Model 700 Trigger FEA

Brian Rages

1/12/01

PURPOSE

The purpose of this report is to detail three modifications of the current Model 700 trigger design and discuss the results of a finite element stress analysis performed on them.

COMPARISON OF PROFILES

In Figure 1, three modified versions of the current Model 700 trigger are compared with the profile of the current Model 700 trigger and the original version. All the material added in these modifications of the current design lies within the shape of the old Model 700 trigger.

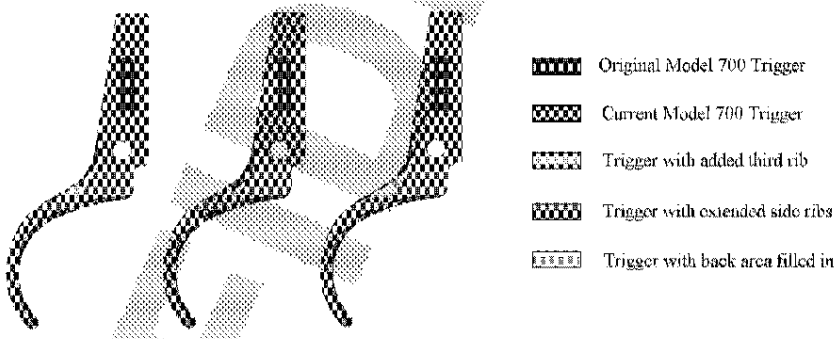

Figure 1. Comparison of trigger profiles.

Figure 2 contains another comparison of the trigger shapes. The first modification, in orange, involves the addition of a third strengthening rib in the area of the trigger where the hoop meets the main trigger body. In the second modification, in green, the two ribs that run along the sides of the trigger hoop were extended up onto the trigger body. In the third modification, in yellow, material was added in the area where the trigger hoop and body meet.

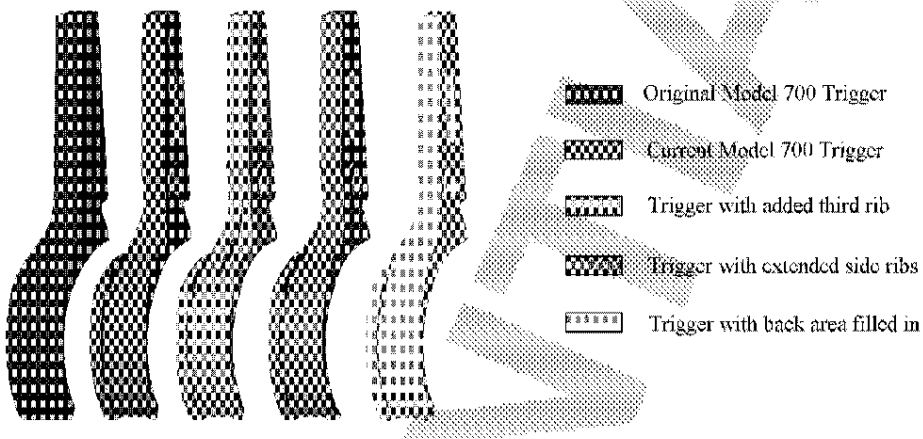

Figure 2. Comparison of trigger shapes.

EFFECTS OF MODIFICATION

The table below contains data related to the effects of modifying the current Model 700 trigger. The first row of the table allows the weight of the triggers to be compared. The location of the composite center of mass is calculated relative to the pivot hole of the trigger. The calculation of the composite center of mass took into account the mass of the connector. For these calculations, the mass of the trigger was taken as 7.4 g/cc. The radial distance to the composite center was calculated from the x and y components of the center of mass location.

	Current Model 700 Trigger	*Third Rib Added*	*Ribs Extended*	*Back Area Filled In*
Weight (ounces)	0.309	0.314	0.312	0.334
Location of composite center of mass (x,y in inches from pivot)	-0.1029, 0.05736	-0.1064, 0.05260	-0.1050, 0.05343	-0.1200, 0.03434
Radial distance to composite center of mass	0.1178	0.1187	0.1178	0.1248
Peak Von Mises stress, 20 pound load.	114,000 psi	52,300 psi	66,500 psi	30,700 psi

RESULTS OF FEA

FEA was performed on the current and modified Model 700 designs. In each analysis, the trigger model was constrained with a rotational constraint at the pivot and a constraint on movement at the area where the trigger contacts the overtravel screw tip. The model was loaded with a 20 pound load spread over a line across the center of the trigger bow.

Figure 1 contains the Von Mises stress distribution on the current Model 700 trigger. The areas of high stress at the end of the hoop ribs are visible in red.

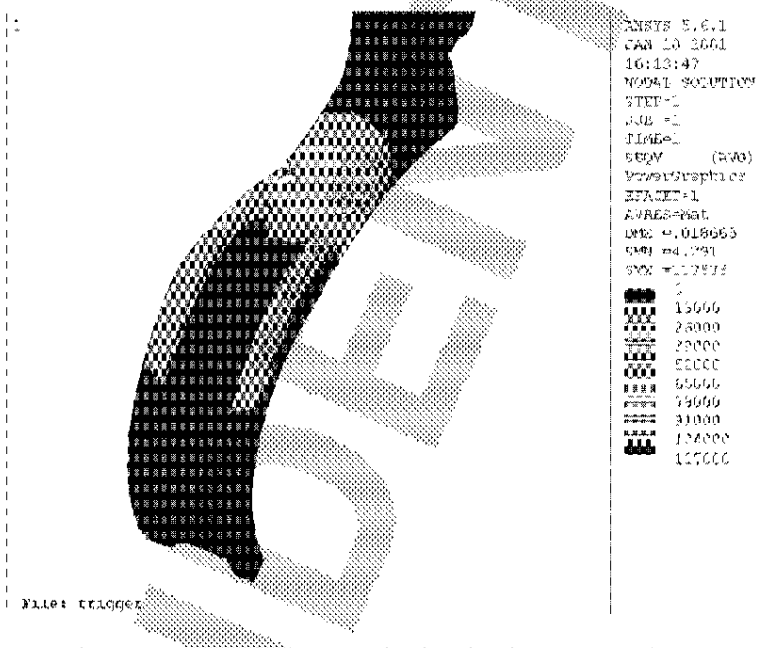

Figure 3. Von Mises stress distribution in current trigger.

In Figure 4, the Von Mises stress distribution on a modified trigger is shown. In this design, a third rib was added in the area between the trigger hoop and the body of the trigger. Peak stresses were lowered considerably, from 114,000 psi to 52,300 psi. Figure 5 contains a close-up view of the rib area. A different scale was used in the color contours of this figure to show the complete range of stress.

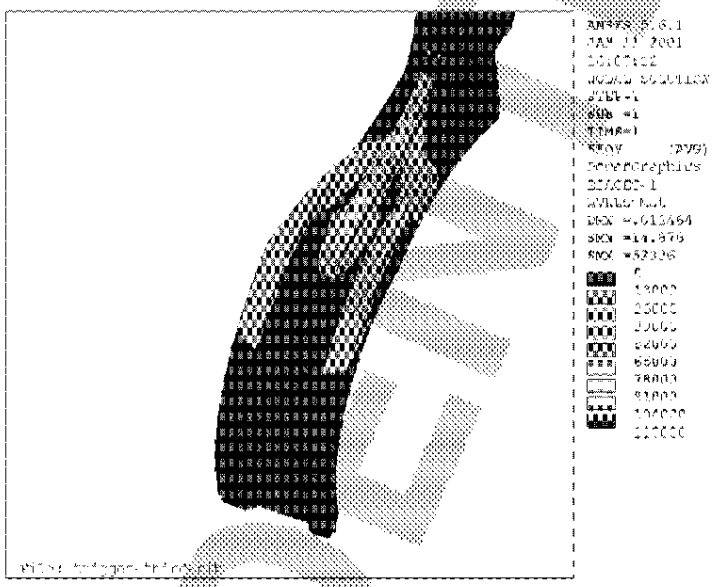

Figure 4. Von Mises stress distribution in trigger with third rib added.

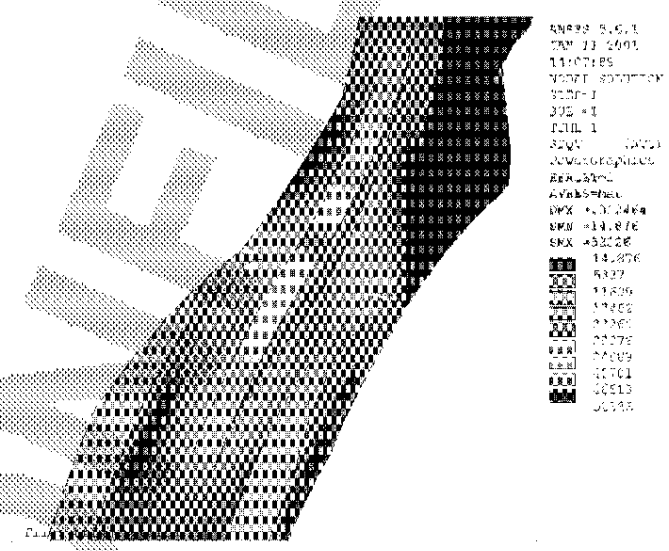

Figure 5. Close-up of Von Mises stress distribution in trigger with added third rib.

In Figure 6, the Von Mises stress distribution is shown for a trigger whose side hoop ribs have been extended. Peak stress drops from 114,000 psi to 66,500 psi. Figure 7 contains a close-up view of the high stress area. A different scale is used in the color contours to show the complete range of stress.

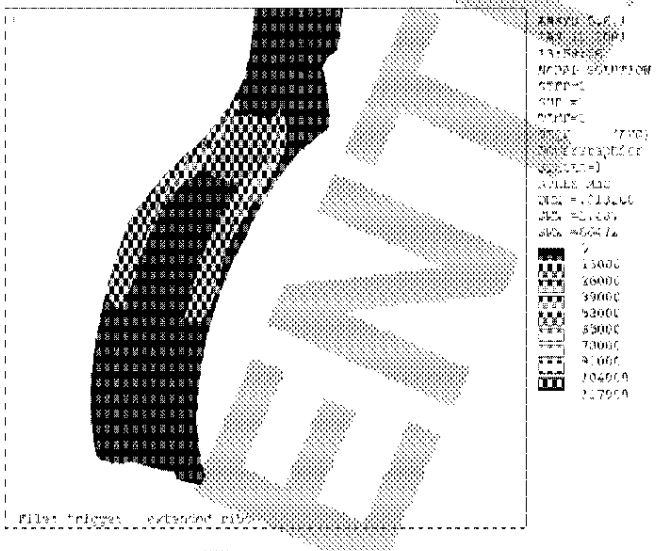

Figure 6. Von Mises stress distribution in trigger with extended ribs.

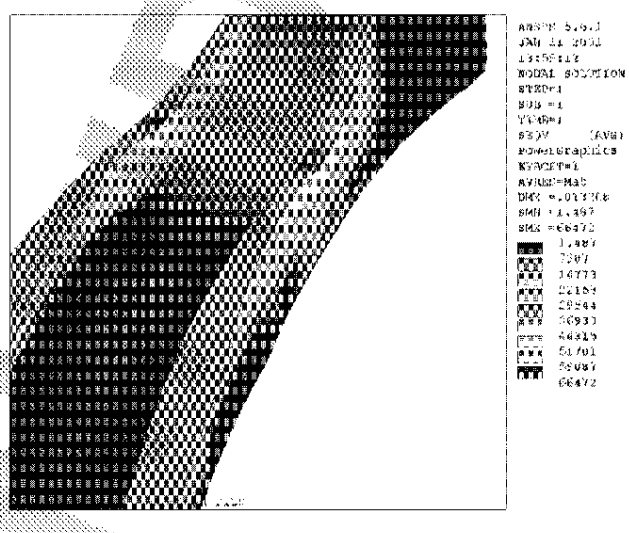

Figure 7. Close-up of Von Mises stress distribution in trigger with extended ribs.

Figure 8 contains the Von Mises stress distribution in the trigger with material added to the area where the hoop of the trigger joins the body. Peak stress for this model is 30,700 psi, about one fourth of the 114,000 psi stress in the current design. Figure 9 contains a close-up view of the high-stress area. A different scale is used in Figure 9 to show the complete range of stress.

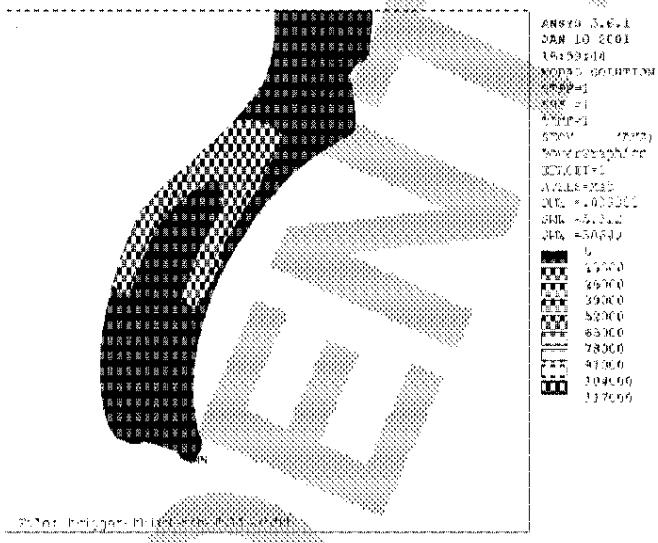

Figure 8. Von Mises stress distribution in trigger with back filled in.

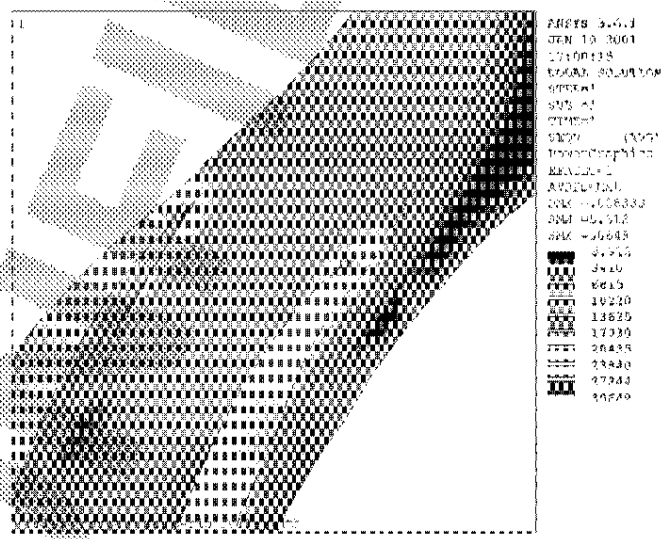

Figure 9. Close-up of Von Mises stress distribution in trigger with back filled in.