Condor Corner

Frank Paynter

This month we are going to explore the process of setting up and flying a short cross-country flight in Condor. Cross-country soaring in general and cross-country racing in particular, is a very difficult skill to learn initially and even harder to practice in a systematic fashion. Some fortunate few are associated with clubs like the Harris Hill Soaring Club in Elmira, NY, where XC instruction is readily available in one of their ASK-21's, and experienced coaches are available. Most of the rest of us learn by tooling around the home airport, and then maybe venturing out a little bit with an experienced XC pilot in a 'leader-follower' flight. Very few U.S. pilots ever have the luxury of a XC instructor or the ability to train under an experienced XC coach.

After getting started on the learning curve, XC practice consists of making as many XC flights as possible and trying to determine if your nascent skills are improving or degrading. For instance, if you land out more often this year than last, is that a good thing or a bad one? If you go 100km on Saturday, and 300km on Sunday, is that better or worse? If you go west and have a 300km flight and someone else goes east and does 500 (or 100) km, is that a testament to your relative skills, or just different air masses? If you come home from a successful XC flight and find that your average XC speed for the day was 50mph, is that good or bad? Maybe someone else could have averaged 60mph over the same course that day (or maybe not!). The problem with XC racing practice is that it is basically impossible to compare one flight against another unless they are accomplished over the same course in the same weather and during the same time frame. This means, of course, that you cannot possibly compare two of your own flights, as they will by definition have been flown at different times.

The Condor simulator can be used both to learn the skills needed to fly XC successfully, and can be used to improve those skills in a systematic fashion. In contrast to real life (RL), you **can** compare successive practice flights, because you can configure Condor to have (almost) the same weather every time. You can fly the same 100km course 10 times in succession, trying out different techniques each time to determine which one works the best, or fly it ten times using the same basic technique to measure your progress. In Condor it is possible and practical to eliminate most of the weather variability in successive flights, thereby isolating and highlighting the influence of pilot technique on results. For instance, a pilot might want to investigate different speed ranges to see if flying much slower or faster than normal yields any benefit.

Of course, this kind of thing can be taken to extremes; if a pilot flies the same course hundreds of times in the same weather, then it may be that the pilot is simply memorizing the entire course, including all the clouds and climbs. However, even in that case, the pilot can still achieve good training effects by trying different techniques, knowing that most of the other variables have been eliminated.

To illustrate the concept, I prepared a short XC course in Condor and flew it using a modern standard class glider (Discus 2). The Condor flight plan (.FPR), flight track (FTR), replay (.FPR) and IGC files from this flight, along with the unabridged version of this article are available for download from the SSA website (Soaring Magazine → Current Issue → November 2010 Issue → Nov2010_CC.ZIP). Due to space limitations, the print version of this article contains only a few of the many images in the electronic version, so I encourage you to download the complete article to get the full effect.

Course Configuration: This course uses the default Slovenia scenery, and covers a combination of mild mountain ridge flying, a flatland segment, and some 'hilly' terrain. To set up the course, proceed as follows:

- Launch Condor, and select 'Free Flight'
- Select the 'Task' tab and arrange the map to show the LESCE-BLED airport, and zoom out (right-click on the map and select 'View → Zoom Out') until most of the central valley is visible.
- Left-click twice on LESCE-BLED. The first click sets it as the takeoff point, and the second one sets it as the start point as well.
- Move the cursor southeast down the north side of the valley 19.8 miles and click on the KAMNIK turnpoint. Then move southwest across the valley to click on LOGATEC (43.5 total miles). Then right-click on LESCE-BLED, and select FINISH to finish the task.
- Right-click on each control point in the table at the upper right part of the screen, and set the properties as follows:
    - Start: Sector Type = Classic, Radius(m) = 5000, Angle = 360
    - KAMNIK: Sector Type = Classic, Radius(m) = 1600, Angle = 360
    - LOGATEC: Sector Type = Classic, Radius(m) = 1600, Angle = 360
    - LESCE-BLED: Sector Type = Classic, Radius(m) = 1600, Angle = 360

  When you are done it should look like Figure 1 below

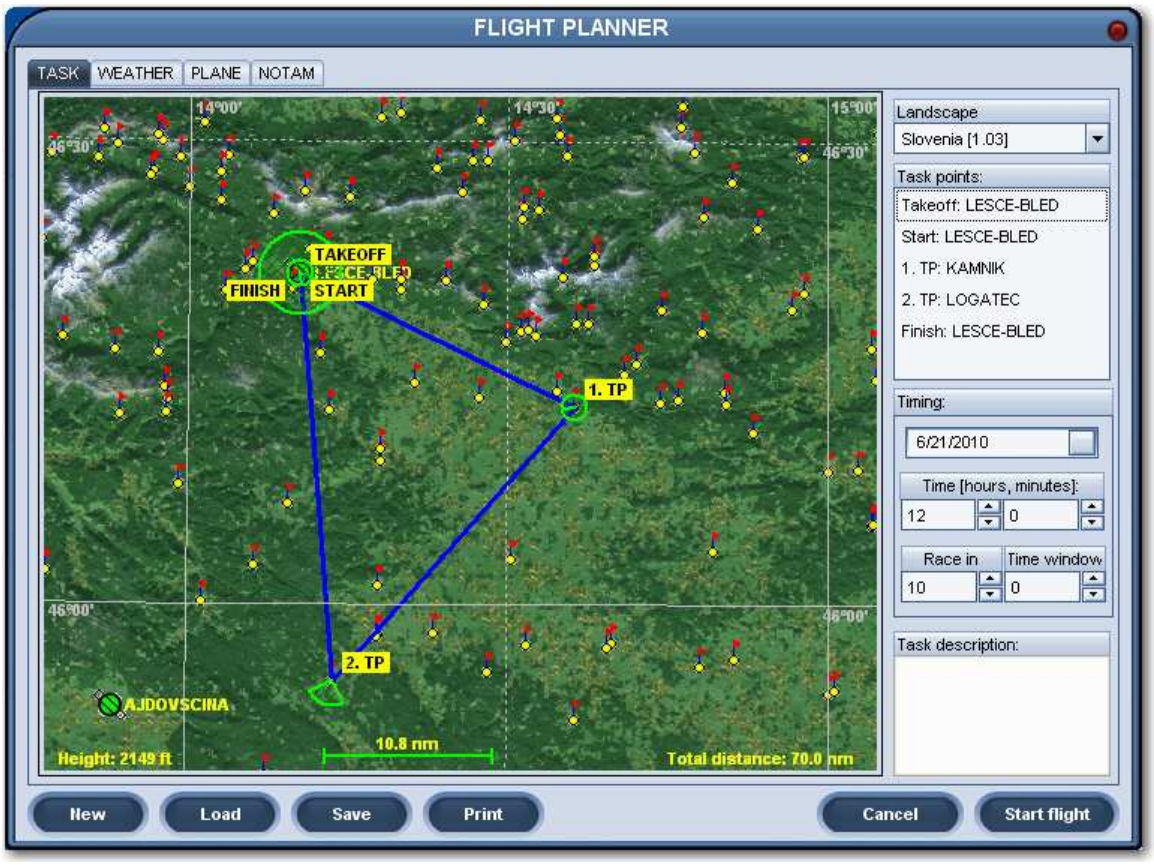

Figure 1: Flight Plan Tab

- Configure the weather tab as follows (Note that to adjust the cloud base height, drag the 'inversion height' 'dew point' and/or the 'temperature' tags around as necessary. Watch that you don't get the cloud base above the inversion height line, as then you will have a blue day!):
    - Wind – 245 degrees with medium variation, 3.8kts with medium variation, no turbulence.
    - Weather preset – Custom
    - Randomize weather – unchecked.
    - Cloud base – 5249 ft, with low variation (dewpoint = 37.5F, ground temp = 60.3F, inversion layer at 8694 ft).
    - Strength – very strong with medium variation
    - Width – very wide with medium variation
    - Activity – normal
    - Turbulence – light.

  When you are finished, this tab should look like Figure 2 below.

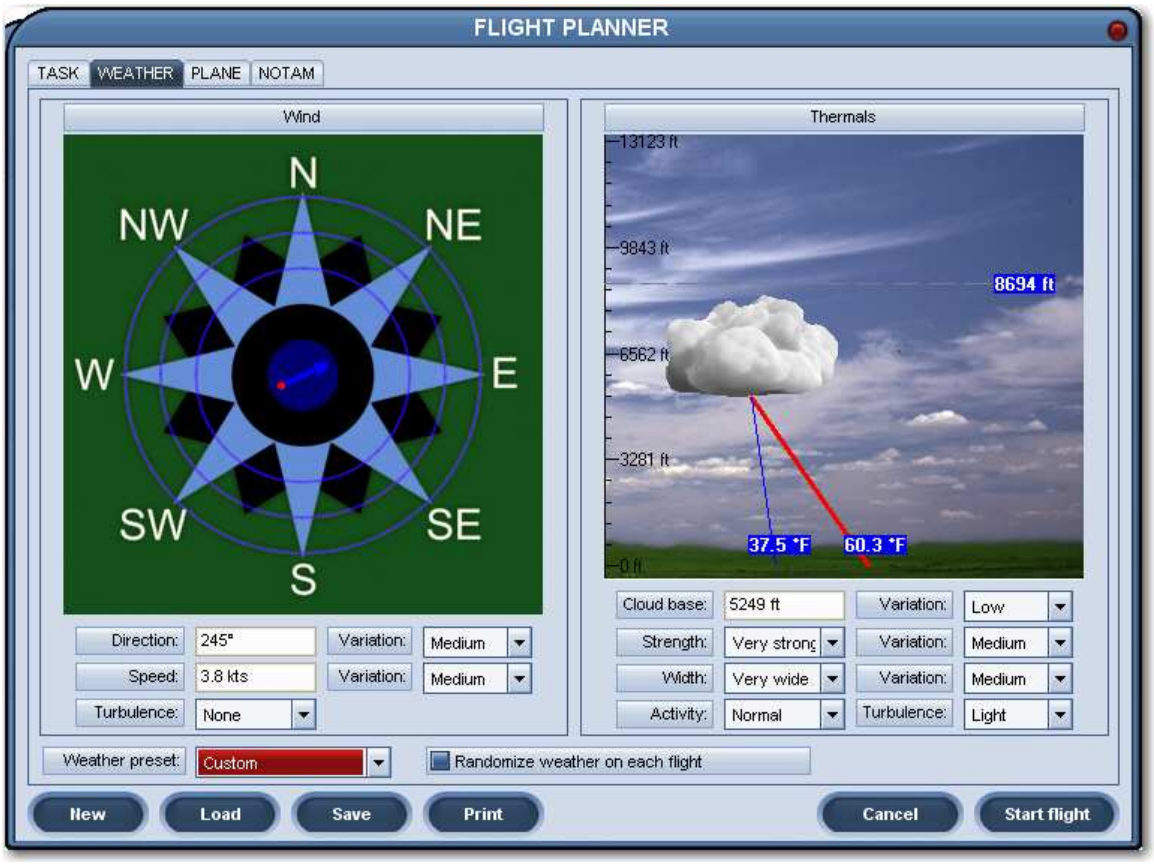

Figure 2: Weather Tab

- On the Plane tab, select the 'standard' class, and the Discus 2 model. Accept the defaults for all other settings. Note that the 'settings' sub-tab on this page allows the user to set the water ballast and CG bias levels, but we are going to fly dry.

- Configure the NOTAM tab as follows:

    - Plane icons range – 0 nm
    - Thermal helpers range (this is toggled on and off with the keyboard 'H' key) – 3 nm
    - Turnpoint helpers range (this is toggled on and off with the keyboard 'J' key) – 3 nm
    - 'Allow PDA', 'Allow external view' and 'Allow height recovery' – checked, all others unchecked.
    - Start type – Aerotow (change to 'Airborne' if you don't want to bother with the aerotow).
    - Aerotow height – 2067 ft
    - Everything else – default setting

    When finished, this tab should look like Figure 4 below.

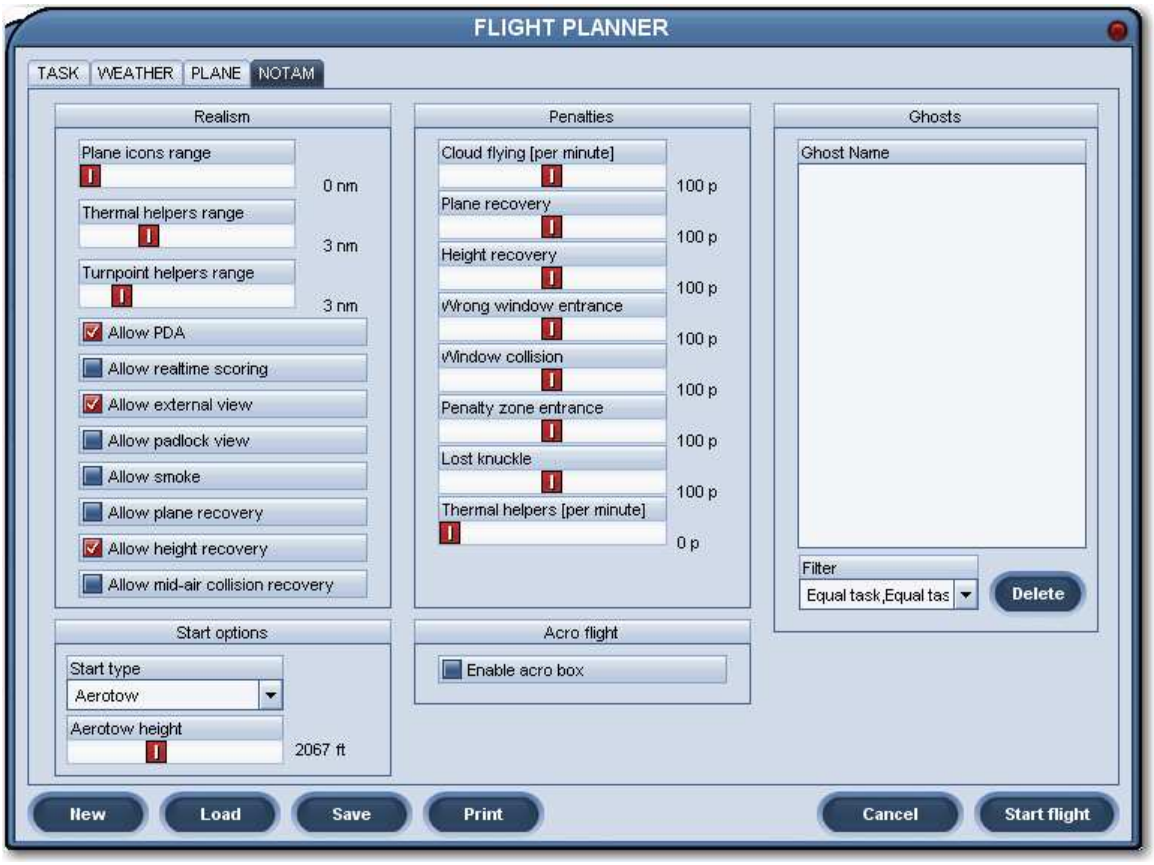

Figure 3: NOTAM Tab

Now that we have the flight plan fully configured, it should be saved to disk so the same flight can be re-flown easily. To do this, click on 'Save' and select a convenient file name (100908_NovCC1.fpl in the Nov2010_CC.ZIP download from the SSA Magazine site). To start the flight, Select 'Start Flight' and get up to altitude. If you are just getting started with thermalling, you might want to press the 'H' key to make thermals visible. Once you are up at cloud base, and the start gate is open (look for the race count-down timer or "The Race is On!" in the upper left-hand corner of the screen), then proceed out on course.

The course was laid out to take advantage of the high ground on the north side of the valley. As you can see from the screenshot below (taken just as I exited the start cylinder) the Q's are lined up along the high ground.

Figure 4: Heading southeast, just after the start

After the start, I flew the first leg at about 80kt or less, which is plenty fast for now. The idea along the first leg was to stay high enough initially so that I would arrive at the high ground near the top of the ridge, as that is where the lift will be strongest. If you were to go faster, you would arrive well down the side of the mountain and the time to climb in the weaker lift might exceed the time saved by getting there faster. I arrived at the first good-looking cloud at about 5500 and pulled up into a really nice 10kt thermal. Note the PDA (screen #3) showing MC 2.5, about 13.55 miles from TP1, with a projected arrival of 4396' (2096' AGL) at TP1.

Figure 5: First climb

After this first climb, my strategy was to try and bump along the ridge tops, not stopping to climb but just pulling up in each thermal and then going on. The next photo shows the situation as I neared TP1. Note the PDA has been switched back to screen #1, (moving map) and zoomed to the 17nm scale.

Figure 6: Close to TP1

After TP1, the challenge was to get across the valley in good order without having to thermal too many times or deviate so much that my average task speed went way down. It can be very tempting to deviate off course (sometimes by a **lot**) to a really good looking cloud. However, unless you are really low or it is clear that there are no good clouds ahead, it usually pays to go straight. The next shot shows the situation just after turning TP1 – there is a good looking cloud ahead, and an obviously dead one off to the right. As you can see, clouds in Condor are pretty realistic, with clearly defined growth and death stages. Also in this shot, you can see that I was at about 6400', 23 miles from TP2, and should arrive there with just about 400' AGL remaining.

Figure 7: Just after TP1

The next shot shows the situation just after turning TP2. I was a little lower than I like at this point, but there were plenty of good looking clouds ahead so I wasn't too worried, and the terrain wasn't particularly intimidating either. What isn't shown here is the cloud that I didn't go to, because it was just beyond the turnpoint. Instead, I turned immediately, and got myself on course to a cloud more along the course line.

Figure 8: Just after TP2

After a couple of climbs along the third leg, I was about 22 miles from home. As the next shot shows, I had just arrived at final glide altitude at MC 2.5. However, it also looked like there was some high terrain between me and the home drome, so some additional altitude might be required. There was also the possibility of turning out into the valley and going around the high ground, but that would probably cost considerably more time than a good climb.

Figure 9: Tentative final glide altitude

A few miles further along the last leg, I encountered a really good climb, around 7-8kt on the averager. At this point I was at about 5000' and had final glide at MC 2.5. However, rather than just bumping it and moving on, I elected to stop and take the climb up to cloud base, and increased my McReady setting to something approximating the average climb rate in this thermal. It is generally faster overall to stop and climb on final glide if the thermal average is significantly greater than the current final glide MC setting, if you then fly the rest of the final glide at the new, higher, MC setting. This climb was averaging 7.5 – 8kt so I set the MC to 7.6 as shown in the next figure, resulting in re-achieving final glide altitude at just about cloud base.

Figure 10: Final glide altitude at higher MC setting

This next shot shows the situation about 17 miles from home, and demonstrates the use of the ‘Panel Zoom’ feature (the keyboard ‘Y’ key). This is very nice for us visually challenged pilots using very high resolution screens.

Figure 11: Using the Panel Zoom ('Y' key) function

In this next shot I had about 9 miles to go, cruising at 80kt or so, and I still couldn't see the home field due to the high ground ahead. I could see that the valley started to open up beyond the high ground, and I knew the field was in that valley, but I couldn't see it directly. However, the computer told me that even at MC 7.5, I'd have almost 700' extra when I arrived. Also, if I applied my conservative '5 miles per thousand feet' rule (assumes no wind and near-max L/D), I only needed about 2000' to cover the remaining 9 miles, and I had almost 4000' above the home field elevation. So, I elected to deviate to the right a few degrees to go around the last peak rather than slow down.

Figure 12: Nine miles from finish

The last figure shows the situation just before the finish. After clearing the high ground I gradually increased my speed to burn off excess altitude, arriving at the 1-mile finish cylinder at about 2000' MSL.

Figure 13: Just before the finish

So, that's it – a successful 70+ mile triangle task, demonstrating some of the basic XC flying strategies and tactics using the Condor sim. The wonderful thing about Condor is that other Condor users can fly the same task, in the same weather and compare notes, or the same pilot can fly the task several times to gauge progress. I encourage you to set up the flight in Condor and fly it for yourself, and/or replay my flight using Condor's 'View Replay' feature (select 'View Replay' and load the '100908_NovCC1.rpy' file).

In subsequent columns, I will use this same task to illustrate different techniques and strategies/tactics. In particular, next time I'll demonstrate how to use the popular Naviter SeeYou program to analyze a flight using the IGC export feature of Condor. Objective flight analysis is a fundamental part of XC racing training; we all fall prey to the 'seeing what you want to see as opposed to what is' syndrome , especially if you don't have an experienced XC racing coach.