



World's first zero emission, hydrogen fuel cell jet

April 6, 2007 -- An unmanned hydrogen fuel cell powered jet made history this week as it took to the skies over the hills of Bern, Switzerland. The “Hyfish” astonished its creators as it flawlessly performed vertical climbs, loops and other aerial acrobatics at speeds reaching 200 km/h. ([click here to see the video](#)).

These first amazing flights were the result of 1 and ½ years of cooperative development between the German Air & Space Center (DLR, or Deutsches Zentrum fuer Luft-und Raumfahrt) and a number of international partners, including Horizon Fuel Cell Technologies Pte Ltd of Singapore, which provided the record performance fuel cell that powered the flight of this next-generation Unmanned Aerial Vehicle (UAV).

UAVs are one of the most demanding applications for emerging hydrogen fuel cell power technologies due to the constraints of size, weight and aerodynamics. Scientists at Stuttgart's DLR Institute for Technical Thermodynamics integrated Horizon's ultra-light and compact fuel cell system into an aircraft with a total weight of just 6 kg. The HyFish has a fuselage length of just 1.2m and a short 1m wingspan. Unlike previous experiments with slower moving and lower power glider configurations, this is the first time a fast plane with jet wings was able to fly with a hydrogen fuel cell as its only power source.

The fuel cell developed by [Horizon Fuel Cell Technologies Pte Ltd](#) fulfilled all the required technical, physical and design conditions of this highly challenging system. The special fuel cell designed by Horizon's team produces an electrical power output of 1 kilowatt from an astounding total system weight of only 3 kilograms, which includes the pressurized hydrogen tank. In optimal conditions, Horizon's fuel cell stack alone was able to deliver a

peak power of 1.3kW at only 800g of weight, achieving a record fuel cell power density of well over 1.5W per gram.

The “HyFish”, as the German UAV is called, is an engineering showcase for fuel cell efficiency and next generation energy technologies in small, unmanned aerial vehicle applications. This flight test proved significant achievements in design challenges, both in terms of weight per horsepower as well as in terms of mechanical load.

The Hyfish hydrogen jet is the second small high tech aircraft to fly with Horizon’s fuel cells in less than one year. Its first fuel cell UAV development started in late 2005 with the NASA-sponsored [Multidisciplinary Flight Dynamics Laboratory](#) at California State University - Los Angeles, leading to a first successful flight in August 25, 2006 ([click here to see the full video](#)).

Horizon plans to deliver high performance fuel cells to at least another three prestigious UAV development programs this year, making it the world-leading supplier of fuel cell systems for unmanned flight. “We are very proud of the great technological progress achieved on our fuel cell designs in the last 12 months. We are confident that record-breaking 15 to 30 hour flight times are now within reach for small UAVs, which would offer new and disruptive possibilities in the aviation industry,” said George Gu, Horizon’s President & CEO.

Globally, aviation accounts for approximately 4 to 9 % of the climate change impact of human activity, and it is also the fastest growing source of greenhouse gas emissions. Success in small-size aircraft applications such as UAVs opens new opportunities for using zero emissions fuel cell technology in general aviation. Fuel cells can be used to support propulsion power, as well as on-board auxiliary power for lighting, video screens, and other passenger comforts. Today, small UAVs designed for environmental monitoring, surveillance, and border patrol missions are a fast-growing segment of the aerospace sector, making this an ideal platform for introducing fuel cell technology into the aviation market.

Horizon Fuel Cell Technologies Pte Ltd is a founding member of Singapore’s fuel cell community, and a key participant in the recently launched clean energy technology hub in Singapore. A Singapore registered company with main operations currently in China, Horizon is a developer of commercial-grade, cost-competitive hydrogen fuel cell solutions targeting a number of early adopter markets. In recent months, Horizon started bringing fuel cell technology to the general public with the launch of the [H-racer](#), the world’s first consumer fuel cell product awarded “[Best Inventions of 2006](#)” by Time Magazine, and “[one of the 11 coolest products of 2007](#)” by Business 2.0. With such progress achieved in the marketplace, Horizon was able to use the proceeds from its smaller products to develop world-class fuel cell power systems as witnessed with the high-speed “HyFish” UAV. Today an increasing number of exciting, real-size fuel cell applications are in the pipeline for commercial launch, while Horizon continues to gain a global reputation for creativity, innovation and technology leadership.

The HyFish hydrogen UAV will be on display to the general public at the Hannover Fair April 16 to 20, Stand G 32/1, Hall 13.