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WHAT THE UNITED STATES EXPECTS FROM THE SIXTH GENERATION FIGHTER AIRCRAFT

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Northrop Grumman was recently in news as it released a video on the conceptual image of the sixth generation fighter aircraft. Sixth Generation Fighter aircraft (SiGFA) is a fighter being designed on concepts akin to concepts of spacecraft depicted in star wars trilogy. The aircraft, equipped with new concept weapon systems, is expected to become operational by 2030-2050.¹ The erstwhile Secretary of the US Air Force, Michael B. Donley, and the then USAF Chief of Staff, Gen. Norton A. Schwartz, while commenting on the F-22 Raptor aircraft way back in April 2009, had hinted that the United States would soon begin work on the sixth-generation capabilities necessary for future air dominance.² The project to design the SiGFA has been on the cards of Defence Advanced Research Projects Agency (DARPA) since 2012 and Northrop Grumman Corporation, maker of the B2 stealth bomber, has been selected to develop

this highly classified, \$80 billion project.³ Before proceeding to the likely capabilities and characteristics envisaged in SiGFA, it would be prudent to bring out the present day status of FGFA.

Fifth Generation Fighter Aircraft (FGFA)

The US Air Force is the only country in the world having combat-ready FGFA. The Lockheed Martin's F-22 Raptor and F-35 Lightning II have been designed to perform ground attack, aerial reconnaissance, and air defence missions. The other few FGFA aircraft currently under various stages of testing and development around the world are the Sukhoi PAK FA, Mitsubishi ATD-X, HAL AMCA, TAI TFX, Chengdu J-20 and Shenyang J-31.⁴ The countries involved in these FGFA projects are Russia, Japan, India, Turkey and China.



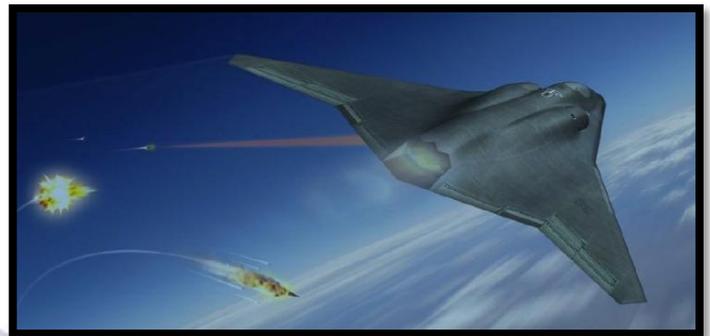
FGFA, like the F-22 Raptor and F-35 Lightning II⁵ encompass numerous advanced technological characteristics like all aspect, advanced stealth features using aligned edges and special coatings. The aircraft caters to stealthy packaging of diverse weapon systems and on-board fuel within the airframe structure. Another stealth characteristic is the use of low probability of intercept radar (LPIR) using embedded antenna systems. The aircraft's high-performance airframe is designed to sustain extreme agility and acceleration. Equipped with advanced avionics features and sensor fusion, the real-time situational awareness in a battlefield is available to the pilot. The aircraft also uses high end computer systems which are not only integrated to the available onboard systems but are networked with other platforms and war fighting machinery within the battle space providing a high-fidelity view of ongoing operations.

Sixth Generation Fighter Aircraft

The SiGFA in comparison to the current Fifth Generation Fighter Aircraft (FGFA) will be superior in terms of its capability to reach supersonic speeds, weapon systems, range, stealth and self-healing structures.⁶ The SiGFA airframe design (see figure below) depicts a tailless fighter with wings like the X-47B unmanned aerial vehicle and a nose and cockpit similar to the F35 Joint Strike Fighter.⁷ It would utilize high end technologies that would provide

an extraordinary edge over the existing capabilities of fifth generation fighter aircraft in areas that would not only enhance the range but allow persistence, survivability, network centricity, situational awareness, human-system integration and weapons effects.⁸

Image: The sixth generation fighter is rumoured to fly at supersonic speeds



Source: <http://www.dailymail.co.uk/sciencetech/article-3437793/Northrop-Grumman-teases-sixth-generation-supersonic-superfighter-laser-weapons-stealth-bomber-set-replace-B-2-Superbowl-ad.html> accessed on February 22, 2016

While the specifications of the aircraft have been kept secret, the likely capabilities and characteristics envisaged in SiGFA design are brought below.

- The aircraft would be extremely stealthy and could incorporate features allowing it to change its shape in flight, “morphing” to optimize for either speed or persistence, and its engines will likely be re-tuneable in-flight for efficient supersonic cruise or subsonic loitering.⁹
- Materials and microelectronics technologies would combine to make the aircraft a large integrated sensor, possibly eliminating the need for nose radar.¹⁰
- The aircraft will be “smart”, in that artificial intelligence will help learn and propose the best possible action to the controlling crew/ pilot. The aircraft will

collect its own data and seamlessly fuse it with off-board sensors, including those on other aircraft.¹¹

- It would be capable of providing a graded response to the varied threats using soft as well as hard kill options. Munitions would likely be of the “dial an effect” type, able to cause anything from impairment to destruction of an air or ground target.¹²
- The conventional wires of “fly by wire” system would extensively use fibre optic technology for functionality. This would not only reduce weight but also help resist jamming.
- The aircraft would be able to fly at hypersonic as well as subsonic speeds, operate at ultra high altitudes and could have extended loiter capability. It would be a long range aircraft aimed at cutting down requirement of mid-air refuelling.¹³ Vertical Take Off and Landing (VTOL) capability would be desirable.
- Development of directed energy weapons (DEW) is already well under way in the United States and SiGFA, in addition to conventional long range weapon systems will be equipped with these new concept weapons like high-powered microwaves and lasers for defence against incoming missiles or as offensive weapons themselves.¹⁴
- The aircraft while being cyber reliant would be capable of carrying out cyber attacks.
- The aircraft may be developed as an Unmanned Aerial Combat Vehicle.

While the FGFA brings together stealth, agility and lethality, the proposed and envisaged characteristics and features of SiGFA project look

forward to putting together all the emerging new concept weapon systems, avionics and smart technologies. The greatest advantage over FGFA would be extreme stealth characteristics, ability to alter shape in flight, new generation of engines allowing ultra high altitude flight and longer range, use of DEWs, cyber attack capability, graded threat response and advanced avionics for self protection.

(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])

Notes

¹ “Sixth-generation jet fighter”, at https://en.wikipedia.org/wiki/Sixth-generation_jet_fighter accessed on February 22, 2016

² Michael Donley and Norton Schwartz, “Moving Beyond the F-22”, *The Washington Post*, April 13, 2009, at <http://www.washingtonpost.com/wp-dyn/content/article/2009/04/12/AR2009041202268.html> accessed on February 22, 2016

³ Mark Prigg, “Northrop Grumman teases sixth generation supersonic ‘superfighter’ with laser weapons and stealth bomber set to replace the B2 in Superbowl ad”, at <http://www.dailymail.co.uk/sciencetech/article-3437793/Northrop-Grumman-teases-sixth-generation-supersonic-superfighter-laser-weapons-stealth-bomber-set-replace-B-2-Superbowl-ad.html> accessed on February 22, 2016

⁴ “Fifth-generation jet fighter”, at https://en.wikipedia.org/wiki/Fifth-generation_jet_fighter accessed on February 22, 2016

⁵ “F-35 Lightning II: Defining the Future”, at http://www.lockheedmartin.com/content/dam/lockheed/data/aero/documents/f-35/collateral/2012%20update/F-35_Defining%20the%20Future.pdf accessed on February 24, 2016

⁶ “6th Generation Fighter”, at http://aircraft.wikia.com/wiki/6th_Generation_Fighter accessed on February 22, 2016

⁷ Kyle Mizokami, “The Laser-Toting Tailless Fighter Jet of the Future”, at <http://www.popularmechanics.com/military/weapons/ne>



ws/a18566/unveiled-northrop-grummans-fighter-of-the-future/ accessed on February 22, 2016

⁸ “6th Generation Fighter”, at http://aircraft.wikia.com/wiki/6th_Generation_Fighter accessed on February 22, 2016

⁹ John A. Tirpak, “The sixth generation fighter”, *Air Force Magazine*, October 2009, at <http://www.airforcemag.com/MagazineArchive/Pages/2009/October%202009/1009fighter.aspx> accessed on February 22, 2016

¹⁰ ibid

¹¹ ibid

¹² ibid

¹³ Yasmin Tadjdeh, “Military Eyes Sixth-Generation Fighter”, at <http://www.nationaldefensemagazine.org/archive/2016/March/Pages/MilitaryEyesSixthGenerationFighter.aspx> accessed on February 22, 2016

¹⁴ Tyler Rogoway, “This is Northrop Grumman's idea of a Sixth-Generation Fighter, But is it feasible?”, at <http://foxtrotalpha.jalopnik.com/this-is-northrop-grummans-idea-of-a-sixth-generation-fi-1747680825> accessed on February 22, 2016