

Full Design and coding of a RNAV (RNP) approach.

With *Arinc Decoder*



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We want to create a RNAV Visual approach to land on the small airport of Agatti (VOAT)

You open the module "Procedure Design" (Via "Manual coding" then "Procedure Design")

Get all the datas of the airport and around's:

Press on the "Create a new Procedure" button.

Enter "VOAT" name it R22-V and select "Approach"

R22-V

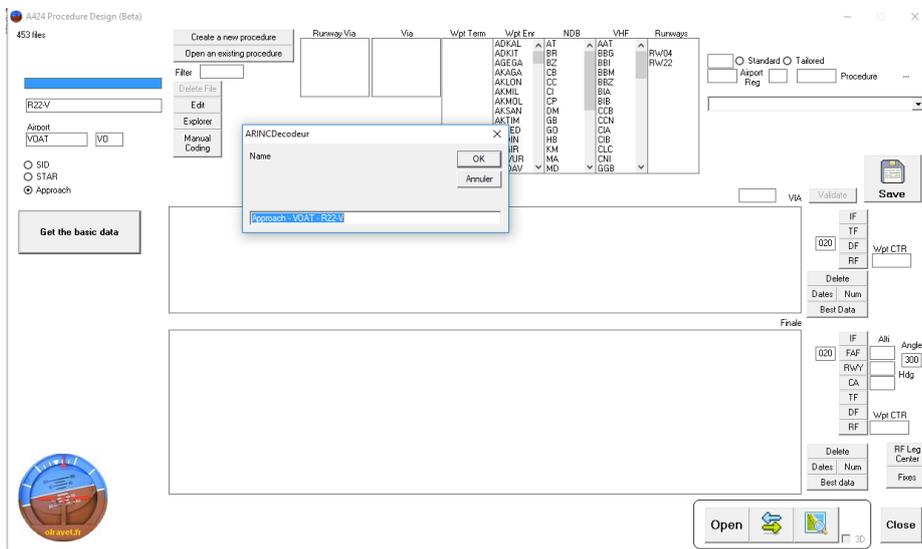
Airport

VOAT VO

- SID
- STAR
- Approach

Get the basic data

Click on "Get the basic data"



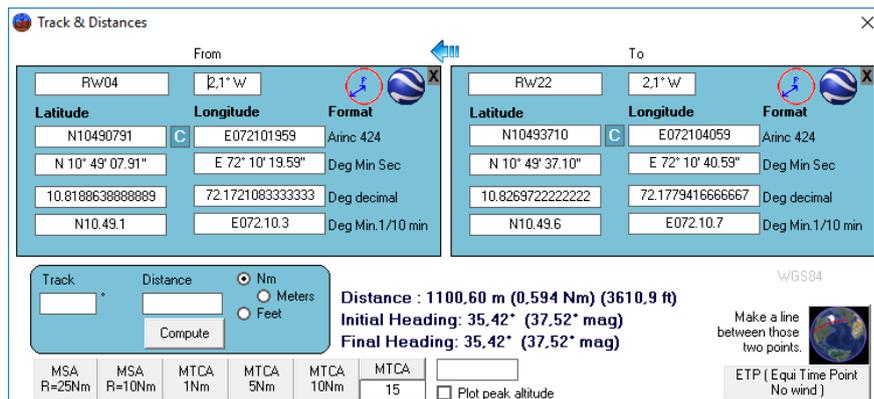
Create the first leg, from runway to FAF

We need to create a straight in approach, so we need to know exactly what the runway axis is.

Select runway 04 and press on the compass ()

Then select runway 22 and press again on this compass

In true direction, we have exactly 35,42°



Press on the little arrow (above) 

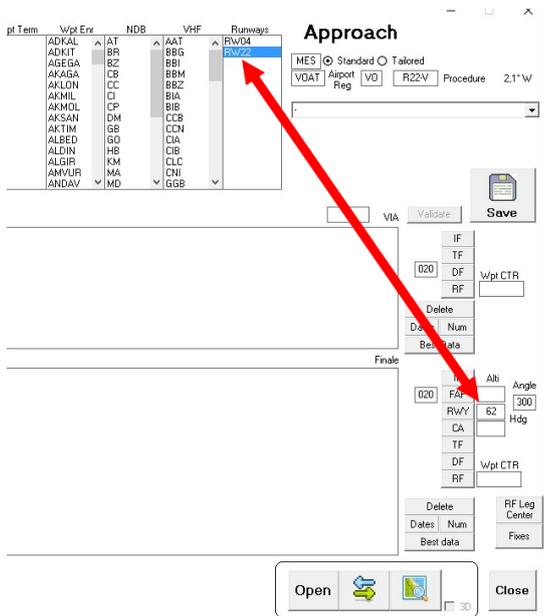
To obtain the runway 22 at the start position.

Determine the distance to the runway for your FAF

Many solutions will be available, depending of your path angle.

Here I take 3° and I want to start the descent from 2000'

The threshold altitude + the TCH are coded in the A424 file. When you selected the runway 22 you had it shown:



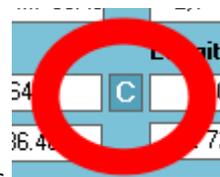
Runways									
Airport	THR:	Lenth	Width:	Heading	THR Alt:	TCH	TakeOff Path	Landing THR	
VDAT	Rw22	3950' (1204 m)	98' (30 m)	218°	12'	50'			
Latitude	Longitude	Displaced THR	Stopway	ILS	ILS Class	UpDate			
N10493710	E072104059	338' (103 m)	295' (90 m)			1904			
Tarmac		PCN: 016 F/D/Y/T			Gradient: -0.500%		 		

The runway 22 has an altitude of 12' and a Threshold Crossing Height (TCH) of 50' so I need to lose 1938' from 2000'

3° is 317.95 feet/nm so $1938/317.95 = 6.095$ nm

You enter those two data in the module: (in the lower left rectangle)

The button "Compute" give you the new coordinates for your FAF.



Copy the coordinates by only pressing on the "C" in the coordinates

Back in the module, press on the button « Add waypoint »

Then click on coordinates, the coordinates computed before will be pasted.

Give a name to your waypoint and press "OK"

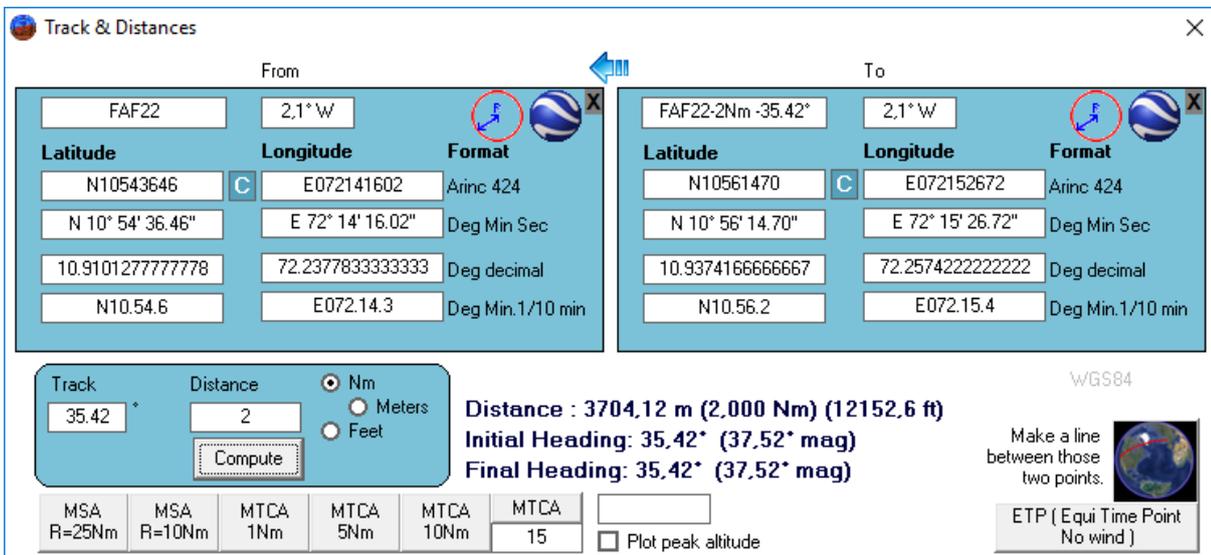
Then save (regularly) your job. Button "Save"

From here you can create your first leg, or continue creating your waypoints.

Let's create a FACF, 2 miles away from the FAF (for a flat level at 2000')

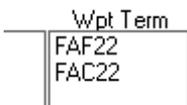
Select your waypoint FAF (in the list where it appear after its creation) and press the compass.

Keep the true track of 35.42° and put 2Nm and compute. Press "C" to copy the coordinates.



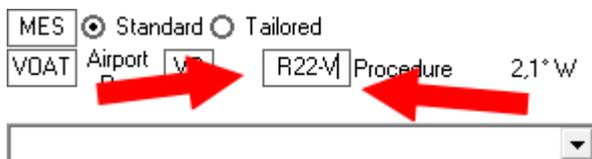
On the module, press “Add Waypoint” and same ... paste the coordinates, write a name and “OK”

Your waypoints will be saved as some terminal waypoints, relative to your Airport:



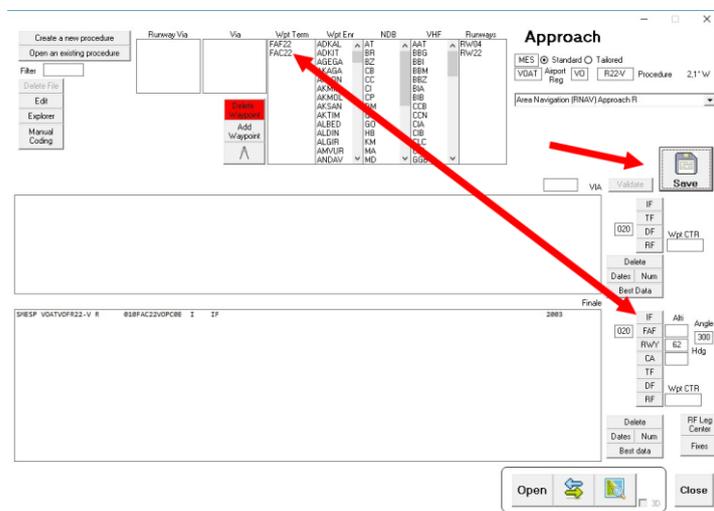
Design the procedure legs

The coded lines will have to know what the name of the procedure is, please fill the field (if it's not automatically done)...

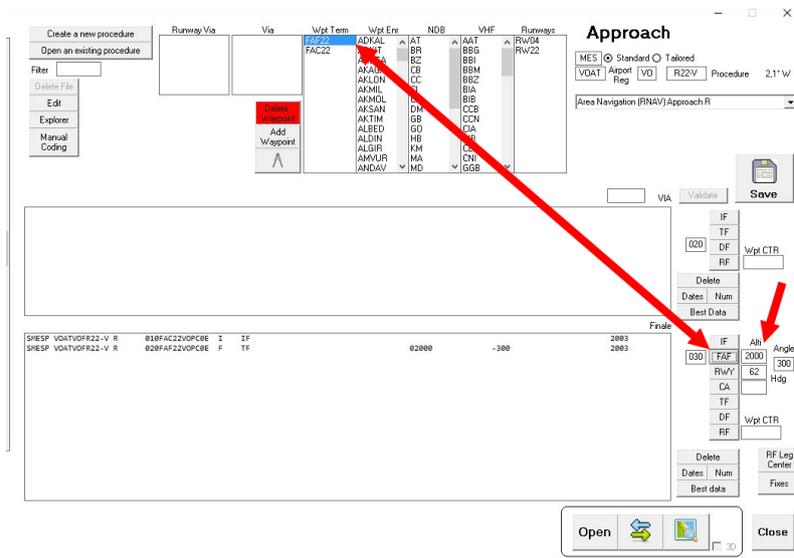


We have to start from the FAF (or the FAF if we don't have any) and go down to the threshold.

Select your FAF and press on the button IF:



Then same with the FAF and button FAF (you can put near to it the interception altitude of 2000')



The lines will be filled up, you can save it after (button "Save")

Same with the Runway 22 and the button "RWY".

From now we can prepare a missed approach, with a CA leg in the runway axis climbing to 5000' (that's an example)

050	FAF	2000	
BD	RWY	62	300
	CA	5000	
	TF		
	DF		

But the heading will have to be filled after.

Design of the waypoints for the transitions (VIAs)

The idea is the same. Here we will create a "T" procedure.

We start from the FACP, from the runway the TRK was 35.42°

Let's create a leg to $35.42+90 = 125.42$ and a leg $35.42 - 90 (+360) = 305.42...$

From

FAC22	2.1° W
Latitude	Longitude
N10° 14.70"	E072°15'26.72"
N 10° 14.70"	E 72° 15' 26.72"
10.937 66666667	72.257422222222
N 10.56.2	E072.15.4

To

FAC22-2Nm -305.42°	2.1° W
Latitude	Longitude
N10572456	E072134730
N 10° 57' 24.56"	E 72° 13' 47.30"
10.956822222222	72.229805555556
N10.57.4	E072.13.8

Track: 305.42 * Distance: 2 (Nm)

Distance : 3704.07 m (2.000 Nm) (12152.5 ft)
 Initial Heading: 305.42° (307.52° mag)
 Final Heading: 305.41° (307.51° mag)

WGS84

Make a line between those two points.

ETP (Equi Time Point No wind)

That we will call IF22A

And

For IF22B...

Design of the legs of the vias.

Same principle...

Select one IAF you just create, and push on IF of the upper list:

You will be ask for a name of the via... here is Agatti from East:

Runways	Via	Wpt Term	Wpt Enr	NDB	VHF	Runways
		FAF22	ADKAL	AT	AAT	Rw04
		FAC22	ADKIT	BR	BBG	Rw22
		IF22A	AGEGA	BZ	BBI	
		IF22B	AKAGA	CB	BBM	
			AKLON	CC	BBZ	
			AKMIL	CI	BIA	
			AKMOL	CP	BIB	
			AKSAN	DM	CCB	
			AKTIM	GB	CCN	
			ALBED	GO	CIA	
			ALDIN	HB	CIB	
			ALGIR	KM	CLC	
			AMVUR	MA	CNI	
			ANDAV	MD	GGB	

SMESP	VOATV0FR22-V R	010FAC22V0PC0E	I	IF	2003
SMESP	VOATV0FR22-V R	020FAF22V0PC0E	F	TF	2003
SMESP	VOATV0FR22-V R	030RW22 V0PG0GY	M	TF	2003
SMESP	VOATV0FR22-V R	040	0	CA	2003

Do the same for Agatti from the west ...

Create a new procedure
Open an existing procedure
Filtre voat
Delete File
Edit
Explorer

Runways	Via	Wpt Term	Wpt Enr	NDB	VHF	Runways
	AGATE AGATW	FAF22 FAC22 IF22A IF22B	ADKAL ADKIT AGEGA AKAGA AKLON AKMIL AKMOL AKSAN AKTIM ALBED ALDIN ALGIR AMVUR ANDAV	AT BR BZ CB CC CI CP DM GB GO HB KM MA MD	AAT BBG BBI BBM BBZ BIA BIB CCB CCN CIA CIB CLC CNI GGB	Rw04 Rw22

Approach
MES Standard Tailored
VOAT Airport Reg VO R22-V Procedure
Area Navigation (RNAV) Approach R

VIA Validate

SMESP VOATVOFR22-V AAGATE 010IF22AVOPC0E	IF	2003
SMESP VOATVOFR22-V AAGATW 010IF22BVOPC0E	IF	2003

BD IF TF

The 2 vias will be available in the list.

Join the IAF with the FACF for the 2 IAFs,

Select the VIA in the list, then select the IAF and press "TF".

re

Runways	Via	Wpt Term	Wpt Enr	NDB	VHF	Runways
	AGATE AGATW	FAF22 FAC22 IF22A IF22B	ADKAL ADKIT AGEGA AKAGA AKLON AKMIL AKMOL AKSAN AKTIM ALBED ALDIN ALGIR AMVUR ANDAV	AT BR BZ CB CC CI CP DM GB GO HB KM MA MD	AAT BBG BBI BBM BBZ BIA BIB CCB CCN CIA CIB CLC CNI GGB	Rw04 Rw22

Approach
MES Standard Tailored
VOAT Airport Reg VO R22-V Procedure
Area Navigation (RNAV) Approach R

VIA Validate

TE 010IF22AVOPC0E	IF	2003
TE 020FAC22VOPC0E	TF	2003
TW 010IF22BVOPC0E	IF	2003

030 IF TF DF RF
Replace dates

Finale

010FAC22VOPC0E	I	IF	2003
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IF De

Same with the other transition... and save.



You can try your job by clicking on the button



Looks pretty OK.

Making the finishes.

Now it's time to put the values mandatory for the A424 format...

The TF legs required distance and magnetic course...

Select the line with a TF and press on the button "Best data"

VIA	Raw	P/T	Fix	T/D	Hdg	AD	Alt1	Alt2	Ang	RNP	Spd	Distance	CTR-turn
AGATE	20	TF	FAC22	E	127.5							2	
SMESP	VOATVOFR22-V	AAGATE	010IF22AVOPC0E										IF
SMESP	VOATVOFR22-V	AAGATE	020FAC22VOPC0E										TF
SMESP	VOATVOFR22-V	AAGATW	010IF22BVOPC0E										IF
SMESP	VOATVOFR22-V	AAGATW	020FAC22VOPC0E										TF

1 (arrow pointing to the 'TF' column) 2 (arrow pointing to the 'Distance' column) 3 (arrow pointing to the 'Validate' button)

Buttons: IF, TF, DF, RF, Replace dates, Validate

And at the end, after data validation, press on "Validate"

Same for the final leg, each time you validate.

The CA leg needs the mag course also, let's put it manually:

First we see that the magnetic course has been calculated by 217.5°... for the very final leg, let's copy this value.

We have to say to the FMS when it's the end of the approach, and the start of the missed approach, with a flag...

The screenshot shows a menu with the following options:

- . Not given
- A: SDF after FAF
- B: SDF before FAF
- M: Missed app** (highlighted)
- P: Path point Fix
- S: SDF Named

 Below the menu is a table with columns: VIA, Row, P/T, Fix, T/D, Hdg, AD, Alt1, Alt2, Ang, RNP, S. The table contains several rows of flight data, with the 'M' flag highlighted in the T/D column of the first row.

Same way to enter the altitudes in the Alti fields :

The screenshot shows the 'AD' field set to '2000'. Below it is a table with columns: T/D, Hdg, AD, Alt1, Alt2, Ang, RNP, Spd. The table contains several rows of flight data, with the 'AD' field highlighted in the first row.

The AD (Altitude Designator) can be entered by clicking in the field. A list of all the possible choice is visible:

The screenshot shows a dropdown menu for the AD field with the following options:

- . Not given
- +: At or Above**
- : At or below
- G: At intercept Alt2
- J: At or above intercept Alt2

 Below the menu is a table with columns: /T, Fix, T/D, Hdg, AD, Alt1. The table contains several rows of flight data, with the 'AD' field highlighted in the first row.

Just click in your choice and validate.

Same for other designators, the end of the via has to be ended in clicking in the "end of leg"...

The screenshot shows a dropdown menu for the 'end of leg' field with the following options:

- B: Flyover end of via
- Y: Fly Over up** (highlighted)

 Below the menu is a table with columns: VIA, Row, P/T, Fix, T/D, Hdg, AD, Alt1, Alt2, Ang, RNP, Spd, Dist. The table contains several rows of flight data, with the 'Y' flag highlighted in the T/D column of the first row.

Auto correction

If a data is wrong, when leaving the textbox it will become red, same if the data should be here and stay missing.

Example here (for the opposite runway procedure)...

Approach - VOAT - R04-V													Agatti		Mag Var : 02.1° W (Apt)		
Via	Seq	Pt	Fix	Typ	F/D	TD	Mag	Crs	Alt 1	Alt 2	Vert Angle	RNP	Speed Limit	Distance Time	Rec Navaid	Cycle : 2003	Updte
AATEST	10	IF	ATIAE	IAF				+	2000							Transition	2003
AATEST	20	TF	ATIAF	Inter AF			307,5°		2000					2 Nm		Transition	2003
ATWES	10	IF	ATIAW	IAF				+	2000							Transition	2003
ATWES	20	TF	ATIAF	Inter AF			127,5°		2000					2 Nm		Transition	2003
	10	IF	ATIAF	FACF					2000								2003
	20	TF	ATFAF	FAF			45°		2000		-3,00°			3 Nm			2003
	40	TF	RW04	MaPt	FO		37,5°		60		-3,00°			6,1 Nm			2003

Obviously the CRS is false between ATIAF and ATFAF, the code show 45° but it is in the runway axis...



Best Data button will show that in green the computed value, in red the faulty actual value. Clicking on "Validate" and the data is corrected.

VIA	Flw	P/T	Fix	T/D	Hdg	AD	Alt1	Alt2	Ang	RNP	Spd	Distance	CTR-tum	Arc Radius	Rec Nav
	20	TF	ATFAF	E	F	45.0	2000		-3,00			3,0			
SNESP	VOATVFR04-V	AATEST	018ATIAEIVPC0E	A	IF					02000					2003
SNESP	VOATVFR04-V	AATEST	020ATIAFVOPC0E	B	TF		30750020			02000					2003
SNESP	VOATVFR04-V	AATHES	018ATIAWVPC0E	A	IF					02000					2003
SNESP	VOATVFR04-V	AATHES	020ATIAFVOPC0E	B	TF		12750020			02000					2003

