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1000km vanuit Vlaanderen

THE CLOUD MAKING MACHINES

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Theory: Dec 2011
Flight: 14 June2012

0. Background

We cannot change the cards we were dealt…

Glider pilots in Belgium, and especially in Flanders, are poor slobs. Each year we are again a bit disillusioned by the pitiful weather conditions, which are amongst the worst of the world. Apart from emigrating or going abroad for our holidays, we unfortunately can't change anything about that.

Each year we are again disappointed about the dwindling open airspace that we can use for our cross country flights. Also in this respect, we are near the shameful bottom of the world. Unfortunately, since our contribution to the economy is a couple of orders of magnitude lower than the ones of the commercial low-cost carriers that eat up the free airspace, we don't hold a lot of bargaining power.

The situation will most likely only worsen.

… just how we play the hand.

So, for now, we have been enduring our hardships: buying expensive flight computers and handhelds with moving maps; flying as quickly as possible, as far away as possible from Belgium, more specifically into Germany; planning our flights around airspaces; increasing the amount of turnpoints and legs; using improving weather analysis; buying transponders to cross TMZs, TMAs and other controlled airspaces; filing flight plans … .

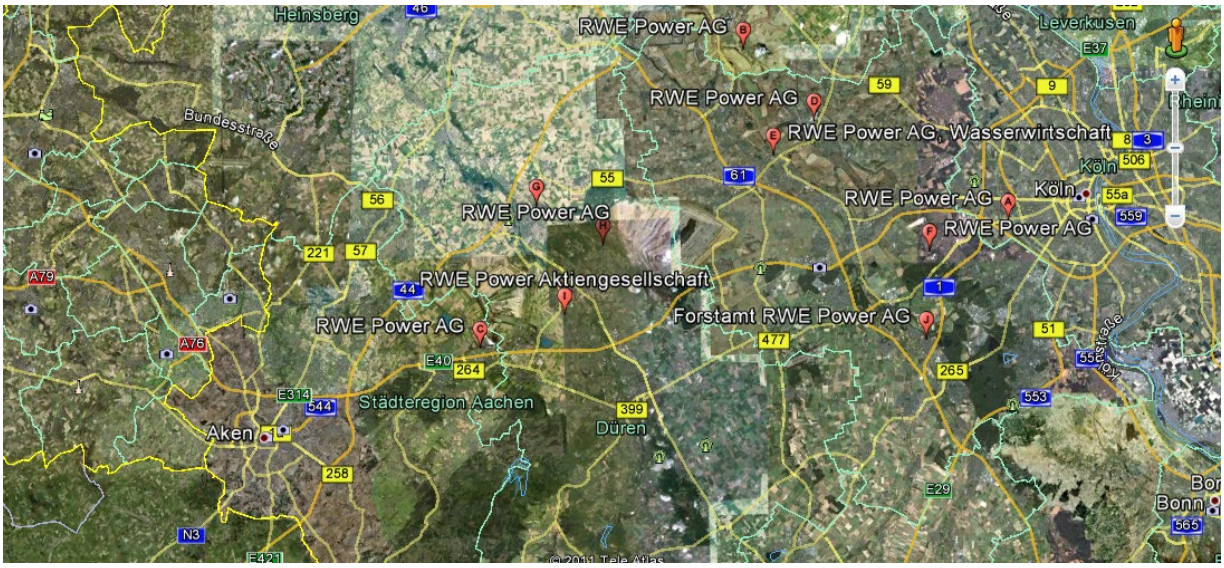
Surprisingly, we have overlooked one tremendous opportunity. This opportunity has only been exploited by a handful of pilots until now, and no one has really optimized it. This is where this report comes in.

1. Concept

The area in Germany we fly into, is Nord-Rhine Westphalia. This is one of the most industrialized areas in the world, and on top of that densely populated. All this industry and all these people require a lot of energy. Therefore, the area has been crammed with power stations, for the largest part owned and operated by the energy giant RWE AG.

The largest ones are all brown coal power plants that are used for baseload power. This means that they run almost always at full capacity, and this reliability is quite useful to us.

Name	MWe	Energysource	MWt	Location	Height of stack	Location2
Kraftwerk Niederaußem	3864	Braunkohle		Bergheim-Niederaußem	200 m	50° 59′ 46″ N,006° 40′ 17″ O
Kraftwerk Weisweiler	2293	Braunkohle/Erdgas	185	Eschweiler	180 m	50° 50′ 21″ N,006° 19′ 26″ O
Kraftwerk Frimmersdorf	2265	Braunkohle	30	Grevenbroich	3 * 160 m, 1 * 200 m	51° 03′ 16″ N,006° 34′ 33″ O
Kraftwerk Voerde	2222	Steinkohle		Voerde	230 m; 240 m; 250 m	51° 34′ 36″ N,006° 41′ 07″ O
Kraftwerk Neurath	2100	Braunkohle		Grevenbroich	195 m	51° 02′ 16″ N,006° 36′ 43″ O
Gersteinwerk	2096	Steinkohle/Erdgas		Werne	282 m	51° 40′ 25″ N,007° 43′ 14″ O
Kraftwerk Scholven	2056	Steinkohle		Gelsenkirchen	302 m + 240,5 m, 5 Kühl	51° 36′ 13″ N,007° 00′ 07″ O
Kraftwerk Herne Baukau	950	Steinkohle		Herne	300 m	51° 33′ 02″ N,007° 11′ 15″ O
Kraftwerk Heyden	920	Steinkohle		Petershagen	225 m	52° 22′ 54″ N,008° 59′ 55″ O
Kraftwerk Veltheim	880	Steinkohle/Gas/Öl		Porta Westfalica	140 m	
Trianel GuD-Kraftwerk Hamm-Uentrop	850	Erdgas		Hamm-Uentrop		
GuD-Kraftwerk Knapsack	800	Erdgas		Hürth-Knapsack	70 m	
Kraftwerk Ibbenbüren	770	Anthrazit		Ibbenbüren	275 m	52° 17′ 09″ N,007° 44′ 45″ O
Kraftwerk Bergkamen	747	Steinkohle		Bergkamen	282 m	51° 38′ 12″ N,007° 37′ 14″ O
Kraftwerk Werdohl-Elverlingsen	637	Steinkohle/Erdgas		Werdohl	282 m	51° 16′ 33″ N,007° 42′ 26″ O
Kraftwerk Huckingen	600	Gichtgas aus HKM-Stahlwerk/I		Duisburg-Huckingen		
Kraftwerk Westfalen	588	Steinkohle		Hamm-Uentrop	200 m	51° 40′ 49″ N,007° 58′ 13″ O
Kraftwerk Lausward	520	Erdgas/Heizöl EL		Düsseldorf-Hafen	150 / 99 m	51° 13′ 15″ N,006° 43′ 54″ O
Kraftwerk Lünen	500	Steinkohle		Lünen	250 m	51° 36′ 51″ N,007° 28′ 53″ O



Large RWE power stations in NRW

Of interest to us are the large ones located between Aachen, Köln and Düsseldorf:

- Niederausem (which I'll call Bergheim from here on) is with an electric capacity of 3800MW the second largest power station in Europe (and with 200m the tallest cooling tower of the world).
- Weisweiler has a capacity of 2300MW
- And the two power stations next to Grevenbroich: Frimmersdorf and Neurath (both 2000+MW)

These 4 stations all run on brown coal, and are cooled with water evaporation in huge cooling towers. The excess heat created in these power stations is thus released in the air in a concentrated plume. This has two advantages for us:

1. When there is no thermal activity and the surrounding air is cool, the steam of the power station will rise, with the vertical velocity and top of the rising air depending on the local meteorological conditions and power output of the plant. So, in the right synoptic situation before and after regular thermal activity during the day, gliders can rise in these plumes, and even punch trough an inversion layer.
2. With thermal activity, these power stations act as triggers, and they increase thermal strength. This makes decisions much easier for us as pilots. It increases our average climb rates and we can optimize our glide speeds and arrival heights very easy to MacCready rules. This is especially important later in the afternoon, when cross country speeds go down due to unreliability of thermals and our psychological reaction to that, ie. flying to careful.

In the right weather, these power stations thus enable us to:

1. Start flying very early in the morning, before thermal activity begins.
2. Fly confident and fast in reliable strong thermals, while thermal activity around us deteriorates.
3. Keep flying in the evening, while thermal activity has ceased everywhere else.

If we would optimally use the opportunities these power stations give us, we could vastly increase our flight distances. Wilfried Groskinsky has already been doing this for many years, and his flights brought this underused potential to my attention.

The steam clouds punching through an inversion layer without thermal activity. Frimmersdorf (left), Neurath (middle) and Bergheim (right)

The largest of these two power stations (Bergheim and Weisweiler), lie on a straight line from our starting points in Flanders. Frimmersdorf and Neurath are a bit from the Weisweiler-Bergheim axis, and lie close to airspace (not a problem when you can activate Segelflugsektor Gustorf).

The good news[1] is that these power stations will remain open for the foreseeable future. Due to the planned closing of the Nuclear power stations, they will even expand (large expansion and modernization plans for Bergheim and Neurath are under governments investigation).

The bad news is solar electricity: it will eat away the base load hours of these large plants, potentially reducing the electrical output and thus also heat output in the periods when we need it the most: during spring and summer days with loads of sunshine. Off course, we need the power plants the most during the transition period, and not during the maximum solar output of the day. But it remains unclear how the large brown coal plants will be used during ramp up and ramp down times with extremely high levels of installed solar capacity (this was a subject of my Master thesis). The power plants are already becoming equipped with CCGT blocks to accommodate this. All in all, this could reduce the reliability of the thermal output of these power stations in the near future.

Additionally, Bergheim could get a hybrid stack, of which I currently cannot estimate the impact on thermal production.

A last point of attention is that the industrial site of Dormagen, which houses a CHP, is on the same axis as well. This is a well known trigger for thermals as well, which could further increase the reach of our “non-solar-driven” glider flight.

[1] From a cross-country pilots’ standpoint, not from an environmental one.

2. Flight Planning

A relatively easy 1000km

In November and December 2011, I spent about 150 hours, going through flight data, airspace maps, transforming my MacCready-and-meteo-data-based Excel-model, and writing this report to find a strategy to make optimal use of the Weisweiler-Bergheim axis.

The flight plans seen here are calculated for a 18m class glider with a sustainer engine. Open class gliders should thus be able to use this plan without a problem, and even stretch all legs a bit. I will come back on the potential for other glider classes in the last section of this report.

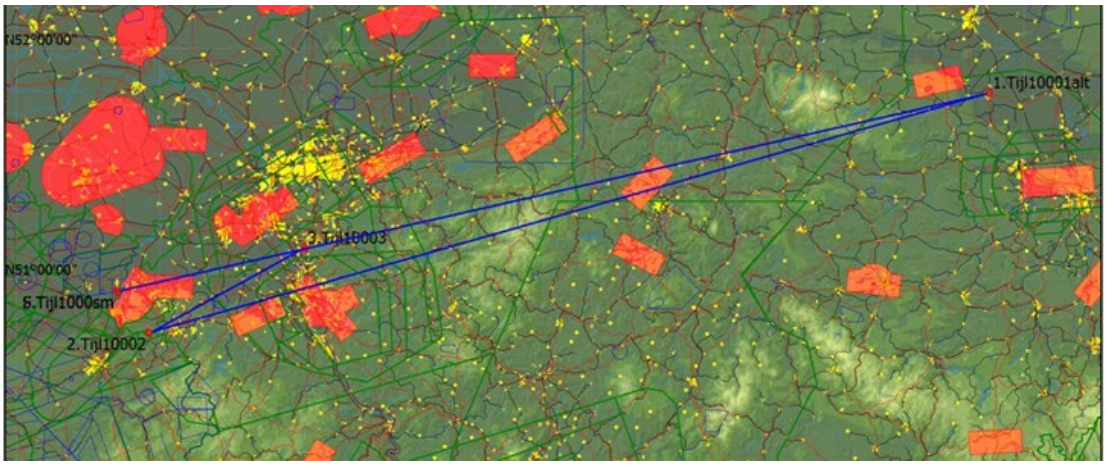
A result of this flight planning is seen in the figure bellow. This task satisfies the requirements for the FAI 1000km diploma (3 turnpoints with proper spacing). I should mention here that all estimates for numbers (time of 1st and last thermals, cross country speeds, climb rate at power stations) are conservative, and are much lower than the weather conditions of the best days of the year.

Opdracht Informatie

Vluchtplanning

Type: Polygoon met drie keerpunten
Opdracht afstand: 1018,5km

Stijl	Code	Punten	Breedte	Lengte	Afst.	Koers
Start	Tijl10sm	Tijl1000sm	N50°56'46"	E005°43'42"		
1.Punt	Tijl1001	Tijl10001alt	N51°48'04"	E011°44'13"	427,6km	75°
2.Punt	Tijl1002	Tijl10002	N50°46'01"	E005°56'56"	418,5km	256°
3.Punt	Tijl1003	Tijl10003	N51°07'29"	E006°58'54"	82,6km	61°
Finish	Tijl10sm	Tijl1000sm	N50°56'46"	E005°43'42"	89,9km	258°

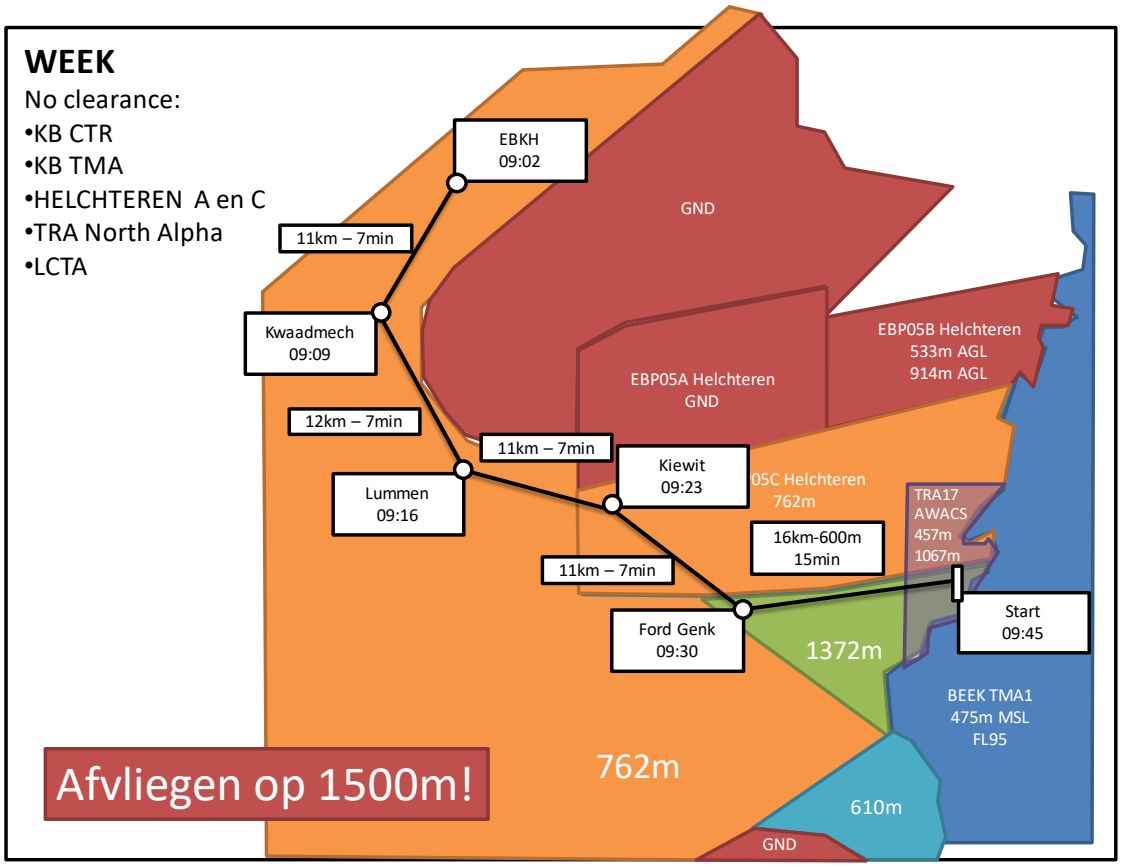


Flight plan for the optimal official 1000km from Flanders using startsequence1.

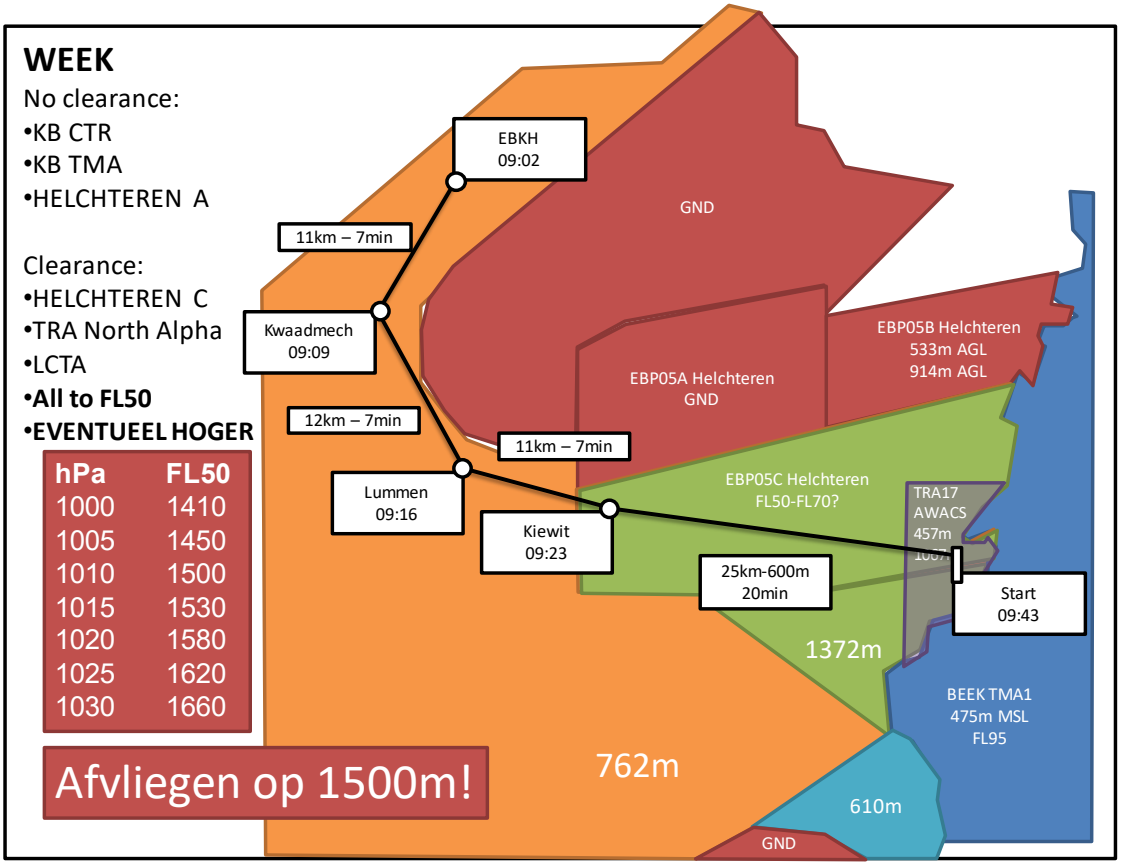
Getting to the startpoint

Getting to the regular startpoint (near Beek TMA) is a pain due to our airspace, and the distance to Weisweiler from Flanders. The problem is getting permission to reach sufficient height to reach the first power plant on course (Weisweiler) at the right location. For a 18m glider ca 1500m would be necessary. An additional problem is the radio contact and required permission to cross TMA Beek. This permission is also required in the evening to come back to Belgium.

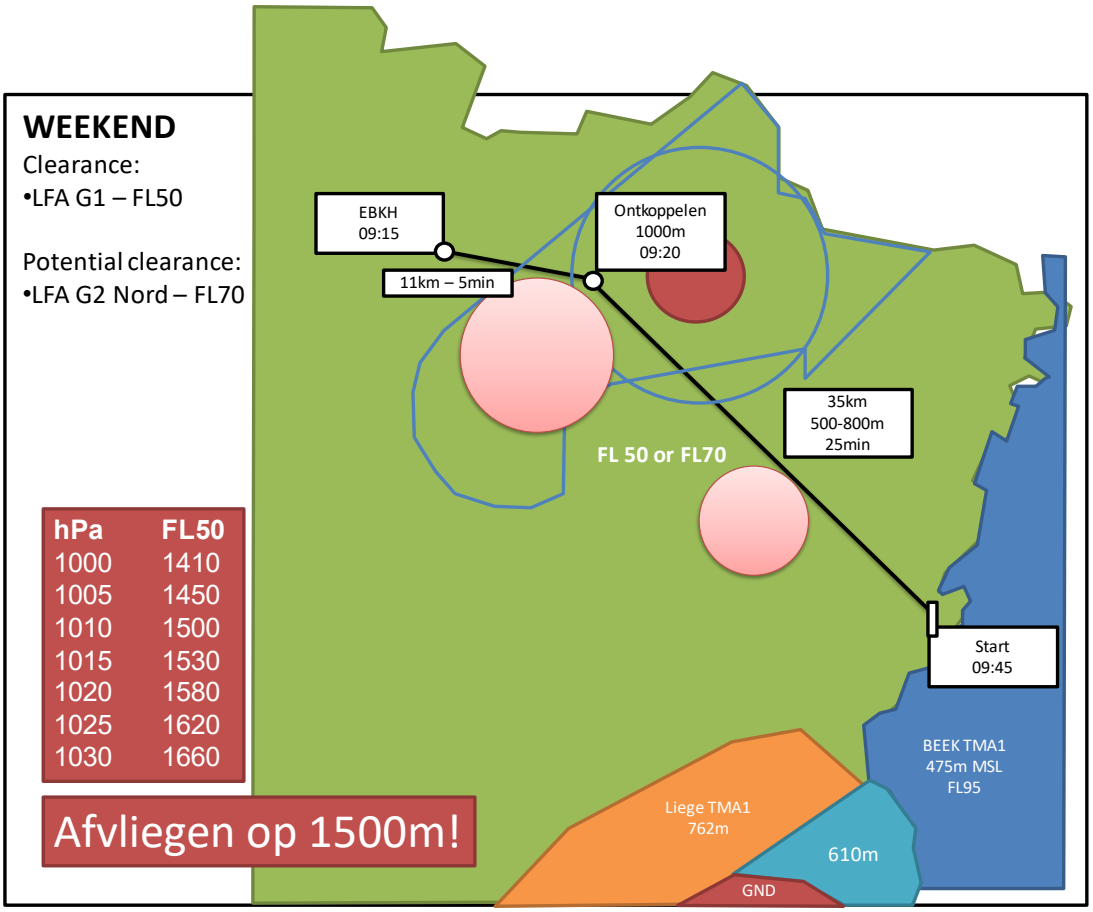
The three possible start sequences with a description of their issues are shown in the figures on the next pages.



Startsequence1: Problematic to obtain the necessary height if no access to TRA North Alpha



Startsequence2: Problematic to obtain the necessary height if no access to Helchteren C



Startsequence3: Problematic to obtain the necessary height if low pressure and LFA G2 Nord not activated

An alternative startpoint

Because of the difficulties associated with the regular startpoint, an alternative startpoint is placed in the Voerstreek. This startpoint has many advantages:

- Almost optimal distance from 1st power plant (Weisweiler)
- On the Weisweiler-Bergheim axis, so more on track and less detours
- No airspace permission required
- No transponder required

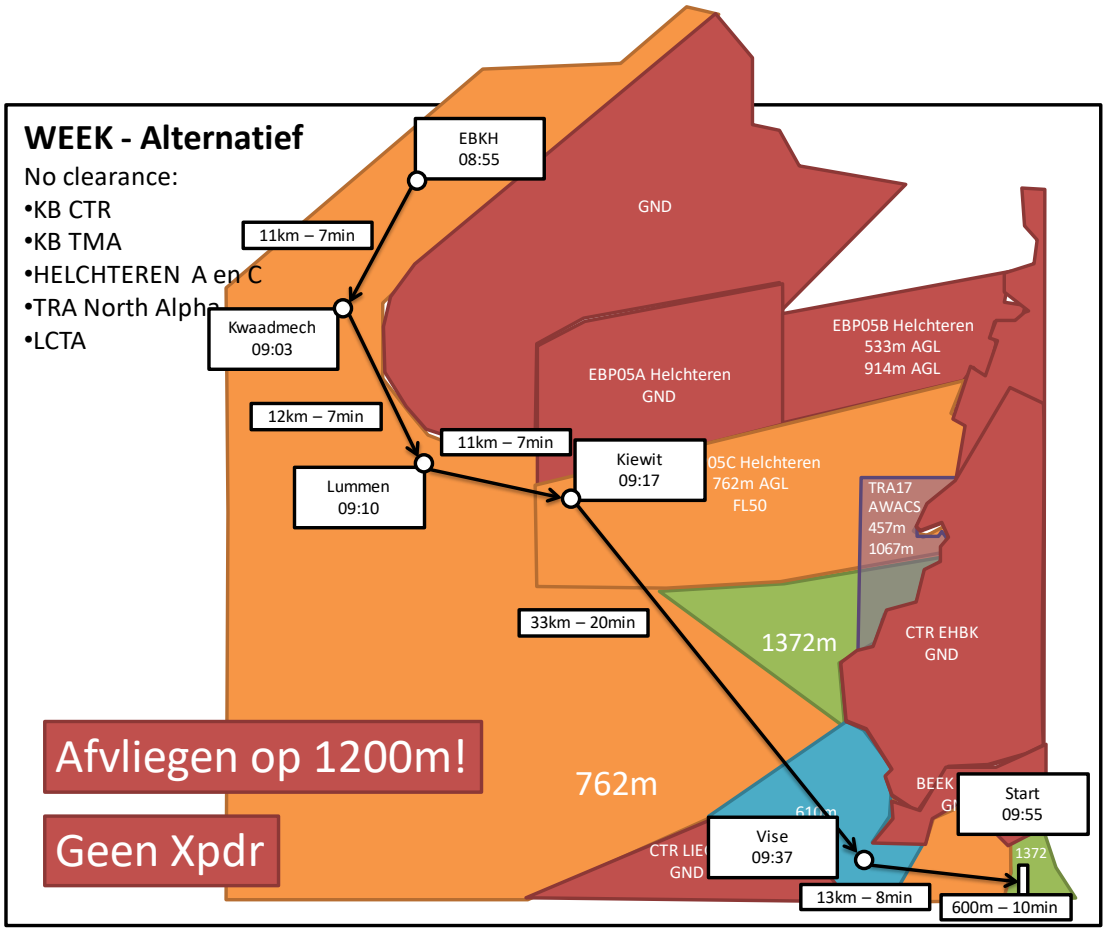
And a couple of disadvantages:

- Long distance to reach (ca 1 hour from Keiheuvel)
- Descending below 611m MSL for Liege TMA2
- Long distance home in the evening (ca 40min to Keiheuvel), reducing the potential flight time

All in all, I prefer this startpoint tot the original one.

Vluchtplanning: Het startpunt

Startpoint 2: Optimal location on Weisweiler-Bergheim axis. Closer to Weisweiler, and thus lower required start altitude (<1300m), and thus no airspace difficulties. And still (but barely) in Flanders!



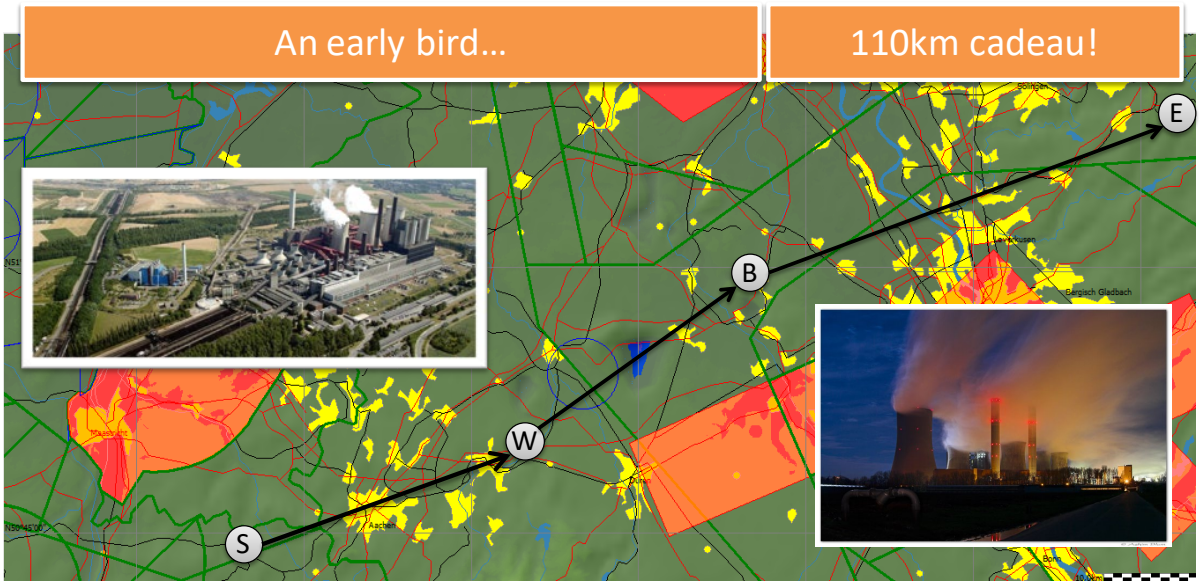
Start sequence 4: Optimal start sequence. The downsides are the long engine run, and the difficulty to reach for pure gliders.

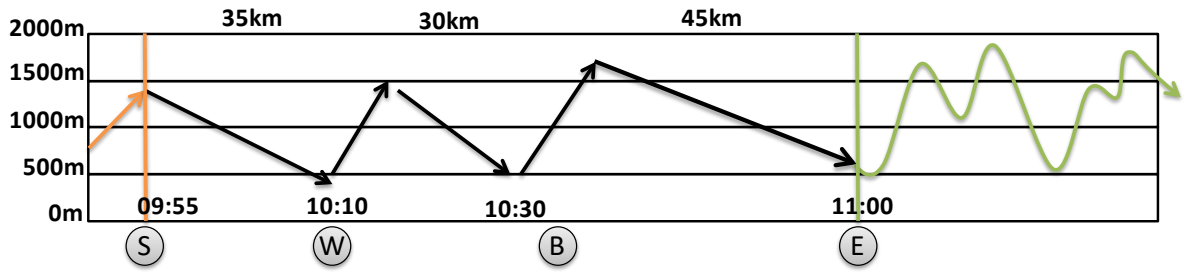
Before thermal activity

If we would pass the start line around 10.00, we would reach Weisweiler 15 minutes later, and normally it should already be producing thermals at that time. After passing by Bergheim (or Neurath in case Bergheim does not work properly), we glide towards the first thermal. At arrival it is 11.00 (first thermal activity on a good day can be before 9.30, so this should not be a problem at all), and 110km are already completed before the rest of the gliding community lifts itself in the air.

The minimal arrival height at the power stations is important:

- Weisweiler: 145m MSL (Elevation) + 180m (Chimney) + 200m (buffer) = 525m MSL
- Bergheim: 110m MSL (Elevation) + 200m (Cooling Tower) + 200m (buffer) = 510m MSL
- Neurath/Frimmersdorf: 115m MSL (Elevation) + 195m (Cooling Tower) + 200m (buffer) = 510m MSL

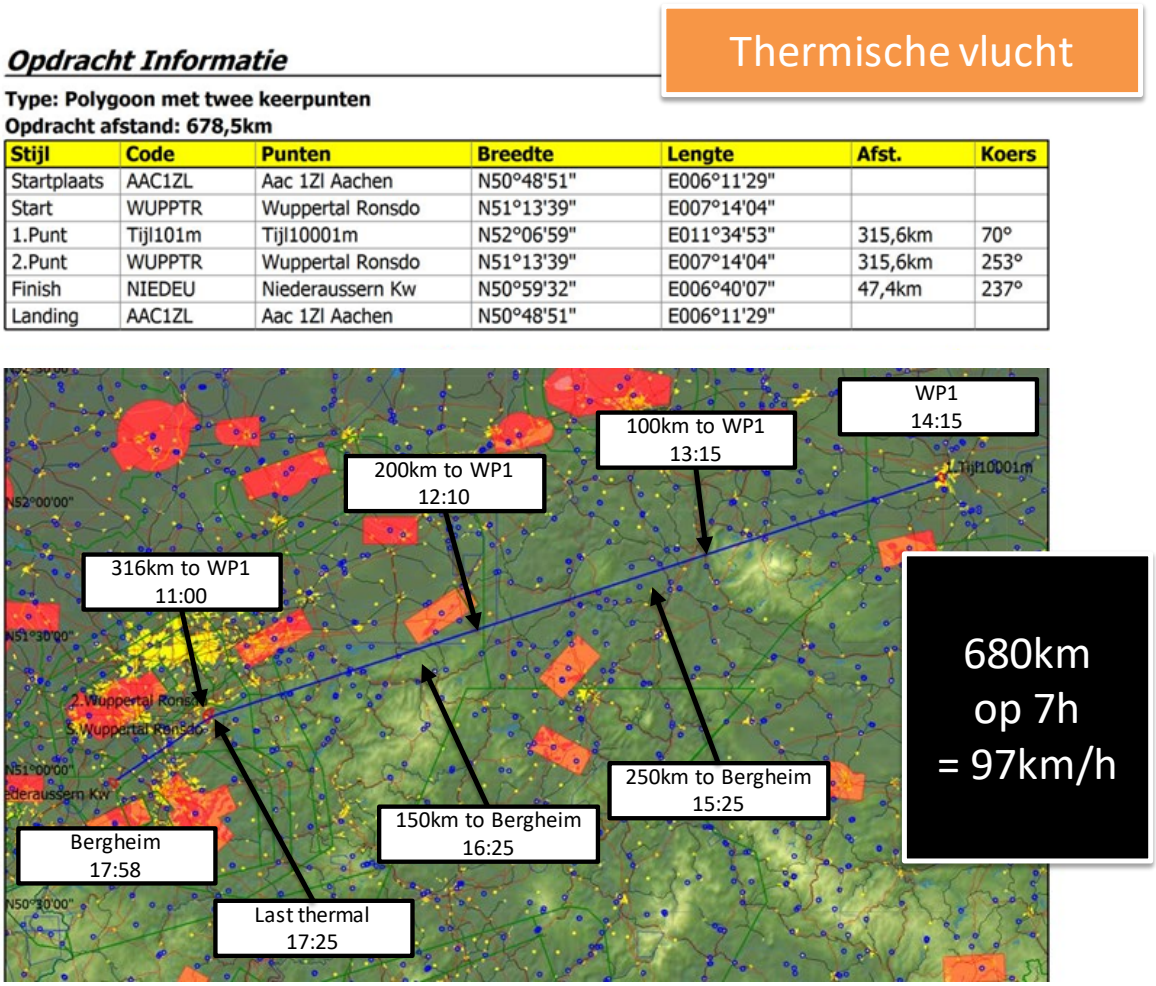




Early to bed, early to rise, makes a man healthy, wealthy and olc winner of the day.

The thermal flight

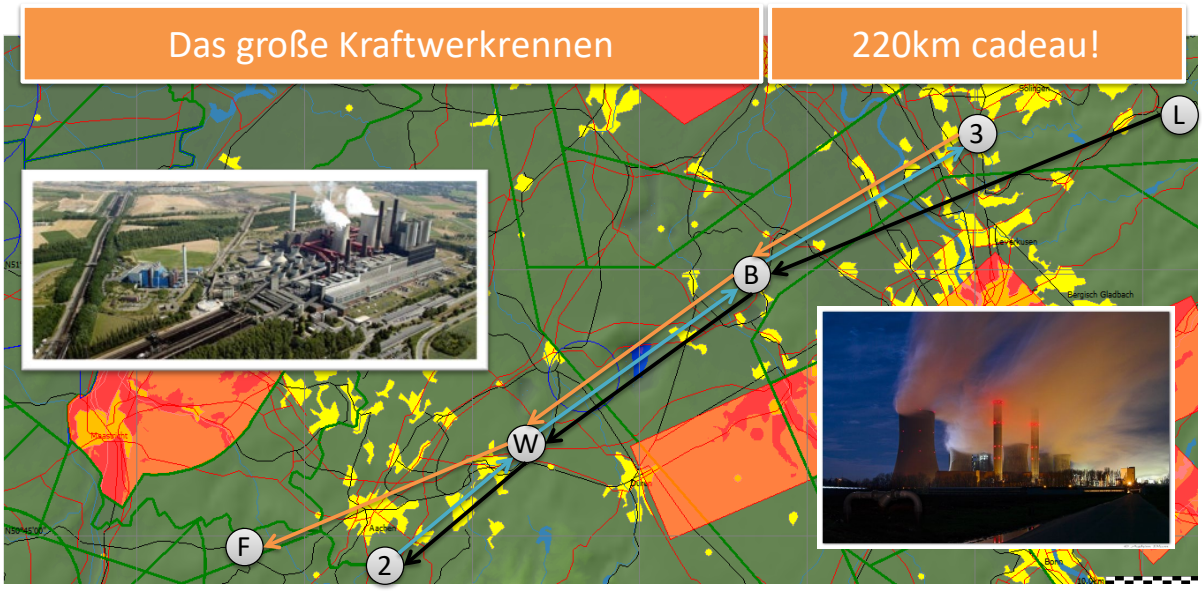
The thermal flight is only ca680km, and in this time plan, we would have 7 hours to complete it. This translates in an average speed of 97kmh, which should not be a problem with an 18m glider on a relatively good day. Again, with the buffers in the evening, we even have at least 30-60 minutes more in reality.

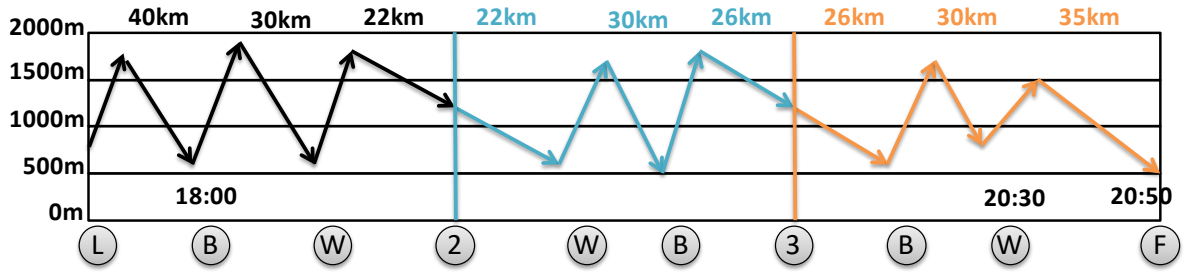


A nice thermal flight.

After the thermal flight

At 18.00 we reach Bergheim (or, alternatively Neurath), and the regular thermal flight is over. Over the next 3 hours, while the thermal activity around is dying, we will do the power plant Jojo. At ca 21:00, we can finally glide over the finish line.





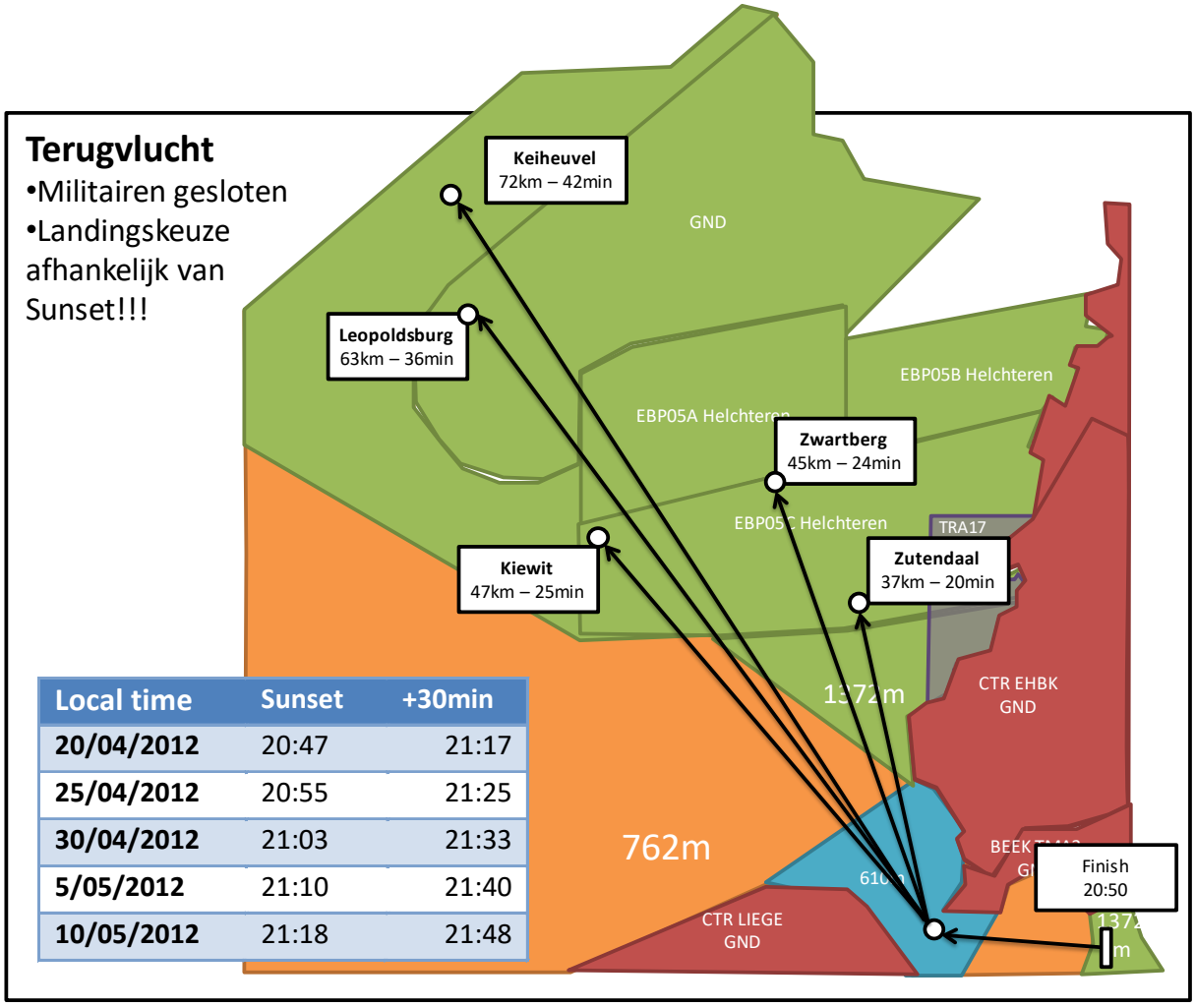
The power plant jojo (altitudes, kilometers and speeds vary according to synoptic situation).

Getting home

The flight is not over yet: we still have to manage to get home with the engine. Time can be an issue here, especially until early May when the days are still short. This means it is necessary to know the exact sunset time of that day and the time needed to reach the airports. On some occasions, getting back to the home airfield won't be possible.

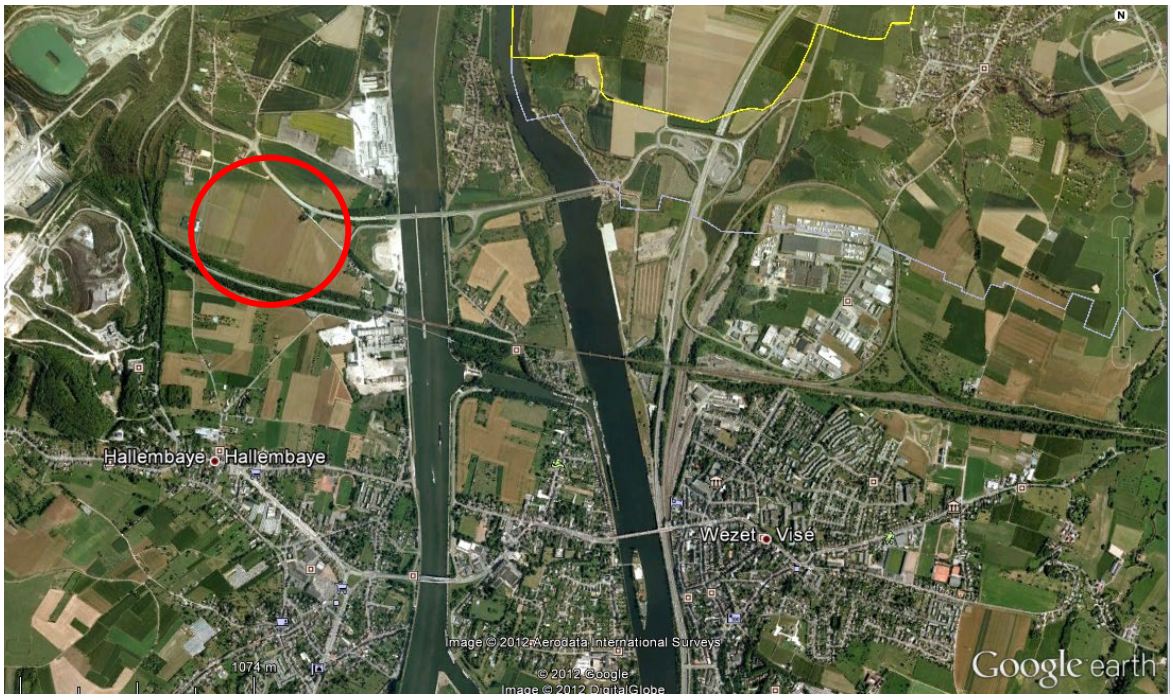
Not on this map are the airfields of Theux-Verviers and Aachen-Merzbrueck, which are both much closer to the finish than Zutendaal, and potentially reachable without use of the engine. A landing in Belgium is highly preferable due to the later official sunset times (Ukkel vs. Köln/Dusseldorf can differ 20 minutes).

A last issue is the size of the fuel tank. I estimate with the typical 13liters of fuel on board, and the consumption during the morning and evening engine runs, around 3 usable liters will be remaining after arrival at Keiheuvel. Don't forget to top it up before take-off!

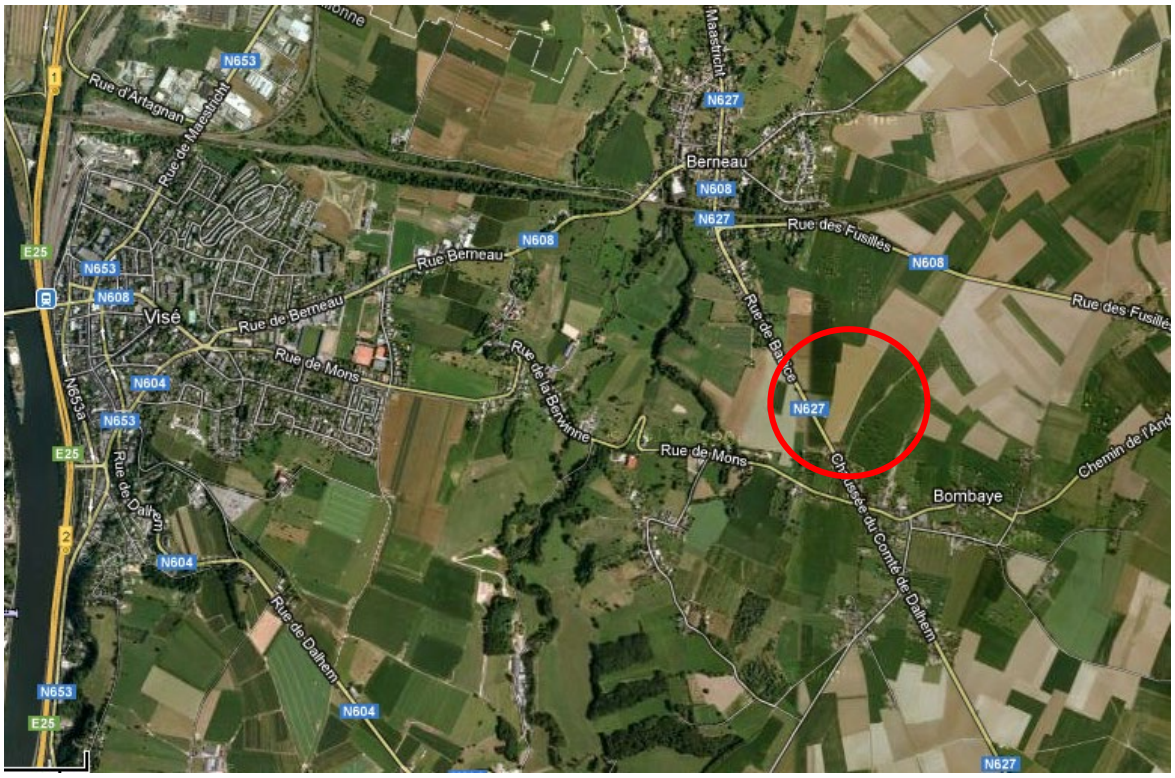


Local time	Sunset	+30min
20/04/2012	20:47	21:17
25/04/2012	20:55	21:25
30/04/2012	21:03	21:33
5/05/2012	21:10	21:40
10/05/2012	21:18	21:48

Flying until the sun goes down (+30min)



Optimal field to start the engine above (both coming from the North and the South). Ground elevation is 50m MSL, Arrival altitude is around 250m AGL. Location is 1km from TMA Beek, and 1,5km from CTR Liege.



Good fields to start the engine above (coming from the South-East, with low altitude). Ground elevation is 120m MSL, Close to TMA Beek. You will need to fly under TMA Liege with engine running at 110-115kph with airbrakes opened a bit.

Seasonal timing

An analysis of Wilfried Groskinsky's flights from 2007-2011, shows that the most large distance flights are flown in the beginning of May. However, the largest distances (900km+) are flown from the beginning of May until the beginning of July. The longest flight of 1139km is flown on 17 July.

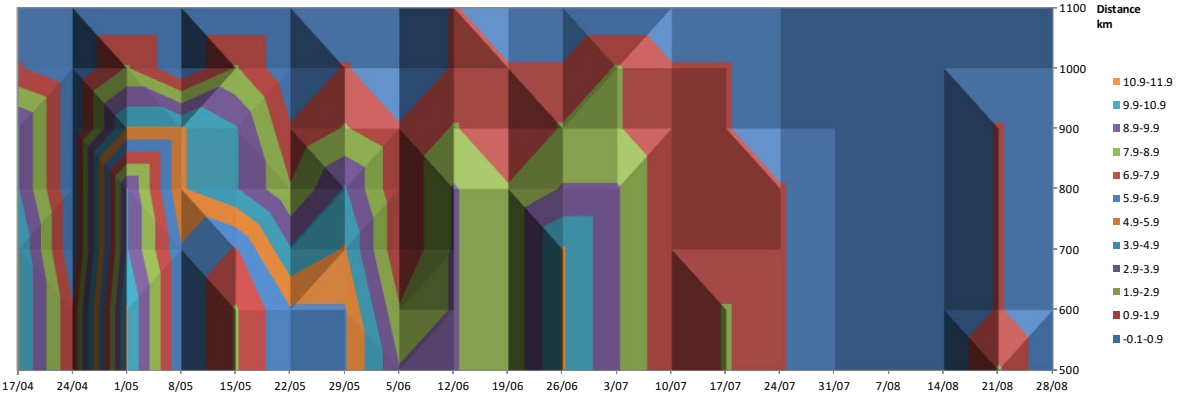
An additional concern for this flight is off course sunset. 1000km flights before ca 15 April should be fairly difficult because of this constraint.

In the best year (2010), he flew 11 times over 900km with a Nimbus 4m. I believe in this type of weather 1000km with the proposed strategy could be completed with an 18m glider (if there are no frontal disruptions reducing the flyable area).

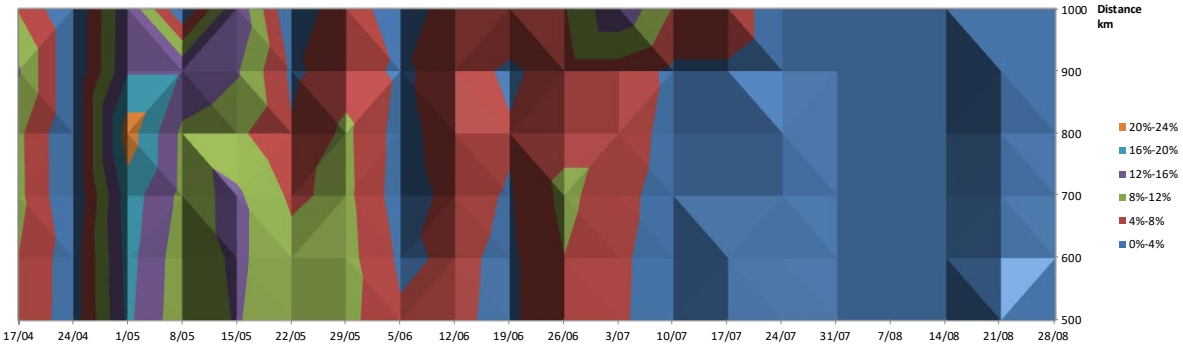
Taking all into consideration, I think the period of 20 April to 20 July is the window to do this flight, with no clear best period. I believe that the weather situation to complete this task should come around at the very least 5 times each year, and in a good year over ten times.

This flight is a solid plan, but not nearly the maximum distance that can be reached with this strategy, as will be discussed in the last part of this report.

(Caveat: it is hard to draw reliable conclusions out of only these files, as there are many possible biases that could skew the data).



Amount of flights above a certain distance in a certain week from 2007-2011 (Grosskinsky)



% of flights of above a certain distance in a certain week from 2007-2011 (Grosskinsky)

Alternatives to the standard "relatively easy 1000k"

The optimal jojo distance

The whole task planning depends on the length of the legs of the jojo. The constraint: what is the optimal distance we have to position the turnpoints from the power plants. The answer is not easy.

For a simple speed optimization of the jojo, a MacCready calculation would do. This calculation depends on:

- Height of the thermal at each power plant
- Minimal entry into the thermal of the power plant
- Strength of the thermal at the power plant
- Polar of the glider (at appropriate wingloading)
- Wind speed and direction

However, we want to optimize the distance of the total flight. The solution then highly depends on the situation. If the weather is bad in the thermal part of the flight, this would ask for a maximization of the distance of the jojo. This would require to fly at slower speeds to maximize the glide angle and thus the legs of the jojo.

The optimal turnpoint location thus depends on the day. In summary:

- If the weather is good during the thermal part, you can use a MacCready calculation.
- If the thermal part of the day is relatively short, you have to maximize the Jojo and thus fly at the speed of maximum glide.
- In most cases, a fairly good answer will be somewhere in between both extremes.

Depending on the forecasted weather conditions, I calculate the distances and speeds to fly the day before the flight, and choose the waypoints (and check the next morning with the latest model run).

It is better to be a bit more conservative, than to land out next to a power plant. But don't be too conservative either, as a shorter jojo, means a longer thermal flight.

Jojo in the morning or evening

On some days, it could be beneficial to do the Kraftwerk jojo in the morning. This is especially the case with a highly stable air mass, when regular thermal activity starts late in the day. Typically this would occur later on in the year (beginning of June until August).

The solution is off course quite easy: fly the standard task the other way around.

However, for the really big tasks, I think it is beneficial to do the jojo in the evening. The reasoning is as follows:

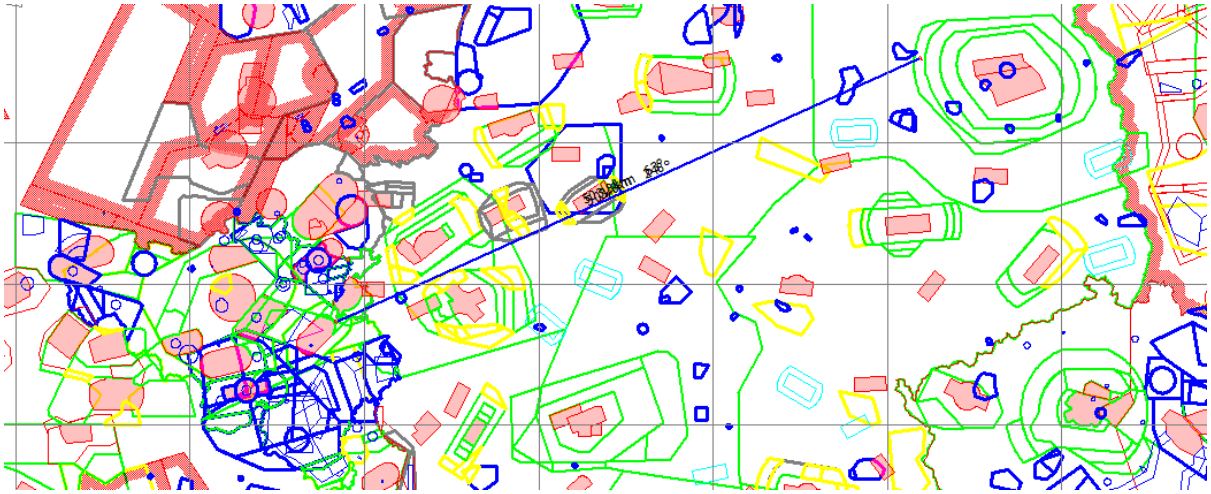
- On the perfect day, early in the morning, cloudbase is still low, but clouds are standing close together. With good use of the energy lines, this enables us to obtain high cross-country speeds.
- In the evening, good thermals can still be available, but they become unreliable. Cloudbase is high, but inter-thermal distances are large. Missing one good climb, will lead to a lot of time

wasted in a weak thermal, or even an early landout. This forces us to fly very conservative in the evening, which worsens cross-country speeds even further.

- I thus believe, we could benefit more from the power plant jojo in the evening than in the morning. But, this theory is debatable, and experience over the coming years will show us the right way to plan our tasks.

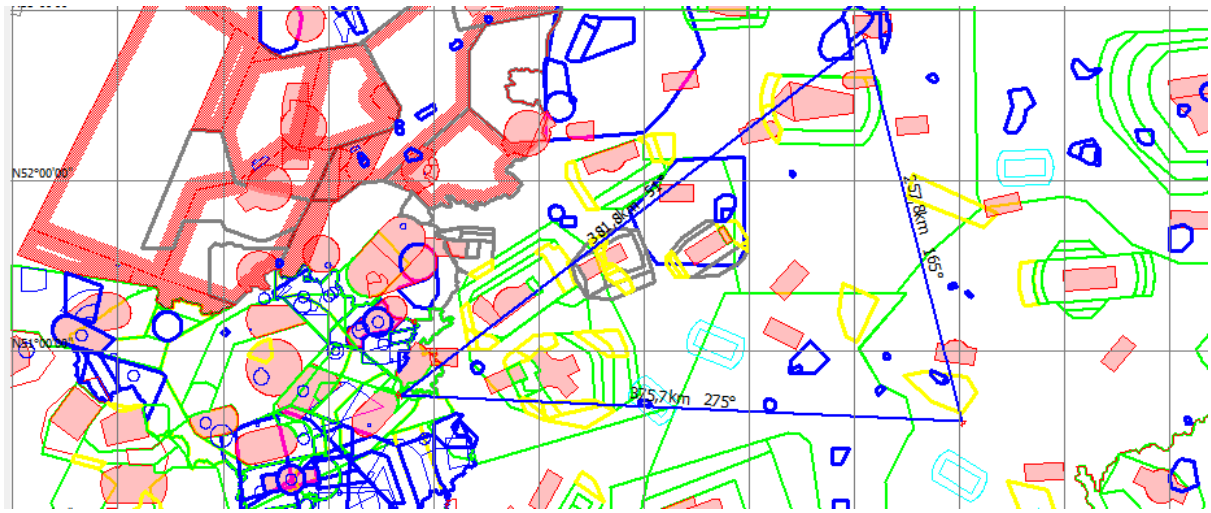
Making it a bit more difficult: The Out-And-Return

You lose 2 legs, and only have the advantage of ca 110km before the thermal part, and ca 65km after the thermal part. To fly 1000km, this means you would have to fly 825km during the thermal part of the day. The only turnpoint would be at the edge of the Berlin TMA. A very nice flight indeed, but the opportunities to complete this flight are much rarer than the conditions necessary for the standard 1000km.



The hardest one: The FAI triangle

It is also possible to use the power plants for an FAI triangle. However, there are some significant detours to avoid airspace, and to get in line of the power plant axis (ca 5%). The larger the flight, the smaller the detours. The 30% OLC bonus can be well worth it.



The "easy" ones: using all the 6 legs OLC and Charron.line give us

To make things easier, it is possible to use up to 5 turnpoints and 6 legs. The two extra legs (used as an extra swing of the jojo) add 155km to the non-thermal part. This leads to a thermal part of only 515km. As an additional benefit, we can now put one jojo before and one after the thermal part.

Off course, this type of task is not eligible for FAI badges and records. Nevertheless, for pure cross country fun, and OLC and Charron kilometers, it is perfect.

The free flight can make it even easier

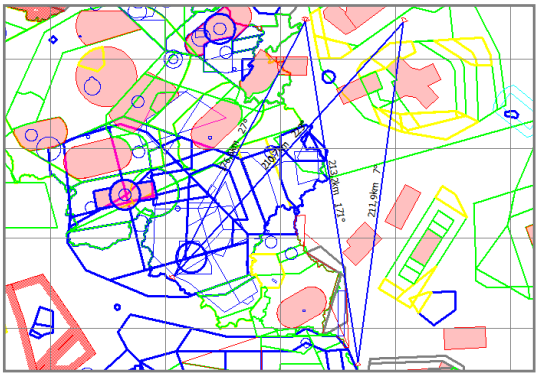
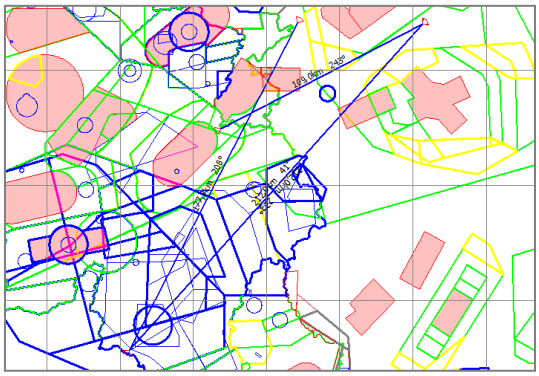
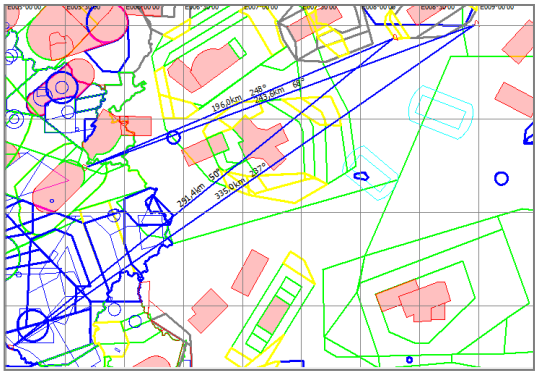
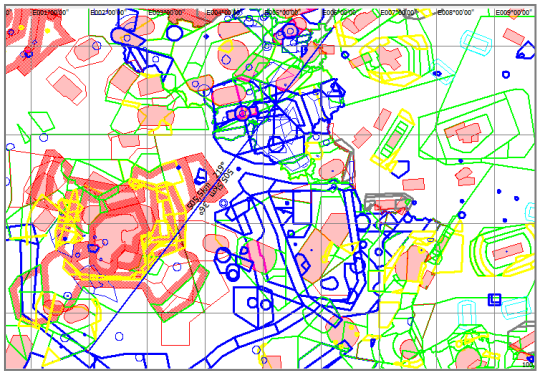
It's rather difficult to know exactly how high the cloudbase at the power plants will be. A free flight makes it much easier to optimize the performance.

However, Charron.line only has 5 legs for free flights. And the bonus of 20% for declared tasks is hard to beat. Also, a free flight with more than 3 turnpoints is ineligible for FAI badges.

Alternative routes for different weather conditions

I believe that the standard 1000km is the best for flying long distances for many reasons: airspace, weather conditions, lining up of power plants, ... However, many alternatives can be conceived for different weather situations. Below are a few from my database. The most important variations are:

- Startpoint and/or finishpoint close to Venlo, and then over Weisweiler to the South, or over Frimmersdorf/Neurath to the East.
- Startpoint near Langenfeld.
- Flying into Belgium, and much further, into France.
- Alternative turnpoints in the East (Nürnberg, Leipzig, Magdeburg, Berlin, Hamburg, Prague…)
- Triangle around Köln or Düsseldorf)
- North-South jojo (parallel to Luxemburg/Hahn/Frankfurt)

3. From sketch to reality

In theory, theory and practice are the same. In practice, they are not.

Waiting for that day…

Since the beginning of the season of 2012, I started looking out for the right weather pattern. You can learn a lot from watching the weather closely, and then comparing that with the flown performances on onlinecontest.org. For various reasons, I missed a couple of days, where there would have been a slight chance for success. However, the days were still very short.

Lesson learned: *The season for this flight begins at the end of March, so be prepared.*

16/04 came around. The pattern looked good for the standard 1000km. It looked even better for a flight to Spain http://www.scribd.com/doc/90226458/16042012-Keiheuvel-Viersen-SpanishBorder. I used the alternative startpoint near Viersen, with the intention of using Weisweiler as the first thermal. During the flight, I saw that the plume was condensed all the way up till cloudbase.

A good lesson: *with high levels of humidity, it is unlikely that the power plants will be usable in the early morning.* If fog, overdevelopments and thunderstorms are forecasted for the morning or early afternoons, you better plan something different.

On the 13th of Mai 2012 ("the day of the decade"), I was participating in the Hahnweide contest. Many 1000km's were flown that day. Also on the 12th of Mai the standard 1000km would have been possible. No regrets, though. The Hahnweide contest was awesome.

Lesson of the day: *It all has to fit together; it is not just about the weather.*

The 4th week of May: The week of "almost"

On Tuesday 22/05, the perfect weather was just a stone's throw away: from Dusseldorf to Leipzig, 700k+ were forecasted and flown by several pilots in that area. Unfortunately, 70km to the West (the line from Keiheuvel to the startpoint), there was fog in the morning (even until 14h00 over the startpoint). *Sigh*, so close, but not a chance of getting through.

Another age-old lesson, as uttered by Kierkegaard: *"Patience is necessary, and one cannot reap immediately where one has sown."*

On Wednesday thunderstorms and high moisture in the lower atmosphere between Aachen, Düsseldorf and Köln were forecasted as well. On top of that, pressure is average to low, a trough line is situated above and the CAPE index remains very high. This is not the perfect air mass. Although we have a North-Easterly wind, which is perfect, the polar air has to fight against the old air mass from the South. It is locked in by the Jetstream over the Atlantic Ocean. The polar air is thus advancing slowly towards the West, and heating up over Poland and Germany. When it finally will arrive here, we will already have blue thermals. Without thunderstorms, it would have been possible.

Thursday the weak cold front will slowly hover over the Düsseldorf-Stuttgart axis. It might be possible to do the 1000km, but heavy thunderstorms block the narrow gateway to and from the Sauerland. Again, without thunderstorms, it would have been possible.

Friday 25/05 comes around. The cold front has passed towards the South-West. The air mass has lost a lot of its "freshness". It will be a very blue day. Forecasted PFD is above 500km in the whole task area. I put in the weather forecast in the model. One unforeseen problem arises: the wind speed is really high. Up to 45kph from the East in the morning. This has several consequences for the jojo:

- The standard startpoint in Flanders is unusable. Against this wind, the max glide ratio for the Ventus2cxt is ca 31. With a start altitude of 1300m and 525m arrival altitude at Weisweiler, I can only glide for about 24km. I would need to shift my startpoint to the border of Belgium and Germany.
- The distance between Weisweiler and Bergheim is 30km. With a minimum arrival altitude of 510m and a glide ratio of 31, I need to reach 1475m in Weisweiler to bridge this distance. Early in the morning, this is not possible. In the evening this is less of a problem.
- The finishpoint can be set much further to the West (at least 60km from Weisweiler). The limitation here would be the fuel constraints to get back to Keiheuvel.

So the list of dealbreakers gets a bit bigger: *wind speed should be below 25-30kph (or a very high cloudbase early on).*

On 2nd of June, I was fully prepared for the 1000k. A nice, but narrow band of good weather from the Netherlands to the Czech Republic was forecasted. Using the power plants would not be possible early in the morning due to low level clouds. Following the topmeteo weather forecast, I chose for Malden in the Netherlands as the perfect start position. This turned out to be a very good choice, and the start went exactly according to plan.

I badly wanted to reach the Czech Republic (something not done before from Belgium), and opted for a quasi out-and-return (broken leg with line-up point). I thus chose for not doing a power plant jojo in the evening, but just a single run on Bergheim/Neurath and Weisweiler, with a finishpoint just in Belgium. The forecast said it was rather impossible to complete the task. Unfortunately, it was correct. The climb rates where too meager (1,1m/s over the task), to reach the power plants. After 901,3km of the task, and 45km before Bergheim/Neurath, I had to use the engine.

After using the engine, I wanted to test the power plants. It was 8 o'clock local time. Full overcast with cirrus clouds, almost dead air. Two clouds were overhead the power plants at an estimated altitude of 1600-1700m. I climbed with ca 0,5-1m/s in Bergheim, but it wasn't too exciting. Without wasting time, I flew to Neurath (5,5km to the north), also with a very nice cloud above. Upon entering, the vario maxed out. I briefly had 5,7m/s on the integrator at 20:22. Just incredible. I didn't fly to Weisweiler anymore, but there was still a cloud overhead.

I am certain the standard 1000km (with a startpoint over Malden, and a turnpoint in East Germany, ca 60km West of my selected turnpoint) would have been possible. I would have reached Bergheim/Neurath at 18:05, which would have given sufficient time for at least one jojo (4 legs, 1003km, finish at 19:50), and potentially another one (6 legs, 1141km, finish at 21:05).

Yet another lesson: *don't be too greedy.*

On the 5th of June, another reasonable day was announced. A lot of moisture in all layers of the atmosphere would be the difficulty. The route to startpoint 2 would potentially be blocked in the morning. The alternative start point near Venlo would be the best solution. Many overdevelopments,

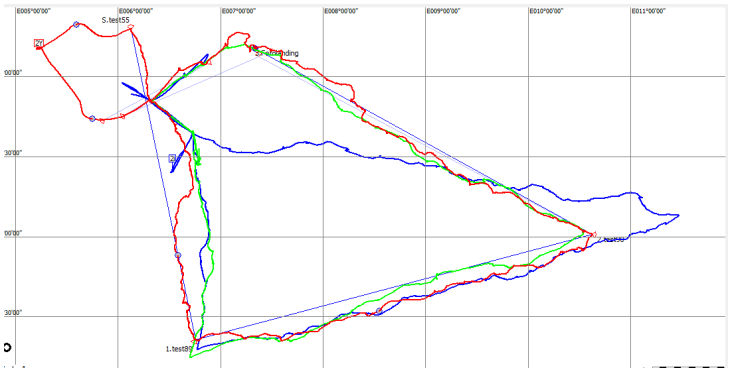
cumulus congestus, altocumulus and cirrus clouds were forecasted from early on in the day. And it would be difficult to get into high terrain early on. Especially into Sauerland.

Analyzing the topmeteo and toptherm forecasts, I decided for a quasi triangle around Frankfurt and Köln. From Venlo parallel to the Belgian and Luxemburg border, to Saarlouis. Then via the south of Frankfurt, turning east of Schweinfurt. Then via the south Rhön into the Sauerland to line up to the corridor between Köln and Düsseldorf to the power plants. Then a jojo to complete the 1000km.

The weather was difficult in some parts, with large spread outs, and not too exiting climb rates. Everything went rather well, up until flying into the corridor towards the power plants. Interestingly Wilfried Grosskinsky (Nimbus 4M, From Dahlemer-Binz, 1067km) and Robin Ermen (Ventus 2cxm, From Wershofen Eifel, 828km) and me (Ventus 2cxt, from Keiheuvel, 913km) all flew very similar tasks, without prior knowledge of each other's intentions. It is especially astounding how close Robin Ermen and me have flown from eachother the entire day. It is because of his flight, I could analyze that I have lost 42minutes in the corridor by my own mistake, just before reaching the power plants. This would have been more than sufficient to complete the declared 1014km task.

In the end I managed to reach Frimmersdorf, which triggered a thermal of ca 1m/s to 1500m MSL at 20:26. Weisweiler gave 2,7m/s to 1500m at 20:47. I reached the next turnpoint at 20:58, with 146km left to complete the task. This would have taken around 1,5 hours. With Sunset+30min at 22:20, it would probably not have been possible to complete it. A landing at Theux would have been the only option. I decided to cancel the task, and safely fly back to Keiheuvel.

Looking back, the task was probably close to perfect for this day (all three flights where in the top of the daily OLC ranking), which shows how good our meteo-forecasting tools have become. You just have to look beyond the PFD.



Flight tracks of W.Grosskinsky (Blue), R.Ermen (Green) and T.Schmelzer (Red) on 05/06/2012

Hopefully the last lessons:

- *Don't fly too conservative in the corridor between Köln and Düsseldorf back to the power plants. Dormagen is a very good bet for finding the final thermal to reach them.*
- *Opening the airbrakes while running the engine, will lead to a sudden increase in measured altitude by ca 30-40 meters, probably caused by turbulences on the statics. Don't fly too close under TMA Liège.*

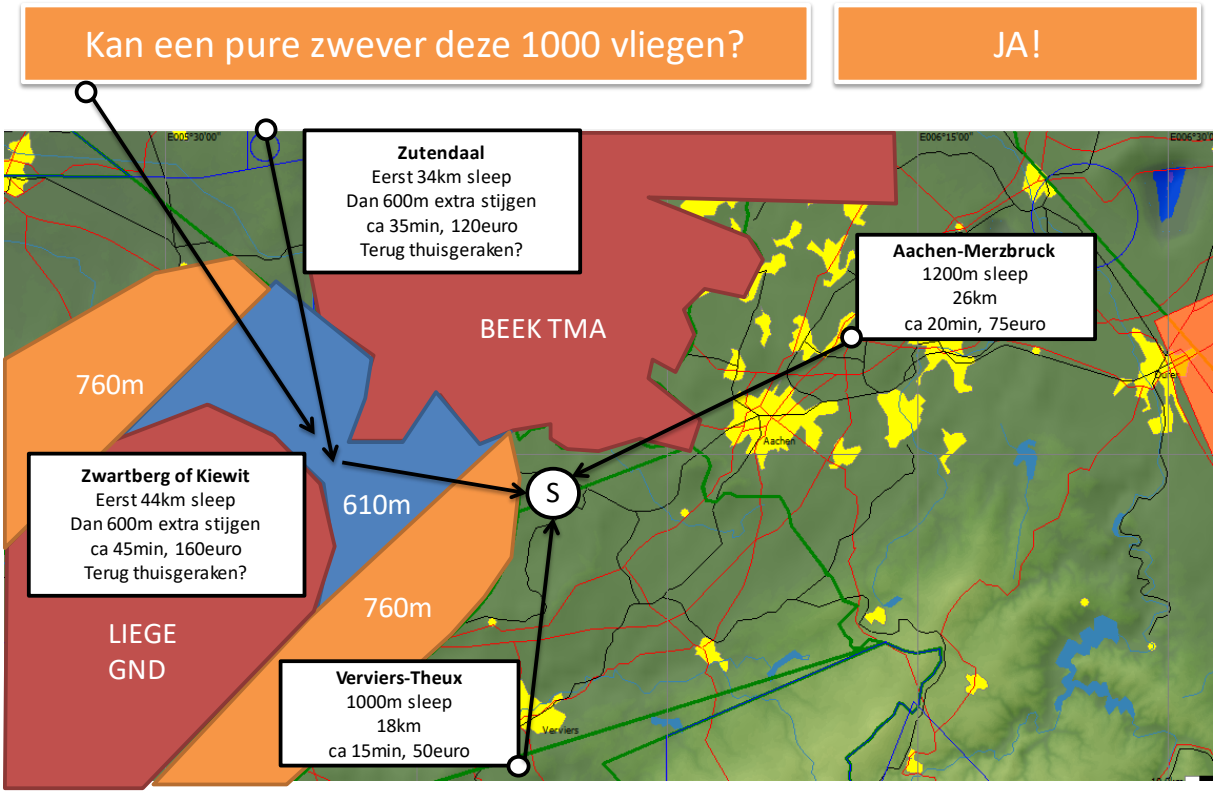
4. Where are the limits?

The flights of this season are not the end of the possibilities. An important question is: what are the limits of this strategy?

Pure Gliders

For maneuvering towards the start line and coming back after the finish, an engine comes in very handy. For pure gliders, things are less easy. I summarized the aerotow details from airports, close to the standard startpoint. It is manageable, especially from Verviers-Theux. Theux is also the perfect landing spot for pure gliders. Aachen-Merzbrück would be good as well, but sunset is 20minutes earlier there.

For alternative startpoints (e.g. Viersen or Langenfeld), many airfields are located in those areas, and it should be easier for pure gliders.



Aerotows from several gliding fields.

Club Class Gliders

With the polar of a Std.Libelle and an optimized task (standard 1000km, with jojo in the evening), the model says the 1000km would be possible if Weisweiler would give its first climb at 9:14, and the last one at 20:51 (shifting in between possible), and if the average climb rate in the thermal part of the flight is 1.9m/s. This would lead to an average speed of 80,5kph over 12h26min.

A big difficulty is the distance between Weisweiler and Bergheim. To bridge the 30km with a 98-to-100-indexed glider, between 850 and 900 meters are required. With a bit of wind and a bit of a margin, this easily becomes 1000m. The required cloudbase at Weisweiler should thus be at least 1550m MSL. This is quite rare early in the morning (around 9:15).

In conclusion, I believe that, at least in theory, it would be possible to fly the standard 1000km with a Std.Libelle or a Std.Cirrus. The weather to achieve this is extremely rare. In praxis, it thus will be very difficult to complete this challenge. With 6 legs, it becomes quite a bit easier. For more modern club class gliders like the LS4, the standard 1000km is doable. And for modern standard class gliders, I think it should be possible at least once or twice a year.

The maximum distance for the 18m class and Open class

For a Ventus2cxt or ASG29E, the standard 1000km should be relatively easy to achieve. And it is far from the maximum of what is feasible.

The polar of a Ventus2cx at 54.4kg/m2 is plugged into the model. First climb at Weisweiler at 9:11. First real thermal of the day around 9:55 (close to Langenfeld), and the average climb rate in the thermal part of the flight is 2.1m/s. Last thermal of the day is around 19:40. The last climb at Weisweiler estimated at 21:44. This would lead to an average speed of 105,1kph over 13h20min, and a bit over 1400km. This seems high, but think like it this way: in a superb thermal day, thermal flights of ca 1050km with a 18meter glider have already been done in and close to the task area with an average speed above 110kph (in thus less than 10 hours) (for example Bernd Goretzki, 18/07/2010 in a Ventus 2cxm: 1046km at 112,6kph in 9h18m). Adding ca 100km in the morning (in ca 1 hour), and another 250km in the evening (in ca 2,5 hours) with the Kraftwerk-jojo is, at least in theory, possible.

For the “old” Open class (Nimbus 4 and ASW22BLE), the number crunching leads to distances slightly over 1500km, with a turnpoint on the Polish border. For the new Open class (Quintus, EB29, Eta and especially the Concordia if the calculated polar of Gerhard Waibel proves to be true), the maximum theoretical distances are quite a bit over 1500km.

The question does become: are a first climb at Weisweiler to ca 1300m around 9:10, and a last climb there to ca 1500m around 21:45 possible?

Wat is er mogelijk? (Praktisch) | 1500km!

... met een Quintus / EB29 / Concordia

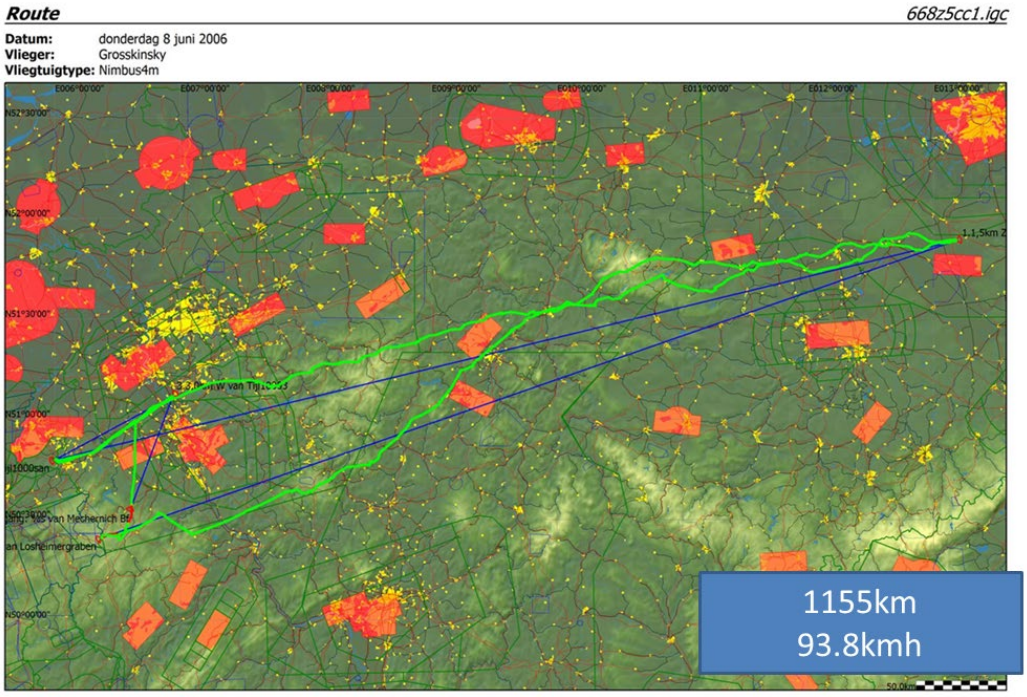
	afstand km	snelheid km/h	tijd uur:minuut	start	einde
Voordien	145	120	01:12:29	8:45	9:57
Thermisch	1092	110	09:55:36	9:57	19:53
Nadien	275	130	02:06:55	19:53	22:00
Totaal	1512 km				

Vraag 1: Zijn start en finishtijden realistisch?

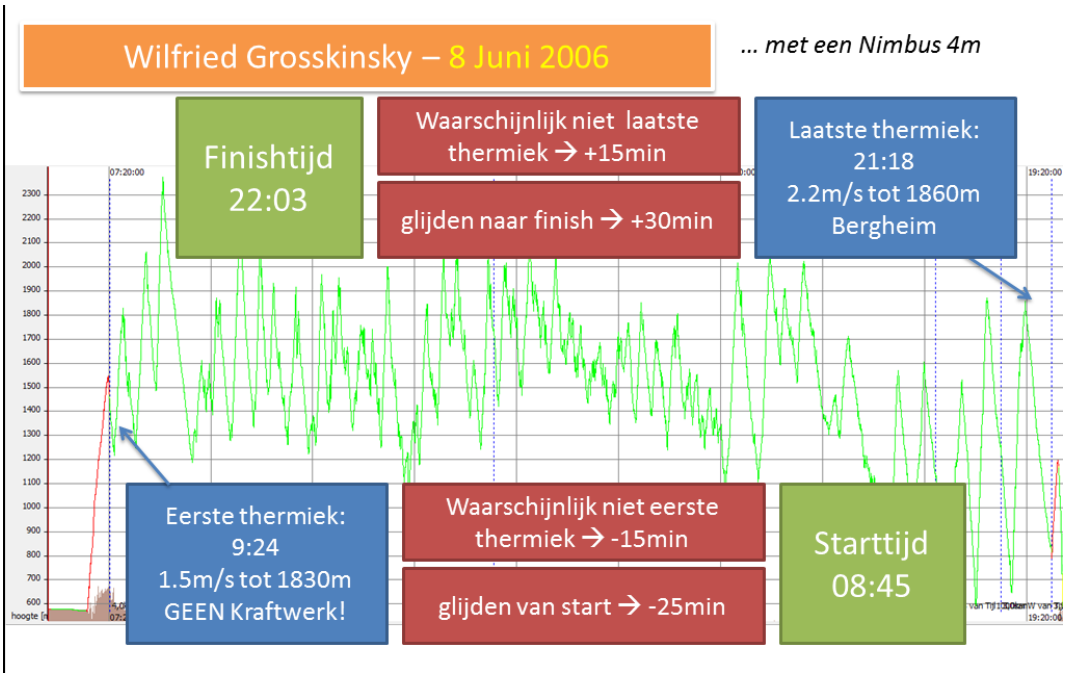
Short schedule of a 1500km flight.

The flight of Wilfried Grosskinsky on 8 June 2006 gives possibly the answer. On that day, he flew 1155km at 93.8kph. In the morning, he didn't use the power plant route, but started straight from Dahlemer Binz toward the East. At 9:24, he caught his first thermal of 1,5m/s up till 1830m. On a very good day, Weisweiler should be able to give a climb up till 1300m 15min before that.

In the evening, he did do a kind of power plant jojo, and had a last climb of 2,2m/s up till 1860m at 21:18 in Bergheim. I think, on the best days Weisweiler should be able to trigger a climb up till 1300m at a reasonable climb rate 25minutes later. However, this will have to be proven by trial.



Flight track of W.Grosskinsky on 8/6/2006.



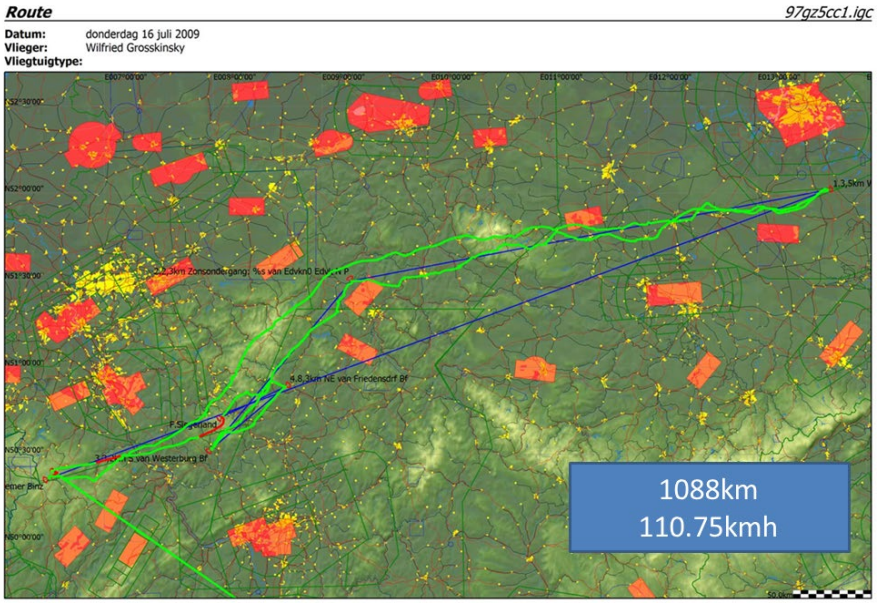
Barograph of W.Grosskinsky on 8/6/2006

Another flight of Wilfried Grosskinsky on 16 July 2009 is also interesting. On that day, he flew 1088km at a speed of 110.75kph. In this flight, he did not use any of the power plants. The meteorological values extracted from the IGC file of this flight, match quite well with the values necessary for cracking the 1500km, and also the route is close to the perfect route (apart from the early turning point in the east, and the track in the south of the Sauerland, instead of the north).

For that day, I have no information on the weather on the power plant. Nevertheless, I am sure that the weather conditions very close to the one needed for the 1500km exist, but they are extremely rare.

And rarity of the right weather conditions is off course not the only difficulty. The pilot will not be allowed to make a single mistake during the whole flight. Something quite hard to achieve over more than 13 hours of concentrated gliding.

The proof will lie in the pursuit.



Flight track of W.Grosskinsky on 16/7/2009

Wilfried Grosskinsky – 16 Juli 2009

... met een Nimbus 4m

	afstand km	snelheid km/h	tijd uur:minuut	start	einde
Voordien	145	111	01:18:31	8:45	10:03
Thermisch	1088	110.75	09:49:20	10:03	19:52
Nadien	275	130	02:07:09	19:52	22:00
Totaal	1508 km				

Sunset: 21:49
+30min: 22:19

Flight of W.Grosskinsky on 16/7/2009 placed into the 1500km schedule.

5. Some words for safety

I hope a lot of pilots will attempt the standard 1000km, and to optimize this strategy. Power plant thermals are a lot of fun, but standard VFR flight rules still apply.

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1. The climbs can be very rough. Not worse than a rotor, but nevertheless, very rough. Fly with sufficient speed, and strap yourself very tight.
2. When flying in a team or with other gliders, keep a lot of distance.
3. Don't fly in the clouds, especially not into a fully condensed plume. With no visibility, the turbulence can easily disorientate you and throw you on your back.
4. They don't always work. Sometimes you have to try a bit downwind, next to the vapor plume.
5. You need about 1300m MSL to bridge the gap between Weisweiler and Bergheim (18m glider, no wind, no big sink area).
6. Strong sink in a large area around the plants is possible. Don't fly towards them with no margins.
7. Don't go in too low. First of all, you are not allowed to. Secondly, because of the turbulence, you will not climb well. 200m above the cooling tower (ca 550m MSL) is a reasonable minimum.
8. Watch out for others.
9. Watch out for airspace of Jülich between Weisweiler and Bergheim. Normally, you will overfly it, but it can get tight, especially when flying from Bergheim towards Weisweiler.
10. If you fly into Belgium, there is quite a bit of military airspace as well (activated by Notam).
11. For pilots flying under the TMA of Liège: look for the landable fields near Visé in Google Earth and have a mental step by step guide ready (Airspace, terrain and engine). It is tight, but can be done safely when you have a strict procedure and know what is coming.