KNOCKOFF WINGS
by Bill Henn
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It was Geneseo, 2004 and my Jumbo twin Arado E-530 had just landed among the cars lining the edge of the field. The model had behaved well, staying aloft for 3:15, but had chosen the worst place to come down. While jogging across the field to retrieve my airplane, I passed fellow club member Ed Pelatowski who said, "nice flight, Bill, but I don't like the sound it made when it hit a car". When I got to the model, I saw it was in two pieces, the outer panel of the left wing had separated from the inner part. A nearby spectator said, "it looks like a clean break and should be easy to fix". He was right, but surprised when I simply plugged the panel back into the wing root section and walked away with an undamaged model.

A very simple, light and foolproof modification had saved my model from serious damage. The Arado had been built so that the outer wing panels would disengage in the event of a crash. Knockoff wings are nothing new, but a feature rarely seen anymore on scale models. It's baffling to me why those who build the large, museum quality models seen at Geneseo do not use them. Through the years I have only seen one or two other models built so that a wing panel could disengage after hitting an obstruction. The knockoff mechanism on these models used a tongue and groove system. That is, a tapered or oval shaped sheet of thin plywood was affixed to one wing panel which fit into a groove on the adjacent panel. This works well, but requires quite a bit of wood and adds considerable weight.

I had first thought of using knockoff wing panels when building my Giant Scale FW-152H. The model had a wingspan of 43" and was not a lightweight. If a wingtip hit the ground first when landing, the model could sustain serious damage. I came up with the idea of using thin carbon fiber strips that were attached permanently to the inner wing panels and fitting into receptacles on the outer panels. These strips were located at the same position and connected to the main spar which was located at about the 35% chord mark. Small pieces of 1/16" round CF were glued into the inner panels near the leading and trailing edges. These pegs fit into the inside of 3/32" OD aluminum tubing and prevented the wing from twisting. Tiny, inconspicuous .015 music wire hooks were installed on both panels on the underside of the wing. The hooks were connected by small orthodontal rubber bands which broke or slipped off when the outer panel would disengage from the inner one. As the photos show, two CF strips were installed side by side, about 1/8" apart on the TA-152. If the wing was stressed, the structure would break before the CF strips. Besides, they flexed nicely upon impact, allowing the wing to rotate backwards and disengage.

The device worked so well that I used it on my -next three large twins, an Arado E-530, Reggiane RE 2005 Bifusoliero, and an FW-189 V6. During testing and competition flying, all four of these models struck the ground at one time or another in a manner that caused a wing panel to come off but no damage incurred. The Giant Scale RE 2005 dethermalized on the very top of a 40' tree during a test flight at our local field. A kind and able young RC'er climbed half way up the tree and managed to poke the model free with a long pole. During the retrieval, both outer wing panels disengaged and fluttered to the ground, making the extraction process much easier. Fortunately, the model only sustained a few minor tears in the tissue.

Since the removable outer panels on the twins were shorter than those on the TA-152, only a single CF strip had to be used on each side. The carbon fiber strips I have been using measure .023"x.118". I don't remember where I bought them, it was either Model Research Labs or FAI Supplies. Hobby Lobby and Midwest also carry inexpensive CF strip close to this size. I would not use anything smaller but a little larger should work fine. These strips are useful for other purposes. They proved invaluable for bridging the gap across the booms on my FW-189 V6. Built to scale, a wing constructed in the usual manner will block the motors in the narrow booms of the FW-189 which has a high thrust line. If the CF strips are used as main spar extenders, they can be run across the top of the booms and not cause any obstruction. My FW-189 has laminated formers made from thin strips of balsa. If the nose blocks on the booms are removed, the CF spar extension cannot even be seen when looking down the interior of the boom. As the photos indicate, the CF strip extends out a few inches beyond the boom, doubling as part of the knockoff mechanism.
Unfortunately, I don't have photos of any of the wings under construction due to a hard drive crash on my computer. The article on my Arado E-530 twin that was published in the April 2005 issue of FM magazine included a bunch of good skeletal shots of the model, clearly showing how the carbon fiber was installed on the "I" beam main spar. The article also includes information and photos on the preparation of braided motors, prop hooks, motor hook coupling devices and trimming twins. The 4/05 issue also includes an excellent and well illustrated article by Dave Stott, "A Reliable Front End for Rubber Models". Back issues may still be available from FM.

Besides being a safety feature, knockoff wings make it easier to store and transport big models. Another way to crash proof a large and heavy model would be to use the same technique that is used in the construction of modern automobiles. For decades, the bodies of passenger cars have been designed to absorb rather than resist the enormous forces generated by crashes. That is, in the event of a crash, the metal body gradually compresses in a controlled manner so as to slow down the deceleration force and reduce the chance of injury to passengers. The fuselages of large multi-engine models with long noses could easily be built in the same manner. The nose could be designed so that it would crumple back to some point ahead of the wing leading edge. A "crash bulkhead" like that which the Coast Guard requires on charter fishing boats could be built at that point. The structure behind the bulkhead could be made stronger than the nose. If the model dove straight in to the ground, there is a good chance that the damage would be limited to the nose, especially if knockoff wings are also used.

Readers who have never built multi-engine models or other large, heavy airplanes and have never experienced the grief when one of them crashes into the ground, may not appreciate the foregoing. Granted, there are a lot of big models that have been flying for years at contests that appear to have never suffered a bad crash. If you talk to their builders you might find otherwise. If you're planning to build a big ship, knockoff wings are the only way to go.