Speed has always been one of the big selling points for aircraft. A fair question would then be, "How does the performance of a canard aircraft compare to a similar conventional aircraft?" There have been quite a few records set by canard aircraft, which is a good indication that they can do very well. AIAA Paper 84-2507, "Design and Analysis of Optimally-Loaded Lifting Systems," by Ilan Kroo is a theoretical look at the big debate, and its conclusion gives the performance edge to a conventionally configured aircraft. Figure 5 provides a parasite-drag-area comparison of several high-performance canard and conventional homebuilt aircraft designs. The data came from David Lednicer and various CAFE Foundation flight tests. It has been adjusted to remove the estimated landing-gear drag area in order to provide a fair comparison. If we take the drag area for a particular design and divide the value by its exposed surface (wetted) area, we get its wetted drag coefficient. This coefficient is an overall indication of how clean a design is. Looking at **Figure 5**, we can see that the canard aircraft have a wetted drag coefficient around 0.0050 (50 "drag counts" in aerodynamic speak). This drag area is comparable to that of the T-18 and Glasair, but higher than a few of the other high-performance aircraft. The higher value is likely due to the higher drag of the canard airfoils used and the relatively blunt after-body on the VariEze and Long-EZ.

Depending on the designer's goals, it is likely that the canard configuration will continue to be used on some future designs. As Rutan stated, "The designers' database for these types of designs is extremely limited, and the importance of understanding their aerodynamics is great." EAA

An EAA member since 1981, Neal Willford learned to fly in an ultralight in 1982 and received his pilot certificate in 1987. He has done design work on a variety of aircraft at Cessna, from the 172 to the Citation X. In recent years he has been heavily involved in the development of the Cessna NGP and 162 SkyCatcher. In his spare time he is finishing a Thorp T-211 Sky Scooter.

References:

"A look at handling qualities of canard aircraft," NASA TM-88354, Seth Anderson, 1986.

Canard: A Revolution in Flight, Andy Lennon, Aviation Publishers, 1984.

"Tale of Three EZs," Burt Rutan, *EAA Sport Aviation,* February 1980.

"Wind-tunnel investigation of a full scale canard configured general aviation airplane," NASA TP-2382, Lon Yip, 1985.

"Effects of Rain or Surface Contamination on Pitch Stability and Control," Burt Rutan, *EAA Sport Aviation,* March 1983.

"Quickie-Type Aircraft Design Origins," Burt Rutan, *EAA Sport Aviation,* October 1981.

"Wind-tunnel investigation of an advanced general aviation canard configuration," NASA TM-85760, Joseph Chambers, Lon Yip, and Thomas Moul, 1984.

"Design and Analysis of Optimally-Loaded Lifting Systems," AIAA Paper 84-2507, Ilan Kroo. Available online at *http://Aero.Stanford.edu/Reports/MultOp/multop.html.*

NASA reports are available online at *http://NTRS.NASA.gov/search.jsp.*

EAA Sport Aviation articles are available online in the members-only section at *www.Oshkosh365.org.*