

Creating aircraft shapes (Manual)

by RexKramer1

Motivation

amnesica and me created an own ADSB application [BelugaProject](#). In our app we use a lot of the concepts of [tar1090](#) by wiedehopf and [dump1090](#) by flightaware. Maybe there are far more contributors. Ein ganz großes Dankeschön / a lot of thanks to all of you.

Time to give something back. We created new aircraft shapes or redesigned some existing ones and would like to share them [**ToDo: Link auf das Github-Repository einfügen**].

We hope that there will be other aviation and adsb fans, who would like to create new aircraft shapes for the community. This manual is for them. It describes our workflow and hopefully may help to increase the amount of aircraft shapes for tar1090 (and BelugaProject).

Introduction

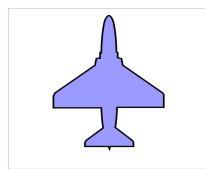
To add new aircraft shapes to [tar1090](#), [dump1090](#) or [BelugaProject](#) it is required to define one or two „path“-variables and some additional parameters.

A look into the tar1090 file [markers.js](#) shows the structure of an aircraft shape:

```
...
// Mac Donnell-Douglas A4 Skyhawk (ICAO A4)
'md_a4': {
  viewBox: '-4.2 -1 32 32',
  id: 26,
  w: 26,
  h: 26,
  accentMult: 0.8,
  strokeScale: 1.1,
  path: 'M11.7 26.5H8v-.7s0-.3.3-.612.6-2.4s-.2-1-.3-4H3v-2.41.3-.6 6.3-5.5.2-
1.3s.3-.2.6-.1V7.8s0-.2.2 0c0 0 0-3.5.5-6.2 0 0 .3-1.2.7-1.2.4 0 .7 1.2.7 1.2.5 2.7.5 6.2.5 6.2
0-.2.2 0 .2 0v11.6.2.2 1.3 6.3 5.5c.3.4.2.6.2.6v2.3h-7.4c-.1 3-.3 4-.3 412.6
2.5c.3.3.3.6.3.6v.7H121-.1.5-.2-.5z',
  accent: 'M9.7 20.41.9-1.7-1-8.4-.9-1.4M14 20.41-.8-1.7.9-8.4 1-1.4',
},
...

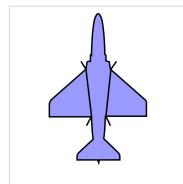
```

„path“ contains the outline of the aircraft, a polygon which is filled with different colors at runtime, depending on the altitude of the aircraft:



Parameter `strokeScale` controls the thickness of our lines in „path“.

„accent“ contains some lines, which will be put on top of the (filled) aircraft polygon at runtime:



Parameter `accentMult` controls the thickness of our lines in „accent“.

„path“ has to be „closed“ to be an outline, accent can be a collection of single lines.

Parameters „w“ (width) and „h“ (height) define the size of the aircraft shape.

Parameter viewBox defines the size of the canvas (here 32 x 32 units),, where we put our aircraft shape on and the position of the shape (X = -4.2 / Y= -1) on our canvas:

▼ Viewbox...

X:	-4,20000	- +
Y:	-1,00000	- +
Width:	32,00000	- +
Height:	32,00000	- +

„id“ is a unique identifier for the aircraft shape. It is used in [tar1090](#), when the aircraft is drawn from a png-file instead of svg-file. You will find a description to extend this png-file in a separate chapter.

Recommended Tools (Open Source)

Inkscape

[Inkscape](#) is recommended for drawing the shapes. This manual describes how to use it for editing of aircraft shapes.

Gimp

[Gimp](#) is recommended for creating or editing the png-File xxx.

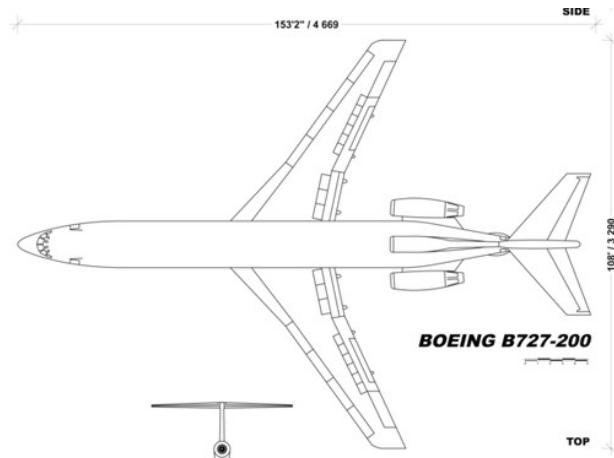
Texteditor

I am using [Notepad++](#) , but any other plain text editor will do.

Preparations

In this manual I will show how to create an aircraft shape for the **Boeing 727-200**.

Get a technical drawing of the desired aircraft, which shows the aircraft from top. I will use this one from commons.wikimedia.org:



Link:<https://commons.wikimedia.org/wiki/File:B727FAMILYv1.0.png>

Find out its dimensions (length and width), you can find it in the web. Search wikipedia or try to find it for example here in the Aircraft Performance Database from Eurocontrol:

<https://contentzone.eurocontrol.int/aircraftperformance/default.aspx?>

The dimensions for the Boeing 727-200 are
length = 46.68 meters
width = 32.92 m (Wingspan)
(taken from https://en.wikipedia.org/wiki/Boeing_727#Specifications)

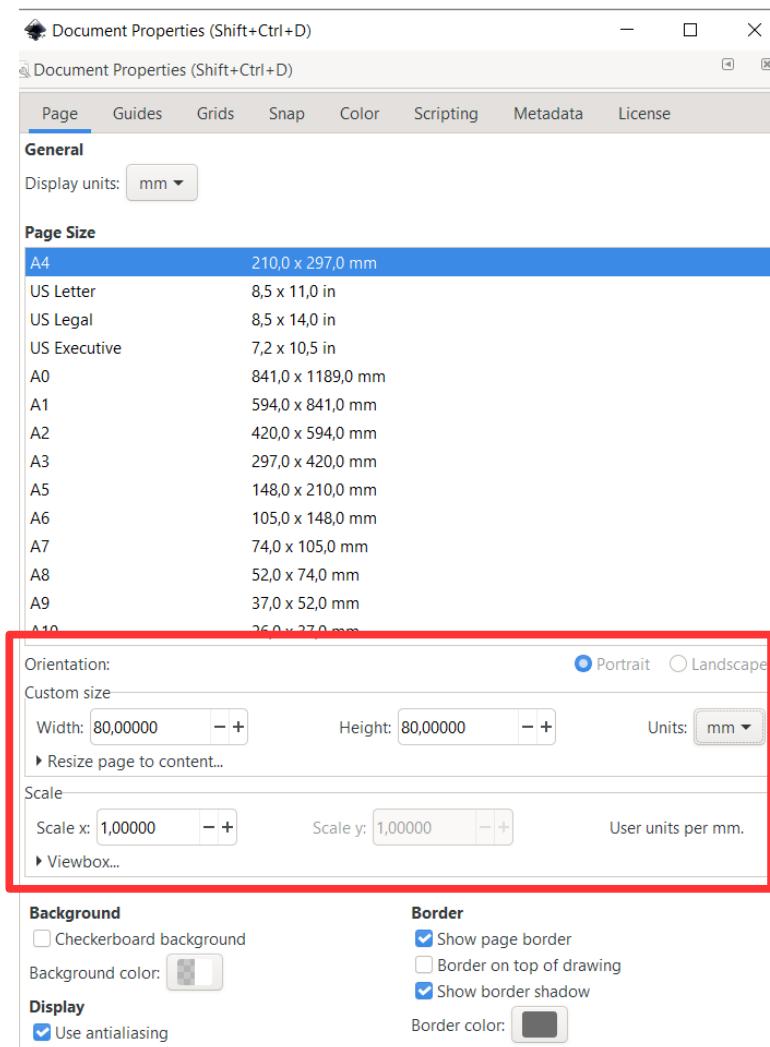
Because I use it as filename for the new svg-file, I get the [ICAO-Typedeignator](#) for my aircrafts from here:
<https://www.icao.int/publications/DOC8643/Pages/Search.aspx>

Typedeignator for the Boeing 727-200 is **B722**.

Drawing the aircraft shape with Inkscape

Setting Document Properties

Setup our canvas in *Menu File / Document Properties*:

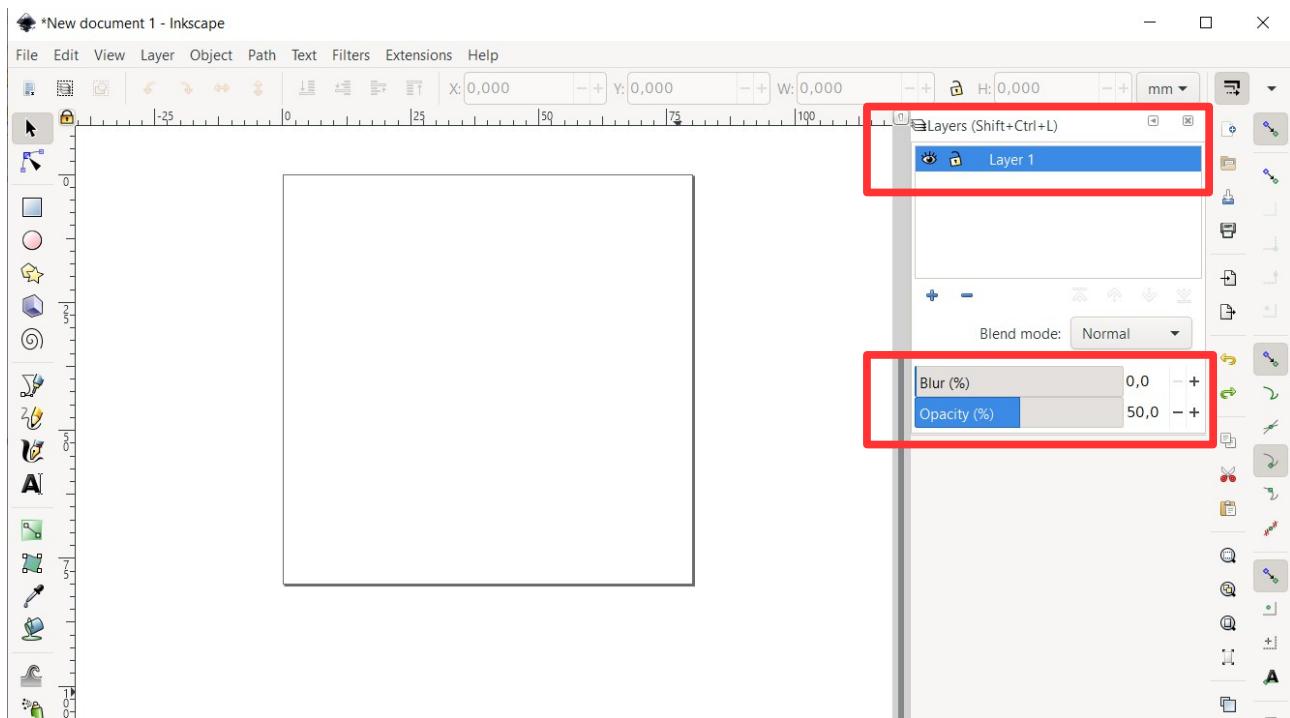


I take these values because they allow easy scaling of our aircraft shapes – 1 mm for 1 meter in real life.
Aircraft dimensions in meters fit well, because most aircraft are smaller than 80 meters width x 80 meters length.

Create Layer „Background Image“

Menu Layer / Layers ...

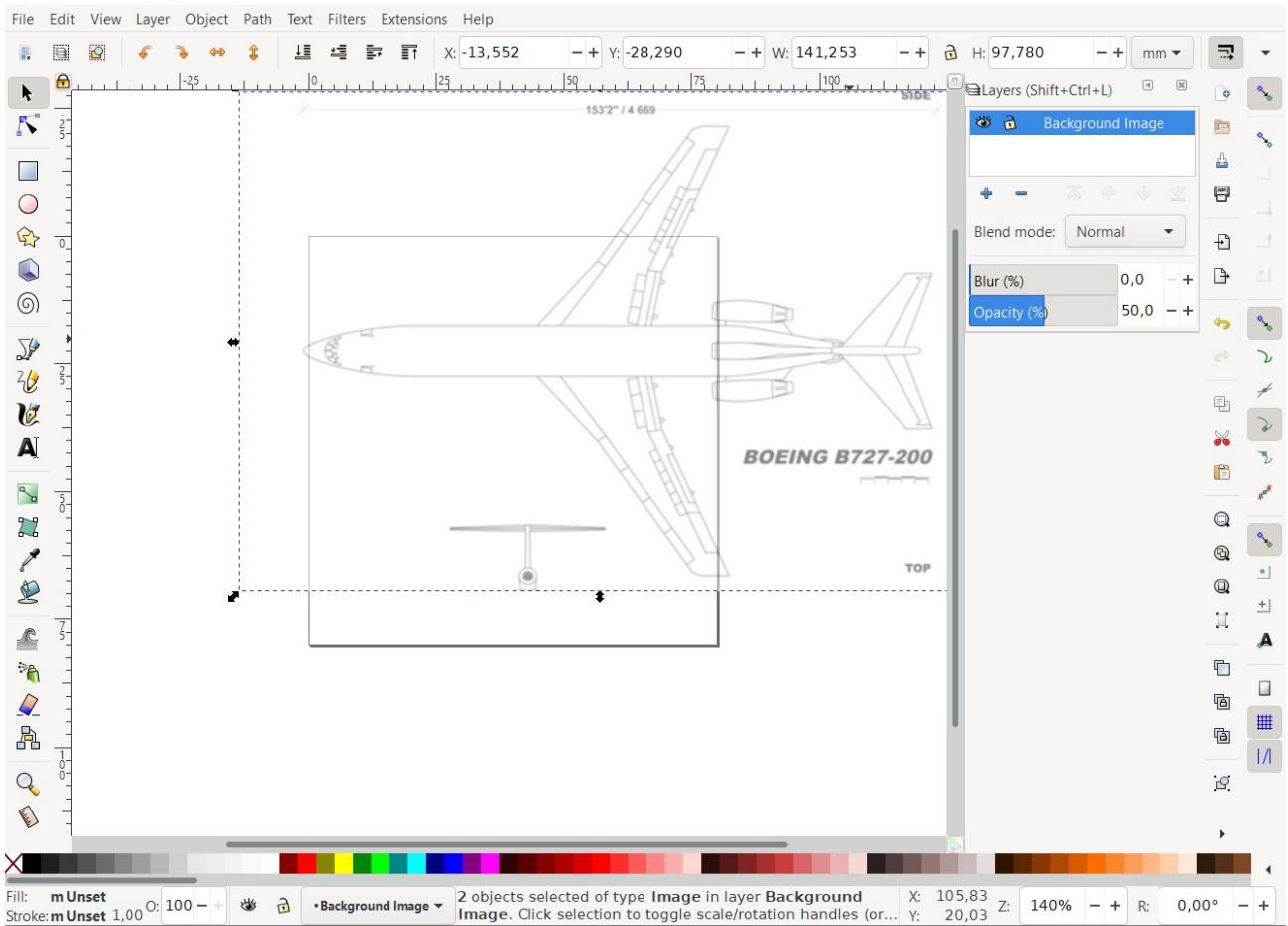
Rename Layer „Layer1“ to „Background Image“ and set Opacity to 50%, select the attributes by clicking into the marked fields:



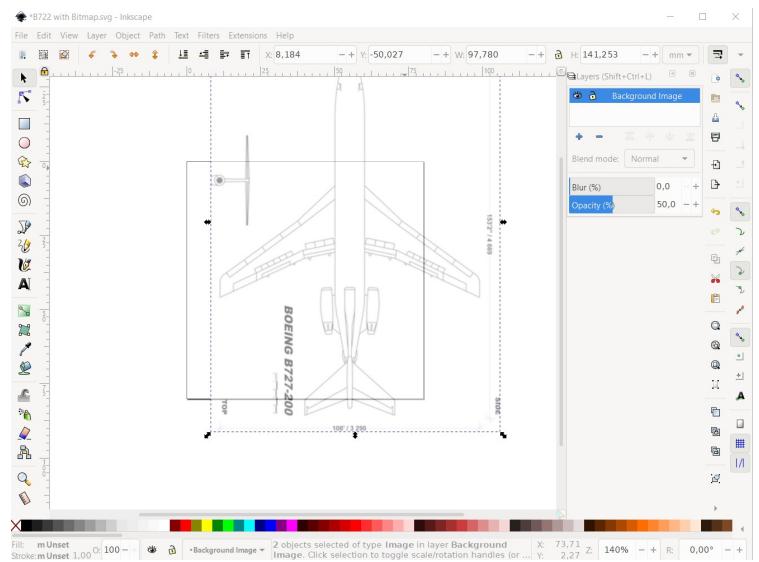
Opacity 50% will allow us comfortable painting on top of our drawing later.

Save Document as „B722 with Bitmap.svg“.

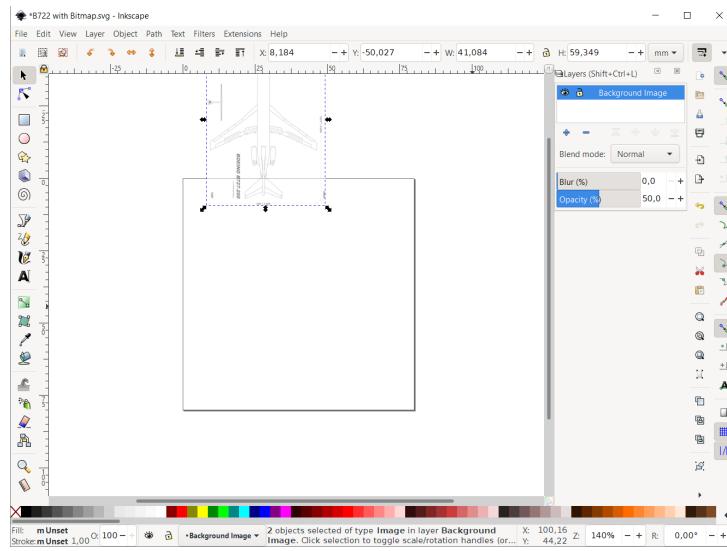
Copy and Paste aircraft drawing:



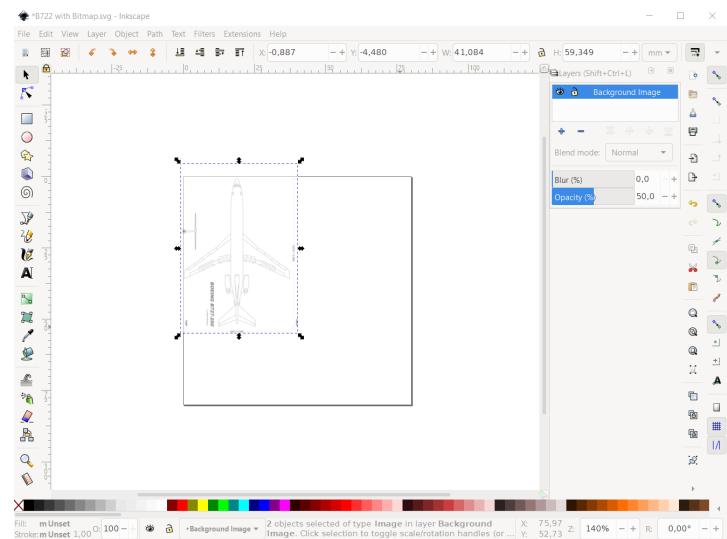
To rotate the drawing use *Menü Object / Rotate CW*:



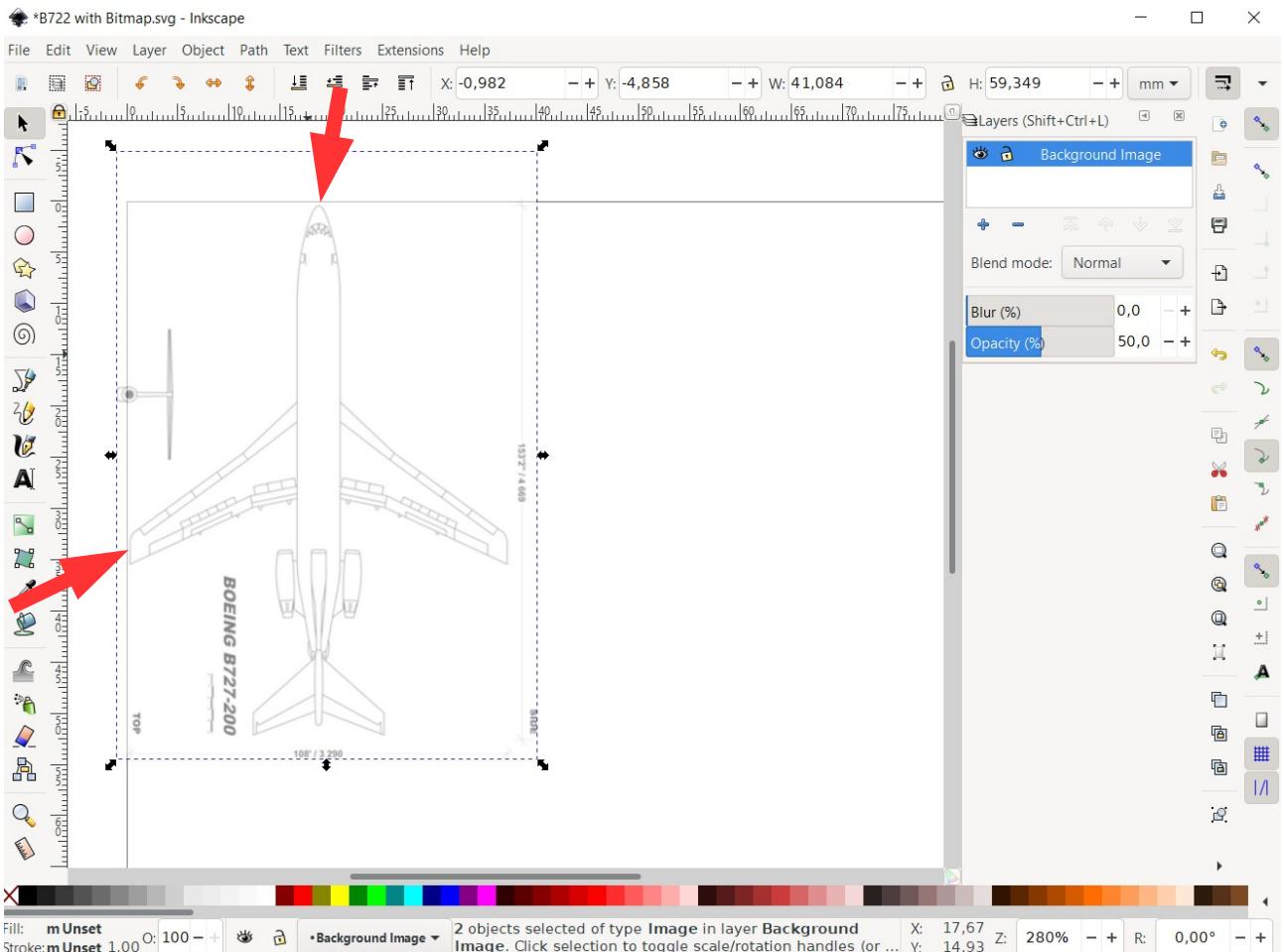
To adjust the size of Background Image, click on the lower right corner and press CTRL, then **resize** the drawing with left Mouse-button to make it fit into the canvas:



Drag the drawing and **line up** the aircraft exactly to the left upper corner of the canvas:



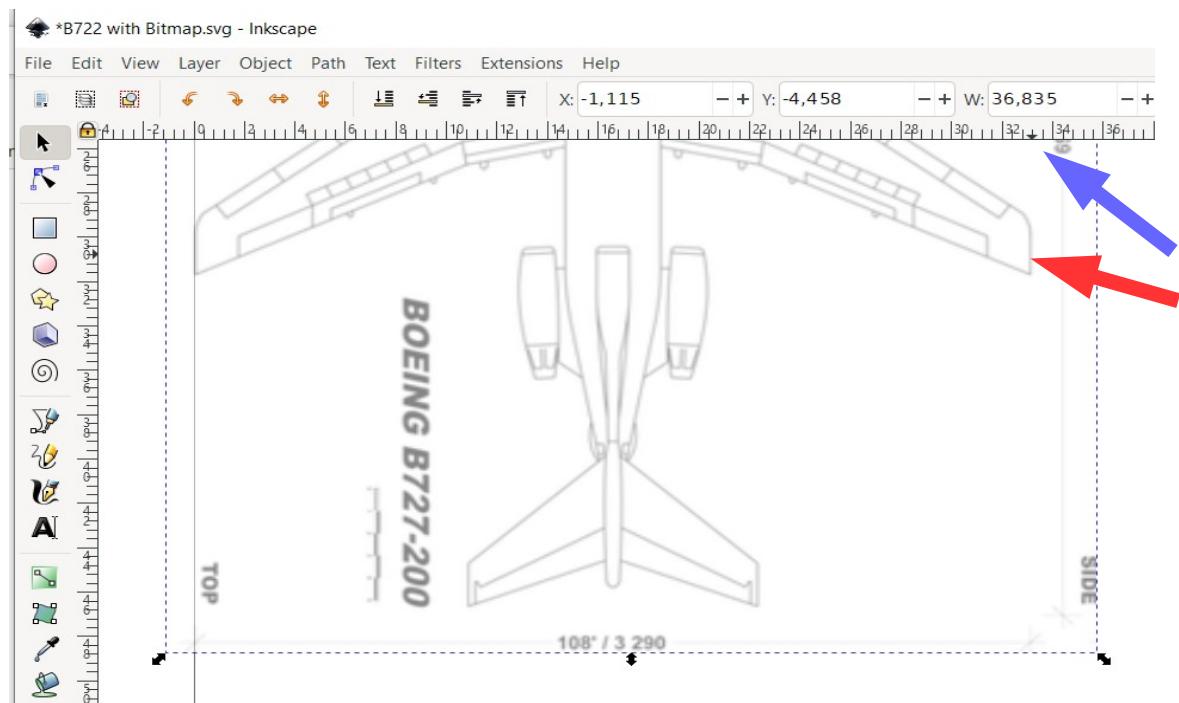
Resize the canvas with **CTRL+ Mousewheel** and move it, so that it looks like this:



Note the **ruler** above the drawing. We use the top ruler to resize the width of our drawing.

Remember: the original dimensions for the Boeing 727-100 are
 length = 46.68 meters
 width = 32.92 m (Wingspan)

Now we adjust the size of our drawing to reach the wingspan (in mm):



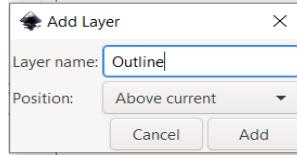
If you put the cursor on the right wing tip of our Boeing (red arrow), you can read out the exact width by the black marker on the ruler (blue arrow). Ofcourse this only works if you have lined up the aircraft properly on the left and top side.

If our drawing is right-scaled, the height has to be approximately 46.68 mm. We can read that out on the left side ruler.

Save file with CTRL+S.

Add Layer „Outline“

Menu Layer / Add Layer ...



Now draw the outline path on this layer.

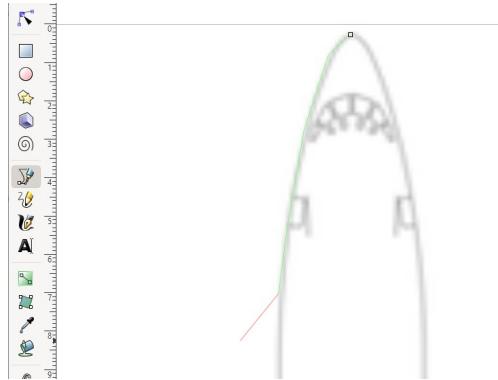
Use the tool „Draw Bezier Curves and straight lines“ from the left toolbar:



Zoom in (+) and use scrollbars to reach desired draw position.

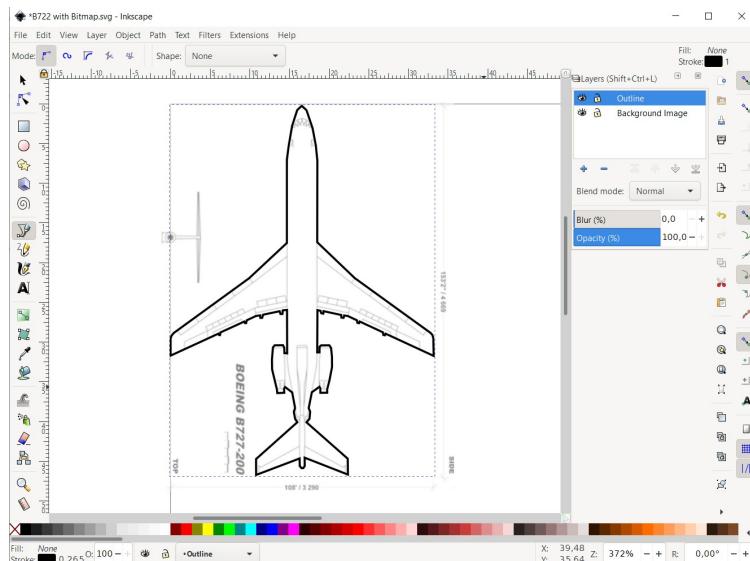
Try to draw the outline complete and do not interrupt.

Begin drawing at top of the aircraft and proceed drawing point for point.

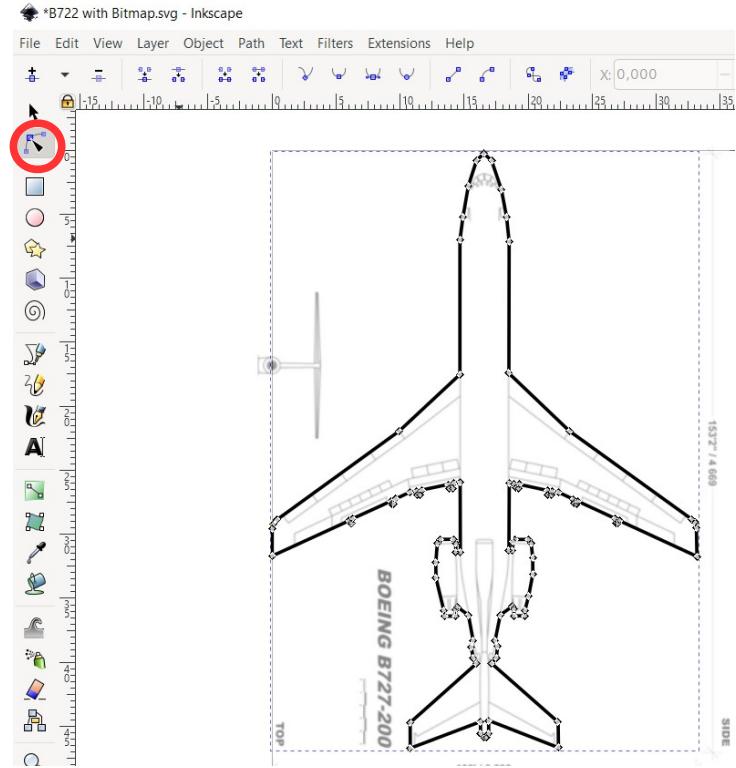


While drawing you can use mousewheel and CTRL+Mousewheel to zoom in and out or use scrollbars to move the window. If a point is wrong, use CTRL+Z for Undo ...

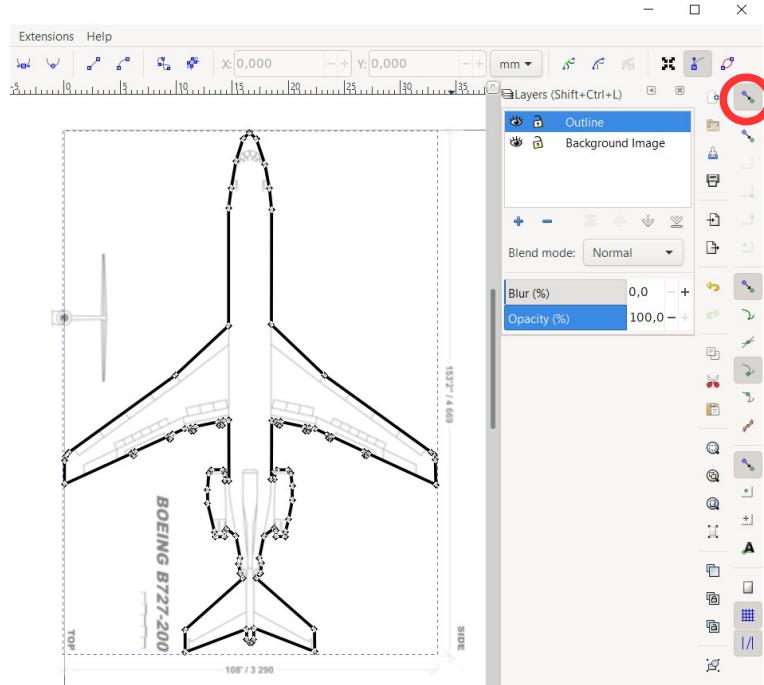
Finally „close“ your path, i.e. connect the last point with the start point (it has to snap in).



With this tool you can show the points of your outline path (your outline path must be selected):

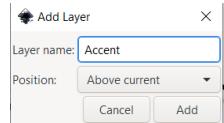


You can move the points for adjustments and corrections. If points snap in to something and can not be moved to a desired new position, then use this button to deactivate „snap in“:



Add Layer „Accent“

Menu Layer / Add Layer ...



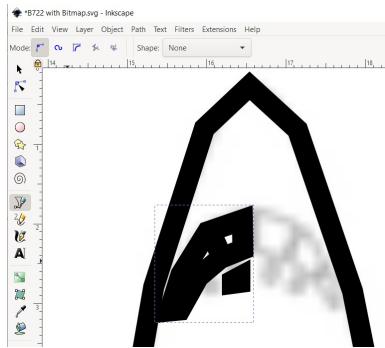
Now draw the accent lines on this layer.

Use the tool „Draw Bezier Curves and straight lines“ from the left toolbar:

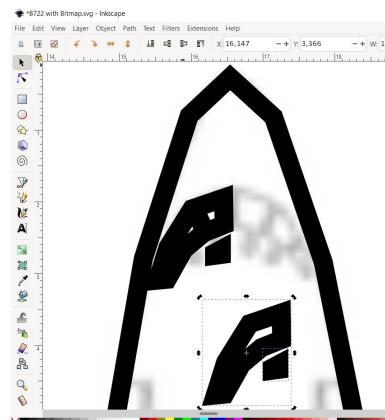


Zoom in (+) and use scrollbars to reach desired draw position.

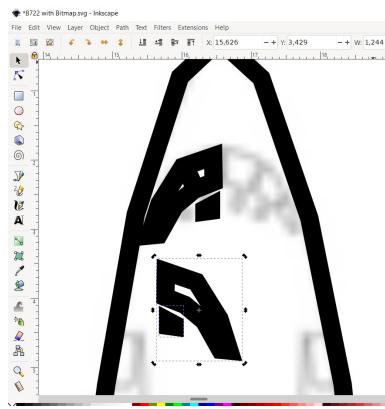
We begin with the cockpit. On the accent layer lines must not be closed. Therefore we can draw the cockpit windows separately. We begin with the left side windows:



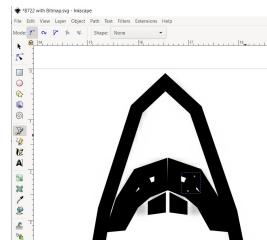
We select the objects, copy them to clipboard (CTRL-C) and paste them with CTRL-V:



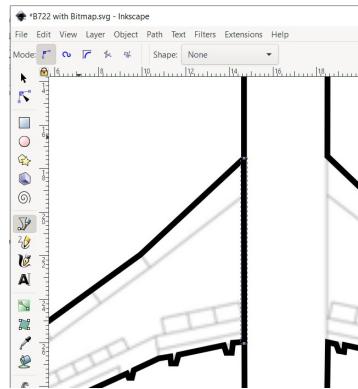
The selected objects can be rotated with *Menu Object / Flip Horizontal*:



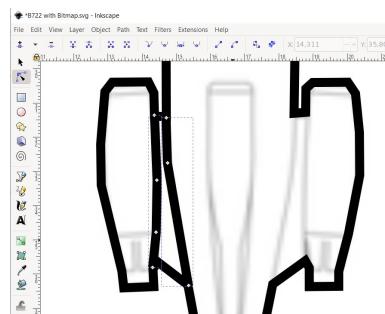
The copied cockpit windows can be moved to the left side of the cockpit section:



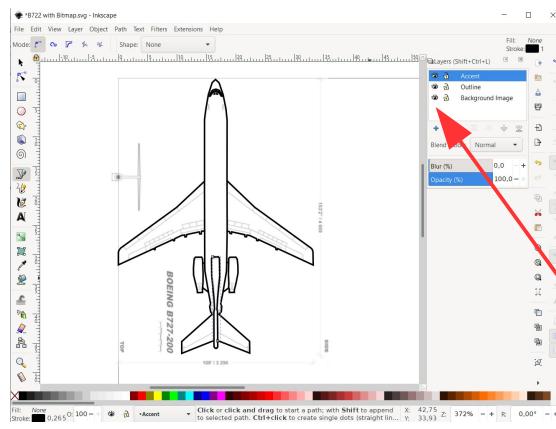
Now we proceed with the fuselage line above the left wing:



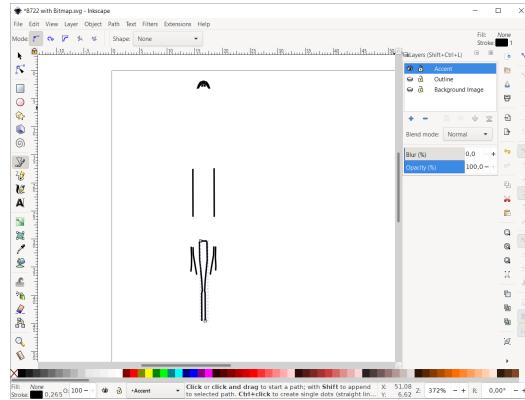
We repeat this with the right side and continue with the rear of our Tri-Jet:



Finally our aircraft looks like this:

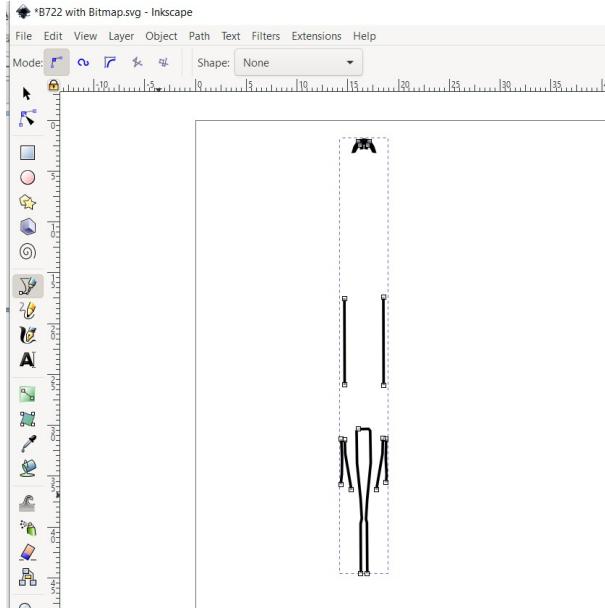


Now switch off visibility for layers „Background Image“ and „Outline“ by clicking the „eye“-symbol in front of the layers:

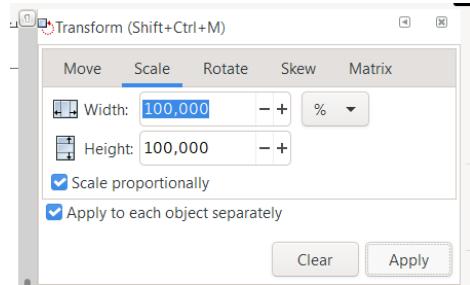


Select all lines on this layer with *Menu Edit / Select All*.

Then „combine“ all lines (on this layer „Accent“) as a single path with *Menu Path / Combine*:

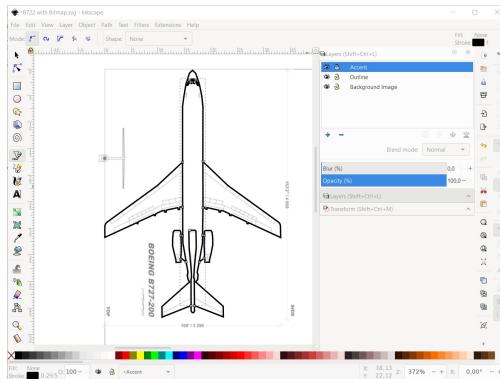


Important: We have to set „Scale proportionally“ for the combined path with *Menu Object / Transform ...*

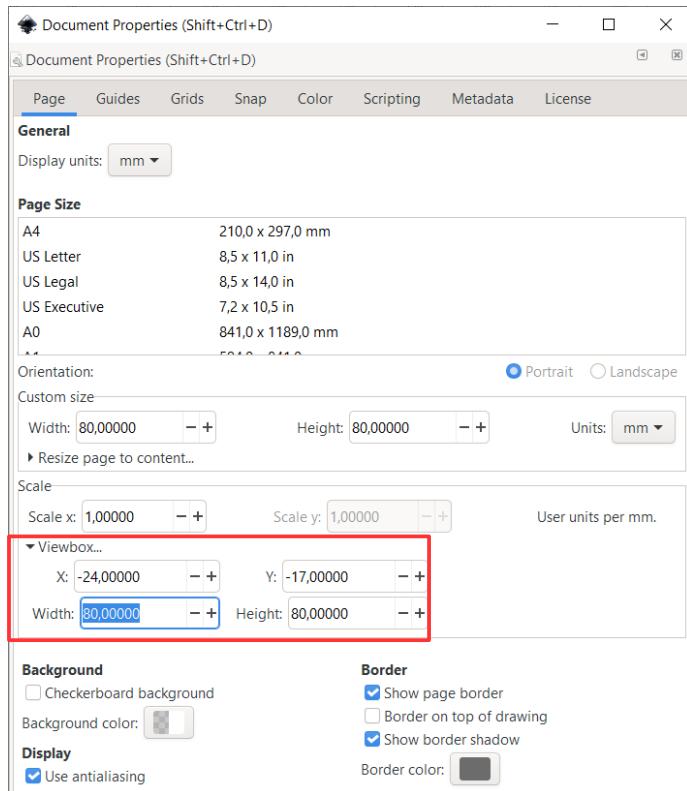


Select „Scale proportionally“ and press button „Apply“.

Make layers „Background Image“ and „Outline“ visual again by clicking the „eye“-symbol in front of the layers.



Change **Viewbox** to center the aircraft shape on the canvas with *Menu File / Document Properties ...*



Formula for centering in canvas:

$$X = \text{Round}(\text{canvas-width} - \text{aircraft-width})/2 * -1$$

$$Y = \text{Round}(\text{canvas-height} - \text{aircraft-length})/2 * -1$$

$$X = \text{Round}(80 \text{ mm} - 32.92 \text{ mm})/2 * -1 = -24$$

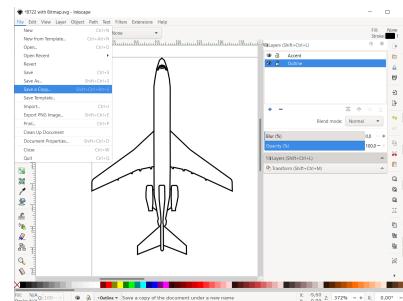
$$Y = \text{Round}(80 \text{ mm} - 46.68 \text{ mm})/2 * -1 = -17$$

Save file with CTRL-S.

Our **source-file „B722 with Bitmap.svg“** is now done.

Create svg-file

Select Layer „Background Image“ and delete it by pressing the „Minus“-Button.



Save file as a copy (important!) with filename **B722.svg.**

Read out parameters for use in tar1090

Open an editor and create a new file with this text (please copy text from here):

```
// Mac Donnell-Douglas A4 Skyhawk (ICAO A4)
'md_a4': {
  viewBox:'-4.2 -1 32 32',
  id: 26,
```

```

w: 26,
h: 26,
accentMult: 0.8,
strokeScale: 1.1,
path: 'M11.7 26.5H8v-.7s0-.3.3-.6l2.6-2.4s-.2-1-.3-4H3v-2.4l.3-.6 6.3-5.5.2-
1.3s.3-.2.6-.1V7.8s0-.2.2 0c 0 0-3.5.5-6.2 0 0 .3-1.2.7-1.2.4 0 .7 1.2.7 1.2.5 2.7.5 6.2.5 6.2
0-.2.2 0 .2 0v11.6.2.2 1.3 6.3 5.5c.3.4.2.6.2.6v2.3h-7.4c-.1 3-.3 4-.3 412.6
2.5c.3.3.3.6.3.6v.7H12l-.1.5-.2-.5z',
accent: 'M9.7 20.41.9-1.7-1-8.4-.9-1.4M14 20.41-.8-1.7.9-8.4 1-1.4',
},

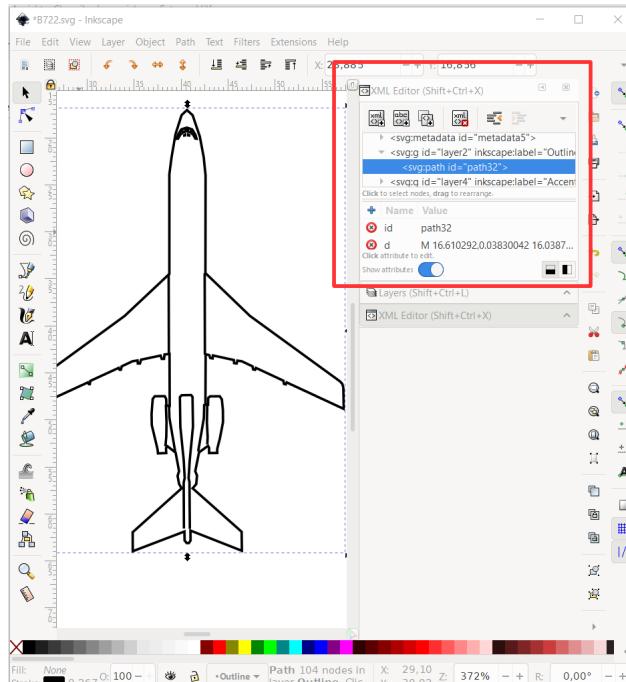
```

Within the next steps we will fill or change the marked text/variables.

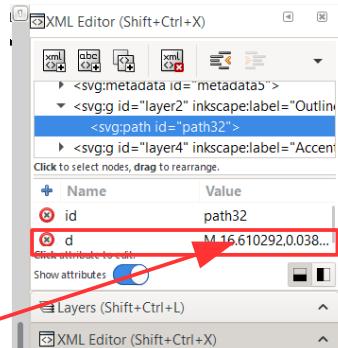
Change description to Boeing 727-200 (ICAO B722) and shape name md_a4 to B722.
 Change „h“ and „w“ from value „26“ to „80“ (the height and width of our canvas).

Go back to Inkscape.

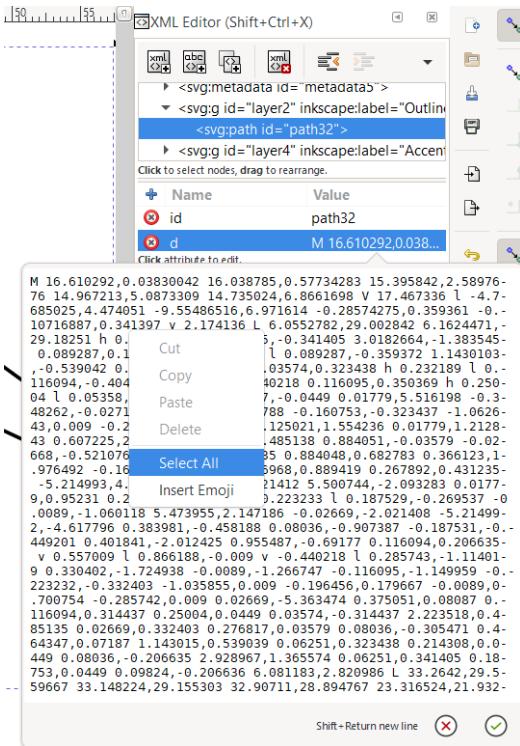
Open XML-Editor with *Menu Edit / XML-Editor ...*



Go to XML-Editor, scroll down to XML-Element with label „Outline“, click on the small arrow left side, this opens the path-Element in this layer:



A click on column „Value“ at element „d“ shows the complete path:

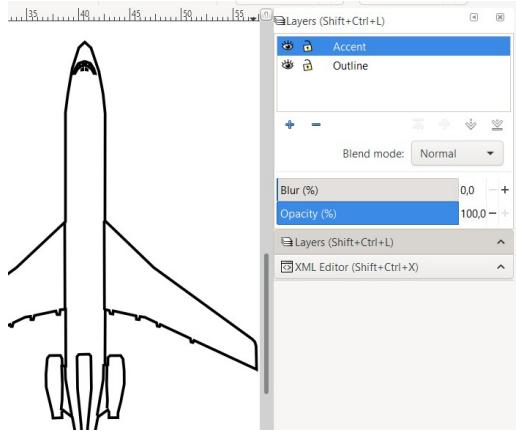


Right-click into the path, choose „Select All“ and then „Copy“. Now the path is in clipboard. Go back to Editor, paste path from clipboard exactly like this:

```
// Boeing 727-200 (ICAO B722)
'B722': {
    viewBox: '-4.2 -1 32 32',
    id: 26,
    w: 80,
    h: 80,
    accentMult: 0.8,
    strokeScale: 1.1,
    path: 'M 16.610292,0.03830042 16.038785,0.57734283 15.395842,2.5897676 14.967213,5.0873309
14.735024,6.8661698 V 17.467336 l -4.7685025,4.474051 -9.55486516,6.971614 -0.28574275,0.359361
-0.10716887,0.341397 v 2.174136 L 6.0552782,29.002842 6.1624471,29.18251 h 0.1071688 1 0.053585,-
0.341405 3.0182664,-1.383545 0.089287,0.197635 h 0.1428714 1 0.089287,-0.359372 1.1430103,-0.539042
0.535786,-0.08983 0.03574,0.323438 h 0.232189 1 0.116094,-0.404277 2.080637,-0.440218
-0.116095,0.350369 h 0.25004 1 0.05358,-0.467171 0.526857,-0.0449 0.01779,5.516198 -0.348262,-0.02711
-0.01779,-0.682788 -0.160753,-0.323437 -1.062643,0.009 -0.214307,0.278503 -0.125021,1.554236
0.01779,1.212843 0.607225,2.542488 0.05358,0.485138 0.884051,-0.03579 -0.02668,-0.521076 0.142871,-
0.206635 0.884048,0.682783 0.366123,1.976492 -0.160755,0.494122 0.16968,0.889419 0.267892,0.431235
-5.214993,4.671696 0.0089,2.021412 5.500744,-2.093283 0.01779,0.95231 0.223233,0.278503 h 0.223233 1
0.187529,-0.269537 -0.0089,-1.060118 5.473955,2.147186 -0.02669,-2.021408 -5.214992,-4.617796
0.383981,-0.458188 0.08036,-0.907387 -0.187531,-0.449201 0.401841,-2.012425 0.955487,-0.69177
0.116094,0.206635 v 0.557009 1 0.866188,-0.009 v -0.440218 1 0.285743,-1.114019 0.330402,-1.724938
-0.0089,-1.266747 -0.116095,-1.149959 -0.223232,-0.332403 -1.035855,0.009 -0.196456,0.179667
-0.0089,0.700754 -0.285742,0.009 0.02669,-5.363474 0.375051,0.08087 0.116094,0.314437 0.25004,0.0449
0.03574,-0.314437 2.223518,0.485135 0.02669,0.332403 0.276817,0.03579 0.08036,-0.305471
0.464347,0.07187 1.143015,0.539039 0.06251,0.323438 0.214308,0.0449 0.08036,-0.206635
2.928967,1.365574 0.06251,0.341405 0.18753,0.0449 0.09824,-0.206636 6.081183,2.820986 L
33.2642,29.559667 33.148224,29.155303 32.90711,28.894767 23.316524,21.93214 18.57481,17.377231
18.5926,6.9916804 18.396145,5.0690966 17.985372,2.8769899 17.217413,0.59504569 z',
    accent: 'M9.7 20.41.9-1.7-1-8.4-9-1.4M14 20.41-8-1.7.9-8.4 1-1.4',
},
},
```

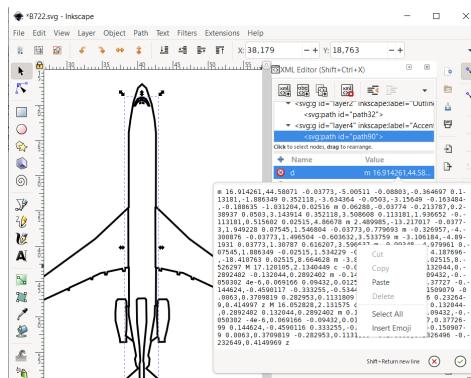
Go back to Inkscape.

Change layer to „Accent“:



Open XML-Editor.

Scroll down to XML-Element with label „Accent“, click on the small arrow left side, this opens the path-Element in this layer. A click on column „Value“ at element „d“ shows the complete path:



Right-click into the path, choose „Select All“ and then „Copy“. Now the path is in clipboard.
Go back to Editor, paste path from clipboard exactly like **this**:

```
// Boeing 727-200 (ICAO B722)
'B722': {
    viewBox: '-4.2 -1 32 32',
    id: 26,
    w: 80,
    h: 80,
    accentMult: 0.8,
    strokeScale: 1.1,
    path: 'M 16.610292,0.03830042 16.038785,0.57734283 15.395842,2.5897676 14.967213,5.0873309 14.735024,6.8661698 V 17.467336 L -4.7685025,4.474051 -9.55486516,6.971614 -0.28574275,0.359361 -0.10716887,0.341397 V 2.174136 L 6.0552782,29.002842 6.1624471,29.18251 H 0.1071688 L 0.053585,-0.341405 3.0182664,-1.383545 0.089287,0.197635 H 0.1428714 L 0.089287,-0.359372 1.1430103,-0.539042 0.535786,-0.08983 0.03574,0.323438 H 0.232189 L 0.116094,-0.404277 2.080637,-0.440218 0.116095,0.350369 H 0.25004 L 0.05358,-0.467171 0.526857,-0.0449 0.01779,5.516198 -0.348262,-0.02711 -0.01779,-0.682788 -0.160753,-0.323437 -1.062643,0.009 -0.214307,0.278503 -0.125021,1.554236 0.01779,1.212843 0.607225,2.542488 0.05358,0.485138 0.884051,-0.03579 -0.02668,-0.521076 0.142871,-0.206635 0.884048,0.682783 0.366123,1.976492 -0.160755,0.494122 0.16968,0.889419 0.267892,0.431235 -5.214993,4.671696 0.0089,2.021412 5.500744,-2.093283 0.01779,0.95231 0.223233,0.278503 H 0.223233 L 0.187529,-0.269537 -0.0089,-1.060118 5.473955,2.147186 -0.02669,-2.021408 -5.214992,-4.617796 0.383981,-0.458188 0.08036,-0.907387 -0.187531,-0.449201 0.401841,-2.012425 0.955487,-0.69177 0.116094,0.206635 V 0.557009 L 0.866188,-0.009 V -0.440218 L 0.285743,-1.114019 0.330402,-1.724938 -0.0089,-1.266747 -0.116095,-1.149959 -0.223232,-0.332403 -1.035855,0.009 -0.196456,0.179667 -0.0089,0.700754 -0.285742,0.009 0.02669,-5.363474 0.375051,0.08087 0.116094,0.314437 0.25004,0.0449 0.03574,-0.314437 2.223518,0.485135 0.02669,0.332403 0.276817,0.03579 0.08036,-0.305471 0.464347,0.07187 L 1.143015,0.539039 0.06251,0.323438 0.214308,0.0449 0.08036,-0.206635 2.928967,1.365574 0.06251,0.341405 0.18753,0.0449 0.09824,-0.206636 6.081183,2.820986 L 33.2642,29.559667 33.148224,29.155303 32.90711,28.894767 23.316524,21.93214 18.57481,17.377231 18.5926,6.9916804 18.396145,5.0690966 17.985372,2.8769899 17.217413,0.59504569 Z',accent: 'm 16.914261,44.58071 -0.03773,-5.00511 -0.08803,-0.364697 0.113181,-1.886349 0.352118,-3.634364 -0.0503,-3.15649 -0.163484,-0.188635 -0.031204,-0.02516 m 0.06288,-0.03774 -0.213787,0.238937 0.0503,3.143914 0.352118,3.508608 0.113181,1.936652 -0.113181,0.515602 0.02515,4.86678 m 2.489985,-13.217017 -0.03773,1.949228 0.07545,1.546804 -0.03773,0.779693 m -0.326957,-4.300876 -0.03773,1.496504 -0.603632,3.533759 m -3.106184,-4.891931 0.03773,1.30787 0.616207,3.596637 m -0.99348,-4.979961 0.07545,1.886349 -0.02515,1.534229 -0.100604,1.01863 m'
```

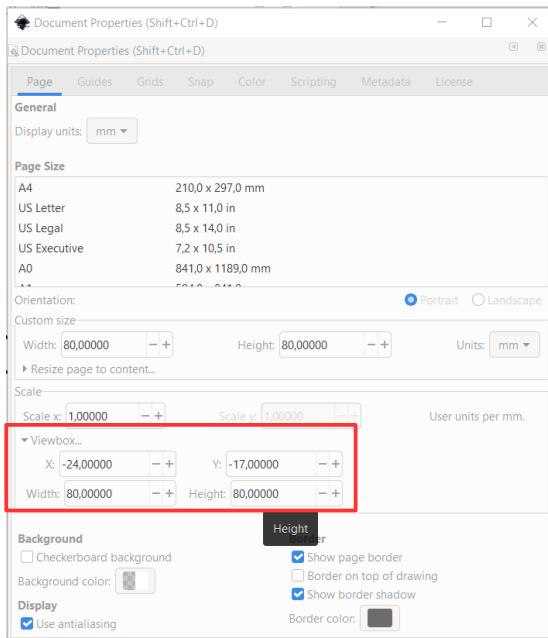
```

4.187696,-18.410763 0.02515,8.664628 m -3.860724,-8.551447 0.02515,8.526297 M 17.120105,2.1340449 c
-0.05659,0.081742 -0.132044,0.2892402 -0.132044,0.2892402 m -0.140832,0.290957 -0.09432,-0.050302
4e-6,0.069166 0.09432,0.012576 z m 0.792267,0.37727 -0.144624,-0.4590117 -0.333255,-0.5344654
-0.440149,-0.1509079 -0.0063,0.3709819 0.282953,0.1131809 0.276665,0.2326496 0.2326499,0.414997 z M
16.052828,2.131575 c 0.05659,0.081742 0.132044,0.2892402 0.132044,0.2892402 m 0.138333,0.2955278
0.09432,-0.050302 -4e-6,0.069166 -0.09432,0.012576 z m -0.792267,0.3772699 0.144624,-0.4590116
0.333255,-0.5344654 0.440149,-0.1509079 0.0063,0.3709819 -0.282953,0.1131809 -0.276665,0.2326496
-0.232649,0.4149969 z',
},

```

Go back to Inkscape.

Open „Document Properties“ with Shift+CTRL+D:



Copy the Values in Viewbox ... (-24 -17 80 80) to our XML-Code in Editor:

```

// Boeing 727-200 (ICAO B722)
'B722': {
  viewBox: '-24 -17 80 80',
  id: 78,
  w: 80,
  h: 80,
  accentMult: 0.8,
  strokeScale: 1.1,
  path: 'M 16.610292,0.03830042 16.038785,0.57734283 15.395842,2.5897676 14.967213,5.0873309
14.735024,6.8661698 V 17.467336 l -4.7685025,4.474051 -9.55486516,6.971614 -0.28574275,0.359361
-0.10716887,0.341397 v 2.174136 L 6.0552782,29.002842 6.1624471,29.18251 h 0.1071688 l 0.053585,-
0.341405 3.0182664,-1.383545 0.089287,0.197635 h 0.1428714 l 0.089287,-0.359372 1.1430103,-0.539042
0.535786,-0.08983 0.03574,0.323438 h 0.232189 l 0.116094,-0.404277 2.080637,-0.440218
0.116095,0.350369 h 0.25004 l 0.05358,-0.467171 0.526857,-0.0449 0.01779,5.516198 -0.348262,-0.02711
-0.01779,-0.682788 -0.160753,-0.323437 l -1.062643,0.009 -0.214307,0.278503 -0.125021,1.554236
0.01779,1.212843 0.607225,2.542488 0.05358,0.485138 0.884051,-0.03579 -0.02668,-0.521076 0.142871,-
0.206635 0.884048,0.682783 0.366123,1.976492 -0.160755,0.494122 0.16968,0.889419 0.267892,0.431235
-5.214993,4.671696 0.0089,2.021412 5.500744,-2.093283 0.01779,0.95231 0.223233,0.278503 h 0.223233 l
0.187529,-0.269537 -0.0089,-1.060118 5.473955,2.147186 -0.02669,-2.021408 -5.214992,-4.617796
0.383981,-0.458188 0.08036,-0.907387 -0.187531,-0.449201 0.401841,-2.012425 0.955487,-0.69177
0.116094,0.206635 v 0.557009 l 0.866188,-0.009 v -0.440218 l 0.285743,-1.114019 0.330402,-1.724938
-0.0089,-1.266747 -0.116095,-1.149959 -0.223232,-0.332403 -1.035855,0.009 -0.196456,0.179667
-0.0089,0.700754 -0.285742,0.009 0.02669,-5.363474 0.375051,0.08087 0.116094,0.314437 0.25004,0.0449
0.03574,-0.314437 2.223518,0.485135 0.02669,0.332403 0.276817,0.03579 0.08036,-0.305471
0.464347,0.07187 1.143015,0.539039 0.06251,0.323438 0.214308,0.0449 0.08036,-0.206635
2.928967,1.365574 0.06251,0.341405 0.18753,0.0449 0.09824,-0.206636 6.081183,2.820986 L
33.2642,29.559667 33.148224,29.155303 32.90711,28.894767 23.316524,21.93214 18.57481,17.377231
18.5926,6.9916804 18.396145,5.0690966 17.985372,2.8769899 17.217413,0.59504569 z',
  accent: 'm 16.914261,44.58071 -0.03773,-5.00511 -0.08803,-0.364697 0.113181,-1.886349
0.352118,-3.634364 -0.0503,-3.15649 -0.163484,-0.188635 -1.031204,0.02516 m 0.06288,-0.03774
-0.213787,0.238937 0.0503,3.143914 0.352118,3.508608 0.113181,1.936652 -0.113181,0.515602
0.02515,4.86678 m 2.489985,-13.217017 -0.03773,1.949228 0.07545,1.546804 -0.03773,0.779693 m
-0.326957,-4.300876 -0.03773,1.496504 -0.603632,3.533759 m -3.106184,-4.891931 0.03773,1.30787
0.616207,3.596637 m -0.99348,-4.979961 0.07545,1.886349 -0.02515,1.534229 -0.100604,1.01863 m
4.187696,-18.410763 0.02515,8.664628 m -3.860724,-8.551447 0.02515,8.526297 M 17.120105,2.1340449 c
-0.05659,0.081742 -0.132044,0.2892402 -0.132044,0.2892402 m -0.140832,0.290957 -0.09432,-0.050302

```

```

4e-6,0.069166 0.09432,0.012576 z m 0.792267,0.37727 -0.144624,-0.4590117 -0.333255,-0.5344654
-0.440149,-0.1509079 -0.0063,0.3709819 0.282953,0.1131809 0.276665,0.2326496 0.232649,0.414997 z M
16.052828,2.131575 c 0.05659,0.081742 0.132044,0.2892402 0.132044,0.2892402 m 0.138333,0.2955278
0.09432,-0.050302 -4e-6,0.069166 -0.09432,0.012576 z m -0.792267,0.3772699 0.144624,-0.4590116
0.333255,-0.5344654 0.440149,-0.1509079 0.0063,0.3709819 -0.282953,0.1131809 -0.276665,0.2326496
-0.232649,0.4149969 z',
},

```

Important: the new aircraft shape B722 has to be assigned in „TypedesignatorIcons“ in `markers.js`.
Search for „B722“ and find:

```

'MD90': ['jet_swept', 1.06],
'B712': ['jet_swept', 1.06], // 54t
'F100': ['jet_swept', 1], // 45t
'B721': ['jet_swept', 1.10], // 80t
'B722': ['jet_swept', 1.10], // 80t

'T154': ['jet_swept', 1.12], // 100t

```

This assignment has to be changed to

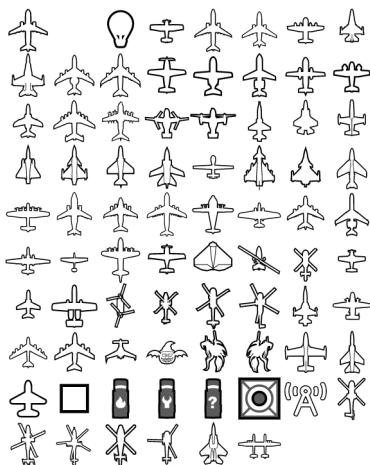
```
'B722': ['B722', 1.10], // 80t
```

Maybe it is required to change the scale factor 1.10, too.

There is only one task left: our B722 needs a unique **id**. We set this value to 78. This parameter is explained at the end of the next chapter.

Export B722.svg to B722.PNG

Tar1090 has a webGL-Mode. When active (default), tar1090 does not use the svg-data (path, accent etc.) from `markers.js`, instead a PNG-file `sprites010.png` is used:



Source: <https://github.com/wiedehopf/tar1090/blob/master/html/images/sprites010.png>

`sprites010.png` contains a matrix of shapes, each with a size of 72px * 72px. We have to add our B722-shape to this matrix.

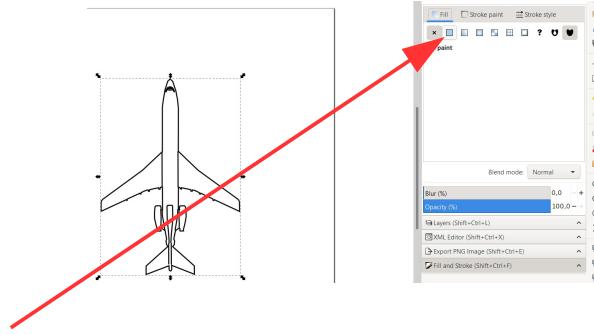
The first step is to export B722.svg to B722.png.

Open B722.svg in Inkscape.

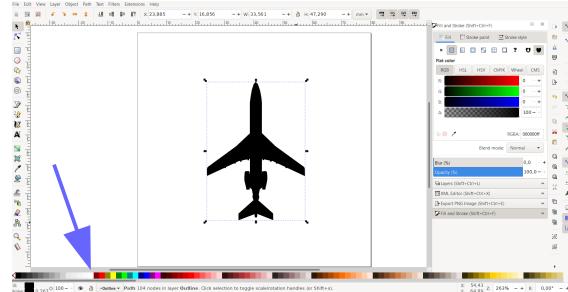
Select layer „Outline“.

Select all with CTRL+A.

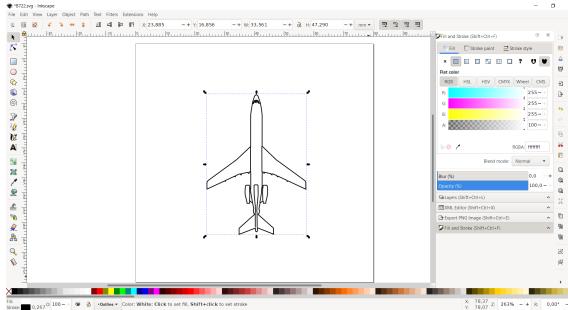
Select Menu Object / Fill and Strike ...



Press Button „Flat color“. Default fill color is „black“, we change the color to „white“ (press „color-button“ marked with the blue arrow).



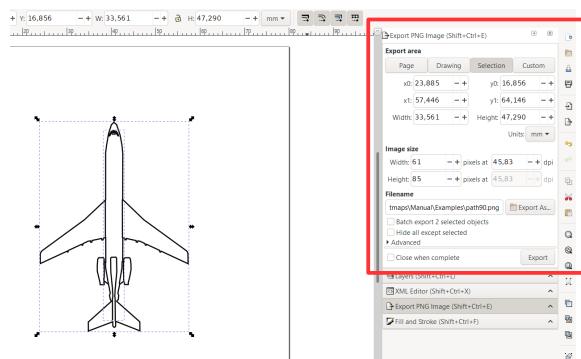
Fill color changes to „white“:



Do not (!) save file!

Select All in All layers with CTRL+ALT+A.

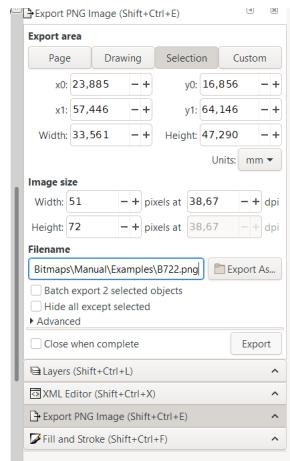
Open Export-command with Menu File / Export PNG-Image ...



Set Image Size:

To maximize our shape in a box of 72px * 72px we change the one of the values *width* or *height* to 72 which is greater than the other. For our B722 we change „Height“ from 85 to 72, and Inkscape adjusts „Width“ automatically to 51.

Set Filename: replace „path90.png“ with „B722.png“.

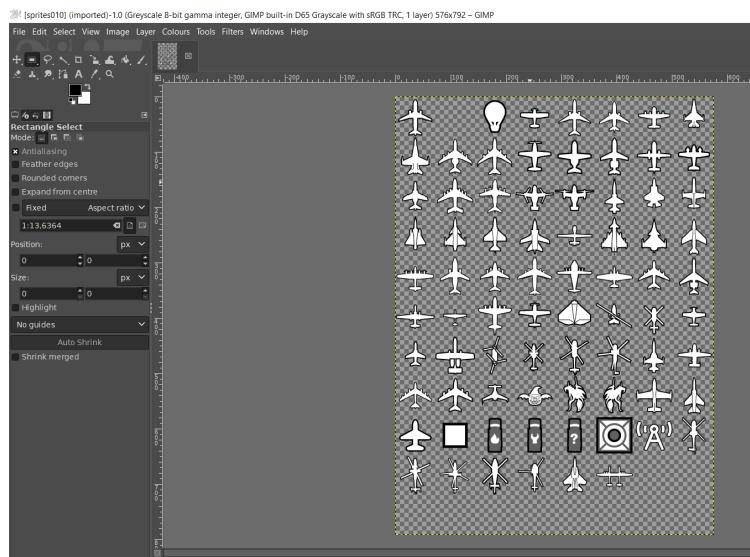


Do not forget to press button „Export“, otherwise nothing will happen.
Do **not (!)** save file, instead revert all changes with *Menu File / Revert*.

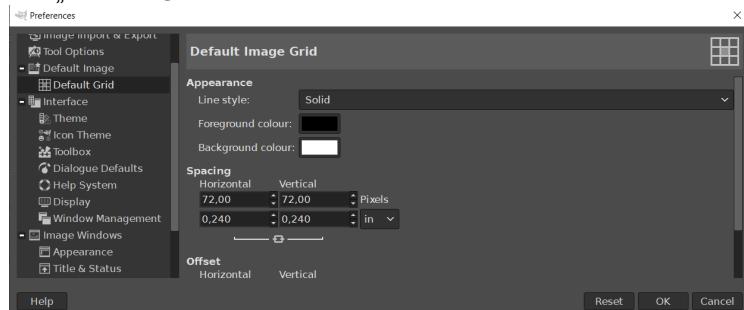
Make a backup of file `sprites010.png`.

Open GIMP.

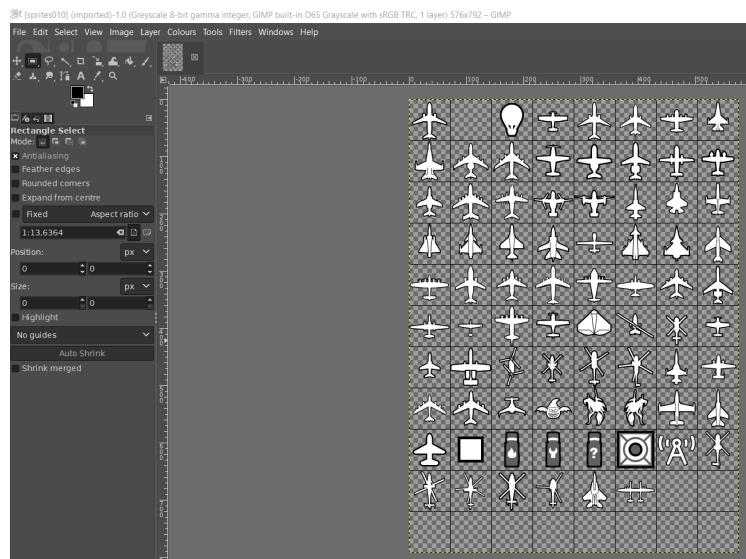
Inside GIMP open File `sprites010.png`



Open Preferences and set „Default Grid“ like this:



Apply Grid with *Menu View / Show Grid*:



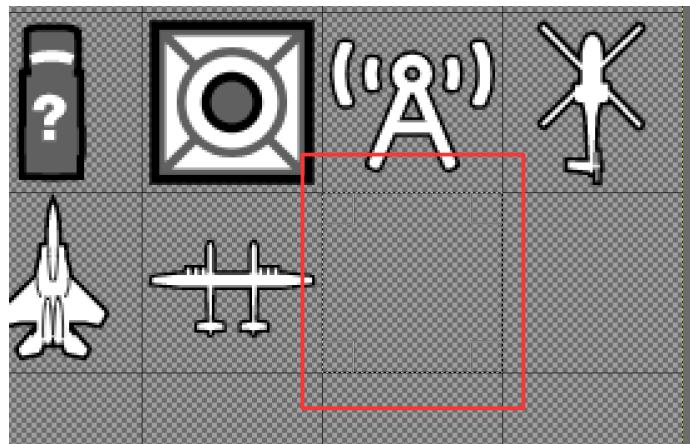
Now open B722.png.

Select complete image with CTRL+A.

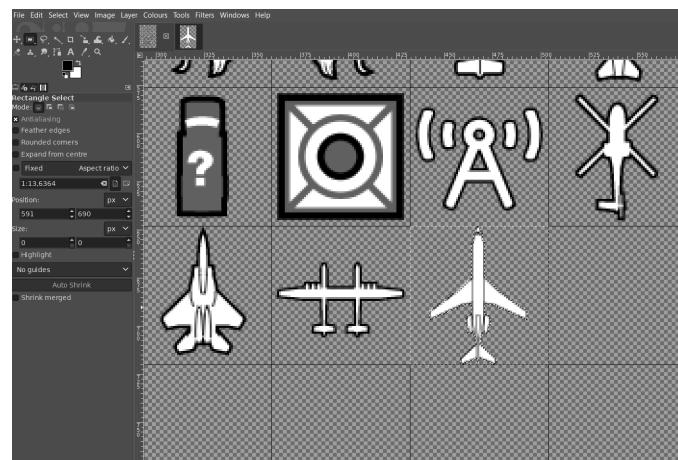
Copy image to clipboard with CTRL+C.

Switch to File sprites010.png.

Select the next empty cell with your mouse (size of selection must be 72px * 72px):



Paste the image from clipboard into the selected cell (*Menu Edit / Paste Into Selection*):



Save File sprites010.png with *Menu File / Overwrite sprites010.png*.

Now we can set the id. It must match with the position of the B722 on the sprite. We add 1 to the value of the „strato“, which has id = 77.

The **id** for B722 in this example is **78**.

Add new aircraft shape to BelugaProject

Adding shape to Database belugaDb

In BelugaProject the svg-code is in a postgresql database table „shape_data“. Postgresql comes with an administration tool „pgAdmin“. This tool allows to edit the content of tables. Navigate to table „shape data“ and use the command View/Edit Data ...:

designator	creator	description	orig_length	orig_width	shape_data	version
B38M	RexKramer1	B38M (B737 Max 8)	39.47	35.92	{"h": 80, "w": 80, "r": 2.0}	
B39M	RexKramer1	B39M (B737 Max 9)	42.11	35.92	{"h": 80, "w": 80, "r": 2.0}	
B52	RexKramer1	B52 (Boeing B-52 Stratofortress)	48.3	56.4	{"h": 80, "w": 80, "r": 2.0}	
B703	RexKramer1	B707 (Boeing 707-300)	46.6	44.4	{"h": 80, "w": 80, "r": 2.0}	
B712	RexKramer1	B712 (Boeing / McDonnell Do...	37.81	28.45	{"h": 80, "w": 80, "r": 2.0}	
B733	RexKramer1	B733 (Boeing 737-300 (WL))	32.18	31.22	{"h": 80, "w": 80, "r": 2.0}	
B734	RexKramer1	B734 (Boeing 737-400)	35.23	28.88	{"h": 80, "w": 80, "r": 2.0}	
B735	RexKramer1	B735 (Boeing 737-500)	31.01	28.9	{"h": 80, "w": 80, "r": 2.0}	
B737	RexKramer1	B737 (Boeing 737-700WL)	33.63	35.79	{"h": 80, "w": 80, "r": 2.0}	

Select a row and press the copy-Button, then the Insert-Button:

designator	creator	description	orig_length	orig_width	shape_data	version
A170	RexKramer1	A170 (ALENIA ATR-72-500)	27.17	27.03	{"h": 80, "w": 80, "r": 2.0}	
ATP	RexKramer1	ATP (British Aerospace ATP)	26.01	30.63	{"h": 80, "w": 80, "r": 2.0}	
B190	RexKramer1	B190 (Beechcraft 1900D)	17.63	17.65	{"h": 80, "w": 80, "r": 2.0}	
B29	RexKramer1	Boeing B-29 Stratofortress	30.18	43.05	{"h": 80, "w": 80, "r": 2.0}	
B350	RexKramer1	B350 (Beechcraft King Air 350)	14.22	17.65	{"h": 80, "w": 80, "r": 2.0}	
B38M	RexKramer1	B38M (B737 Max 8)	39.47	35.92	{"h": 80, "w": 80, "r": 2.0}	
B39M	RexKramer1	B39M (B737 Max 9)	42.11	35.92	{"h": 80, "w": 80, "r": 2.0}	
B52	RexKramer1	B52 (Boeing B-52 Stratofortress)	48.3	56.4	{"h": 80, "w": 80, "r": 2.0}	
B703	RexKramer1	B707 (Boeing 707-300)	46.6	44.4	{"h": 80, "w": 80, "r": 2.0}	
B712	RexKramer1	B712 (Boeing / McDonnell Do...	37.81	28.45	{"h": 80, "w": 80, "r": 2.0}	
B733	RexKramer1	B733 (Boeing 737-300 (WL))	32.18	31.22	{"h": 80, "w": 80, "r": 2.0}	
B734	RexKramer1	B734 (Boeing 737-400)	35.23	28.88	{"h": 80, "w": 80, "r": 2.0}	

The result is a new row with the copied content at the end of the table:

Data Output Explain Messages Notifications

designator	creator	description	orig_length	orig_width	shape_data	version
[PK] character varying (255)	character varying (255)	character varying (255)	double precision	double precision	jsonb	character varying
184 S095	RexKramer1	Sukhoi Su-100-95	29.87	27.8	{"n": 80, "w": 80, ...}	2.0
185 T204	RexKramer1	Tupolev Tu-204-100	46	42	{"h": 80, "w": 80, ...}	2.0
186 T38	RexKramer1	Northrop T38 Talon	14	7.7	{"h": 80, "w": 80, ...}	2.0
187 TIGR	RexKramer1	Eurocopter Tiger	15.8	13	{"h": 80, "w": 80, ...}	2.0
188 TOR_fast	RexKramer1	Panavia Tornado (ICAO TOR) i...	16.72	13.9	{"h": 80, "w": 80, ...}	2.0
189 TOR_slow	RexKramer1	Panavia Tornado (ICAO TOR) i...	16.72	13.9	{"h": 80, "w": 80, ...}	2.0
190 Twin_prop_large	RexKramer1	Default shape (Fokker F50)	25.25	29	{"h": 80, "w": 80, ...}	2.0
191 U2	RexKramer1	Lockheed U-2 Dragon Lady (U...)	19.13	31.39	{"h": 80, "w": 80, ...}	2.0
192 UH1	RexKramer1	Bell UH1D	17.4	14.63	{"h": 80, "w": 80, ...}	2.0
193 unidentified	RexKramer1	Default-Shape für unknown ty...	26	30	{"h": 40, "w": 40, ...}	2.0
194 unknown	unknown	Default shape (out of use)	0	0	{"h": 22, "w": 22, ...}	1.0
195 V22_fast	RexKramer1	Bell-Boeing V22 Osprey (fast)	17.48	13.94	{"h": 80, "w": 80, ...}	2.0
196 V22_slow	RexKramer1	Bell-Boeing V22 Osprey (slow)	17.48	13.94	{"h": 80, "w": 80, ...}	2.0
197 B712	RexKramer1	B712 (Boeing / McDonnell Do...	37.81	28.45	{"h": 80, "w": 80, ...}	2.0

Change the attributes for B722: doubleclick into each field, then edit the field content.

id	designator	creator	description	orig_length	orig_width	shape_data	version
196	V22_slow	RexKramer1	Bell-Boeing V22 Osprey (slow)	17.48	13.94	{"h": 80, "w": 80, ...}	2.0
197	B722	RexKramer1	B722 (Boeing B727-200)	46.68	30.59	{"h": 80, "w": 80, ...}	2.0

Save changes with this button:

The screenshot shows a PostgreSQL browser window with the 'shape_data' column selected. Below the table, there's a toolbar with various icons, and a prominent 'Save Data Changes (F6)' button.

The column „shape data“ contains the JSON-Code from the svg-file.

The structure in Beluga Project is similar to tar1090:

```
{
  "h": 80,
  "w": 80,
  "path": [
    "",
    "accent": [
      ""
    ],
    "viewBox": "0 0 80 80",
    "accentMult": 1.0,
    "strokeScale": 1.0
}
```

Open an text editor, copy this JSON-snippet into a file and replace the values in the same way as described for tar1090 before.

The result should be:

```
{
  "h": 80,
  "w": 80,
  "path": [
    "M 16.610292,0.03830042 16.038785,0.57734283 15.395842,2.5897676 14.967213,5.0873309
14.735024,6.8661698 V 17.467336 l -4.7685025,4.474051 -9.55486516,6.971614 -0.28574275,0.359361
-0.10716887,0.341397 v 2.174136 L 6.0552782,29.002842 6.1624471,29.18251 h 0.1071688 l 0.053585,-
0.341405 3.0182664,-1.383545 0.089287,0.197635 h 0.1428714 l 0.089287,-0.359372 1.1430103,-0.539042
0.535786,-0.08983 0.03574,0.323438 h 0.232189 l 0.116094,-0.404277 2.080637,-0.440218
0.116095,0.350369 h 0.25004 l 0.05358,-0.467171 0.526857,-0.0449 0.01779,5.516198 -0.348262,-0.02711
-0.01779,-0.682788 -0.160753,-0.323437 -1.062643,0.009 -0.214307,0.278503 -0.125021,1.554236
0.01779,1.212843 0.607225,2.542488 0.05358,0.485138 0.884051,-0.03579 -0.02668,-0.521076 0.142871,-
0.206635 0.884048,0.682783 0.366123,1.976492 -0.160755,0.494122 0.16968,0.889419 0.267892,0.431235
-5.214993,4.671696 0.0089,2.021412 5.500744,-2.093283 0.01779,0.95231 0.223233,0.278503 h 0.223233 l
0.187529,-0.269537 -0.0089,-1.060118 5.473955,2.147186 -0.02669,-0.214048 -5.214992,-4.617796
0.383981,-0.458188 0.08036,-0.907387 -0.187531,-0.449201 0.401841,-2.012425 0.955487,-0.69177
0.116094,0.206635 v 0.557009 l 0.866188,-0.009 v -0.440218 l 0.285743,-1.114019 0.330402,-1.724938
-0.0089,-1.266747 -0.116095,-1.149959 -0.223232,-0.332403 -1.035855,0.009 -0.196456,0.179667
```

```

-0.0089,0.700754 -0.285742,0.009 0.02669,-5.363474 0.375051,0.08087 0.116094,0.314437 0.25004,0.0449
0.03574,-0.314437 2.223518,0.485135 0.02669,0.332403 0.276817,0.03579 0.08036,-0.305471
0.464347,0.07187 1.143015,0.539039 0.06251,0.323438 0.214308,0.0449 0.08036,-0.206635
2.928967,1.365574 0.06251,0.341405 0.18753,0.0449 0.09824,-0.206636 6.081183,2.820986 L
33.2642,29.559667 33.148224,29.155303 32.90711,28.894767 23.316524,21.93214 18.57481,17.377231
18.5926,6.9916804 18.396145,5.0690966 17.985372,2.8769899 17.217413,0.59504569 z",
  "accent": "
    "m 16.914261,44.58071 -0.03773,-5.00511 -0.08803,-0.364697 0.113181,-1.886349
0.352118,-3.634364 -0.0503,-3.15649 -0.163484,-0.188635 -1.031204,0.02516 m 0.06288,-0.03774
-0.213787,0.238937 0.0503,3.143914 0.352118,3.508608 0.113181,1.936652 -0.113181,0.515602
0.02515,4.86678 m 2.489985,-13.217017 -0.03773,1.949228 0.07545,1.546804 -0.03773,0.779693 m
-0.326957,-4.300876 -0.03773,1.496504 -0.603632,3.533759 m -3.106184,-4.891931 0.03773,1.30787
0.616207,3.596637 m -0.99348,-4.979961 0.07545,1.886349 -0.02515,1.534229 -0.100604,1.01863 m
4.187696,-18.410763 0.02515,8.664628 m -3.860724,-8.551447 0.02515,8.526297 M 17.120105,2.1340449 c
-0.05659,0.081742 -0.132044,0.2892402 -0.132044,0.2892402 m -0.140832,0.290957 -0.09432,-0.050302
4e-6,0.069166 0.09432,0.012576 z m 0.792267,0.37727 -0.144624,-0.459017 -0.333255,-0.5344654
-0.440149,-0.1509079 -0.0063,0.3709819 0.282953,0.1131809 0.276665,0.2326496 0.232649,0.414997 z M
16.052828,2.131575 c 0.05659,0.081742 0.132044,0.2892402 0.132044,0.2892402 m 0.138333,0.2955278
0.09432,-0.050302 -4e-6,0.069166 -0.09432,0.012576 z m -0.792267,0.3772699 0.144624,-0.4590116
0.333255,-0.5344654 0.440149,-0.1509079 0.0063,0.3709819 -0.282953,0.1131809 -0.276665,0.2326496
-0.232649,0.4149969 z",
  "viewBox": "-24 -17 80 80",
  "accentMult": 1.0,
  "strokeScale": 1.0
}

```

Now copy all this code to clipboard and paste it into the database table *shape data*, column *shape_data*:

pgAdmin 4

127.0.0.1:6102/browser/

AIDS 8 Heimnetz IIS/214 Google Maps OpenStreetMap Iosm... Inpunkt Web Suchen Thesma Web Deep Corona Testzentren St... pgAdmin File Object Tools Help

Browser

shape.data

Dashboard Properties SQL Statistics Dependencies Dependents

No limit

shape.data

Query Editor Query History

1 SELECT * FROM public.shape_data

2 ORDER BY designator ASC

Data Output Explain Messages Notifications

designator	creator	description	orig_length	orig_width	shu...
184 SU95	RexKramer1	Suchhoi SU-100 model	29.87	27.8	17.90
185 T204	RexKramer1	Tupolev Tu-204-100	46	42	17.90
186 T38	RexKramer1	Northrop T38 Talon	14	7.7	17.90
187 TIGR	RexKramer1	Eurocopter Tiger	15.8	13	17.90
188 TOR_fast	RexKramer1	Panavia Tornado (IACN TOR) I...	16.72	13.9	17.90
189 TOR_slow	RexKramer1	Panavia Tornado (IACN TOR) I...	16.72	13.9	17.90
190 Twin_prep_Jarge	RexKramer1	Default shape (Fokker F50)	25.25	29	17.90
191 U2	RexKramer1	Lockheed U-2 Dragon Lady (U...	19.13	21.39	17.90
192 UH1	RexKramer1	Bell UH1D	17.4	14.63	17.90
193 unidentified	RexKramer1	Default-Shape for unknown ty...	26	30	17.90
194 unknown		Default shape (out of use)	0	0	17.90
195 V22_fast	RexKramer1	Bell-Boeing V22 Osprey (fast)	17.46	13.94	17.90
196 V22_slow	RexKramer1	Bell-Boeing V22 Osprey (slow)	17.46	13.94	17.90
197 B722	RexKramer1	Boeing B727-200	46.68	36.59	17.90

Save changes with F6.

Similar to tar1090 the new shape has to be assigned to a typedesignator. This is done in Database table map_type_to_shape:

Dashboard Properties SQL Statistics Dependencies Dependents shape_data map_type_to_shape_data

map_type_to_shape_data

Query Editor Query History

```
1 SELECT * FROM public.map_type_to_shape_data
2 ORDER BY type_designator ASC
```

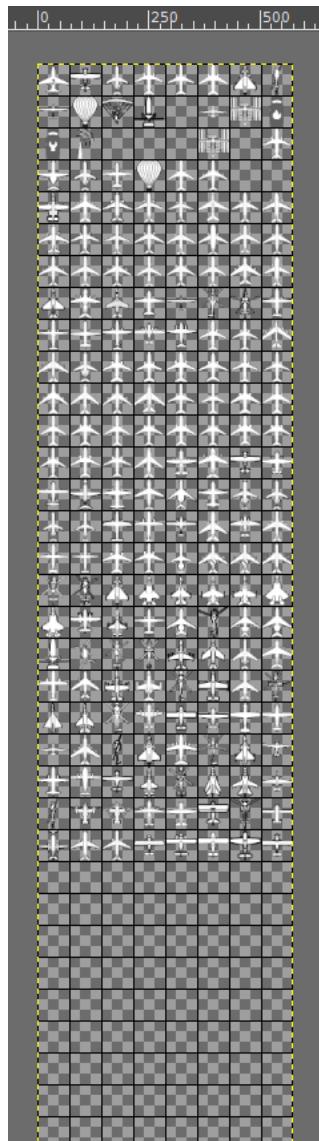
Data Output Explain Messages Notifications

type_designator	creator	description	shape_designator	shape_scale	version
PK character varying (255)	character varying (255)	character varying (255)	character varying (255)	double precision	character varying (255)
87 B701	RexKramer1	[null]	B703	0.5	2.0
88 B703	RexKramer1	[null]	B703	0.5	2.0
89 B712	RexKramer1	[null]	B712	0.5	2.0
90 B721	RexKramer1	[null]	JET_swept	0.5	2.0
91 B722	RexKramer1	[null]	JET_swept	0.5	2.0
92 B731	RexKramer1		Cat_A3	0.37	2.0
93 B732	RexKramer1		Cat_A3	0.4	2.0
94 B733	RexKramer1		B733	0.5	2.0
95 B734	RexKramer1		B734	0.5	2.0
96 B735	RexKramer1		B735	0.5	2.0
97 B736	RexKramer1		Cat_A3	0.37	2.0
98 B737	RexKramer1		B737	0.5	2.0
99 B738	RexKramer1		B738	0.5	2.0
100 B739	RexKramer1		B739	0.5	2.0
101 B741	RexKramer1		B742	0.5	2.0

We have to change the attribute „shape_designator“ from the default value „JET_swept“ to „B722“. Save changes with F6.

Adding shape to Database BelugaProjectSprites.png

BelugaProject use a Sprites.png-file, too. But it is bigger than in tar1090:



Adding a new shape is done the same way as for tar1090.

Open beluga_sprites.png in GIMP.

Turn on grid with 72px * 72px.

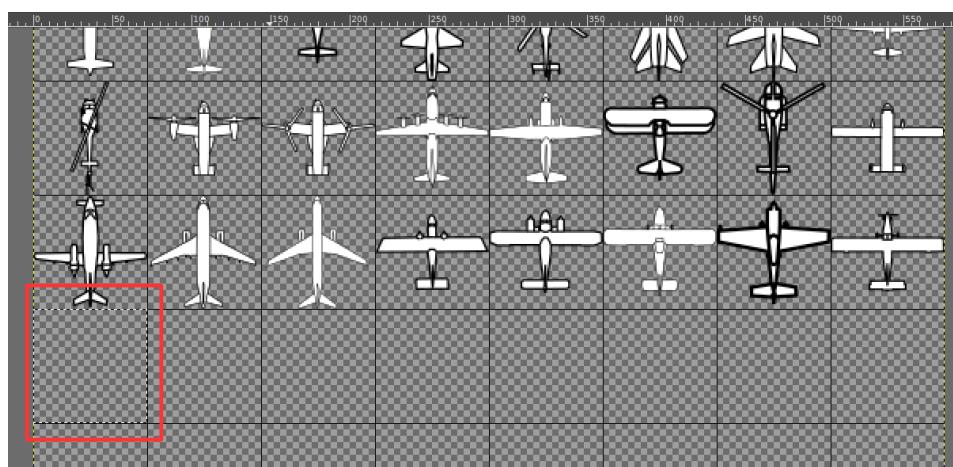
Open B722.png.

Select All (CTRL+A)

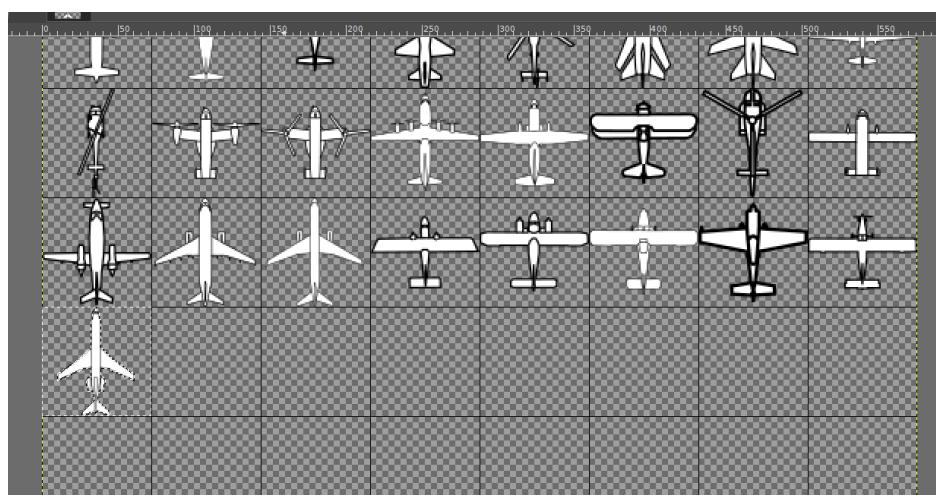
Copy to clipboard (CTRL+C)

Go to Window with beluga_sprites.png

Select next free cell (size of selection = 72px * 72px)



Menu Edit / Paste Into Selection



Calculate PNG-Scale

PNG-Scale = MAX(length; width) / 72px

with

length of aircraft (46.68 mm)

width of aircraft (32.92 mm)

$$= 46.68 / 72 = 0.65$$

The calculated png-scale has to be fine tuned during test.