregarding the instruments and "flying the picture" by this point, it's worth bearing in mind that our power flying cousins may tend to have their heads in the cockpit during this crucial stage of flight.

However, a study by Shuch (1992) showed that expertise and pilot complacency, arising from a history of incident-free flights, could play a role in the mid-air collision process. This may have its roots in the disregard of the accepted rules of the air, in terms of who gives way to whom and under what circumstances. The rules of the air can easily be forgotten, or conveniently ignored, as we struggle to stay in that weak thermal that is going to prevent a premature landing.

There is also concern over the possible misunderstanding in the general aviation pilot community of visual interpretation of potential collision situations. In a study the visual perception of aircraft-type objects by Hershenson & Samuels (1999), the experimenters used a small remotely controlled drone plane that was observed by pilots in another aircraft. When the drone plane appeared to be a normal-sized airplane, it presented the illusion of being far away from the observers and moving too fast. This is called the "airplane illusion," and in such situations, familiar size determines the apparent size and distance of the observed airplane. It sets the depth for the frontal plane component of the perceived motion and the relative depth difference for the motion-in-depth component. Because these perceived distances are large, the perceived velocities are large in the respective directions.

The size of an approaching object, to the observer, does not increase in a linear fashion, but at an exponential rate that causes the object's apparent size to grow rapidly in the final few seconds before collision. This visual illusion may be a contributory factor to reaction time in potential collision situations. For example, a general aviation aircraft and a military jet approaching each other head-on at speeds of 150 knots and 450 knots, respectively, would have a closing speed of 600 knots. At about 20 seconds before impact, if the two aircraft were 6,000 meter's apart, each will present a visual target to the other of only around one-sixteenth of a degree. Ten seconds from impact, the distance will have halved and the target size will have increased to one-eighth of a degree; at five seconds, the size will have again doubled but will still be only about one-quarter of a degree. For the pilots of each aircraft, the other will remain a small item on the canopy until it is probably too late for the pilots to take avoiding action.

To some extent, the mechanics of the human eye can contribute to the search failure in this type of situation. The retina of the eye is not equally sensitive over its whole surface. In fact, it is only in a small area, the central fovea of the retina, that visual acuity is good. Even at very small angular departures from this central area, acuity drops off to a small fraction of the central acuity. From a perceptual point of view, if we are conducting a visual search for a small target and the object of our search does not happen to fall on the foveal area, then the chances for actually detecting the object decrease with the distance it is away from the fovea. This is particularly true if the target has no relative movement to the observer's position.

The implications for effective traffic scanning are clear: A pilot may have spotted another aircraft, looked away for a few moments, and then be unable to see the target aircraft again because the aircraft's image does not happen to land on the sensitive area of the retina when resuming the scan.

Examination of the flight phase data for the number of accident in each category reveals an interesting pattern. The highest accident rate, overall, is recorded in the approach and landing phase with the largest number of fatalities occurring in the maneuvering category (NTSB Report Number ARG-99-01). The approach and landing phase of flight officially starts when the pilot enters the traffic pattern of a controlled or uncontrolled airfield, with the intent of making an approach to the active runway, followed by a full stop landing or power up and go around. During this phase of flight, the pilot workload is high and requires a lot of concentration on events both inside and outside the cockpit (Billings, Grayson, Hecht & Curry 1980). These activities in the cockpit would include checking flight instrument readings, performing and acting on pre-landing checklists, listening to and responding to the airport control tower (if the field is controlled) or listening out for pilot transmissions on the Unicom frequency (if the field is uncontrolled), while maintaining directional control of the aircraft and the correct height above the ground to comply with traffic pattern requirements.

While the pilot is performing these duties, he or she is also required to keep an effective look-out for other traffic in the pattern and aircraft that may be encroaching into the airspace either unannounced or undetected. During the approach and landing phase, the pilot may not look out of the cockpit effectively or frequently enough — other than to check the landing area — to avoid another aircraft on a conflicting flight path, resulting in a potential collision situation. A last minute detection of the other aircraft may result in violent avoiding action that could result in a stall-spin situation that may not be recoverable from the pattern altitude, or momentary disorientation and loss of control that could lead to an uncontrolled flight into the ground. In the case of the Grob Astir/K8 collision, the Grob pilot pulled back so hard on the stick, in an effort to avoid the inevitable collision, that he actually pulled the plastic hand grip away from the control column. This led him to believe, for several seconds, that the glider was no longer responding to his control inputs, until he realized the situation and promptly replaced the hand grip. Sounds amusing, but the panic level in the cockpit could have been disastrous if the aircraft was at pattern altitude.

According to Chou, Madhavan & Funk (1996), cockpit procedural errors can increase a pilot's stress and anxiety levels, and limit the amount of cognitive resources available to deal with other demands of the situation. In aviation circles, this is called "getting behind the airplane," for in such circumstances, the pilot can quickly be overwhelmed by the task of flying the aircraft and maintaining an adequate visual scan for other traffic. Chou *et al* attributed procedural errors, while in the approach and landing phase, as a factor in the perceived increase in pilot workload.

In a low-fidelity simulator study carried out by Chou *et al*, involving 24 undergraduate and graduate engineering students and engineering faculty members from Oregon State University, cockpit task management (CTM) performance was found to be inversely related to the workload. However, this may be more of a temporal perception issue because of a cognitive narrowing of attention that accompanies the increased stress experienced by the pilot. The workload may stay the same, but with a limited amount of time before the aircraft is committed to a landing, this may cause a narrowing of cognitive functions that leads to a focus on the instruments and events inside the cockpit (Billings, Grayson, Hecht & Curry 1980). In effect, experienced or perceived workload depends on the pilot's level of proficiency, the level of automation or technology used to aid in handling the workload, and the pilot's cognitive capacity to handle multiple data inputs.

The NTSB report for the year 1996 shows the highest fatalities have occurred in the maneuvering category and this may be due to several as yet undetermined factors. However, for the interest of this article into pilot detection of potential collision situations, undetected aircraft presence would be a contributor in this category. Pilots who do not perform an effective visual scan of the area outside the cockpit, before commencing a change of direction or altitude maneuver, run the risk of placing their aircraft into the flight path of another airplane. There is some evidence to indicate that pilot complacency, due to experience or a sense of personal invulnerability due to a long period of accident free flights, may be a contributing factor in this type of situation (Shuch 1992). The NTSB does track fatalities by pilot age, with the largest number of deaths, for the reporting year of 1996, occurring in the 40 to 49 age group. One important factor missing from the NTSB data is the number of hours held by each pilot. While complacency may have a basis in pilot age, no data is available to suggest any covariation between age, pilot hours, and experience. However, FAA human factors research has shown that eyesight, hearing, and hand-eye reaction time ability all decline with age. Deteriorating eyesight will mean the human system can take longer to recognize necessary information or problems. Vibration, inherent in most power aircraft, and mercifully absent from most gliders, brings a 10% reduction in visual acuity that affects sensory input to cognitive processes. Cognitively older subjects show poorer performance when tested. Yet, when pre-dosed with 50 grams of glucose prior to testing, their test results improve significantly (Lyman and Orlady 1981), so eat those energy bars guys! However, the fatality distribution may be attributed to the actual number of pilots flying in any given age group. Aviation is not an inexpensive pastime and, arguably, less afforded by younger pilots than pilots in their 40's. Likewise, the limitations of the biannual pilots physical, or annual for pilots of a certain vintage, may find that medical issues reduce the number of pilots retaining their licenses in later years. It may just be that the fatality rates are a function of the number of pilots flying in a particular age group. Being a member of this age group myself, I'm only too aware of the limitations of my declining cognitive capacities, so it goes that we should all be aware of our own vulnerability, rather than invulnerability.

Training is the first and foremost weapon we have to combat the risk of mid-air collisions. Emphasizing the importance of the look-before-turn requirement must be an early part of any student pilot's experience. Most of my early instructors would take over the glider if I started to turn without first looking in the direction I was intending to fly. The sound of " I have control" just when you were about to execute your best tun to date is a sure way to reinforce this essential mode of behavior, Pavlovian as it may sound. So instructors, are we taking over the glider or emphasizing look out when students forget and become fixated on the control of the aircraft?

A second line of defense is learning an effective visual-scan technique early on in our flying careers. There are the advocates of the "scan-from-side-to-side-and up-and-down" technique, which I find an effective nausea-inducing method. Given the physical and cognitive limitations of the human eye/brain system, a systematic but random scan, taking time to pause momentarily on each area, may prove more effective in detecting a small object. It works for me and helps reduce my propensity for airsickness. Another interesting phenomenon can occur when we do not scan effectively. "Empty field myopia," where the eyes go into a holding pattern, focusing on a spot a few inches in front of our noses, can occur when we are not actively looking or searching for objects in our immediate surroundings. I find this effect to be more pronounced after a few beers, but since flying and drinking alcohol are mutually exclusive pastimes, this should not be a problem.

The appearance of a roll of masking tape, just before takeoff, can have a rather unnerving effect on student pilots. It typically means that the instruments are going to be covered over and guess what? Yep, flying the glider by the picture. This helps to encourage a better look out and a reduced reliance on the flight instruments. This is good practice and should be done on a regular basis during a pilot's training and subsequent development. A word of warning to fellow instructors: do not try this with the student in the back seat! I have a good friend in England who is still utterly amazed at my judgment, while flying with *no* instruments in the back of a K13 some years ago. It was just possible, by peering round his shoulders, or looking at the reflection of the instruments in the canopy, to see all that needed to be seen to answer his questions and requirements over a three-flight experiment. He'd pull the release and ask our height: "Oh, about 2,300 feet," would be the reply to a stunned silence, since I could see the altimeter over his shoulder. He'd ask for a specific speed: I could just make out the ASI in the canopy reflection, so the required 65 knots would be held with rock solid precision. So it continued, with me cheating, while grinning my head off at his amazement at my piloting prowess. Everyone else, including the chief instructor, was in on the joke except poor Merv.

Mid-air collisions are killers. It is our responsibility to see-and-avoid other traffic and take the appropriate action. The most important factor to bear in mind is this: Just because you've seen him, doesn't mean this visual detection is mutual. Even if the laws of the air give you the right of way, it will be of little consolation to have that engraved on your head stone, just because the other guy had his head in the cockpit.

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Duty roster

Peter Vickery

We have are now scheduling MITSA Juniors for AM and PM sessions each day. Most of you know Matt Tadry and Rob Cutler and their level of competence, but some of the other Juniors are not yet as experienced with ground handling, so I'd encourage all members, and particularly DOs, to keep a fatherly and professional eye on the youngsters and direct their unbounded enthusiasm appropriately. Ray Tadry, Matt's father, has taken over as the Juniors' representative to the board, and Ray himself is likely to become a student pilot in the not too distant future.

A couple of points for the edification of DOs. All Juniors flights should be charged at a flat rate of $5.00. Phil Gaisford has been in contact with the new GBSC President with respect to closer cooperation between the clubs, and we may, therefore, be towing GBSC gliders during the coming season or be towed by GBSC tow planes. Please be sure to note GBSC tows in the remarks column of the operations log and be specific with tow heights, in order that the respective treasurers can determine the cash offsets. We must also ensure that daily membership forms are completed by GBSC pilots taking MITSA tows.

All operations logs and any money collected by DOs should now be sent to me, and not to Steve Glow as in the past. I will provide a supply of stamped, addressed envelopes in the trailer filing cabinet. I will consolidate and record data for dissemination as required. Execution parties will take place before flying commences on Saturdays in order to summarily dispense with those DOs not doing the job properly in prior weeks!!

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