January 2011 Condor Corner
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In the November Condor Corner article I presented a short cross-country flight in Condor, and promised that the next article would talk about how to use the popular SeeYou IGC viewer program to analyze the flight.

In any serious training endeavor, a way of objectively measuring progress (or lack thereof) is a fundamental requirement for improvement over time. Otherwise, it is just too easy to convince oneself that progress is being made, even when there is no objective evidence to support the claim. For real-life cross-country soaring, the problem is even worse because soaring performance is heavily dependent on that particular day's weather conditions. A 3kt average climb rate for the day might be wonderful on a windy, blue day, but terrible on a day with cloud streets forever. We can minimize the impact of weather in Condor by flying the same weather conditions, but if we want to use Condor as a cross-country training tool, we still need an objective way to measure improvement that can be translated to 'real-life'.

For measuring cross-country soaring performance (real-life or Condor), I use the popular 'SeeYou' IGC viewer made by Naviter (http://www.Naviter.com). There may be better programs out there, and SeeYou has more than it's fair share of quirks, but it is a first-rate way of eliminating (or at least minimizing) the tendency to say at the end of a soaring day "well, I think I did OK, even though I got low twice and almost landed out. Nobody else could have done better" (I've said this to myself so many times now it should be printed on my forehead!). However, it's not enough to just look at the flight in SeeYou and say "wow – that looks pretty good!" – you need to have decided in advance what specific statistics are important for efficient cross-country performance, and then make an honest appraisal using those statistics. For my own flights, I use the following parameters:

- **Overall climb average for the task:** Of course this value is highly dependent on the day's weather, but if there were multiple flights in the same air mass (like at a contest), this is an excellent comparison. There is almost always a very good correlation between average task climb rates (taken in conjunction with climb percentage) to the day's score.
- **Total circling percentage:** In general, anything less than about 30% is indicative of a good flight, assuming reasonable weather (however, a 50% climb percentage can win the day in 'survival' conditions)
- **Task L/D and per-glide L/D.** In still air at cruising speed I get about 40:1 from myVentus 2bx dry at about 70-75mph. If I see that my L/D for the entire task is above 40:1, then I presume that I'm having some positive effect on the process – maybe exploiting a cloud street, a ridge section, or an energy line of some sort. Much less than 40:1, then I start wondering if I should take up knitting instead.
- **Off-course deviation percentage:** For modern cross-country races, especially AAT/TAT tasks, it is very important to fly straight lines. Off-course deviations or dog-legs can be very costly in terms of average speeds (unless they aren't – one day at Perry last year, the top pilots deviated 20 miles off course to a cloud street,

while the not-so-smart among us went straight on course into blue conditions – rats!). At the 2010 15m Nationals at Uvalde, the top pilots were consistently averaging less than 10% off-course deviation for the day, every day (my averages were more like 20%).

- **Thermalling turn duration:** In a cross-country soaring camp a few years ago, Doug Jacobs said that a good pilot should be able to make a complete thermalling circle in 15 seconds or less, with little or no effort, if conditions warrant. After that camp I started measuring my thermalling circles and found they were more like 30 seconds per turn, and trying to make them faster just screwed things up even more! It took me a loooonng time to be able to make tight thermalling turns while still maintaining coordination and thermal awareness, and I still have to practice this regularly.

OK, so given the above set of 'objective measurement criteria', how did I do on last month's cross-country flight in Condor? Figure 1 below shows this flight (available as 100908_NovCC1.igc from the 'Soaring Magazine → Current Issue' page on the SSA website) in See You. I have selected the 'Route + Barogram' desktop (Window → Desktops → Route + Barogram) with stacked map and 'barogram' views. (I downloaded and installed the 'cit_germany.exe' vector map from the SeeYou site to get the terrain display).

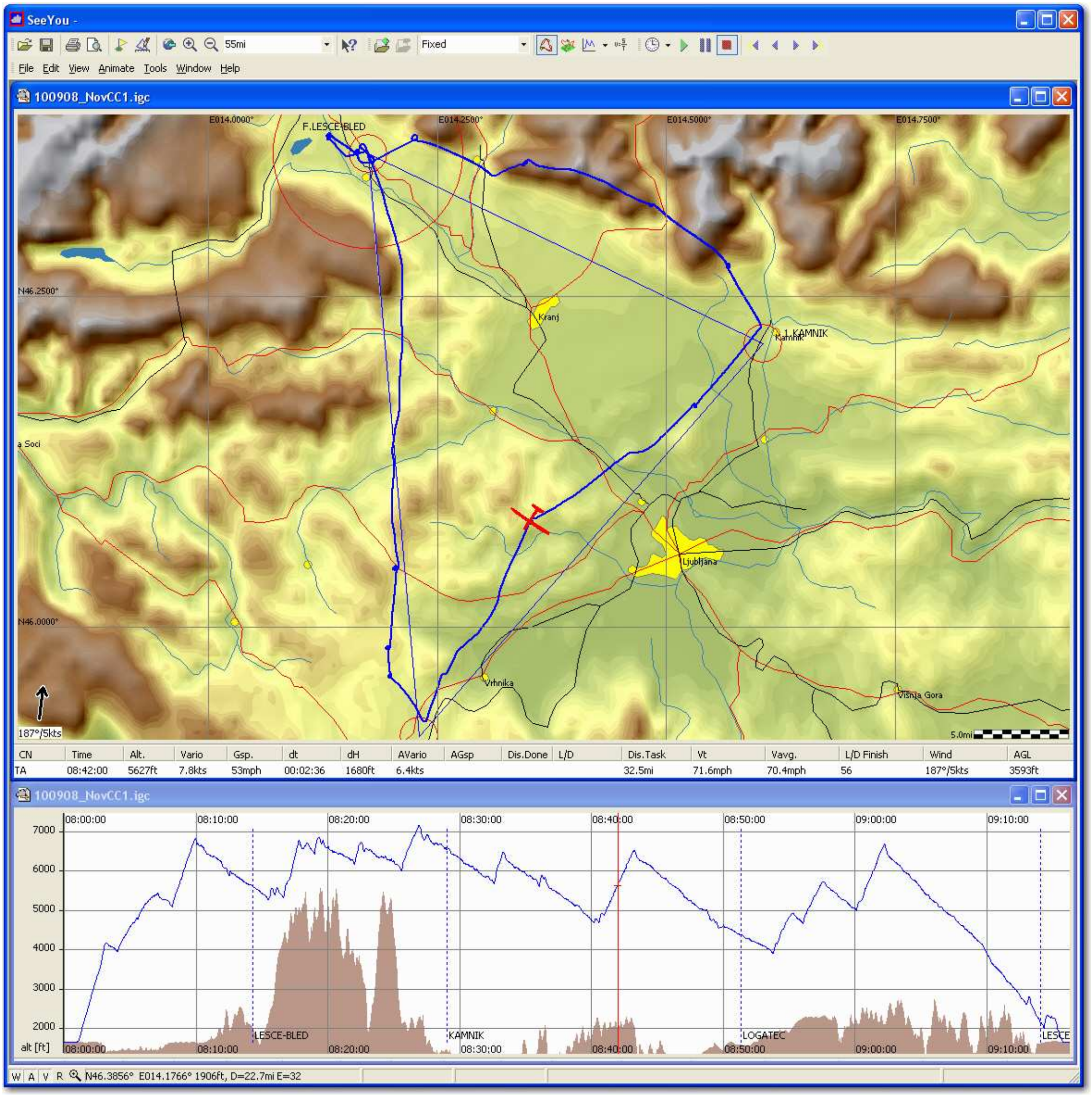

Figure 1: Route + Barogram view

I generally start analysis of a flight with this combined view to get a feel for the general characteristics of the flight, including off-course deviations, the 'working band', and the overall (bottom to top) average for several climbs. In the map view you can see that I deviated a bit north of track to exploit the high ground there, and only took 3 thermals on the first leg, ending the leg at about 6500' MSL. After that, things went a bit downhill (literally) as I crossed the valley, ending the 2nd leg at about 4400' MSL. On this leg I didn't deviate as much, but there was a jog to the west toward higher ground where I got a good thermal. On the 3rd leg I took another three climbs, eventually getting back up to 6500' MSL for the final glide. Deviation on this last leg weren't as pronounced, except for the last little bit where I elected to go around high ground at the end. From the barogram view it looks like I used two distinct 'working bands' – one for the high ground over the first leg, and another for the valley crossing and 3rd leg. By double-clicking on any of the climb segments (say the one at 08:42 as shown in Figure 1 above) I can see that the deviation to high ground on the second leg netted me a 1680’ 6.4kt bottom-to-top average climb, well in line with the best climbs of the day. Also in the barogram view I can get a feel for how well I used the energy line on the first leg, by double-clicking on the glide segment at 08:20. When I do this (See Figure 2), the readout at the bottom of the upper screen tells me that this particular glide covered 12.2 miles at an average speed of 92mph with an average L/D of 531 – not bad!

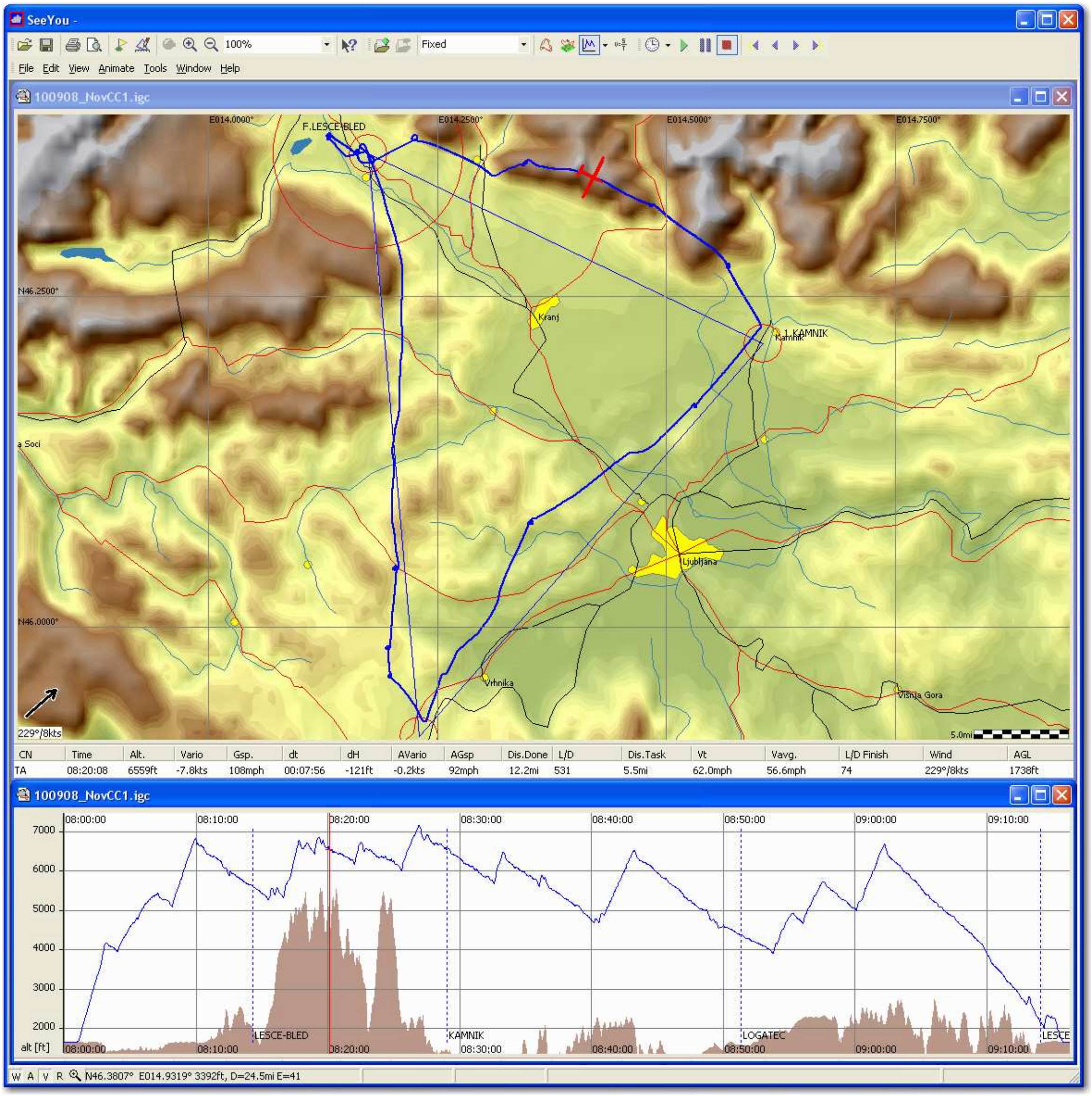

Figure 2: Long glide on 1st leg

After getting a general feel for the flight, I then turn to the statistics page to gather the ‘objective measures’ as noted above. To get the stats page up, I first double-click the title bar of the top window to make it fill the SeeYou window, and then click on the ‘V = S/T’ icon on the toolbar (or select View → Statistics). This replaces the map view with the statistics window, as shown in Figure 3 (I also clicked on the 'Task' tab). The stats view shows the overall task stats in the first section, followed by similar stats for the individual legs.

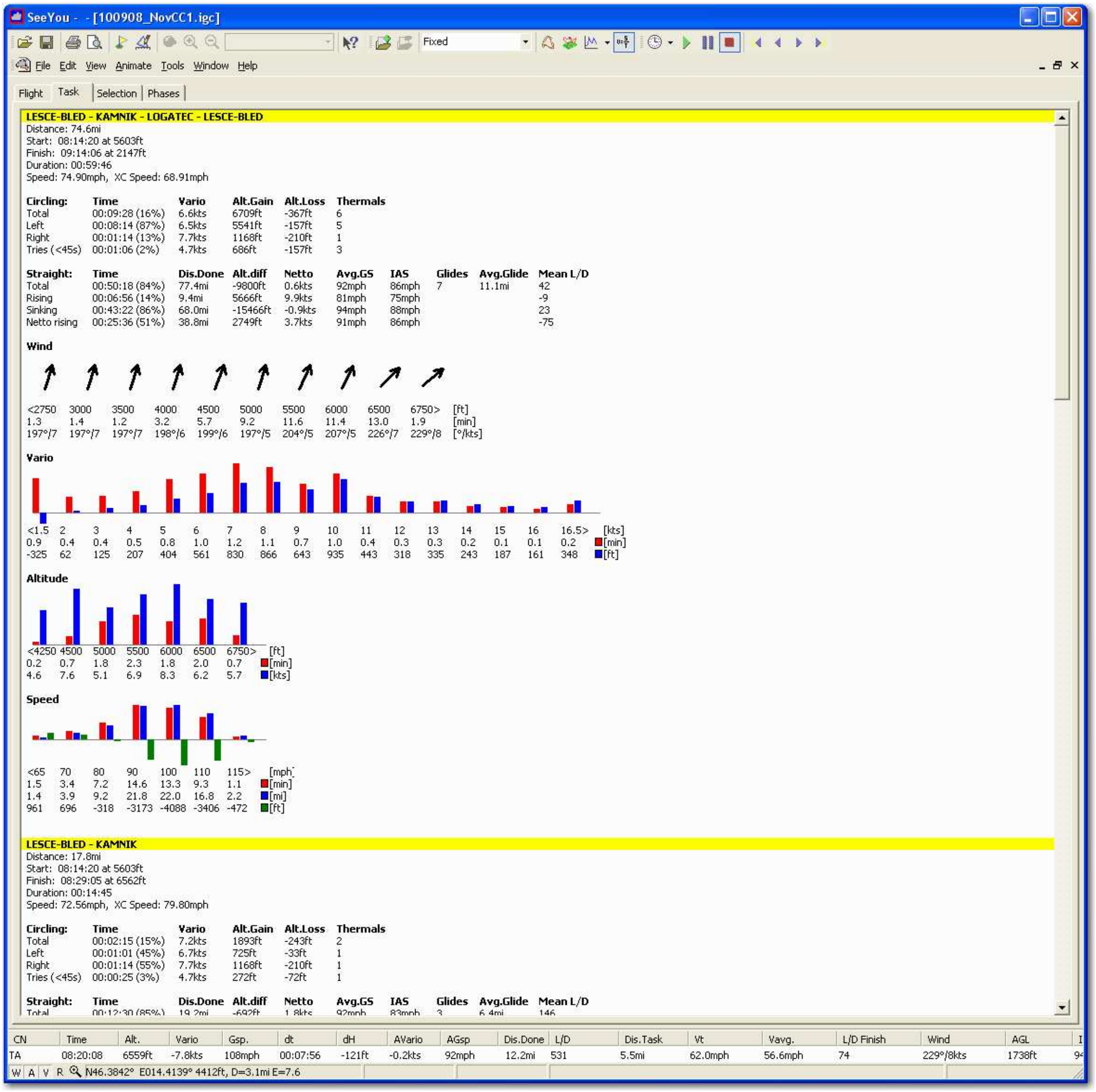

Figure 3: Task statistics

The tasks stats show the following:

- **Overall climb average for the task:** 6.6kt
- **Total circling percentage:** 16%
- **Task L/D:** 7 glides at 11.1 mi/glide, mean L/D = 42.
- **Off-course deviation percentage:** In SeeYou, the 'Dis.Done' stat is the total distance flown, computed by summing over all point-to-point fixes (including thermal turns), while the 'Distance' stat is the straight-line distance between turnpoints. Assuming the distance covered while circling isn't significant

compared to the straight line task distance, the off-course deviation can be computed as ‘Distance Done’ / ‘Distance’, which in this case is 77.4/74.6 = 1.0375 or about 4% deviation, indicating that my deviations over the high ground in leg one leg 2 didn’t cost me much at all, and certainly paid off in terms of climb rate.

- **Thermalling turn duration:** In order to get this value, I zoom in on thermals in the map view, count the number of whole turns in the center section of the thermal (I exclude any centering turns and the exit turn into account), and divide that number into the total time taken for the thermal. For the first thermal after the start I averaged about 17 seconds/turn. For three turns in the thermal midway between tp1 and tp2 I averaged about 23 seconds/turn, and in the last thermal I averaged around 20 seconds/turn.

In terms of the ‘objective measures’ I set out at the beginning of the article? The task climb rate, circling percentage, and off-course deviation numbers look pretty good, indicating good thermal selection and exploitation of available energy lines. The L/D number looks a bit suspect, although the nominal L/D for a Discus 2 with no water ballast at an average speed of 75mph is about 33-35, so 42 indicates I was doing something right. However, I was clearly not meeting my 15 second/turn criteria at any point in the flight, and this probably cost me a minute or so overall. 1 minute works out to about 2% of the entire task time, or about 1.25 mph, so it’s nothing to sneeze at.

If this were a real-life (RL) flight, I would just have to accept that I did OK, but I need to stay focused in the thermals and not let the turn times get away from me. Even though the average climb rate is pretty high, it could have been higher. However, since it is Condor, I actually have the option of making that same exact flight again to see whether or not I can improve specific aspects of the flight and/or the overall performance. In fact, I could repeat it any number of times, limited only by my capacity for self-inflicted injuries. All kidding aside, being able to repeat a task under the same weather conditions can allow an aspiring pilot to gain some insight into the potential gains or losses associated with different techniques and/or decisions in a given task area and weather conditions. After flying the task a few times, then SeeYou can be used to compare the flights, just as if each flight were flown on the same day by different pilots.

Condor, like any other activity simulator, isn’t a complete substitute for the real thing. When I fly in Condor I know I can’t die, and I know I don’t have to worry about a long retrieve or even about flying over unlandable terrain. In real life, I am acutely aware that I am mortal, I really don’t want to fly over unlandable terrain unless I have lots of altitude and escape options, and those concerns necessarily slow me down. However, Condor is “close enough” to the real thing for it to be valuable for cross-country race training, especially since it offers some advantages and possibilities we don’t have in real-life flying. Also, if you happen to be in the enviable position of having a knowledgeable coach or mentor, Condor could allow you to fly with that person even if you aren’t in the same area, and then discuss how your performance might be improved. And of course, with Condor you can fly in the winter without having to get you and your glider from here to New Zealand!