



## **THE U.S. X-51A WAVE RIDER: U.S. GEARS UP FOR PROMPT GLOBAL STRIKE**

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Technology has advanced to a stage where cruise missiles can now fly at hypersonic speeds also. The U.S. X-51A Wave Rider is one such hypersonic experimental aircraft developed for the task of Conventional Prompt Global Strike. The CPGS is a strategy laid down by the United States to develop conventional weapon systems which could reach any part of the world in less than an hour or even less. The families of systems are also being developed to address the Anti Access Area Denial strategies of its adversaries, to be able to strike time critical targets and also to reduce Washington's reliance on its forward bases. This article takes a look at the features of the Wave Rider and its implications.

### **The Uniqueness in Technology**

The idea of a scramjet engine is not new to the United States. In the 1980s President Ronald Reagan laid stress on the development of the X-30 National Aerospace Plane that "could demonstrate the capability to fly from New York to Tokyo". The Wave Rider demonstrates a hypersonic range of Mach 4.5 to 6.5. The missile is lifted with the help of the pressure which is lifted beneath the missile. In its first test, the Wave Rider was released from the B-52 bombers.

A unique feature of the Wave Rider is that it does not use rocket engine but instead uses air-breathing engine which makes the travelling of the missile faster and cheaper. The hassle of carrying the oxidizer is not there and hence, the payloads on the X-51A can be increased. Another unique feature of this missile is that the missile uses hydrocarbon fuel in the scramjet's combustion chamber, while other systems which achieve hypersonic speeds usually use hydrogen fuel in the scramjet combustion chamber. The hydro carbon enhances the "viability" and "usability" of the missile. Even though hydrogen is easily flammable resulting in small amount of energy needed to ignite and make it burn faster

generating huge thrust, its low density makes it inappropriate to be used in a scramjet engine. Hydrocarbon fuels are denser enabling the missile to fly for longer distances.

The X-51A would be the quintessence of technology for improving the efficiency of missiles and other high speed weapons. However, in 2012, during a test flight, it was reported that the control fin of the weapon had malfunctioned due to which it lost control during its flight.

The achievement of the hypersonic speeds will enable the X-51A to strike time critical targets and destroy them with its own kinetic energy thereby making it an apt weapon for Prompt Global Strike. Subsonic speeds are not the best weapons for such targets and the U.S. has already experienced it in 1998 when the Tomahawk missed striking Osama Bin Laden.

Needless to say that the X-51A is expected not reach a target within one hour, but also to counter enemy Anti Access Area Denial strategies.

### **The Future**

The X-51A is expected to serve as the “bedrock” for future research on hypersonics and also for the practical application of hypersonic flight. According to analysts, the X-51A would be a leap forward to moving from Earth to space and then hitting targets from space itself by enhancing its acceleration. By 2014, DARPA also plans to launch Small Responsive Space Access X-Plane for “quick reaction time” which would also include space.

It must be noted that it would take the United States some time to develop such air breathing technologies and it is expected to be ready only by 2025. Development of scramjet engine is more difficult than any other air breathing engine.

This missile would be a respite for the United States whose deterrence mostly relies on ballistic missiles as a part of the nuclear triad. The Wave Rider would be conventionally armed which is expected to reduce the reliance on nuclear weapons. However, despite being conventionally armed, the Wave Rider would not enable in nuclear arms reduction neither with Russia nor with China. The weapon would be able to strike off China or Russia’s armaments in less than an hour. Being hypersonic, it would be difficult to be intercepted. This means that the missile defence would not be able to act as a deterrent against the US X-51A Wave Rider. Hence, with a superfast weapon to destroy Chinese and Russian

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counter force weapons and a missile defence to be able to prevent the residual missile from reaching the US territory or its forward bases, it would be difficult for the Chinese and Russians to think of nuclear arms reduction and could instead send them scrambling for more. Indeed, the offence defence spiral would continue.

Since the X-51A is restricted by ranges, it would need to depend on the B-52H Stratofortress Bombers<sup>1</sup> which are refuelled at the Guam Base. Hence, the United States would need to rely on its forward bases. At present, such a capability is only demonstrated. The weapon is yet to prove its strategic value.

*(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies CAPS)*

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<sup>1</sup> The weapon was tested from the B-52H Stratofortress.