

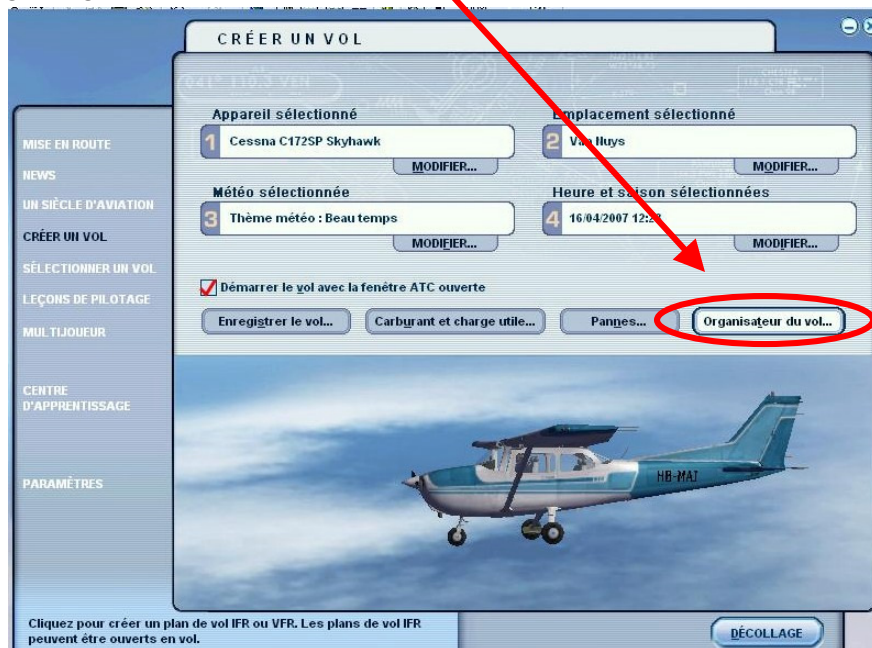
Instruments training

KVNY Van Nuys airport to **KSBA** Santa Barbara Mun. airport with a ILS landing on rwy7
VFR flight based on a VOR to VOR route, without radio (which is totally wrong to do so...), but this will let us to fully understand the VOR navigation.
Plane used, a Cessna 172

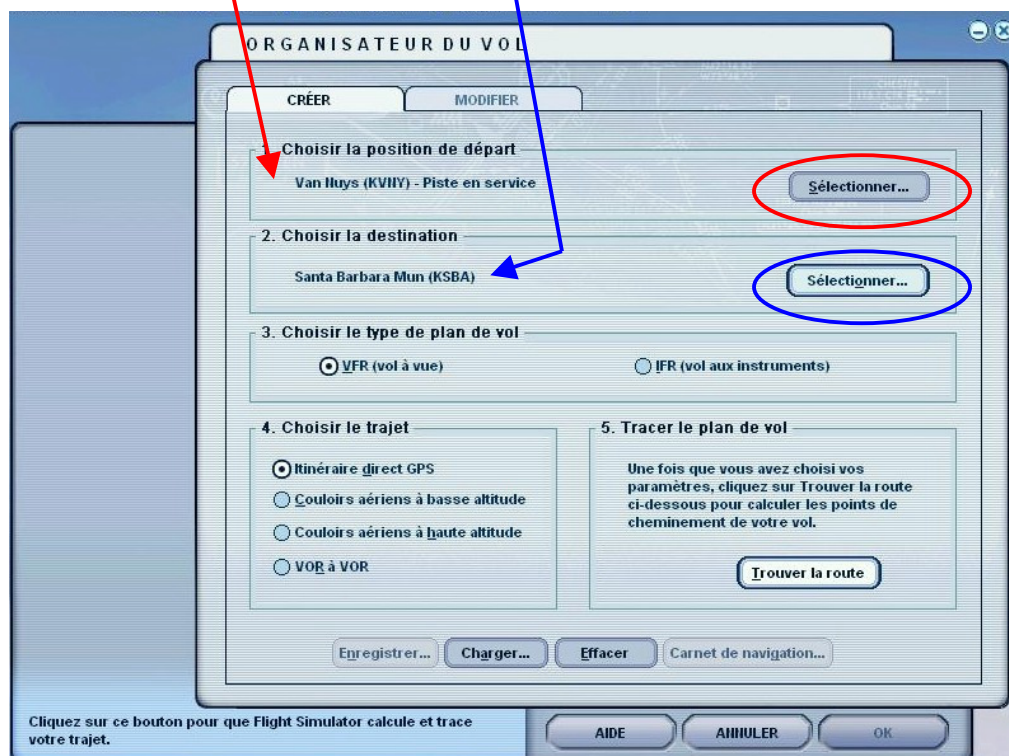
First of all, we are going to set our flightplan manually to understand how we can integrate waypoints on a flightplan.

The easiest way to do it:

- On our flight organizer section under FS9



- we first set our **starting** and **final** airports. You have the two ICAO codes in bold at the top of the page.



- Then you choose a **VFR flight**, with a **direct GPS route**

ORGANISATEUR DU VOL

CRÉER MODIFIER

1. Choisir la position de départ
Van Nuys (KVNY) - Piste en service [Sélectionner...]

2. Choisir la destination
Santa Barbara Mun (KSBA) [Sélectionner...]

3. Choisir le type de plan de vol
☒ VFR (vol à vue) ☐ IFR (vol aux instruments)

4. Choisir le trajet
☒ Itinéraire direct GPS
☐ Couloirs aériens à basse altitude
☐ Couloirs aériens à haute altitude
☐ VOR à VOR

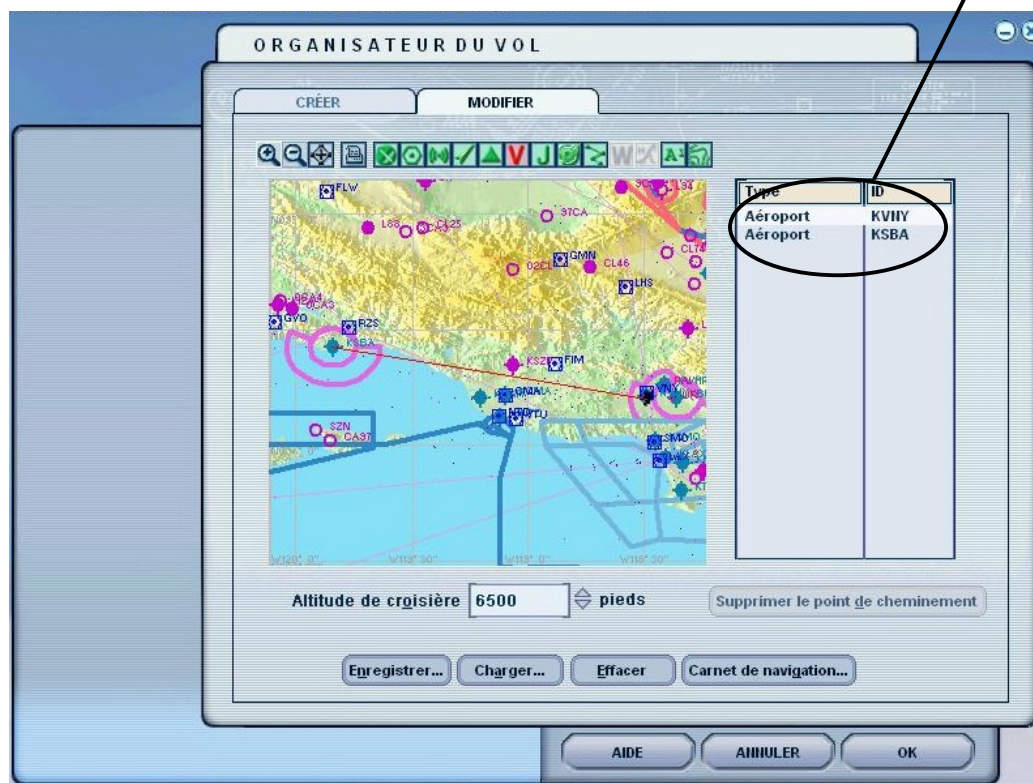
5. Tracer le plan de vol
 Une fois que vous avez choisi vos paramètres, cliquez sur Trouver la route ci-dessous pour calculer les points de cheminement de votre vol.
 [Trouver la route]

[Enregistrer...] [Charger...] [Effacer] [Carnet de navigation...]

Cliquez sur ce bouton pour que Flight Simulator calcule et trace votre trajet.

[AIDE] [ANNULER] [OK]

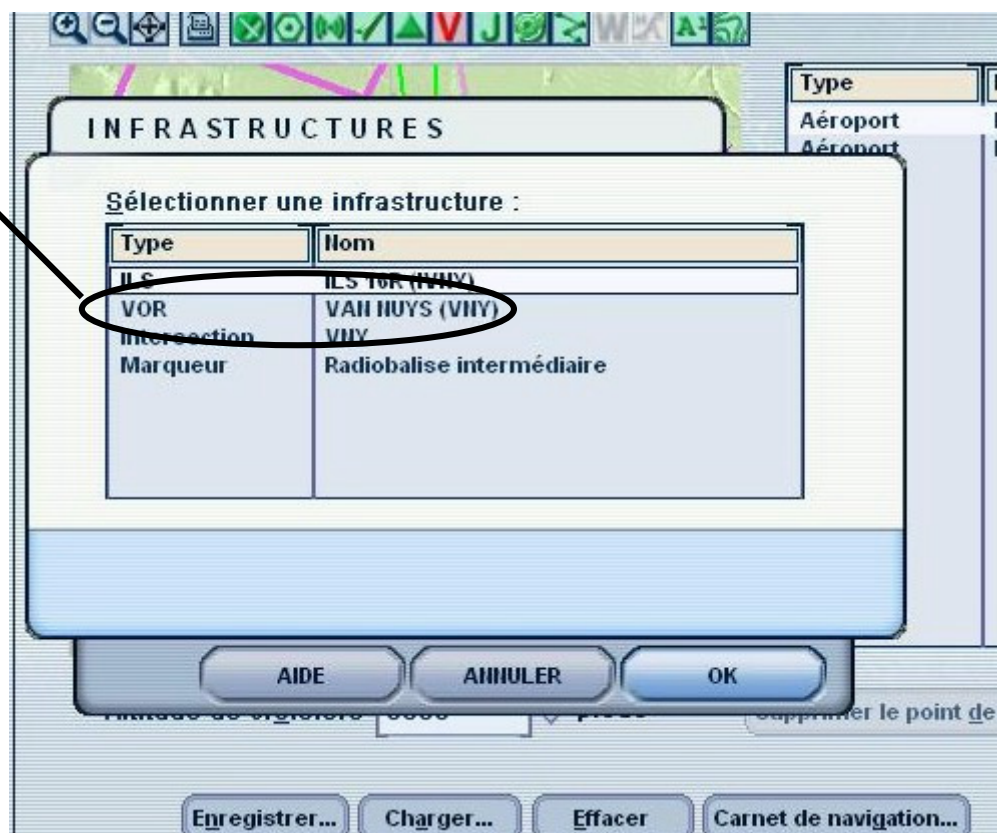
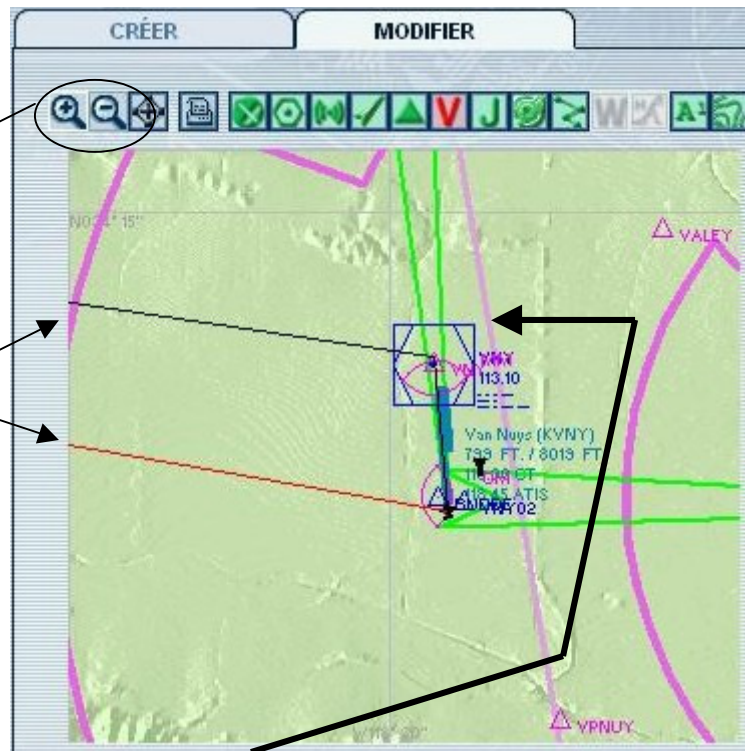
- Hit the button saying "find the route"
- A map showing the route in red (usually) appears with only our two airports



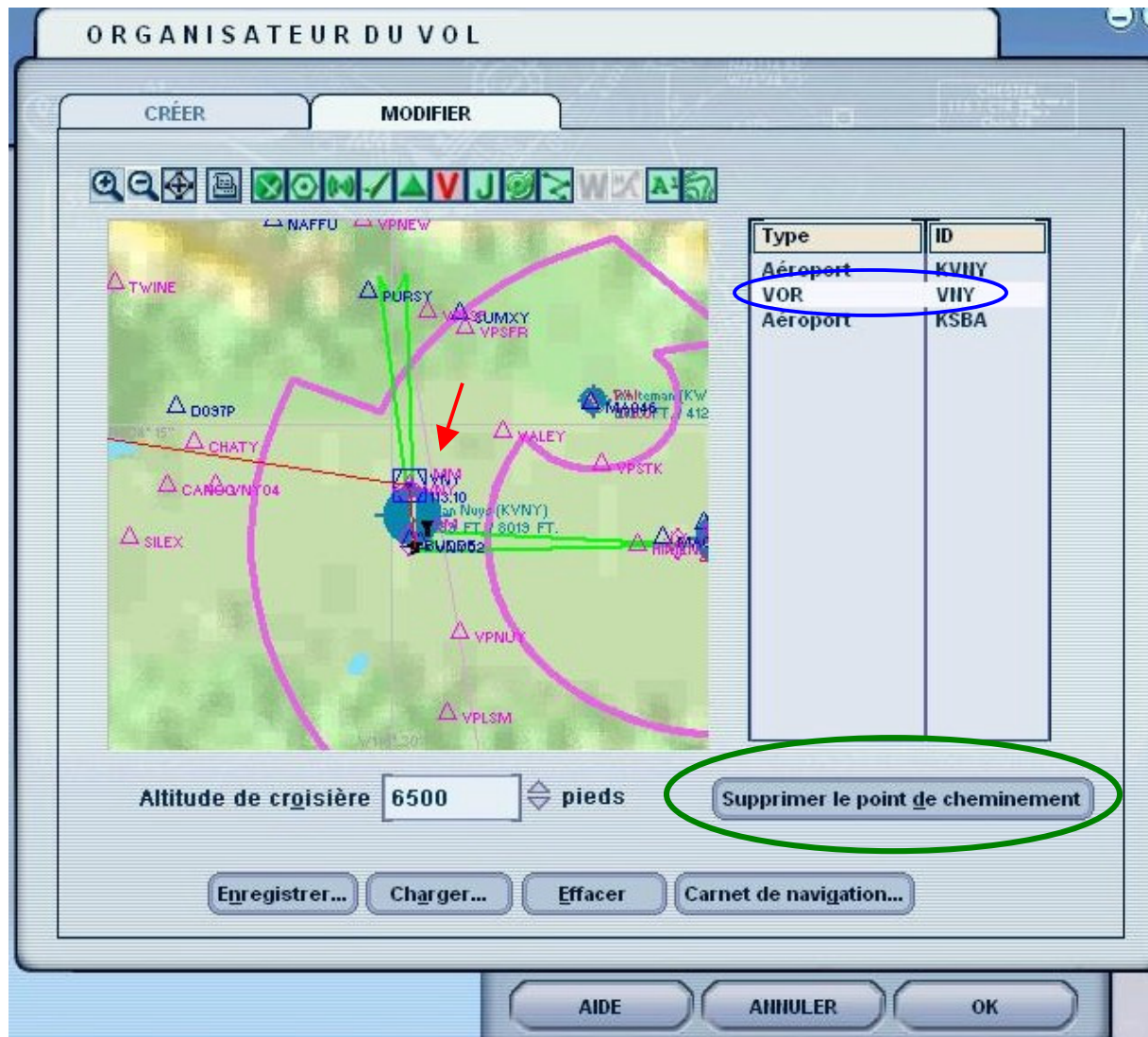
- Now we will modify this route adding waypoints. We can zoom in or out to help our work. The "lenses" are the two first icons. Adding waypoints is done by left clicking on the route line in red and sliding it to a chosen waypoint (when working, the line appear in black, hence the two colours shown here).

When releasing the mouse button, if a multiple points are available in this area, a selection appears on your screen, which leave you with your best choice possible. As here we want to fly a VOR to VOR route, then our choice will be the

only VOR for this area. (VOR are shown in a blue square on the maps, and next to them the frequency. This one has a 113.10 frequency and not readable it's name VNY). Select it by a click with the mouse and then hit OK.



- A brand new way point has just been added and appears in your list between the two airports. Also notice the red line marking the angle on the VOR. If you think it's a mistake, select the line with your mouse, then just delete it with the appropriate button.



- Now we will repeat this operation as much as we want to add waypoints on our route.

- Here we will add three more VOR on our route (FIM, RZS, GVO). The red line is now crossing each one of those.

ORGANISATEUR DU VOL

CRÉER MODIFIER

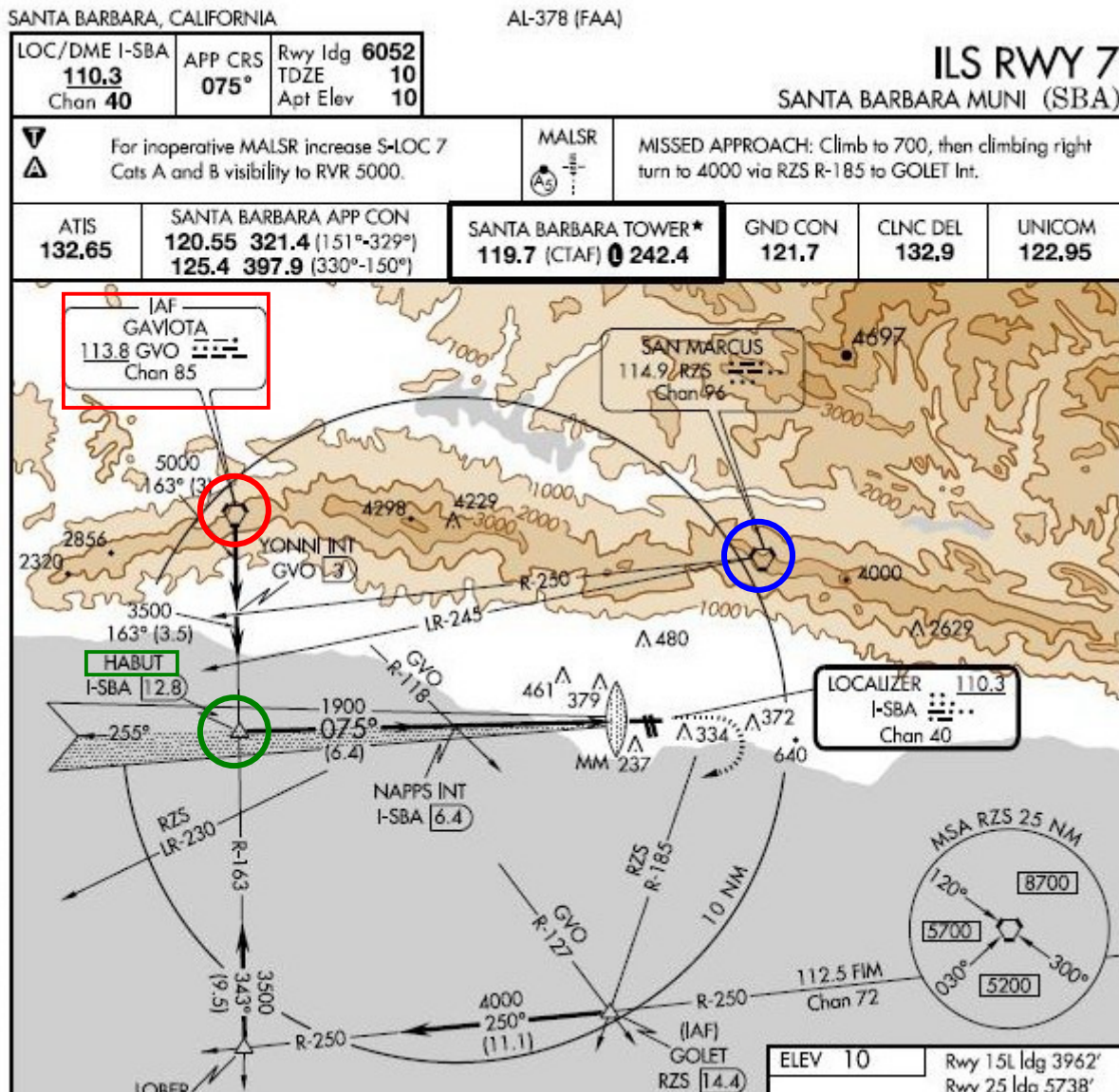
Altitude de croisière pieds

AIDE ANNULER OK

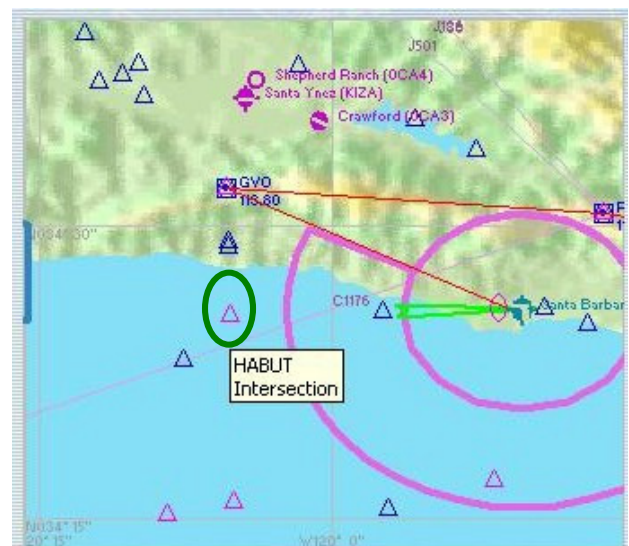
Type	ID
Aéroport	KVNY
VOR	VNY
VOR	FIM
VOR	RZS
VOR	GVO
Aéroport	KSBA

- Most important airports have charts for all kind of purpose, from airport diagram, to ILS charts and arrival ways... All US charts are available for free here <http://www.aimnav.com/airports/>

This is the KSBA chart. On this chart, we can find our **GVO** VOR, as well as the **RZS** VOR.



- Next stage is to leave us on the right approach for the ILS of KSBA on rwy7. From our last VOR called GVO, we can find a way to intercept our ILS "cone" to leave us a nice instrument approach. For that, we need to find the **HABUT** intersection. On that chart we can also recognize the ILS cone with a direction set to 075°... but we will leave that for later. We know now where to search this HABUT intersection on our simulator, so we will add it to our flight plan like we did with the VOR.



- Once all the way points have been added, you can also print your flight plan prior to confirm your flight. **If you forget that, don't worry, you can recall that page and print it once your aircraft is on the tarmac.** Then you'll have to save your flight plan, and confirm the fact that you want to have your aircraft placed on the departure airport. From that you are automatically redirected to your flight creation window. We can now hit the take off button as we leave the weather on a standard nice weather..



- Our flight plan should look like this. There you can find all your VOR, as well as their frequencies and their direction from each other. **On your radio stack, you need to tune your first two VOR frequencies (113.10 & 112.50) on your NAV1 selector, 112.50 being the standby frequency. You can also set the last two frequencies (114.90 & 113.80) on your NAV2 selector**, even though NAV2 is more like a backup tool since it does not have all the functions of NAV1..

Plan de vol Microsoft Flight Simulator

Van Nuys -> Santa Barbara Mun

Distance : 101.6 mn

Consommation de carburant : 10.7 gal / 63.9 livres

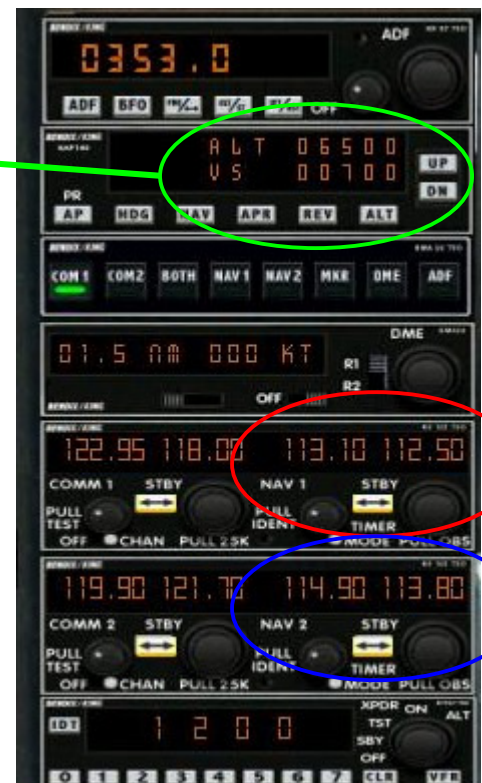
Durée du vol : 1:00

Points de cheminement	Route	Alt (pieds)	Cap	Distance		VS (kts)	Carburant	Arrivée
				Étape				
KVNY				Res	Est	Est	ETE	
				101.6	Rée	Rée	ATE	
VNY (113.10)	-D->	1424	341	1.6	110	0.1	0:00	
				100.0				
FIM (112.50)	-D->	6499	278	20.9	95	2.3	0:13	
				79.1				
RZS (114.90)	-D->	6499	267	45.0	94	5.0	0:28	
				34.2				
GVO (113.80)	-D->	6499	260	15.9	94	1.8	0:10	
				18.3				
HABUT	-D->	4711	164	6.5	112	0.6	0:03	
				11.7				
KSBA	-D->	10	073	11.7	133	0.9	0:05	
				0.0				

Pas pour utilisation opérationnelle

- On our flight plan, we also had an proposed altitude of 6500ft, so do not forget to set it on the autopilot, as well as the climb rate, here 700ft/min on the C172

- Now, we are ready for take off...



- A few seconds after TO, we should take a brief look at our radio stack and our OBS setting. Our first heading is 341° as you can see on our flight plan. **So my OBS is set on 341°**, which allow me to engage my **autopilot on altitude (Alt) mode and navigation (Nav) mode**. **The last important indication is the remaining distance between my plane and the targeted VOR, which is now 00.5 nm (BTW my speed is 80kt)**. I must be ready to set my OBS to the next VOR direction, which is 278° and to switch my freq. as well to 112.50



Once this is done, my plane begin to turn right away, heading toward my next target. Notice the new OBS setting to 278° (W = 270°)



Tutorial made by Marc Joye for Vorona Aviation
<http://www.voronaaviation.com/index.php>
 April 2007

Now that I have finished my turn, my next target is at **20.4nm** (on the flight plan, it was originally **20.9nm**, but the difference is the time needed to finish the turn). **Also take the time to notice the Nav1 switched freq.**

Plan de vol Microsoft Flight Simulator

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Distance : 101.6 mn

Consommation de carburant : 10.7 gal / 63.9 livres

Durée du vol : 1:00

Points de cheminement	Route	Alt (pieds)	Cap	Distance		VS (kts)	Carburant	Arrivée
				Étape	Res			
KVNY							53.0	0:00
					Est	Est		ETE
				101.6	Rée	Rée		ATE
VNY (113.10)	-D->	1424	341	1.6	110	0.1	0:00	
				100.0				
FIM (112.50)	-D->	6499	278	20.9	95	2.3	0:13	
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				18.3				
HABUT	-D->	4711	164	6.5	112	0.6	0:03	
				11.7				
KSBA	-D->	10	073	11.7	133	0.9	0:05	
				0.0				

Pas pour utilisation opérationnelle



Here we are, leaving Van Nuys (KVNY)



- During the AP (auto pilot) flight, do not forget to set your next VOR instead of just doing nothing but look at the window... Now it's time to set your standby NAV1 freq. to 114.9 (the RZS VOR)
- To leave you a nicer transition between the active VOR and the next one, you can also select your **heading to match the next VOR's heading (here, 267°)**. We are now at **04.1nm of our next waypoint...**

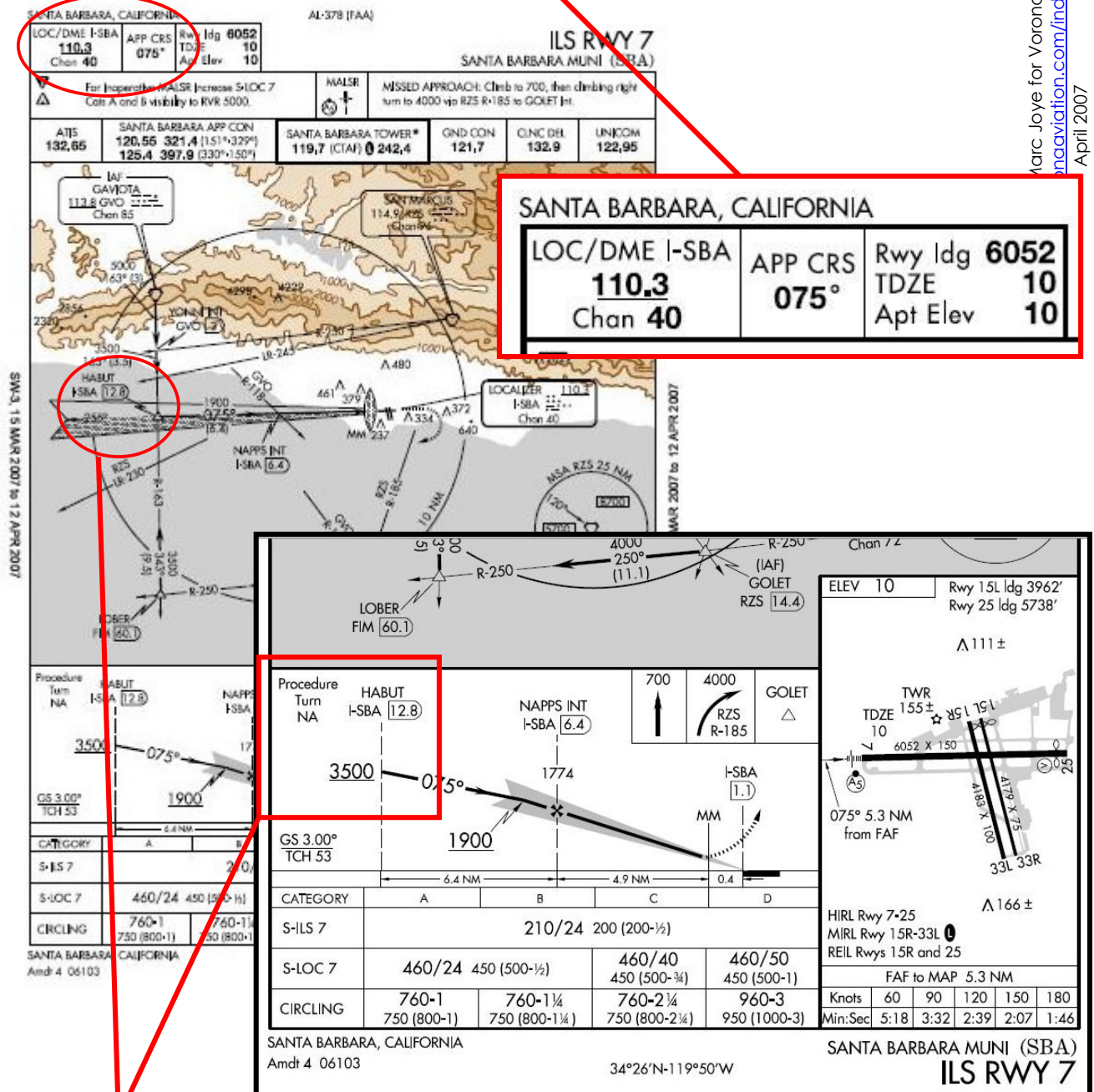


- When arriving at 0.1nm of our target, **we will simply hit the HDG button of the AP**, this will release the NAV button automatically, **our plane will turn to match our heading** and then **we have time to switch the NAV1 freq. and correctly set the OBS course...**



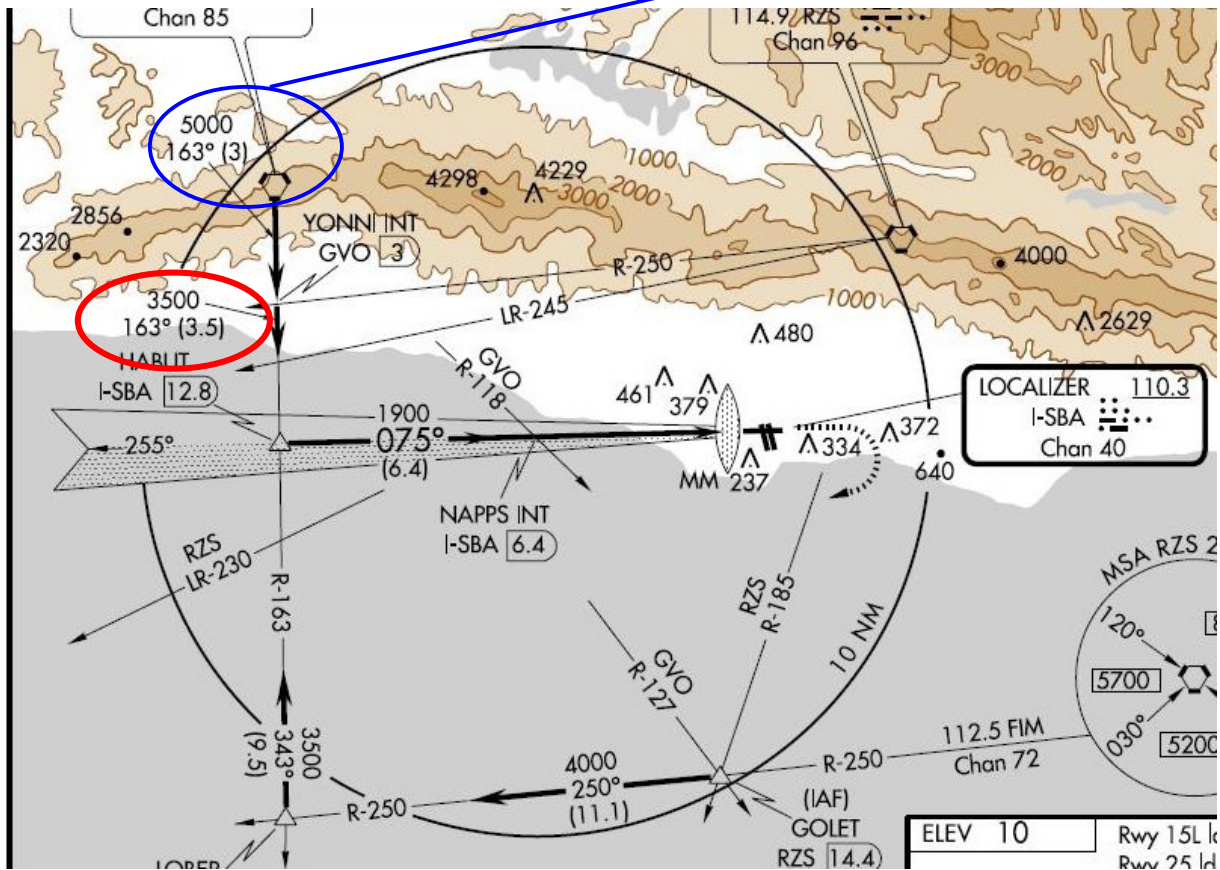
- Now that our OBS and our nav1 freq. are set, **we simply hit back the NAV button on our autopilot.**
- We must now repeat the operation for each following VOR

- Now that we are heading to our last VOR, it's time to go back to our ILS Chart. First of all, a few explanations... the LOC/DME square show you the freq. you must use on your NAV1, and the APP CRS tells you the course you have to set to your OBS



- The next thing to look at is your procedure turn. Here, you have a targeted alt. of 3'500ft when "hitting" HABUT, so do not forget to descend at that altitude to intercept the ILS cone correctly (from the bottom of it).

- The last thing to look at is your HDG from GVO to catch HABUT (here 163° at 3'500ft) for that turn, set and use the HDG of your AP to the 163. be aware that at GVO your alt. must be 5000ft.



- Notice all the described indications and settings from above on the panel of my C172



SIMULATION INTERROMPUE - Appuyez sur P pour continuer.

- Once you turned GVO VOR, **notice that I'm flying with the HDG at 163° and descending at 3500ft**, set your main OBS and NAV1 channel to the course and the frequency shown on the ILS chart. (here 110.30 for the nav1 & 075° for the OBS)



- Now **we are flying under the ILS plan as you can see from the OBS**. **On the figure above, we were flying at the altitude of the ILS plan.**



- Now we can prepare for our Instrument landing.
Disengage the HDG button and hit your APR button. By doing this, we enable our plane to automatically follow the ILS descent and direction plan. **To catch the ILS "cone", you MUST be flying under it,** and once you cut it's plan, your plane will automatically adjust and maintain it's descent rate straight to the RWY.
- Here the plane just caught the ILS and is turning toward the runway



- Now we are perfectly aligned to the rwy... notice that the **ALT** button is disengaged. It happens automatically once the plane is on the right descent plan.



- Finally you'll have to disengage the autopilot to land manually. Here it is...



Tutorial created by Marc Joy, as a personal introduction to VOR flying on **Flight simulator only**. This is not a formal training session (I'm no flying professional, nor do I have any flight license), but just my thoughts on what would help new pilots mastering that part of instrument flying. Part of Vorona Aviation training. Visit us at : <http://www.voronaaviation.com/index.php>