
Exercice

Modern Marvels Extreme Aircraft I – http://www.youtube.com/watch?v=bnr9PtnL2_0

Extreme power, extreme speed. From the X-1 that broke the sound barrier, to the scramjet aiming for Mach 10, planes on the cutting edge, from the past, the present and **the future**. Now, Extreme Aircraft, on Modern Marvels.

In March of 2004, a test plane mounted on a rocket carried aloft by a bomber made history at Edwards Air Force Base, east of Los Angeles.

After release from its B-52 mothership, the small unmanned X-43 flew at the **amazing** speed of Mach 7, faster than any known jet aircraft has ever flown.

“It was a very significant event. Some people have even gone so far as to equate it actually with the Wright Brothers flight.”

When it **separated** from the rocket, the X-43 accelerated on its own power to Mach 7.

“Mach 7 is approximately five thousand miles per hour so you can imagine flying New York to Los Angeles in just over a half an hour.”

The NASA Dryden flight research center says the scramjet powered X-43 is capable of reaching at least Mach 10. A scramjet is a supersonic combustion ramjet. The ramjet, sometimes called the flying stovepipe is one of the simplest engine designs ever conceived, with virtually no moving parts. It's basically a hollow tube into which fuel is injected and ignited. Unlike regular jets, there are no compressor blades inside to compress the air. In a ramjet, **supersonic air** is slowed down to subsonic speed inside the engine. But in a scramjet, the air **moves through** the engine at supersonic speed.

“The X-43 vehicle has to endure some very extreme temperatures. The temperature along the leading edges of the vehicle for example, are in excess of 3000 degrees Fahrenheit.”

The front of the X-43 and the leading edges of the tail are made of carbon-carbon, a lightweight and strong composite material that can withstand extremely high **temperatures**.

“Carbon-carbon that we use is a sort of high-tech cousin to carbon fiber. It's um... The carbon itself is different. It's a much higher temperature, the bonding agent is a much higher temperature. It can go to 3000 degrees without degrading. It doesn't wear away.”

“What you see is the front of the vehicle, the tungstene nose. The very front edge is the carbon-carbon **leading edge** that provides **the thermal** protection. As you can see, there's a lot of complicated machinery and very densely packed systems inside this vehicle in order to **make it work**.”

A number of small electric motors on the aircraft are controlled by computer signals from the ground.

“Motors on these electric actuators move the surfaces. That's how we maintain control of the vehicle in flight.”

Keeping the fuel burning inside the engine at supersonic speeds has been described as trying to keep a **match lit** in a hurricane.

“The flame doesn't really blow out because there are areas in the engine, small areas that aren't supersonic, that allow a flame to **grab hold** and to sustain itself.”

“There's something about flying that fast [that] I think just captures the imagination of folks. It's just **phenomenal** to imagine flying that fast.”

“I'd say the main interest you find for the scramjet in the near term would be the military. They would like to have a missile that goes say Mach 5, Mach 6, five or six times the speed of sound, so it can get to a target very quickly and has a **lot of range** in doing that. You could do that now on a **solid rocket motor** but it runs out of gas pretty quickly.”

The Air Force is also interested in using scramjet **propulsion** for superfast bombers that can strike anywhere in the world with amazing speed, flying more than 10 times as fast as current bombers.

“There's no reason that a human couldn't pilot or be a passenger on a hypersonic airplane. ‘Vision vehicles’ as we call them include space access vehicles to take astronauts to the space station or to orbit, and also potentially passenger vehicles again to take people **to the other side** of the world.”

Some experts believe the scramjet could usher in a whole new era in aviation.

“We entered the 19th century moving at 6 miles an hour, the speed of an **animal-drawn** vehicle. We entered the 20th century moving at 60 miles an hour, the speed of a steam **locomotive**. We entered the 21st century at 600 miles an hour, the speed of an intercontinental jetliner. If you plot this in semi-logarithmic fashion, you get a nice straight line that indicates we may well enter the next century at 6000 miles an hour, which is precisely where you see the X-43 really pointing us and heading in **that direction**.”

The X-43 scramjet is carrying on a tradition of cutting-edge aircraft development that goes back decades. And although Mach 7 is a major accomplishment for an air-breathing jet engine, rocket-powered planes were flying almost that fast decades ago. It all began with the most amazing series of extreme aircraft in aviation history. They were called “the X planes”, the “X” standing for “**experimental**”. The very first X plane was appropriately named the X-1.

“In 1944, the United States decided to bite the bullet really and develop a specialized family of research airplanes, of which the X-1 is the first, that would essentially use the sky as a laboratory and which would carry 500 pounds of recording instrumentation and at the same time would also radio very important values that were measured in flight down to **ground stations**. This marked **the birth really** of a remarkable family of airplanes that continues [at ??] the present day, the so-called X series.”