

John,

Reference Al's comments on the polyurethane glue. I found this on the net and thought you might want to use some/all/none of it for the newsletter:

Jim Nunnallee

POLYURETHANE GLUES

Polyurethane glues were developed several years ago in Europe as non-fuming alternative to epoxies. The glues have not had much publicity with regard to R/C model building, however, they possess many useful properties. They are available from many woodworking mail-order houses, and are now finding their way into various lumber/home supply/ tool super stores. They go under brand names such as: Gorilla Glue, Titebond Polyurethane Glue, Excel, Elmers Pro Bond Polyurethane, and others. More brands seem to be appearing with time. These glues have a consistency similar to epoxy during application, with some variation in viscosity. The polyurethane glues have little if any discernable odor. They are single component glues which are catalyzed for curing by moisture or humidity in the atmosphere.

Polyurethane glue is comparable in cost to epoxy, however, it needs to be applied to only one of the surfaces to be joined. Compared to epoxy, a little bit goes a very long way, and there is no waste. Like epoxies, polyurethane glues produce very strong bonds with many materials; and for the model builder, they work very well with balsa, hardwoods and metals, and they are very effective on polystyrene foam. They are waterproof, and highly fuel resistant. Basically, once cured, they cannot be attacked by most solvents used in model plane building. The glue bond they produce is very tough and somewhat flexible. Best of all, these glues sand easily so cleanup of external seams is easy. leaving no significant glue ridge. The polyurethane glues are not appropriate for quick assembly, but are very useful when some adjustment of the members to be joined is needed. Gorilla Glue has a 20-minute working time. Clamping (or pinning) is required for two-to-four hours. In the humidity of a normal Eastern U.S. environment, about 2 hours will suffice.

During the curing process, some foaming of the glue occurs. This drives the glue into the wood pores, and makes it easy to achieve exceptionally strong bonds with small quantities of glue, for example in laminating sheets. It is necessary only to spread the glue thinly on one side to be joined. The glue then forces itself into the pores of both surfaces and achieves a strong and light weight bond. It is not dependent on capillarity to achieve penetration. The foaming action does fill gaps. However, it remains important to

get good joint fits for maximum strength. Gorilla Glue claims that gaps up to 0.1 mm can be tolerated without loss in joint strength.

The foaming also results in some squeeze-out of glue at the edges. That glue which squeezes out of the joint during curing can be cleaned up easily by scraping or sanding. Usually, the sanding required is light, and the joint can be cleaned up without gouging or causing a projecting glue joint above the surrounding balsa. However, some forethought is advisable. It's best to select another glue if a clean joint is required and sanding or scraping is not possible (for example in hinge installation).