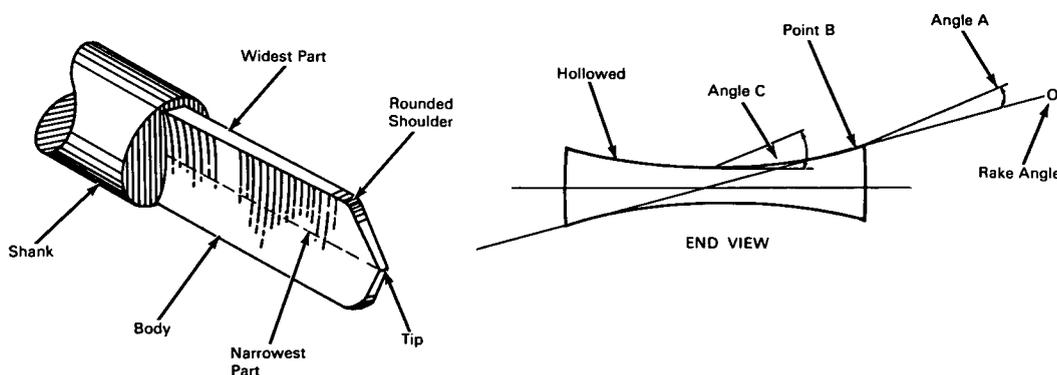


# NASA TECH BRIEF



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## Drill Bit Design Assures Clean Holes in Laminated Materials



**The problem:** In drilling laminated materials, drill bits have operated by a scraping action due to their zero-to-negative radial rake angle. This has resulted in delamination due to tearing of the material at the ends of the holes and heat generated in bit and material.

**The solution:** A drill bit of new design that cuts or shaves the material as it progresses through it. The bit acts to hold down the material during drilling to prevent tearing or ripping and produces a clean, smooth, and defect-free hole.

**How it's done:** The body of the drill bit is formed by grinding hollows in each side of the body portion so that the narrowest part of the body is located at its exact center running from shank to tip. The widest points occur at the outer extremities of the body and the forward or tip portion of the drill has shoulders rounded to the diameter of the drilled hole to permit the drill to smoothly enter the material.

As shown in the end portion view, a line drawn diagonally through a cross section of the bit passes through the exact center of the tip. This line represents  $0^\circ$  radial rake. The body is hollowed with a cir-

cular curve of a radius sufficiently short that angle A is formed by a tangent and the  $0^\circ$  line at the outer extremity of the bit. Such positive radial rake angles of from  $1^\circ$  to  $15^\circ$  have proven satisfactory. The curve of the hollow of the cutting edge decreases from a positive radial rake (angle A), to  $0^\circ$  radial rake (point B), then to a negative radial rake at angle C. This particular positive-to-negative radial rake is the feature that enables this drill bit to produce superior holes.

**Note:** This invention was developed to prevent crazing or chipping in stretched plastic windows for high-altitude, high-performance aircraft where such defects cannot be tolerated.

**Patent status:** Title to this invention has been waived under the provisions of the National Aeronautics and Space Act (42 U.S.C. 2457 (f)), to Douglas Aircraft Company, Inc., 3000 Ocean Park Boulevard, Santa Monica, California.

Source: Raymond N. Tillotson of Douglas Aircraft Company, Inc. under contract to Western Operations Office (WOO-098)

Category 05