SPIRAL STABILITY

By Jim DeTar

An article published in the May 20088 issue of Tailspin, Mike Nassise, Editor

Flying Aces Club (FAC) free flight contests usually feature a large number of events, reflecting the many and varied types of aircraft and eras represented by the scale modeling enthusiasts' efforts. For whatever reason, I found that at an upcoming 2-day FAC meet I would be too busy on the first day, but somewhat slack on the second. Looking over the list of events that were to be flown on that last day of the meet, I noticed that Modern Military, an event for post 1945 military aircraft, was included. Great, let's build a plane for that event, helping to balance things out.

My choice was the Grumman Guardian, an early 1950's Navy antisubmarine aircraft. With it's mid-wing configuration, generous nose moment and ample wing area and tail surfaces, it looked like a good candidate for rubber power. Add to this Bob Sweitzer's P-Nut plan that had been published in the *FAC News,* and I had a natural starting point.

The plan was enlarged to 21" wingspan, and the fuselage construction was re-engineered to a box and former configuration. The original plan had separate, glue 'em to the fuse sides wing panels which I felt should be changed to a stronger, one piece, straight through the fuse wing. Past experience with other models had taught me that separate wing panels, glued to the sides of the model were weak and subject to damage in anything but a perfect landing. Fortunately, before I went too far, I realized that putting the wing through the fuselage would leave no place for the rubber motor. Duhh!! The two separate wing panels turned out to be a blessing in disguise. More on this latter. Also, the big vertical tail and two sub-fins on the stab looked great to me to begin with.

The model was constructed and test flights ensued. The Guardian flew nicely in a climbing left circling pattern under power but, when the power ran down, the plane slowed, dropped the right wing tip, and went into a downward spiral to the ground. It was climbing left, but then almost stopped when attempting to transition into a right hand glide. The resulting stall, wing dip, and persistent downward spiral quickly ended the flight. Okay, let's add some left rudder. This got a left-left pattern, but the airplane would still go into a downward spiral.

I went home thinking "spiral instability". I had what appeared to be sufficient dihedral in the wings, but hadn't I heard or read somewhere about a relationship between dihedral and vertical tail size? Research revealed that yes, that big vertical fin could be the culprit. It turns out, as no doubt many experienced flyers already know, that **a** too large vertical tail can result in spiral instability problems, as much as a too small vertical tail can result in tail wagging "Dutch Roll". That big vertical tail and sub-fins apparently overwhelm the ability of the dihedral to keep the wings level. Unlike the horizontal stabilizer, in the case of the vertical fin, bigger is not necessarily better.

So, adjustments were made. A new, reduced size fin and sub-fins were built. An increase in dihedral could also help the problem, but build a new wing!!? Aha, those separate wing panels. By carefully loosening the glue joint attaching the panels to the fuse sides, I was able to slip a *1/32"* shim between the fuse sides and the bottom on each wing panel root. Result: a few more degrees of dihedral. I know, this breaks the cardinal rule of making just one trim adjustment at a time, but it worked. The model now flies in a left-left pattern, with consistent times in the minute and a half range. Gee, it's great when things work out!!.