The Wave of Statistics By Kevin Brooker From the Atlantic Flyer, October 2005

Near the end of the soaring season I tally up the year-to-date hours and see if there is any chance of making the somewhat arbitrary goal of logging 50 hours. Most years come up short but I can't figure any reason to stop trying. I have a slim idea how the notion of 50 hours of flight time per year has stuck into my head and how it relates to gliders is completely lost.

Right after I got married (15 years ago this October) my wife and I purchased a 1946 Stinson 108 with the idea of rebuilding it and having adventures rivaling those of Charles Lindbergh and his wife Ann Morrow. We did manage to get the restoration 90% complete and sold it when business went soft and we needed the cash more then we needed an airplane. As far as I know the Stinson is flying somewhere in Minnesota. While trying to justify keeping the 108, I calculated that we needed to fly it a minimum of 50 hours per year to break even on the cost of renting. Fly more and the hourly cost went down; less and we should just suck up the inconvenience of renting and kiss the notion of free wheeling high adventure goodbye. An examination of my logbook indicated it would be possible to fly 50 hours at my current annual pace. I was applying the "Go Broke Saving Money" theory to my aviation habit. I guess for sailplane flying 50 is a nice number to shoot for.

Apparently, there are two categories of logbook users. Those who keep meticulous notes (I'm one of these) and pilots who don't log anything at all. Given my cavalier attitude towards most forms of paperwork I must be a closet statistics freak about my flying. At the end November when soaring stops for the year (soaring is pretty non-existent during the winter but I seem to recall a legend about Vermont die-hards who found a ski for their Blanik and used a winch to make flights from a lake) I tally up a list of statistics rivaling baseball; a sport known for recording the slices of minutia about the game.

I know how many hours I have in every glider I've flown; hours at contests; number of off field landings percentage of time in gliders and at soaring locations, hours flown per month, etc. During each of these statistical madness sessions I compare each year and see how my flying has changed. One number remains constant within a few percentage points; Hours flown in wave. Each year 15% +/- of my flight time takes place exploring the wave systems of New England; primarily the waves set up by the Presidential Range of northern New Hampshire.

Mount Washington is the centerpiece of the Pressie Range and the primary generator of standing wave. The unofficial altitude record is a bit over 33,000' MSL. Not bad for an unpowered airplane and a geographical location boasting the "Worst Weather in the World". I've said it before here in the Flyer but when the wind is blowing hard enough that a human cannot stand up (50-60 kts), I want to go fly `cause the wave is gonna rip. Dude. The view will be spectacular since wave rarely sets up when the air is full of visibility robbing moisture. Flights into the mid 20,000' ranges are common and it's always fun to calculate how far I can glide from 25,000. In a 40:1 glider it works out to 189 miles in still air.

Wind speed is not the only requirement for standing waves to set up. The direction needs to be within 30 degrees of perpendicular to the generating feature, remain at a relatively constant heading, and steadily increase in speed with altitude. 25 knots at the height of the generator is good but more then 80 (at Mount Washington) and the inertia of the air mass is too great and changing direction from horizontal to vertical is too difficult. The wave exists but is not good for soaring.

The vertical profile of the air temperature must indicate an unstable layer from the ground up to the generator. Next layer needs to be stable. The exact thickness doesn't matter too much but the' thicker it is the bigger the wave. Ideally there will be another layer of unstable air on the top.

The generating feature works best if there is a sharpness to then leeward side. The south east side of the Presidentials is filled with steep ravines. The Great Gulf, separating Mount Washington and Mount Jefferson drops very steeply and is the primary generator for a northwest wind. For you purists, Mt. Clay is in between Washington and Jefferson and is only considered a "peak" due to some geographic definition of elevation change. Most consider this just a bump in the ridge and you have to know what it looks like to pick it out as a stand alone feature.

When the wind of stable air crosses the edge it is pulled down into the unstable air mass which , acts like a big spring and "pushes" region of stable air back up. Eventually the stable air moves deeply into the unstable air on top and falls back down and into contact with the Ground level the stability and the cycle repeats itself. I've counted 15 wave crests in satellite photos of the Presidentials. You don't need mountains for wave to form since the air is not lifted by contact with the ground. In theory, a canyon will also generate wave but I don't know if anyone has flown a canyon wave or even where to find one.

Wave eventually peters out. At each wave crest the top is lower and the bottom of the lift tends to be higher than the next upwind crest. At some point the air mass returns to the pre-wave layering. Some of this energy loss might be due to the mixing of the stable and unstable air trapped between the wave and the ground in an area known as rotor.

Clouds associated with wave systems form perpendicular to the wind and seeing stripes in the sky is a good way to find or avoid wave. If moisture is present it will form clouds as the air cools from being lifted. Smooth shaped lenticular clouds mark the crests of the wave. These are spectacular and they are very often layered. One of the most spectacular things I have ever witnessed from an aircraft was looking between the layers. I felt like a diver deep beneath the ocean surface swimming among pack ice and blinding white bergs. There were caverns in the sky and the thought and consideration of trying to fly up between the layers was pretty strong. Legality aside, the idea was pretty alluring but the reality of getting killed was much stronger so I stayed away.

The cigar shaped clouds or roll clouds beneath the lennies mark the dreaded rotor. This tumbling air is incredibly turbulent and violent. Flying through strong rotor is without a doubt a frightening experience. If you've ever gone body surfing in the ocean and been tossed around feeling the water push you up before shoving you back towards the bottom and felt this sensation over all or just parts of your body then you have an idea of what the air does to the sailplane. The only good part about rotor is flying out into the laminar flow of the wave. This transition from rotor to wave is instant. As many times as I've left the rotor for wave I always hang on for a bit longer waiting for Mother Nature to wait until I've relaxed before giving me one last slap. So far it has yet to happen.

The wave is laminar flow air and the smoothest flying I have ever done. The air is rising at an incredible rate (best I've seen is 2,600 ft/min.) and the ride is super calm. Seeing the ground fall away and the mountains become flat and blend into the rest of the terrain always entertains me and I sit in the cockpit and giggle.

Oxygen is required and aside from the cold is the limiting factor of how long the pilot can stay and sky surf. With the temperature falling at 3 degrees per 1,000' it gets cold pretty fast. My wave attire is a full set of long underwear and good loose fitting mountaineering socks and down over boots on the feet. A fleece vest, topped by a down mountaineering suit, down mittens and a good warm hat to complete the outfit. Great when the outside air temp is 40 below zero and a personal sauna when working hard to keep the glider upright while passing through the rotor.

A few of you sharp readers have noticed the wave gliders spend a bit of time in Class A airspace. How's it done? Transponders and flight plans? Complete disrespect for the law? Big sky, little plane theory? None of the above.

Wave sites can develop a Letter of Agreement (LoA) with the FAA that outlines the procedure for flights above 18,000'. This LoA is set up weeks to months in advance of the wave season and approved by the ATC with jurisdiction of the airspace above the wave site. At Mount Washington this area is controlled by Boston Center (BC). When it looks like a good wave day we contact ATC and request the airspace for the Mount Washington glider area and an altitude we feel is reasonable (35k is not an uncommon request) and what hours we will be flying and with how many gliders. If the request is granted we're good to go (there are a few other procedures but this is the simple version) knowing Boston can ask for the space back if they need it. I cannot say enough good things about the controllers in Boston. They have been fantastic to work with and very accommodating. Thanks.

The season's end is approaching and I'm a few hours short of 50. Hopefully this wave season is a good one and I'll make it. If not I had fun and there's always 2006 to try again. As always, if there are any questions or comments please feel free to contact me at Redpoint@sover.net So far no one has and I'm not sure if anyone's reading this stuff. Probably too busy trying to satisfy their year end goals. Fly safe and keep the dirty side down.