

10.40 Mapping the fabric-covered surfaces*

Some aircraft surfaces may be covered with fabric. In the middle of XX century this was a relatively thick cotton, taut (because it was painted several times with a nitrocellulose dope) as a drum. The rudders, elevators and ailerons used in the most of airplanes from the first half of the 40's had such fabric surfaces.

Such surfaces have characteristic ridges along the edges of the underlying ribs (Figure 10.40.1a). This fabric surface is tautened on the steel frame, so its areas located away from the ribs look completely flat. (In the static conditions on the ground. During the flight the fabric on the control surfaces can have bulges and recesses). Figure 10.40.1b) shows a typical bump map that imitates the rudder fabric surface:

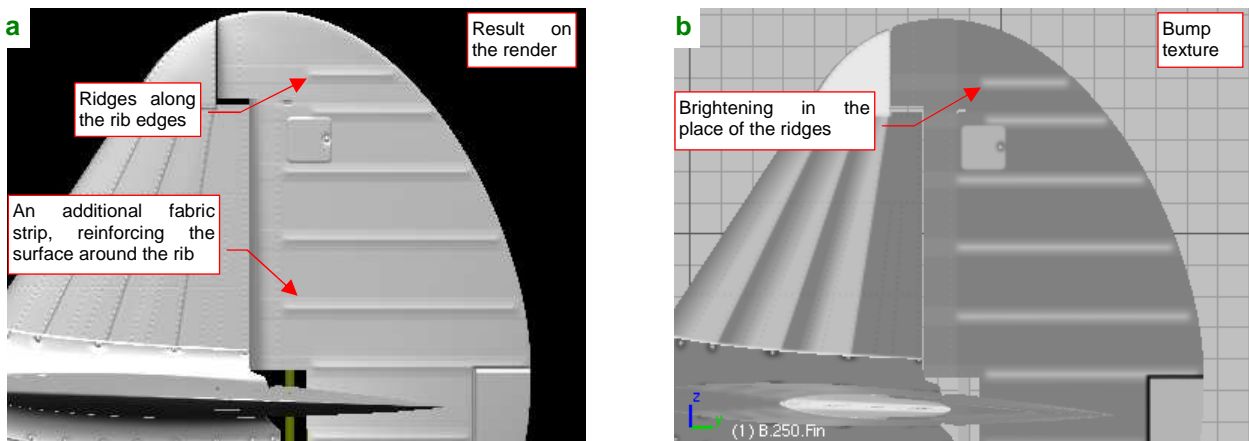


Figure 10.40.1 Imitating the fabric skin using a bump texture

The image of this bump texture was created in Inkscape (Figure 10.40.2):

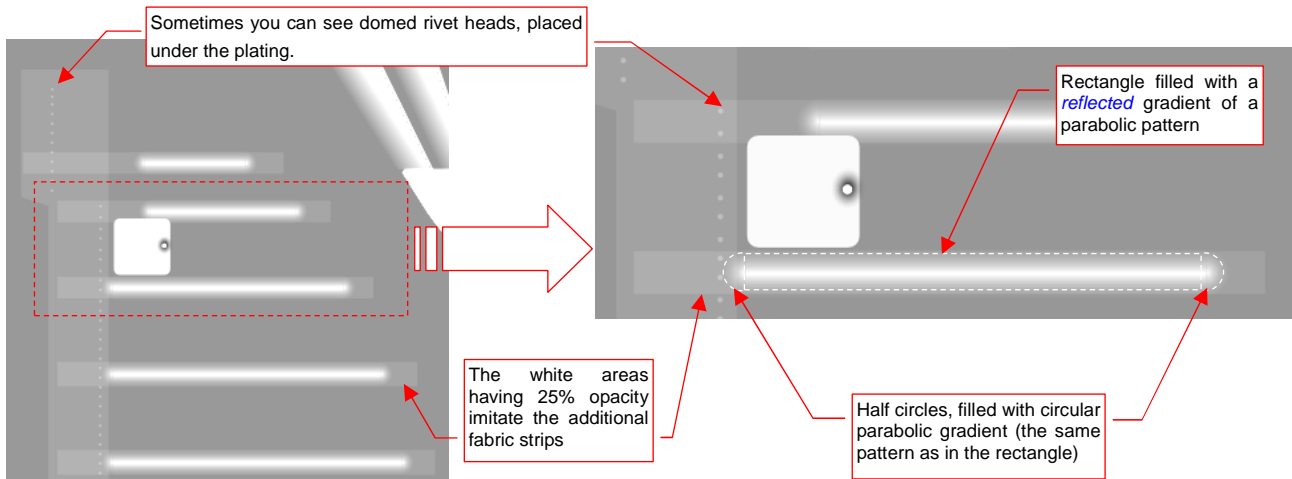


Figure 10.40.2 Details of the texture image

On each rib draw a rectangle filled with a linear gradient reflected along the rib edge. On both sides of this rectangle add the closing half circle. Fill them with the circular gradient, using the same gradient pattern as in the rectangle (Figure 10.40.2). Reinforcing fabric strips, sewn onto the canvas in areas exposed to abrasion can be easily mapped with a single white bars with the low opacity (the **A** component of their color should have opacity of 25%, i.e. 64 in the 0..255 scale). Where such fragments overlap each other, you will get the "thickening" in a natural way.

Sometimes you can see some underlying domed rivet heads protruding from the fabric skin. Actually we should draw each of them as a circular gradient. On the other hand these rivets are small. When you export this drawing to a bitmap they will become "naturally blurred" in the effect of the rasterization. Thus I decided to reproduce them in the same way as the other rivets (Figure 10.40.2).

To obtain proper ridges along the ribs, use a white gradient ($R, G, B = 100\%$, which means in Inkscape values of 255). Its subsequent nodes will have different opacity (A). Their opacity decreases in a parabolic way (Figure 10.40.3):

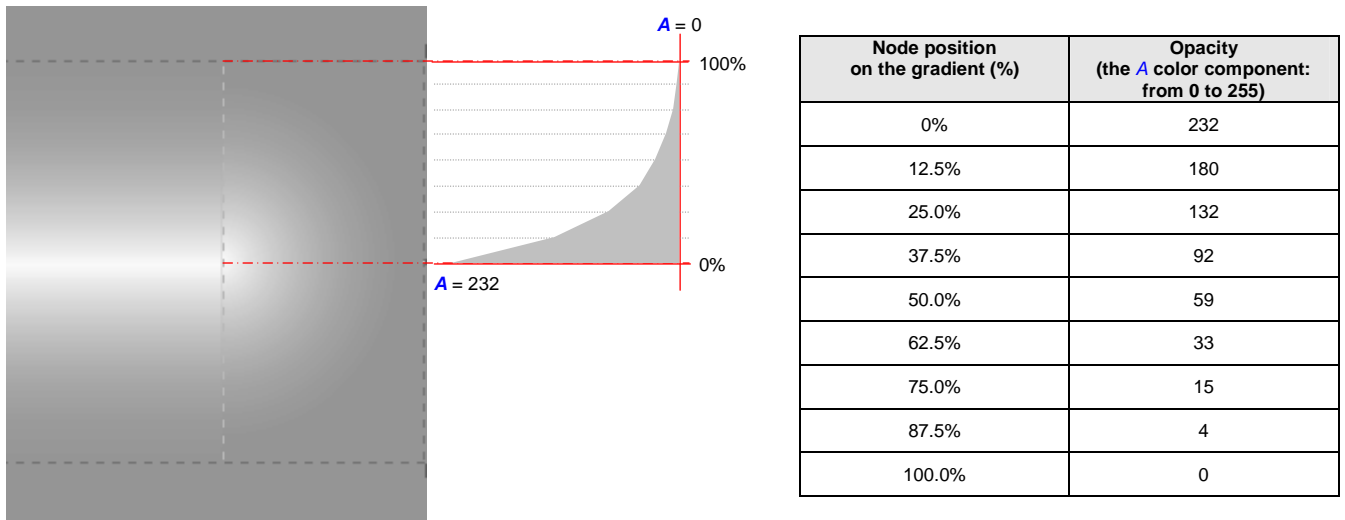


Figure 10.40.3 Parabolic gradient pattern, used to model the ridges on the fabric sheathing

Such a gradient creates convincing ridges around the ribs, even on much broader areas than those shown on the previous page. Such a wider area can be used in structures, where the recesses of the fabric skin between the ribs were deeper.

The texture for a control area (a fabric-covered rudder, for example) start by drawing a single ridge of the rib - a rectangle with two circular ends, filled with a gradient. Apply also the semi-transparent bar of the additional fabric reinforcement. To facilitate the further steps give all these four elements rounded position coordinates and dimensions. (If you have declared in Inkscape the size of your image of 2048x204 px or larger, there should not be any problem with that).

Then simply select and copy these four objects in the place of the next rib. Usually after this operation you will have to adjust the length of these new rectangles to their rib, then move accordingly the circular ends. To precisely fit the position of these ends with the rectangle length — set their new values numerically in the X , Y and W fields on the toolbar above the screen. (That is why it is useful to have their values rounded, without any fractional part - it is easier to control such coordinates).

All these elements of the fabric-covered surface draw on a separate layer. Decrease the opacity of this layer by about 50%. This will allow you to conveniently control the depth of fabric ridges on your model.