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# NASA TECH BRIEF

*Manned Spacecraft Center*



## Built-In Bleeder System in Laminated Plastic Structures

### The problem:

During fabrication of glass-fabric-reinforced polyimide-resin-laminated parts by a conventional process, it was found that these parts could not meet the required specifications. The parts, varying in thickness from 0.2 to 0.5 cm (0.06 to 0.2 in), contained excess resin and did not meet flammability restrictions.

### The solution:

Resin absorbing, glass bleeder cloth, which is normally used as a throwaway surface in the fabrication of laminated plastic structures, is interplied with the layup to become an integral part of the structure. The resulting laminate has a low resin content and is relatively non-flammable. In addition, this economical method is simple to carry out and produces tight, wrinkle-free surfaces.

### How it's done:

Currently, plastic laminated structures are prepared by placing a bleeder cloth on the surface of the structure during cure. After the cure, this bleeder cloth is stripped off and discarded. The new system efficiently utilizes the bleeder cloth by interplying it with the resin impregnated fabric in a one-to-one ratio. The excess resin, rather than flowing out to the surface, will seep into the interplied bleeder cloths until the resin content is uniformly distributed through all the layers.

This method may be used to prepare laminates of varying thickness. Different numbers of plies are used to make laminates of different thicknesses, but the procedure is essentially the same, regardless of the thickness of the laminate. In a typical preparation, twelve plies of a commercially available polyimide prepreg are interplied with eleven plies of dry glass-fiber bleeder cloth. The layup is placed on a 0.3-cm (1/8-in) aluminum caul plate and covered with one ply of Teflon release fabric and one ply of bleeder cloth. In addition, a continuous band of bleeder fabric is placed around the layup, and the part is cured in a vacuum bag mold. (This process may also be used with press laminated structures.) The laminate, prepared in this manner, has a resin content of 20.4%, flame travel limited to 4.1 cm (1-5/8 in), and an interlaminate shear strength of $13.27 \times 10^6$ N/m$^2$ (1924 psi). Laminates of other thicknesses, prepared similarly, have equivalent properties.

With this technique, the part is complete after the cure, and elaborate stripping is eliminated. Wrinkling, especially in cylindrical parts for which the layup is accomplished by wrapping, is markedly reduced. Furthermore, because there is little waste, the cost of fabrication is less than in conventional methods.

### Notes:

1. This information may be of interest to the manufacturers of laminated structures such as boats, aircraft, ducting, etc.
2. Requests for further information may be directed to:
   Technology Utilization Officer
   Manned Spacecraft Center
   Code JM7
   Houston, Texas 77058
   Reference: TSP72-10562

### Patent status:

NASA has decided not to apply for a patent.

Source: Angel G. Aguilar and Gordon J. Cizek of
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Category 08