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The Introduction to the Modelaircraft World

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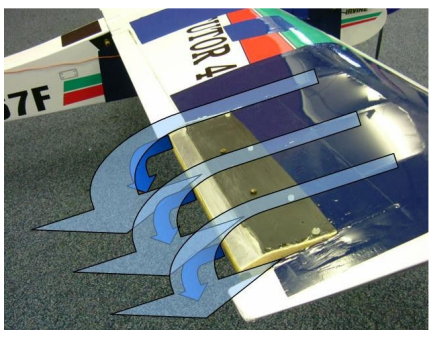
Technology update with model aircrafts

Don't flap

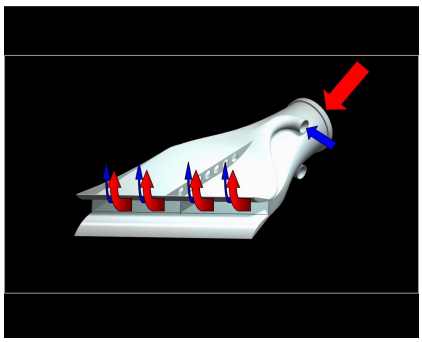
Systems developed for UAVs may be upscaled not only to larger, manned military aircraft but also for civil applications, bringing weight and cost savings. One example of such systems involves flapless technology.

BAE Systems' partnership with Zeading UK universities into flapless flight research has recently advanced, with scale air vehicles successfully test flown to demonstrate new concepts of flapless airflow control. Flapless in this context means no ailerons or elevators, with only blown air to control roll and pitch. Two air vehicles were flown late last year, which form the first of a set of planned demonstrators as part of the FLAVIIR (Flapless Air Vehicle Integrated Industrial Research) program for Future UAVs. A third, integrating the technology of the first two, is due to fly shortly.

An added bonus, according to BAE, is that a reduction in moving and electrical parts brings cost, reliability, weight, efficiency, and maintenance Wing trailing edge benefits to both military and civil types.



According to BAE, the first vehicle flown achieves roll control by blowing air from the trailing edge of one wing, which in turn entrains the upper surface flow and so increases lift, thus producing roll. That aircraft Features a two-stroke engine and a wingspan of 1.59 m, a mass of about 2.5 kg, and a cruise speed of 25 to 30 m/s. The second aircraft is based on the **Vector-11** delta-wing electric fan model aircraft, with a 1.2 m span, 2.3 kg mass, and cruise speed of 30 m/s. Both aircraft also feature a secondary air supply via a turbocharger-based compressor.



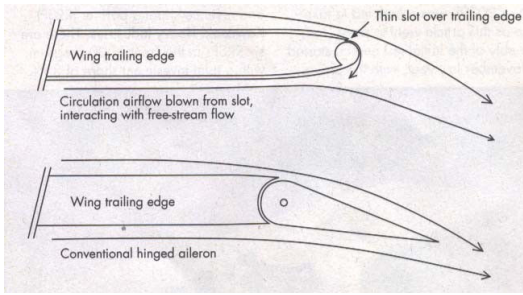
BAE describes the vehicle achieving pitch control by the deflection of the main propulsive jet. This deflection is achieved by using secondary jets that exhaust from small slots at the upper and lower surface of the main jet and follow a curved surface, which in turn entrains the main jet and results in full-thrust vectoring.

The third test vehicle, designated Santos, will see the integration of the technology from both earlier aircraft into a single electric platform driven by two electric ducted fans, one for main thrust and the other for secondary air supplies. Further developments may involve extrapolation of the Santos concept by examining aspects of jet engine design with secondary supply requirements.

Also scheduled is a 40-kg autonomous vehicle (Demon). A likely jet engine to be used for this vehicle is

the single radial compressor AMT Olympus with secondary supplies probably via a form of engine bleed. The program schedule is for this flying demonstrator to be completed in early 2009. BAE added that as the other technologies in the program are researched, further flapless vehicles would be developed.

The five-year project covers all key aspects and technologies of the nextgeneration UAVs, including aerodynamics, control systems,



electromagnetics, manufacturing, materials/structures, numerical simulation, and integration. The 2009 aircraft would represent a "maintenance-free," low-cost UAV without conventional control surfaces and without a performance penalty against a comparable conventional design.

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