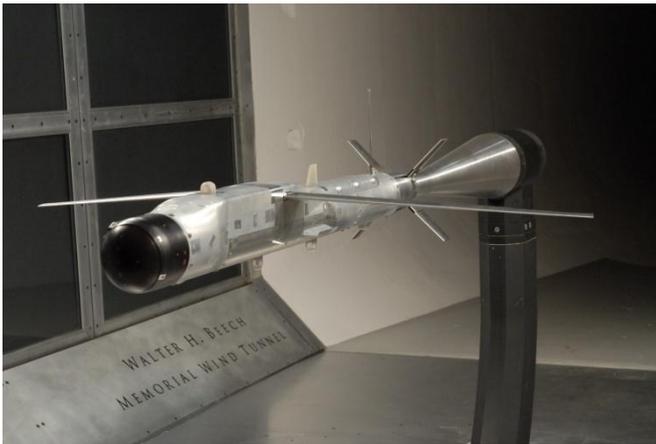


## Abstract for the Consortium for Kansas Unmanned Systems' 2013 Conference

### Recent UAS Aerodynamics Testing Activities at the National Institute for Aviation Research

Since 2009, the Walter H. Beech Wind Tunnel (WBWT) at Wichita State University's National Institute for Aviation Research has provided significant aerodynamic testing services in support of eleven unmanned aerial systems (UAS), aerial target, missile, and bomb development programs. Most of these tests are protected with tightly sealed nondisclosure agreements, but three of these programs have permitted public presentation in regards to the general nature of the tests conducted at the WBWT. These three programs are Boeing's ScanEagle Compressed Carriage (SECC) UAS, Raytheon Missile Systems' Small Diameter Bomb (SDB-II), and Composite Engineering's Firejet II aerial target. A [press release](#) was issued for the SECC UAS test; images from the SDB-II and Firejet II tests are shown below. Shortly after completion of testing the SDB-II at the WBWT, Raytheon Missile Systems was awarded a \$144 million contract from the U.S. Air Force for continued development work and has continued to be awarded development contracts in the interim.



**Raytheon Missile Systems' SDB-II at the WBWT**



**CEi's Firejet-II at the WBWT**

The WBWT, a low-subsonic (up to 240 mph) closed-return wind tunnel with a 7x10-foot test section, is well-suited to the size range desired for UAS scale models. Test capabilities include continuous full-day runs of powered models, high angles of attack (up to +50°), advanced on-board instrumentation (pressure measurement, accelerometers, control surface loads, etc.), and real-time data processing and support. Model mounting options include sting support strut/internal balance and variable strut/external balance methods. Complete mount hardware image systems are available for all common test mounting setups.

Recent upgrades to the wind tunnel include two significant modernizations funded by federal grants. In 2004 the WBWT completed a \$6 million renovation including a new fan and electrical drive, active cooling system, flow turbulence and angularity reducing screens and honeycomb sections, a world-class underfloor external balance, and a fully-integrated closed-loop real-time data acquisition and processing system. In 2007 the WBWT invested in a \$1.5 million sting-mount motion system and suite of two-inch diameter internal balances. Manufacturing is underway for additional sting and internal balance sizes. These upgrades have enabled the WBWT to provide testing services on par with state-of-the-art commercial facilities throughout the world, and the WBWT looks forward to sustaining a prominent relationship in the development segment of numerous UAS programs in years to come. The goal of the presentation is to educate the Kansas UAS industry on the capabilities and value of wind tunnel testing at the WBWT.