

# Catch a Wave and You're Sittin' on Top of the World

Those of us who soar out of Front Royal experience some of the best soaring conditions on the East Coast. More than half the time good thermals provide lift for multi-hour flights, typically to altitudes of 4,000-6,000 feet MSL, and sometimes as high as 10,000 feet MSL. That compares well with thermals to 15,000 MSL at places like Moriarty, New Mexico where you're at 6,000 feet MSL sitting on the runway.

Then, we have the Massanutten ridge that goes straight for nearly 50 miles. When the wind is on the ridge at 15-20 knots it's possible to fly its length at over 100 knots. But perhaps the most exciting ride comes from the wave. Flights well into the flight levels have been achieved in our area. On May 31 I contacted the wave at Front Royal and climbed up to 10,600 feet MSL in beautiful clear air, riding above the clouds. Despite my directions on where the wave was working I was the only one able to get in it. Hence, the inspiration for this article.

Whereas ridge lift occurs in front of an obstacle, wave is a downstream effect. Under the right conditions air flows over an obstacle and sets up a standing wave downstream. What are the right conditions and where is the obstacle? The obstacle most likely to cause wave at Front Royal is the Dolly Sods, just west of Petersburg Airport in West Virginia, about 50 nm west of Front Royal. The Appalachian Plateau, elevation 3,000-4,000 MSL, ends abruptly at the Dolly Sods, and the elevation drops by about 2,500 feet over a very short distance. When stable air



Club member and instructor, George Hazelrigg, pilots the club's Grob-103 above 10,600 feet MSL in the wave above Front Royal May 31.

is flowing out of the northwest over the Dolly Sods at about 15-20 knots on the surface, increasing to about 50 knots at 5,000 AGL, the conditions are likely to cause wave. When the air is sufficiently moist, the crests of the wave may be marked with long, thin lenticular clouds. Lenticular clouds are stationary even though the air is flowing past them at 50 knots. This is because they form and dissipate dynamically in the wave. But, in drier air, there might be no clouds at all. An interesting feature of the wave is that the air flow in the wave is entirely laminar. That means that it is just about the smoothest ride you can experience. Flight in the wave is incredibly tranguil. Flight under the

wave can be gut wrenching.

If you're planning on catching the wave you should first take some time to understand its source and structure. The wave is the downstream ripple in the air after flowing over an obstacle. This ripple, if accompanied with lenticular clouds, can be seen in satellite images. I have counted up to 25 cycles or crests spanning a few hundred miles emanating from the Dolly Sods. In fact, wave has been observed as far downstream as 1,500 miles from the obstacle. A strong wave will provide lift of five knots or more (sometimes a lot more), intensifying at increasing altitudes as one gets closer to the source. The wave produces equally strong sink

where the air is descending. The interface between the wave and the ground is also interesting. In this space, which might be several thousand feet thick, the air typically rolls, sometimes forming cylindrical "roll clouds." In ideal conditions you can see the clouds rolling. This "rotor" can cause some rather deceiving wind conditions. With 50 knot westerly winds at altitude the surface winds might be 20 knots out of the west at one place, calm three miles east, and 20 knots out of the east three miles further east.

If you are in the right place at the right time you might slip through the rotor with minimal turbulence. But in general, the rotor is quite turbulent. It's something you need to be prepared for. It's best not to try it alone the first time. Be sure your belts are as tight as you can make them, then be prepared for a wild ride. The rule is that you must release on tow immediately if (a) the bank angle of the tow plane and glider differ by 180 degrees or (b) if the glider and tow plane are facing each other. Off tow in the rotor, you'll find big lift and big sink. The trick is to get in the lift and stay there. Keep in mind that the rotor is cylindrical in shape with its axis perpendicular to the wind and thermaling techniques are not likely to work. Try to fly along the rising side of the rotor, paralleling its axis. Most of the time the air in the rotor is cloudless, so good luck on this. If you're a wuss and can hang on, another technique is to get towed above the rotor and into the wave itself. You'll immediately recognize the wave as the extreme turbulence of the rotor gives way to the extreme tranquility of the wave. Be sure to release in lift. If you release in sink you'll soon be slammed back into the rotor.

Now the big questions. So, I'm out flying. How can I know if there is wave and how do I find it? The first clues to the presence of wave would be appropriate wind conditions and lenticular clouds. But these are not necessary conditions. The second clue is given by the nature of the turbulence. Turbulence caused by thermals and that caused by rotor are completely dissimilar. I would liken thermal turbulence to driving on a road that has dips and rises, giving a smooth sensation of rising and sinking. Turbulence caused by rotor is much more like driving on railroad



## A simple diagram illustrates the lift, sink and turbulence encountered on a typical wave flying day.

tracks. It produces a rapid series of jarring shocks, sometimes with strong positive and negative g forces. If you can find the upside of the rotor and can stay in it, it's likely to take you to the upside of the wave.

So, back to Sunday, May 31. There I was, bouncing my guts out and thinking, "This has to be rotor." I flew upwind under a row of clouds that ran perpendicular to the wind and encountered increasingly strong lift up to about 7,000 MSL. On the one hand my inclination was to make thermaling turns under the clouds, but my curiosity took over and I decided to continue flying into the blue upwind of the clouds. As I did this the lift continued and the ride became very smooth. The wave that day was not extensive and it wasn't easy to stay in it. This is where experience pays off. I flew back and forth in the blue, upwind of the clouds, making figure-eight turns into the wind (not circles) to stay about the same distance from the cloud line. Much of the time I maintained 3-4 knots up. With some patience and trying to map the wave in my head I was able to gain nearly 4,000 feet. At that point I was above all but the tallest cumulus and I could drift back over the leading edge of the line of clouds. And there I sat for the next hour. Then, as mysteriously as it came, the wave went away and down I came, back into the turbulence below. This encounter with the

wave was atypical because of its orientation and structure, so it took quite a bit of experimenting to figure it out.

Okay, you're at the field, you suspect wave and you feel ready to catch it. First, get prepared. Be sure you are properly dressed, particularly in winter, spring and fall. Remember that you might be going up 10,000-14,000 feet. With a lapse rate of about four degrees per thousand feet it will be up to 50 degrees colder in the wave than on the ground. On a 50 degree day you can expect some pretty cold temperatures at altitude. During winter encounters with the wave I've experienced temperatures of -25 degrees at 14,000 feet. Your feet will likely be the coldest so take particular care to wear heavy socks and insulating shoes. You can use chemical foot warmers but I don't because I can't control them in flight and I don't want anything on me I can't control. The second thing that I find almost a necessity is a GPS. The most important readout you get from your GPS is ground speed. By watching your ground speed vary as you circle you can deduce the direction and speed of the wind. Once established in the wave you'll want to fly into the wind with as low a ground speed as possible. Keep in mind that with a 50 knot wind at altitude you can actually park over a point on the ground. And that can be a good thing, because it can be

hard to stay in the wave. If the wave is cloudless it can also be difficult, when you fall out of the lift, to determine whether you flew forward out of it or drifted back out of it. The GPS will help here. Once you are approaching the flight levels you might want to travel, so a map is a good idea too.

Next, you want to be prepared to pee. As you climb to higher altitudes, your body compensates for the reduced partial pressure of oxygen by forcing water

ables your blood to absorb and transport more oxygen, but it has an obvious side effect. On several trips into the wave I've found myself huffing and puffing as I pass through about 12,000 MSL. Soon I have to dump ballast. But after that I find that my huffing and puffing is gone and I have acclimated quite well to the altitude. Of course, you still want to be aware of your altitude limitations and take care that you don't become hypoxic. You might wear a blood oxygen sensor or take oxygen with you. Remember that a really good wave day can get you well up into the oxygen altitudes. If you take oxygen with you be sure you know how to use it and be sure to bring spare batteries.

Since you are all bundled up and with gadgets hanging off you everywhere it's a good idea to get in the glider on the ramp and let others push you out to the runway. First, you don't want to be rushed. Everything you'll need in flight has to be accessible. Second, you don't want to get hot and sweaty. That will just make you cold at altitude. Strap in as though you really mean it. I'm reminded of my aerobatic training when my instructor asked, "Are your belts comfortable?"

"Yes."

"Then they're not tight enough."

You'll know you're belted properly when your voice goes up about half an octave. The wind is usually pretty much down the runway on a wave day, so launch isn't a big deal. The next 2,000 feet will be a different story. On tow, be sure to fly attitude and don't let yourself get even the least bit out of position. That will give you the best chance of recovery when you need it. Don't be anxious to get off tow. If you can endure the ride start your search for the wave from a high altitude. I've often taken tows to 5,000 feet in search of the wave. Don't count on the rotor to take you to the wave. It's if the towplane can deposit you in the wave (on the up side).

Once in the wave, note your position over the ground. It's hard to do this accurately as you get to the higher altitudes, but you'll need to be able to stay over pretty much the same spot on the ground to keep climbing. And you'll need to be able to judge whether you've flown forward out of the wave or fallen out the back side if you get into sink. If you need to turn so as not to move upwind, try figure 8 turns, always into the wind. If you turn downwind or circle you're likely to get blown back into sink. If there are lenticular clouds you'll likely be able to climb above them and use them as markers on your position relative to the lift and sink. Experiment a bit to find the areas of best lift, and do your best to keep out of the sink.

If the wave is good, and if you do a good job of positioning yourself in it, you should soon get to substantially higher altitudes. Let's say that you've climbed to 12,000 feet MSL and the wave seems to be weakening. Now you can try jumping forward one cycle closer to the source. Doing this usually puts you in stronger wave and enables you to go a few thousand feet higher. Keep in mind that it will be about five miles from the lift you're in, through the sink on the down side of the wave and into the lift in the next cycle; and you'll be

flying into a 50 knot headwind. Take a deep breath and push over to about 100 knots and count on a 4,000foot altitude loss. But, if you do this right, there will be a clear reward. I've worked through three or four cycles with this maneuver, getting about halfway to Petersburg. But it's entirely possible to go the whole distance to the source. You don't have to worry too much about the return trip. With a 50 knot tailwind Photo by George Hazelrigg and 15,000 feet between

out of your blood. This en- Wave-induced clouds hover over Front Royal May 31.

you and the ground, the 45 nm run home is a simple straight glide that can take less than 20 minutes. A Skyline member once reported to me a GPS ground speed of over 200 knots on his return from Petersburg.

Now, some words of caution. First, beware of hypoxia. Read up on the symptoms and, if you can, take a ride in a hyperbaric chamber. This will enable you to experience your specific symptoms of hypoxia and help you diagnose yourself more quickly.

Second, keep in mind that above 10,000 feet you're flying in airspace frequented by fast-moving heavy metal. Know the approach paths into Dulles (from the west over Winchester. By the way Winchester is a trivial hop from Front Royal at 14,000 feet). Expect to see heavy metal fly under you and don't stop your scan for even a second. Also, don't bust cloud minimums, especially above 10,000 feet MSL. Remember that the 250 knot speed limit does not apply above 10,000 MSL. Closure rates can be very high.

Third, there is always the risk of clouds forming around or beneath you. Once I was in wave at about 8,000 feet in a cloudless blue sky. Ten seconds later I was enveloped in a cloud. It formed around me almost instantaneously as moist air moved through the area. My immediate reaction was to push the stick forward to gain speed and dive, followed by no other control inputs. Luckily, I broke into the clear in about 30 seconds. A cloudless day can quickly change, leaving you with a cloud deck below that you may have to penetrate. Practice a benign spiral in the specific glider you plan to fly in the

wave. This maneuver can get you out of trouble and usually clouds associated with wave are quite high leaving plenty of room beneath to recover and fly home. But, stuck over a cloud deck you can easily get lost. Here's where the GPS comes in handy. If you get stuck on top of a deck try to be patient and stay close to home. Cloud decks in wave are usually transient and disappear in 15 minutes to an hour or so. But, if you have to come down through the clouds be sure to use a benign spiral.

The benign spiral is a very simple maneuver to perform. Simultaneously pull full spoiler and trim to about 50 knots. Once stabilized in this configuration, let go of everything but the spoiler handle. Be sure that you make absolutely no control inputs, either with the stick or rudder. The glider should enter a shallow bank and descend in this quite stable configuration. Be sure to practice this maneuver before you have to fly in clouds. If you don't you won't have the confidence to keep your hands and feet off the controls as you become more and more disoriented in the clouds.

Finally, I need to mention how to go really high into the flight levels. If you know your airspace, you know you go from Class E airspace into Class A airspace as you ascend through 18,000 feet MSL. Above that, you're in the flight levels. For example, Flight Level (FL) 200 is the altitude at which your altimeter reads 20,000 feet when set to a barometric pressure of 29.92 inches. To fly in Class A airspace you must have a transponder and an IFR clearance. So how do gliders do it? We use a thing called a wave window. A wave window is airspace, negotiated with the local air traffic control folks, that can be converted upon advanced request to Class E airspace. We have negotiated a wave window for the Front Roval area and it is available to enable us to go as high as FL 230.

So there you have it. Catching the wave is like everything else in soaring. It takes knowledge and skill. Read about it. Study it. And fly it with an instructor. Then, when you have a basic competence, go do it. It's one of soaring's most exciting experiences.

—Story, photos and diagram by George Hazelrigg

# Copy That

#### Capstan Partners Wanted Skyliners,

l'm renewing my efforts to either sell or find one

or two partners to share my Capstan. I prefer the partner option. \$20,000 is the sale price to a Skyline club member, \$10,000 for a half share or \$6,667 for a third share, but I'd need two partners to join at same time.

—Regards, Shane Neitzey

#### Fly With an Eagle?

Karl Striedieck lives and flies from his ridge top strip on Bald Eagle Mountain near State College, Penn. He's a U.S. Air Force and Pennsylvania Air National Guard pilot, and, more importantly to this conversation, started flying gliders in 1965.

In 1968, Karl set an out-and-return world distance record flying a KA-8B from an auto-tow launch out of his home field. Later that year those of us at the Capitol Area Soaring School in Leesburg, Va. were privileged to have him visit and describe this impressive flight, and show videos of him doing touch and go landings on his mountain top strip.

Karl went on to many more national and international soaring accomplishments, too many to list here, and was named to the U.S. Soaring Hall of Fame at the National Soaring Museum at Harris Hill, N.Y. in 1980.

Generous with his time and talent Karl often offers other pilots the chance to fly with him in his Duo Discus during soaring contests. For a \$200 donation to the U.S. Soaring Team Fund you can spend the day in the plane with one of the finest soaring pilots in the world. He will do this again at the Region IV North contest to be held in Fairfield, Penn. (hosted by M-ASA) on Oct. 11-17. At this time there are slots available on three of those days. You'll learn more about real soaring in one day than in any other six months of your life. To get more information or to sign up write Karl at: *karls@uplink.net. —Jim Kellett* 

#### I'll Gladly Pay You Tuesday for a Tow Today

Just a friendly reminder. "Fly on account" means you actually have money in the club's bank account. It isn't a float because you forgot to bring

money or a checkbook. Nobody in the club should have a positive account with Skyline Soaring Club.

—Dan Noonan, SSC Treasurer

#### **President's Letter**

We're now halfway through 2009 and things are looking good for the club. As far as operations go we're in line with the last two years at this time with a little more than 500 tows. We have also been able to increase our tow pilot force to about 12 qualified full-time pilots with a few more finishing their training. Compared to a low of about seven full-time tow pilots in early 2008, things are now going well. All four club gliders and two tow planes are fully operational, are being flown regularly and operations are running pretty smooth. However, we need to get more of you out to the field and flying since we've had multiple good days with few people to take advantage of it.

As the summer weather has improved so have some of the club activities. The Away Day at Craig Hageman's field was a big success and provided those who participated a great learning opportunity and a lot of fun. This Fourth of July we'll have normal flying operations, but we'll mix it with a pot luck picnic with hamburgers, hot dogs and a fun time. So come out, have some fun and take part in AOPA's recommended "Fly on the Fourth of July." Also in July we'll hold our first (hopefully annual) week of soaring. We'll run normal operations on the weekends and conduct operations every weekday from July 20-24 with priority given to student training.



Photo by Martin Gomez

The view from Martin Gomez's Pawnee towplane includes Ryan Hatfield landing the Sprite while Curtis Wheeler waits to be pushed onto the runway in the Cirrus. "Yes, I had the parking brakes on and the camera set to "monkey mode," said Martin.

This will be a great opportunity for students to get an intense week of instruction and leap forward in their training.

The club has signed a letter of agreement (LOA) with Potomac TRACON for pre-assigned transponder codes for our gliders and tow planes. This agreement is similar to those signed by M-ASA and Tidewater glider clubs and gives us distinct transponder codes for our aircraft. This LOA should provide a better margin of safety for all of us since it will help TRACON get a better daily picture of our glider operations. All duty officers, tow pilots and glider pilots with transponders need to read the LOA which is posted in the club website's documents section.

The board has also approved the first installment of the Husky loan repayment. Members who contributed to the Husky loan should see a check sometime in July for the first payment.

I would like to extend a big thanks to all members who helped with the completing the Grob airworthiness directive. The bolt replacement was not a simple task and took the majority of the day for those who helped, but it kept the Grob flying and saved the club a fair amount of money. I also want to thank all those that helped with the Away-Day planning and operation; it's because of your hard work that it was such a success.

-Craig Bendorf, SSC President

#### Skyline Soaring Logo Clothing From Land's End

Perhaps you've noticed, particularly in winter, members wearing insulated jackets, polo shirts, sweatshirts, etc., that have the Skyline logo embroidered on them. Skyline has a long-standing deal with Land's End clothiers that I suspect many current members are unaware. You can purchase any item in the Land's End catalog with our club logo. I suggest that you stick to black, white, navy blue or dark green items since those are the only colors that

comprodon't mise the colors in the logo itself. Go to the Land's End **Business** Services website at: http://ocs.landsend.com/. The that first page pops up lists current specials, and some are very John Noss prepares Kathy Lightbody

useful. Select the she'll be back to fly again.

item(s) you want, note the article number and call 1 (800) 587-1541. Tell them your customer number, (3622564) which identifies the Skyline Soaring Club logo, and place your order after providing whatever other information is necessary.

Adding the logo adds \$5.95 to the cost but you may find substantial discounts on the website for shipping, certain items, etc.

—Jim Kellett

#### Martin's Photo Album

Martin Gomez was able to shoot just a few photos during his recent FRR visits as he spent most of his time towing. To view Martin's most recent photos go to: http://www. flickr.com/photos/21003395@N08/ sets/72157620549667863/detail/

#### Wunderbar!

For the current weather in Front Royal try the website www.wunderground. com. One of the Front Royal weather observation points is Catlett Mountain, the hill just east of the airport, less than a mile from the takeoff end of runway 27. To check current local conditions use Front Royal's zip code, 22630.

—Spencer Annear

#### FAST Flight Thank You A Letter to John Noss From a **Recent FAST Flver**

Hi John.

for her first FAST flight. She says

I have relived the soaring event in my mind a thousand times. I am so glad that I was able to complete my birthday by going up, even if it was a quickie.

I thank you, Rick, Bruce and Gor-

don for making it happen as I know you were probably pushing it to get me up there given the weather during that time.

I would love to come back and get up higher to really soar, so I will be back as soon as I can

and will pick a nice day! You were the best instructor; I never even had butterflies. It was a thrill.

With much appreciation for making my birthday one to always remember! —Kathy Lightbody



## High View Away Day Operations Report

think this is what soaring was meant to be; a long field with the grass cut short, lots of fluffy white clouds, a cool breeze, friendly people sitting around shooting the breeze and thermals that can keep a Schweitzer 1-26 up for hours. Well, we had all that and more at High View, June 6.

Once again it was thanks to Craig Hagaman for letting us come out to his field and actually live a day in that Utopian soaring world. The SSC Flightof-the-Day goes to David Collier in his SGS 1-26 with three hours. The first runner-up was John Noss in the club's SGS 1-36 at two and a half hours.

Honorable mentions go to everyone else who logged around an hour and

reported using full spoilers just to get down to pattern altitude. It was a really great day of soaring at High View with a total of 12 flights. Yes, you should have been there.

A few photos of the day are now on the SSC website at: http://www. skylinesoaring.org/SNAPSHOTS/ index.cgi?mode=album&album=Aw ayDay2009 —Vern Kline

# Grob Repairs

Skyliners - As you might be aware, on Saturday, May 30, we managed to replace the airbrakes/ elevator bolt on the Grob, as required by the airworthiness directive.

hanks to Eric and George's relentless determination, we did succeed. The directive estimated the time for the bolt replacement to be one hour. It was accurate in the fact that replacing the bolt, just unscrewing the old bolt and installing the new one, did indeed take one hour. However, we needed an additional three and a half hours to disassemble and reassemble all the required elements. This included removing the wings, rear seat, access shelf, inner wheel fairing and wheel. And, despite all that, we still needed two people to work in coordination just to insert the %\$\*&^! bolt.

Many, many thanks to Eric, George and the others who helped. And yes, assembling the Grob wings is a real PITA.

–Sobieslaw Dziadek



Skyline club members worked together to replace the airbrakes/elevator bolt on the club's Grob-103, May 31.



Skyline Soaring Club, Inc. is a private, 501(c7) non-profit organiza-

tion, dedicated to the enjoyment and promotion of the sport of soaring. SSC is based at the Front Royal-Warren County, Va. Airport and is an affiliate club of the Soaring Society of America. For information about the club go to www. skylinesoaring.org or e-mail welcome@ skylinesoaring.org.

Left: An image by Martin Gomez for those glider pilots who've never seen the towplane from the pilot's seat.

"Despite its ungainly appearance, the Pawnee is a delight to fly. It's light on the controls, easy to land, powerful, and has great visibility. Cockpit comfort depends on your build. I can't get a comfortable distance from both the stick and the pedals. The interior of the Pawnee was designed for crashworthiness and durability, not comfort. Those big holes around the landing gear bungees let in a lot of cooling air ... yearround."

—Martin Gomez

President — Craig Bendorf Secretary — Jim Kellett Treasurer — Daniel Noonan Membership — Steve Rockwood Chief Tow Pilot — Curtis Wheeler Chief Flight Instructor — Jim Kellett Safety Officer — John Noss Skylines Editor — Dennis Johnson Directors — Shane Neitzey, Spencer Annear, Paul Seketa, Jim Parrish, Vern Kline

