

Greenhorn in the White Mountains:

A novice's prep and experience in the Mt. Washington Wave

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INTRO

It is usually just around the very moment that you think you have a skill mastered that you are greatly humbled by a realization of how much you have yet to learn. This very humbling is what I believe makes soaring such a constantly rewarding activity, where even the greatest pilots are still students of safety and theory, no matter how far he or she has come. It is through this constant learning process that I came to re-engage my passion for advanced soaring flight, after roughly 6 years of almost exclusive primary instruction for various clubs around the country. I first began dreaming of high-altitude soaring while perusing the wall photos and equipment rooms at Black Forest Soaring at Kelly Airpark in Colorado. It only took a few great stories of what it used to be like, the latest articles on the Perlan Project, and a photo or two of Neil Armstrong with a BFSS 1-26 in full altitude gear that I decided soaring wave flight was indeed my place in the world. That the greatest state in this American republic (New Hampshire) happens to be home to some of the best wave conditions east of the Mississippi...well that just about iced the dream cake!

After graduating USAFA in 2010, I was able to connect with Malcolm Windsor, of the Greater Boston Soaring Club, who agreed to sell me his precious 1985 Schreder HP-14 that he had done improvements too, but was ready to move on from soaring. If looking for a high-altitude ship, I'm not sure you could find a better ship than this all-metal, 90-degree flapped, v-tailed piece of fine American beauty with the legs of a Libelle and the stall speed of a 1-26 (I may be a bit biased at this point). I chose the HP primarily for the enormous storage room behind the pilot's seatback that allows ample room for oxygen equipment and batteries that are required for cold, long-duration flights. In 2011 and 2012, I managed to find time between a masters degree and deployment to strip and re-paint the glider, enabling the Oxygen and electronic systems to be completed a week before the 2013 annual NH Mount Washington wave camp.

Hardware Preparation

The difficulty in finding an oxygen system that will safely take you into the double and triple-Lennie zones is that the only people left in society that would use such a system are the dozen or so soaring pilots that are still young and ambitious (we'll use that term for now) enough to fly an unpowered ship higher than most pressurized cabin aircraft operate. The cheapest solution to the lack of options was purchasing a surplus A-14 regulator (\$15 e-bay find!) and having it completely refurbished by Fluid Power Ohio. The team at FPO is incredibly helpful, professional, and the only people in the world I could find who can recertify one of these regulators. From that point, I worked with Eric Westernen at Mountain High Oxygen systems to custom design a high-pressure system that would allow me to fit enough oxygen tanks for 1000L of O₂ at 1800psi to the A-14 regulator. Although there are certainly some limitations to our setup, such as not being able to pull the tanks out to fill them, the overall product was simple to assemble, very reliable, and I somehow managed to hemorrhage the money for it faster than the glider consumed it. Below in figures 1 and 2 are the basic schematic of the oxygen setup, as well as photos of the final configuration. The A-14 is bolted to the main canopy rail, just over my right elbow. I poured expanding flotation foam into a trash bag to create a custom-fitting cradle for the tanks to ensure that there was no room for them to move inside the storage area. For my mask, I used a surplus Air Force MBU-12 mask, and replaced the bayonets with elastic bands to hold the mask in place

while in flight. The internal mask microphone also had to be replaced, as the military and civilian radio systems use different impedances on their microphones.

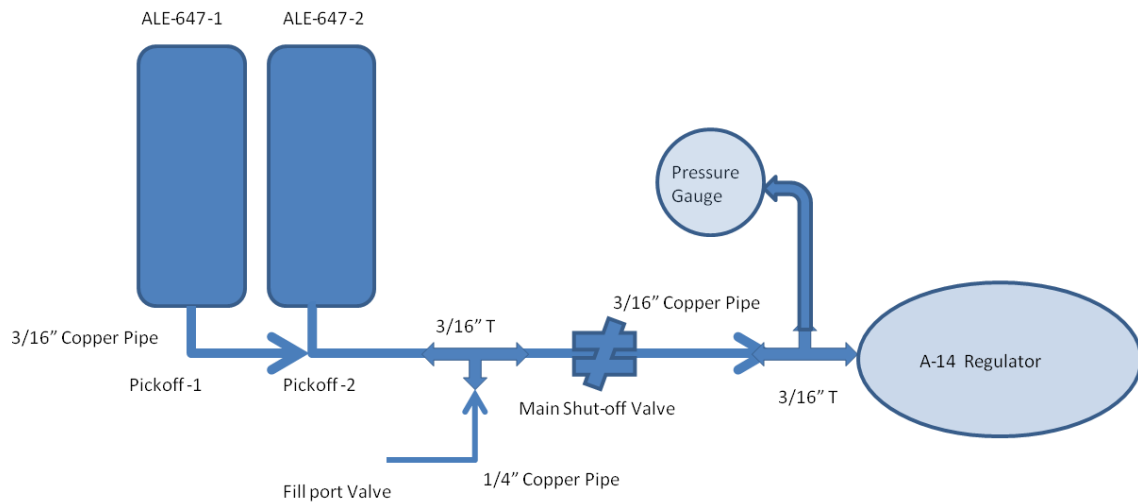


Figure 1- Oxygen System Block Diagram



Figure 2 - Installed Oxygen System

The other major hardware additions to the ship included the installation of a LXNAV 7 variometer, Oudie flight display, and LX Nano flight recorder from Cumulus Soaring. All three of these devices completely changed the dynamic of how I was able to make decisions in the air, and greatly contributed to improving my situational awareness, safety, and ability to get the most from post-flight analysis. The entire glider restoration process was capped off with “clear-view” double-canopy panels that Dan Reagan from Caesar Creek Club in Ohio generously made for my front and rear canopies. The

November 2013 SOARING magazine article describes exactly how he went about making the set for his glider. Even at 27,000 feet, I had no icing at all on my canopies where the panels were installed.



Figure 3 - Clear-Vision Panels

The final aspect of physical preparation, and the one area that I did not anticipate being so complicated, or so important, is ensuring you have all the tools, emergency kits, Texas catheters (if you are into that) battery chargers, snacks, and the rest of the caravan that is needed to safely operate your glider for a week at a time. For most contest pilots, these things are probably second nature; however for those who have never been to a camp or traveled to a contest before they are easily overlooked. I quickly discovered upon reaching Gorham that preparation and organization of your ground equipment is as critical to your pre-and post-flight activities as your trailer is in retrieval. Thankfully, Frank Paynter has written on this issue a few times on SoaringCafé.com that I was prepared enough to get by for the week, but I will definitely be paying closer attention in the future. My temporary solution for this year was a plastic tote-shelf that has a drawer for tape/grease/other assembly tools, another for all batteries, chargers, and electronics, and a third with my oxygen mask, catheters, and any other in-flight amenities I dreamed up. In a futile attempt to keep track of everything, I started an excel spreadsheet with all the packed items that should be in each drawer, which was helpful at least until I arrived and started using the drawers.



Figure 4 - "MW" Ready for Test Flight at CCSC

Research

My declaration to my friends and soaring colleagues that I wanted to start attempting high-altitude flight and to break the NH soaring record was met with the most resistance I have experienced since suggesting to my mother that I purchase a motorcycle. Most of this opposition appears to stem from well aged pilots' concern for those under 30 self-inducing death in search of the fountain of adrenaline. Unfortunately, a tough precedent has been set in this realm, and the only way to combat it is honest self-assessment, and rigorous self-study. The very first place I send any student remotely interested in a new realm of soaring is to the SSA Glider Flying Handbook, and so that too is where I began. From there, I referenced several excellent sections of "SOARING" by Derek Piggott and "The Complete Glider Flying Handbook" by Welch and Irving. Once I started to get a better appreciation for the environment and techniques of altitude and wave flying, I went back and read the 1954 final report from the Sierra wave project, as well as several classic SOARING magazine articles from the Mount Washington camps, such as "Diamonds Before Breakfast" by Kevin Brooker. The combinations of these texts allow one to take in a healthy balance of the elementary aspects of meteorology involved in wave, as well as provide a glimpse into expected emotions, thought patterns, and process that you will go through when flying in that environment. The Mount Washington Soaring Association webpage also has a wealth of information that covers the majority of pertinent issues, particularly with east-coast flying.

Around the same time that Dan Reagan offered to build me a double canopy, he also lent me his copy of the "Practical Wave Flying" by Mark Palmer – which is part of Bob Wander's *Gliding Mentor Series*. I do not think it is possible to speak more effectively to all aspects of beginning and intermediate wave flying than has been accomplished in this text. It is a very good initial read, and even better resource to jump back to as you explore other media and need clarification. Another book in the series – "Riding on Air: Ridge, Wave, and Convergence Lift" by Rolf Hertenstien- is a bit more technical in nature, but provides incredible visualizations and meteorological discussion and is a perfect complement to the first. I recommend any pilot interested in flying in wave to purchase these books, regardless of experience level. I will shamelessly advertise that these books can be found at www.bobwander.com.

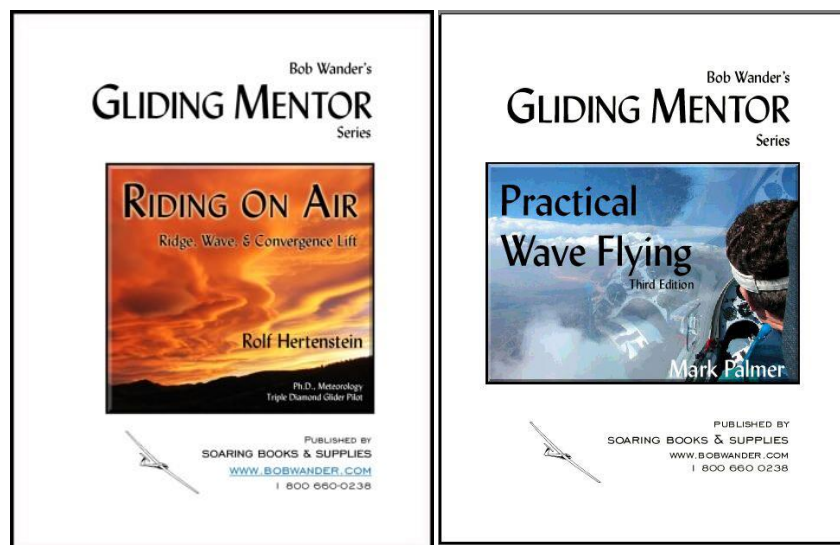


Figure 5 - Bob Wander's Gliding Mentor Series

The third major place to look in preparation is from aviation physiologists and veteran wave pilots. I am incredibly fortunate to have been able to talk to both Dr. Quay Snyder (Master Sailplane Instructor and retired AF Flight Doc), and Dr. Steele Lipe (accomplished wave pilot/researcher and spoke at 1995 SSA convention on physiology). It was certainly to my advantage that both of these gentleman are also accomplished soaring pilots, but having an open and frank discussion with any medical personnel to establish your personal health and potential limitations allows you to better gauge where in the broad spectrum of pilot physiology your system resides, and what to expect. For example, a recent 22 year old college graduate from a small military school at the foot of the Rocky Mountains will have a far easier time functioning at altitude than a moderately overweight 50 year old smoker. The difference between these two particular examples can be staggering, in excess of a 15,000 foot difference between equivalent time of consciousness. Effective oxygen use and understanding of altitude risks definitively stood out to me as the weakest area of appreciation and understanding while talking with otherwise highly experienced wave pilots.

From my discussions with the Docs, I was also able to work a seat into an altitude chamber class at the Air Force School of Aerospace Medicine in Dayton, OH. I was pleasantly surprised when it came time to ride the chamber to 28k that due to limited resources, I would be using the same model mask as I had purchased surplus for my A-14 during my chamber ride! My experiences in the chamber confirmed to me why hypoxia is so incredibly lethal to pilots... you don't realize how far you have gone until you have recovered. I liken my feelings of moderate hypoxia and effective recovery to nodding off while driving on an interstate at 2am; the world was a little fuzzy, and a quite pleasant until I sucked down some 100% oxygen and world came back into focus like a camera zoom. Thankfully I also found that I become incredibly flushed when hypoxic, which is a much easier and safer symptom to recognize. Unfortunately budget cuts have disallowed the ability for private pilots to make use of the military chambers, making a detailed discussion with a physiologist and oxygen discipline while flying even more important.

Mission Planning

Once armed with enough theory to drown a philosophy major, I began to make all of my planning more tangible, by studying the landscape, past techniques, and local operating procedures. For Mount Washington Soaring, a great first hack at all of these can be found in an excellent piece Mr. John Good wrote in 2011, that is mandatory reading for first timers at the MWSA camp. John's paper clearly lays out the geography of the Gorham area, as well as the various methods that have been used to contact the wave since the first encampment. Many of the local policies and nuances, such as the inability to see the airport from the Moriah-Carter ridge are also laid out for the reader to study and use as a reference. In order to get a photo-realistic view of John's writings, however, I found it incredibly helpful to find Goham Airport in Google Earth, and use the flight simulator option to literally "fly" the routes depicted in the guide. This also provided an opportunity to commit each of the key peaks and landmarks in the area to memory before even showing up at the field. Another great tool at this point was the free software *IGC Flight Replay*, which allows you to "fly" an IGC file using a Google Earth plugin.

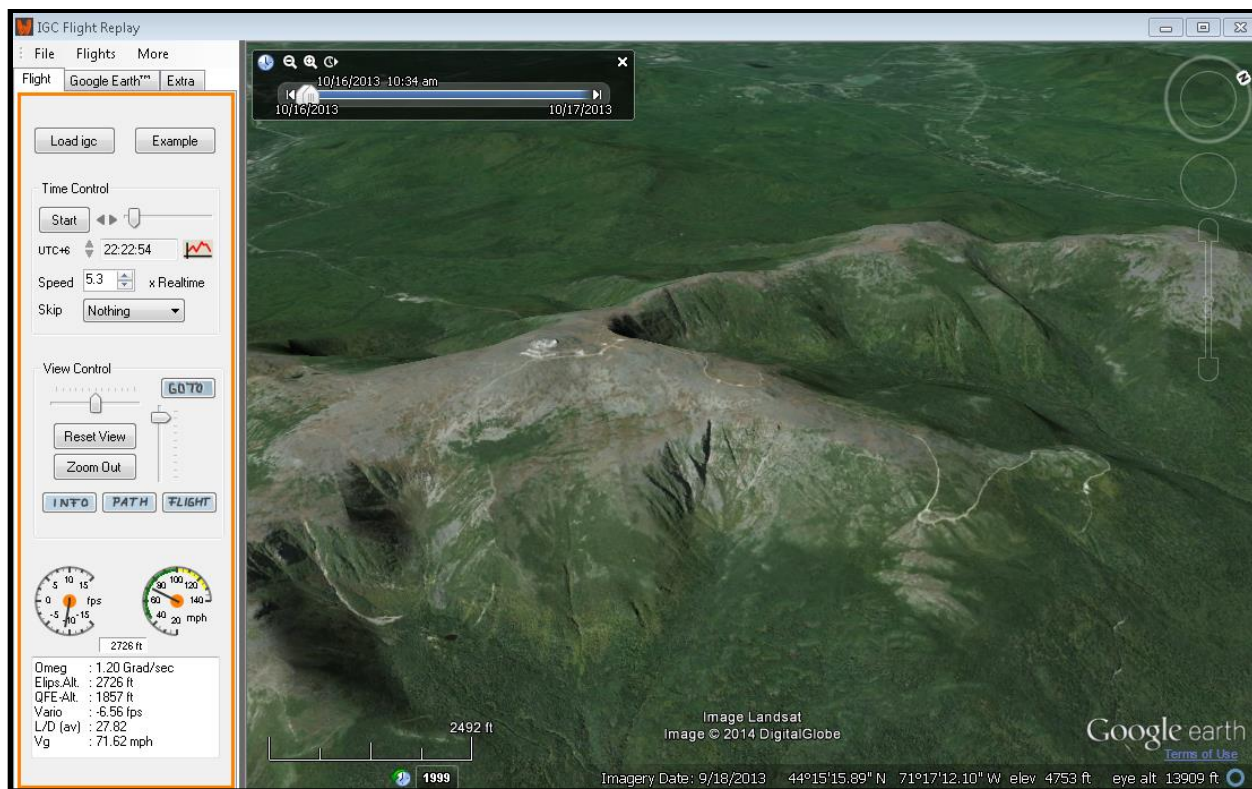


Figure 6 - IGC Flight Replay

After correlating landmarks with John's paper and learning the landscape from above, I began to fuse all the previous materials and play Tuesday morning pilot-quarterback in See-You. This is easily accomplished by using IGC files from previous encampments at Gorham that can be download from the OLC site. This style of analysis lets you follow someone's tracks with 20/20 hindsight, and see exactly what allowed effective climbs, where time and energy was wasted, and most importantly when and where critical flight decisions need to be made. Whereas in a contest or most X-C flying the variety of locations between pilots can make comparative analysis rather difficult at times, in a wave area such as Gorham it is a lot easier to establish at least a solid 70% solution and build from there. This year having my own tracks for comparison will only help, as I have a slightly better understanding of how a wave flight track actually corresponds to what the glider is actually doing. From this work, I established exactly what my plan of action was going to be when I hit wave, allowing better decision-making and more confidence while flying solo in the wave for the first time. Many of these strategies were slightly tweaked and refined when I arrived in Gorham, as no book or computer simulation can quite compare to early-morning coffee discussions of horror stories about getting stuck on-top with hail at the field...

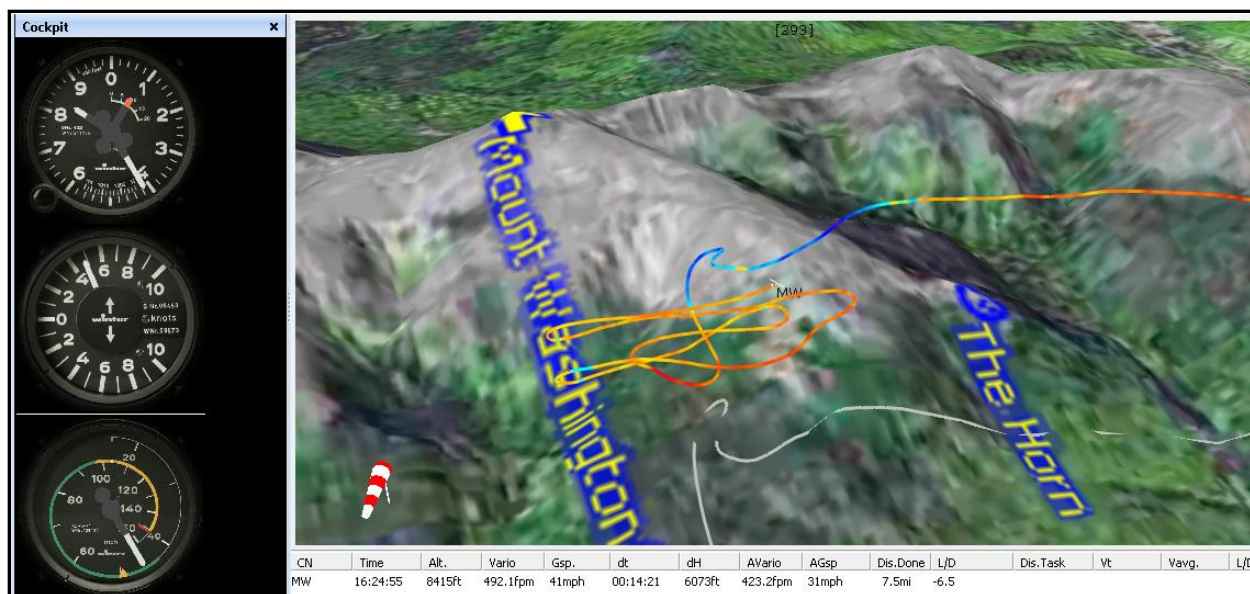


Figure 7 - See-You Analysis

Arrival and the Careless Mistake

Being born and raised in the great state of New Hampshire, the emotions associated with cresting into the Mount Washington Valley in the middle of foliage season can only be described as purely spiritual. Pulling into Gorham airport (through the wrong entrance albeit) was equally pleasant, as I was greeted warmly by complete strangers wondering who pulled that hideous trailer from Ohio, and how it could possibly have made the trip. I of course put this generosity and warmth to the test by asking for aid in assembling my HP-14, but goodwill prevailed and I simply had to promise to never ask that of them again. The other bad news upon arrival was that the historically and famously worst weather in the world was predicted to blow at roughly 5-10 mph in the wrong direction for the next week. This me allowed several days of rather short, un-exhausting flights to grow accustomed to the area, as well as soak in as much possible information from the old hands on the field as I could.



Figure 8 - The Mount Washington Home for Wayward Boys

The first flight that I took to the summit of Mount Washington was a sled ride in the middle of the week, and occurred completely by happenstance, and will remain one of the most memorable flights of my life. My ship's previous owner, Mac Windsor, passed away this past year, and unbeknownst to me asked to have his ashes scattered over the MW Valley. As fate would have it, this was also the first year that I was able to attend the camp, so we just happened to have both Mac, some of his close friends and family, and his glider all in one place for his last flight. As a result, I had the opportunity to fly N102MW (re-named with his initials back in 1993) in formation with Rick Roelke and Mac's son Jonathan in the GBSC Puchaz. It was truly an honor to be there for that flight, and made the trip and previous 4 days of sitting on the ground completely worthwhile.



Figure 9 - Coming Back Down Through the Clouds

The following day there was no flying, so I took the opportunity to reconfigure my cockpit, adjust settings on my flight computer, and pour some molds for a tail dolly project for the winter. The nature of my lackadaisical tinkering manifested the following day, as light wave and ridge lift were accompanied by 4-5 knot thermals, and everyone rushed to get into the air. Again under the patient mentorship of Walter Striedieck released from tow at roughly 2000 ft off of pine mountain (the key landmark for locating the airfield), and immediately began climbing at 2-3knots in a straight line course for the Moriah-Carter ridge. As I turned back towards pine mountain to stay along the line of lift, my right rudder pedal clanked to the cockpit floor, leaving me only the left to try and manage coordinated flight in my 16.5 meter wingspan, V-tailed glider. Due to the HP-14 v-tail mixing configuration, I was able to apply right rudder by pulling back on the left pedal, enabling me complete but crude rudder control. After announcing my emergency (and flying through 7knots of lift on the way home) and being wisely coaxed from the ground to return immediately, I was able to put the glider down safely and diagnose the problem. The culprit in this case was my own negligence, as I had failed to reinstall the clevis pins that hold the rudder adjustment pins in place, leaving nothing but friction to hold them in place. The clevis pins were laying on the floor next to the rudder pedals, just where I had left them. It also turned out that the left rudder pedal was likewise un-pinned, and was again only held in place by friction and the grace of god.

Just Pay for it...

Around the last Thursday or Friday of the trip the possibility of winds increasing from the west were being discussed, as well as the rumored arrival of “Uncle Hank” Nixon, attempting to finish his last diamond. I must admit that I had never heard of Mr. Nixon, and now hold that as a badge of shame, as he is arguably the most eccentric, helpful, and singularly impressive soaring personalities I have ever encountered. After Uncle Hank’s arrival and classic introduction (“Hank’s my name, soaring’s my game”), the potential for wave was declared, and the fleet was launched. Unfortunately, this was also the first day after the government shut-down, so the wave window was capped at FL180 so the military could practice in the MOA. This was also the first time in my soaring career that I have been unquestionable humbled by another pilot. After a failed attempt to get away from the field via thermalling off of Mt. Hayes, I was heading back over Gorham to the airfield at roughly 1300ft AGL, and saw what a soon determined to be uncle hank, traveling at least 100mph at the same altitude, in the opposite direction of me, after diving to 700 ft over the field to get a low “notch” in his flight recorder.



Figure 10 - Early Morning Lenticular Clouds

After landing, and upon hearing confirmation that the wave was indeed working, I decided that I would just pay for the long tow to the primary, and work on “earning” my way to the wave at some future point. Rather gentle rotor and expert mentor-towing by Walter Striedieck made my first attempt at connecting with the primary wave almost unbelievably simple. Roughly 10 minutes after releasing at 6000 ft, I has easily climbed up the face of a very distinctive downwind edge of the Foehn gap, and was crossing through 12,000 ft. After about an hour in the cockpit, I was feeling rather smug as I climbed through 17,000ft, only to hear Uncle Hank come over the radio to declare that he had just hit 17,960 feet, and completed his long-awaited third diamond badge. The grandeur of completing this feat –a diamond badge without going over FL180-is remarkable enough on its own. To top it off, however, I had

just seen him an hour or so before traveling in the opposite direction of the wave, towards a mountain that wasn't working, and he still managed to beat me to 18k after I landed and towed to the primary. In a juvenile gesture to alleviate my wounded ego, I at least ensured that I made the highest climb of the day-to 17,996 ft!



Figure 11 - Climbing Through the Foehn Gap

The next five hours of flight were almost entirely uneventful, as the conditions were glassy-smooth, with a cloud deck below that was completely unbroken with the exception of the Foehn gap I climbed through. The resulting cotton-covered world view cannot be described as anything short of majestic, though I was extra careful to heed the advice that many of those tall fluffy clouds have rocks in them. One of the most enjoyable aspects of wave flying is that you are in a stable enough position for long periods of time that you are able to make incredible strides in your flying efficiency and skill, as well as take time to better understand all your in-flight equipment in a real environment. With all of this “time” at your disposal, however, it is critically important to remember a means of relieving oneself. I unfortunately found myself needing to urinate about two hours into the flight, but had already defiantly resolved to make the 5-hour badge duration with no civilized relief method in sight. Thankfully, my years of training with computer and Xbox games allowed me to “camel up” and complete my first ever wave flight at 5 hours and 20 minutes.



Figure 12 - Sunset at Cloud-Top

Again... But Higher this time!

The next morning the forecast was for strong wave conditions, and the FAA granted up to 27,000ft of airspace for the gliders to play in. Unfortunately, in the morning the only large hole that you could climb up through was the Foehn gap east of Mt. Washington, with the cloud base sitting lower than the mountain peaks, at about 4500 ft. A few pilots attempted to fly the Moriah-Carter Ridge to contact the wave, but every one of them returned unsuccessfully. While waiting for a better opening, I took the opportunity to ride backseat in the Post-Mills Soaring Bird-Dog tow plane; giving me an entirely new appreciation and respect for all that tow-pilots endure. After releasing the glider, this flight also allowed me to see that towing down the valley would not be too difficult at this point, and prompted me to take a tow. This being my last day in Gorham, I again decided to just pay for the full tow to the primary, so that I could spend more time in wave and less fighting not to land.



Figure 13 – Towing Walter Striedieck and Jerry Smith in “i1”

The second tow through the rotor was a bit more interesting, though still moderate turbulence at best (not that I am complaining about that). Again on this tow, however, the tow pilot had to tell me that the show stopped there, due to my hesitancy to disconnect without climbing at 10+ knots when over mountains. I was relieved to find that within a minute of releasing I was climbing up the face of the well-formed lenticular cloud at an average of about 11 knots, and was crossing through FL180 after only 10 minutes in the wave. After 18k, my climb slowed down to a relatively steady 2-4 knots, which I was able to ride up to the 27,000 ft FAA limit we had been given for the day. As I passed 26k ft, I attempted to call Boston Center to request up to 35k, but apparently 150 miles is more than a 1980's handheld radio can clearly transmit, so I had to relay through a Diamond motor-glider that had joined us for the day. In the time it took to relay the message and wait for a response, I had climbed to 27k ft, and was desperately attempting to stay below the limit, on a ship with no airbrakes.



Figure 14 - Climbing Through 25k Ft

This was also the moment that I truly grasped the difference between true airspeed and indicated airspeed at high altitudes. A quick glance at my Oudie revealed that my 60 mph indicated airspeed was roughly 100 mph true airspeed, which explained why I was unable to move my flap drive handle. I ended up pulling the glider into a straight-forward stall in order to put out 30 degrees of flap, and then make a large circle downwind in my continuing effort to not violate the FAA's limits. The moment that I finally arrived back at roughly 16k and completely out of position in the wave, we received confirmation from Boston Center that we could fly up to 35,000 ft. Despite my best efforts to relocate the 3-4knots of lift I had found while attempting to leave the wave, repeated tactical judgment errors prevented me from climbing any higher than my peak while trying to leave, at 27,192 ft MSL.

The one thing that a lot of pilots overlook when approaching high-altitude flight is the importance of a slow descent, for the sake of both the pilot and the aircraft. Especially as it gets later in the day, and the sun is no longer keeping you as warm in the cockpit, there is a certain desire to just pull full airbrakes/flaps and dive for the airfield. Particularly when going over 20,000 ft on oxygen, allowing your body time to re-adjust to a more compressed environment can significantly decrease your chances of negative side effects after being at altitude. Likewise, the rapid warming of a sailplane's skin and components can crack and destroy gel-coats, pop paint and rivets, not to mention the high potential for frozen controls. The risk of these things occurring is very real, as indicated by the 2013 Mt. Washington group experiencing instances of both frozen flight controls and paint popping off after flying over 17k feet. Despite taking my time on the way down, I still managed to pop off the clear-coat paint on my checkered tail, making a red and black tail now a red and gray one. I suppose that at least next year if I do come down a little bit faster I can shake the rest of it off....



Figure 15 - "MW" and I On Final

Thoughts for the Future

Without question, the preparation, traveling, and flying with the annual Mount Washington Soaring camp has been one of the greatest experiences of my life. It is rare that an actual event can surpass your anticipation, and this has surely been one of those times. The two key mistakes or "learning opportunities" that resulted from the process have generally all been stated before, but I feel warrant mentioning, given that as an instructor of 6 years, I still made them all. The first of these is to do your due diligence in preparation and research. Although I believe that I did a significant amount of preparation for my flights, having a disorganized trailer made assembly, maintenance and disassembly painstaking and embarrassing tasks. Finally, (in a failed attempt at brevity), I re-discovered that maintaining focus, checklists, and your limits are paramount to maintaining flight safety. As a student

and instructor from the U.S. Air Force Academy's glider program, my training was incredibly checklist-centric, yet twice now I have made mistake that could be cured by creating and following an appropriate checklist. When the excitement of good soaring conditions arises, the untrained consensus is almost always to jump in the air and figure everything out as you go. Losing the use of my right rudder pedal has given me new appreciation for the importance of maintaining focus on pre-flight tasks and taking your time to prepare correctly. My two small flights into the wave were mostly relaxing, and technically speaking, quite easy. I believe that they were "easy" in part due to the mild conditions for the day, but in a much larger part to my dedication to personal preparation and the guidance by the many experienced pilots I met that make the pilgrimage each year to the greatest soaring site in America.



Figure 16 - HP-14 102MW

Chris Giacomo "MW"