“Defiant”, a Today Unique Helicopter in the World

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Abstract: You do not see helicopters like this every day. Sikorsky-Boeing SB1 Defiant in his first demonstration flight showed that it is much more than just a fancy design on paper as he could initially think, with a first relevant flight demonstration. The initial flight lasted less than 30 min, enough time for Defiant to prove he can climb and descend easily, move back and forth and turn left and right with extraordinary ease and maneuverability. Companies have described this action as a low-speed flight maneuver and a short film has revealed that the helicopter can also operate in the area of about 10 to 20 m of land successfully. His first start in the inaugural flight test was held at a Sikorsky airport in West Palm Beach, Florida. SB1 Defiant has an unusual design that instantly conquers you. If most helicopters have one main rotor for vertical lifting, "Defiant" has a pair of coaxial rotors, one rotating clockwise and the other rotating trigonometrically (counterclockwise) to achieve a balancing the dynamics of the couple - that is, to prevent it from overturning one side or another. This means that the aircraft no longer needs the standard rotor at the helicopter tail. Instead, it has a new, distinctive, rear-wheel drive, which has the role of getting Defiant's zoom along the high-speed horizontal flight. "Defiant" is designed to fly at almost twice the speed of classic helicopters while maintaining the best low speed and hover performance of conventional helicopters. Coaxial design can also be found in some Russian military helicopters but without a propeller. Sikorsky used the project earlier (with the propeller) in the experimental X2 helicopter and the next S-97 Raider. The Defiant Project is considered by the United States Army for the Future Lift Vertical program, which intends to find a replacement for many of the US military helicopters used today (Finally, as in the early 2030s, where Defiant's rival in that area is the Bell V-280 Valor, which is not a helicopter, but rather a V-22 Osprey-like tiller-like aircraft used by US marines. The V-280 has been able to improve flight quality since its first flight in December 2017). The Sikorsky-Boeing team will then analyze the flight data recorder and film on this first demonstration flight with the aim of establishing a plan for several "Defiant" test flights in the coming weeks and months to confirm other important features of the new helicopter, before making a complete presentation, for massive future production orders. Sikorsky and Boeing have long been working on this high-speed military helicopter project and have released the first images of what is expected to become a very efficient utility helicopter of the United States Army sometime in 2030. SB1 Defiant is a technology demonstrator with Future Lift technology, built around the Sikorsky X2 platform, using two counter-rotating blades at the top of the plane to eliminate the problem of a 150 km/h traction rotor (~ 240 km/h).

Keywords: Boeing, Sikorsky, SB1 Defiant, STOVL

Introduction

Sikorsky and Boeing have reunited this time to build a new helicopter, able to quickly take off vertically, thus achieving a true ultra-fast lift, but also with great maneuverability, capabilities that will give it some advantages special in front of classical helicopters. It can move easily in any direction, simultaneously with tilt.
maneuvers and with very fast attack and defense, regardless of the height it is found, being able to move permanently including the zigzag as we have shown already at even low altitudes, to which other helicopters do not have the courage to handle either side or the other, in order not to become unbalanced and fall out of the lack of altitude. In other words, it is a beehive or a beehive bee that may, while struggling to carry out various operations including military, obviously of recognition, espionage, or attack even during confusing flight including low altitude, acceleration and large decelerations, with higher speeds than classic helicopters, which can double from them.

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SB1 Defiant is a technology demonstrator with Future Lift technology, built around the Sikorsky X2 platform, using two counter-rotating blades at the top of the plane to eliminate the problem of a 150 km/h tractor rotor (~ 240 km/h).

Simply placing it in a stable hover without wind, a helicopter tip blade generates an equal amount of lifting force of its entire rotation around the central axis.

But when you begin to move through the air, the blade starts to develop an extra height on the side where the blades hurry forward in the wind and rise less on the opposite side, where the blades turn with the wind. This can become so unbalanced that it threatens to defy the helicopter altogether if you do not stay at a defined maximum air speed.

Sikorsky technology places two main rotors one above the other, rotating in opposite directions, balancing the lift profile on both sides and allowing the ship to fly much faster - up to twice the speed of a regular helicopter - agility.

It also eliminates the need for a rotor because the rotation can only be managed with top rotors. SB1 Defiant uses a propeller to the rear, along with active hooks and lifts.

At take-off, this means that the aircraft can rise and move quickly without having to lean forward. At higher speeds, the rear carrier provides an extra mechanism and elevators and lifts help with quick handling.

Defiant will have a retractable landing system, reducing traction to allow higher speeds at greater efficiency, resulting in a greater distance. Its double rotor system will reduce leakage and stop leakage and Sikorsky also claims a "dramatically reduced acoustic signature". On the ground, the top rotors can be folded back, allowing for easy storage and transport.

When he enters the service, Defiant will wear a team of four and a cabin equipped for up to 12 troops ready for battle or eight medevac rifles.

It is in an assault configuration; there will be a variant of attack that shares a common transmission and many other systems, but it has a different fuselage and is more armed (Rulkov et al., 2016; Agarwala, 2016; Babayemi, 2016; Gusti and Semin, 2016; Mohamed et al., 2016; Wessels and Raad, 2016; Rajput et al., 2016; Rea and Ottaviano, 2016; Zurfi and Zhang, 2016a; 2016b; Zheng and Li, 2016; Buonomano et al., 2016a; 2016b; Faizal et al., 2016; Ascione et al., 2016; Elmeddahi et al., 2016; Calise et al., 2016; Morse et al., 2016; Abouoibaïda, 2016; Rohit and Dixit, 2016; Kazakov et al., 2016; Alwetaishi, 2016; Riccio et al., 2016a; 2016b; Iqbal, 2016; Hasan and El-Naas, 2016; Al-Hasan and Al-Ghamdi, 2016; Jiang et al., 2016; Sepúlveda, 2016; Martins et al., 2016; Pisello et al., 2016; Jarahi, 2016; Mondal et al., 2016; Mansour, 2016; Al Qadi et al., 2016b; Campo et al., 2016; Samantaray et al., 2016; Malomar et al., 2016; Rich and Badar, 2016; Hirun, 2016; Bucinell, 2016; Nabilou, 2016b; Barone et al., 2016; Chisari and Bedon, 2016; Bedon and Louter, 2016; dos Santos and Bedon, 2016; Minghini et al., 2016; Bedon, 2016; Jafari et al., 2016; Chiozzi et al., 2016; Orlando and Benvenuti, 2016; Wang and Yagi, 2016; Obaiys et al., 2016; Ahmed et al., 2016; Jauhari et al., 2016; Syahtrullah and Sinaga, 2016; Shammugam, 2016; Faber and Bicker, 2016; Wang et al., 2016; Moubarek and Ghasrallah, 2016; Amani, 2016; Shruti, 2016; Pérez-de León et al., 2016; Mohseni and Tsavdaridis, 2016; Abu-Lebdeh et al., 2016; Augustine et al., 2016; Jarahi and Seifilaleh, 2016; Nabilou, 2016a; You et al., 2016; Al Qadi et al., 2016a; Rama et al., 2016; Sallami et al., 2016; Huang et al., 2016; Ali et al., 2016; Kamble and Kumar, 2016; Saikia and Karak, 2016; Zeferino et al., 2016; Pravettoni et al., 2016; Bedon and Amadio, 2016; Chen and Xu, 2016; Mavukkandy et al., 2016; Yeargin et al., 2016; Madani and Dababneh, 2016; Alhasanat et al., 2016; Elliott et al., 2016; Suarez et al., 2016; Kuli et al., 2016; Waters et al., 2016; Montgomery et al., 2016; Lamarrre et al., 2016; Petrescu, 2012b; Aversa et al., 2017a; 2017b; 2016a; 2016b; 2016c; 2016d; 2016e; 2016f; 2016g; 2016h; 2016i; 2016j; 2016k; 2016m; 2016n; 2016o; Petrescu and Petrescu, 2016; 2015a; 2015b; 2015c; 2015d; 2015e; 2014a; 2014b; 2014c; 2014d; 2014e; 2014f; 2014g; 2014h; 2014i; 2013a; 2013b; 2013c; 2013d; 2013e; 2013f; 2013g; 2012; 2011; 2005a; 2005b; 2005c; 2005d; 2003; 2002a; 2002b; 2000a; 2000b; 1997a; 1997b; 1997c; 1995a; 1995b; Petrescu, 2018; 2015a; 2015b; 2012; Petrescu et al., 2016; 2017a; 2017b; 2017c; 2017d; 2018a; 2018b; 2018d; Petrescu and Calautit, 2016a; 2016b; Daud et al., 2008; Taher et al., 2008; Zulkifi et al., 2008; Pourmahmoud, 2008; Panirselvam et al., 2008; Ng et al., 2008; El-Tous, 2008; Akhesme et al., 2008; Nachiengtai et al., 2008; Moeti et al., 2008; Boucetta, 2008; Darabi et al., 2008; Semin and Bakar, 2008; Al-Abbas, 2009;
Abdullah et al., 2009; Abu-Ein, 2009; Opafunso et al., 2009; Semin et al., 2009a; 2009b; 2009c; Zulkifli et al., 2009; Ab-Rahman et al., 2009; Abdullah and Halim, 2009; Zotos and Costopoulos, 2009; Feraga et al., 2009; Bakar et al., 2009; Cardu et al., 2009; Bolonkin, 2009a; 2009b; Nandhakumar et al., 2009; Odeh et al., 2009; Lubis et al., 2009; Fathallah and Bakar, 2009; Marghany and Hashim, 2009; Kwon et al., 2010; Aly and Abuelnasr, 2010; Farahani et al., 2010; Ahmed et al., 2010; Kunanoppadon, 2010; Helmy and El-Taweel, 2010; Qutbodin, 2010; Pattanasethanon, 2010; Fen et al., 2011; Thongwan et al., 2011; Theansuwan and Tiratranasirichai, 2011; Al Smadi, 2011; Tourab et al., 2011; Raptis et al., 2011; Momani et al., 2011; Ismail et al., 2011; Anizan et al., 2011; Tsolakis and Raptis, 2011; Abdullah et al., 2011; Kechiche et al., 2011; Ho et al., 2011; Rajbhandari et al., 2011; Aleksic and Lovric, 2011; Kaewnai and Wongwises, 2011; Idarwazeh, 2011; Ebrahim et al., 2012; Abdelkrim et al., 2012; Mohan et al., 2012; Abam et al., 2012; Hassan et al., 2012; Jalil and Sampe, 2013; Jaoude and El-Tawil, 2013; Ali and Shumaker, 2013; Zhao, 2013; El-Labban et al., 2013; Djalel et al., 2013; Nahas and Kozaitis, 2014).

**Materials and Methods**

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It can move easily in any direction, simultaneously with tilt maneuvers and with very fast attack and defense, regardless of the height it is found, being able to move permanently including the zigzag as we have shown already at even low altitudes, to which other helicopters do not have the courage to handle either side or the other, in order not to become unbalanced and fall out of the lack of altitude.

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![Fig. 1: Sikorsky-Boeing SB1 Defiant in his first demonstration flight](https://ssrn.com/abstract=3417345)
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Results

Defiant is designed to fly at nearly twice the speed and has twice the range of conventional helicopters while retaining the very best, if not better low-speed and hover performance of conventional helicopters... This design provides for exceptional performance in the objective area, where potential enemy activity places a premium on maneuverability, survivability and flexibility. We are thrilled with the results of today’s flight and look forward to an exciting flight test program.

Defiant is a further extrapolation of Sikorsky's X2 technology demonstrator, which pioneered its unique configuration. The S-97 Raider, an armed reconnaissance coaxial-rotor compound helicopter that the company also derived from the X2 concept and has helped further inform the development of the SB1, has been flying for years now and two prototypes are currently in testing. Lockheed Martin has since purchased Sikorsky, but it continues to operate under that name and as a separate business unit.

The Defiant and the Valor are set to go head to head as part of the Army's Joint Multi-Roie (JMR) technology demonstration program. The service had hoped to begin these flight tests in December 2017 but pushed its timeline back due to the delays with the SB1.

The Army plans to use the results from JMR to help better understand and define the Future Vertical Lift (FVL) program requirements. The SB>1 and V-280, or refined versions of these designs, will be heading for a brawl over the “medium” portion of that project, which aims to replace hundreds of UH-60 Black Hawks and AH-64 Apaches. The Sikorsky-Boeing team plans to pitch the Defiant as a successor to the Black Hawks and has shown a companion gunship design as the Apache replacement.

Discussion

Sikorsky and Boeing have long been working on this high-speed military helicopter project and have released the first images of what is expected to become a very efficient utility helicopter of the United States Army sometime in 2030.

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Conclusion

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Ethics

Author declares that are not ethical issues that may arise after the publication of this manuscript. This article is original and contains unpublished material.

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