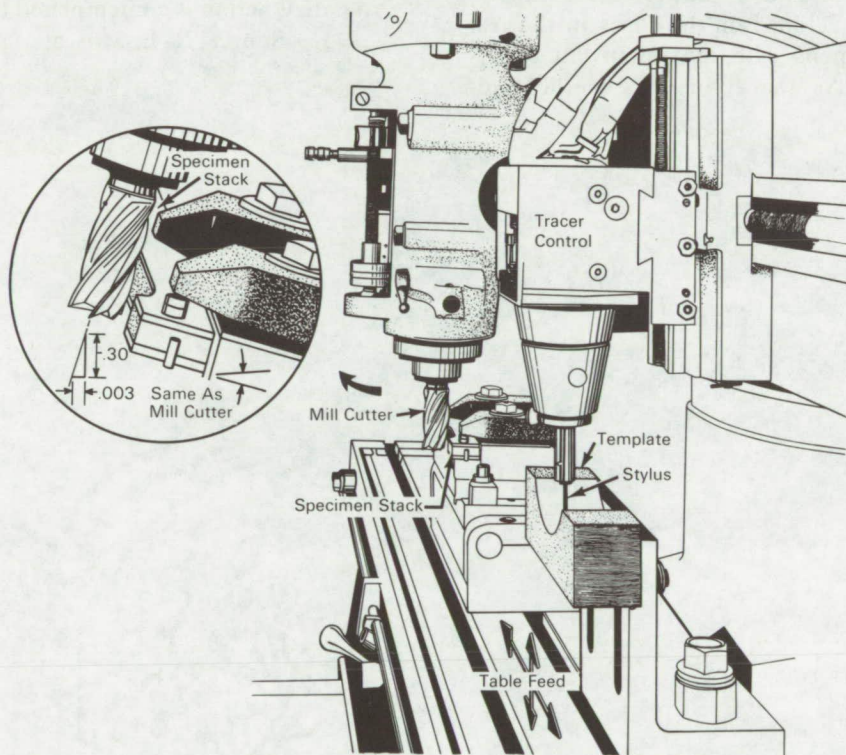


# NASA TECH BRIEF



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## Machining Technique Prevents Undercutting in Tensile Specimens



A technique has been devised to prevent undercutting at the test section in tensile specimens when machining the four corners of the reduced section (transition section). The tensile specimens are made with a gradual taper in the test section, resulting in a width at the center of the specimen that is from 0.002 to 0.006 inch less than the width at the four corners of the reduced section. Tensile failures are thus forced to occur at the narrow central cross section.

The tapers are machined on a milling machine equipped with a contour-tracer-controlled vertical-

travel table. The specimens are stacked in convenient groups, blanked off, and drilled for locking bolts at each end. The locking bolts are used to align and secure the specimens for further handling and machining. The specimens are then set up in the milling machine. To machine tensile specimens with a 1 1/4-inch test section having a 0.006-inch (.003-inch on a side) reduction, use is made of an arc-shaped template with a chord length of 1 1/4 inches and a depth at the center of 0.30 inch. The stylus follows this template which controls the vertical travel of the table at a

(continued overleaf)

ratio (vertical to horizontal) of 100 to 1. The spindle is stationary and tilted to correspond to a 0.003-inch horizontal displacement in 0.3-inch vertical travel of the table. The stack of specimens is aligned and tilted in the width direction by the same angle as the spindle so that the stack and spindle are perpendicular to each other. A mill cutter with a diameter corresponding to the radius of the transition section of the tensile specimens is placed in the spindle. The cutter and specimens are then oriented with the tracer stylus and template so that when the stylus reaches the bottom of the arc on the template the cutter is at the center of the test section. By following the template with the stylus, the table with the specimens is moved up 0.30 inch at a gradual pace corresponding to successive positions of the stylus. This operation causes an elliptical shape to be machined on the edges in the test section of the specimens with maximum cut occurring at the center. As the stylus passes the mid-

point and starts up the curve on the template, the table is controlled to descend at the same pace as in ascending. The taper is completed when the stylus traverses the arc of the 1 1/4-inch chord. The specimen stack is then turned over, realigned, and machined on the other edge in the same manner as in the previous operation.

**Note:**

Details may be obtained from:  
Technology Utilization Officer  
Langley Research Center  
Langley Station  
Hampton, Virginia 23365  
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**Patent status:**

No patent action is contemplated by NASA.  
Source: R. E. Moscatel and D. M. Royster  
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