

Stealth Technology

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Abstract

Entering into enemy airspace or territory without detected by enemy and accomplishing the objective is a very difficult thing. In modern times technology is changing rapidly. In a simple word Stealth is something which is almost invisible. STEALTH technology is a combination of different types of coding and engineering. It is vastly used by different countries as their weapon. By using aircrafts, warships and ground vehicles stealth, it is very much easier to enter in enemy zone without getting caught by their attention. Here we will discuss about how it is invented and how does it work and the limitations and advantages about this evolving technology.

Keywords: Introduction, Stealth technology, working principle of radar and stealth technology, advantages and disadvantages.

Introduction

Stealth technology is a technology which covers the range of aircraft, ships and missiles, to make them less visible to any detection methods. In simple terms, stealth technology allows an aircraft to be almost invisible to Radar. It can able to reduce the detection range of an aircraft. This is identical with the camouflage tactics applied by warriors in jungle warfare. If the soldier does not come near you, you cannot see him. That technique gives a clear and safe hitting distance for the aircraft, the radar systems which can detect stealth aircraft is still a threat. Stealth technology has been expanded into each and every area like aircrafts, missiles, ships; it is much needed to develop powerful radar system. Many countries have already announced that they have developed techniques for counter-stealth that allow them to detect stealth object.

History

During the World War II time period when the RADAR was invented, then it was difficult to fly aircrafts or sail warships into enemy zone since the aircrafts or warships were very easy to track and specially the aircrafts. In order to avoid the radars, Germans used to coat their U-boat snorkels with anti-radar material. After the World War II, scientists engaged themselves for discovering the RADAR echoes, they decided to take their research much far to become knowledgeable to the RADAR echoes or the beams of electromagnetic waves, which are returned from the objects of various shapes, sizes, surfaces, and types. To save the aircraft from the detection by the 1980s, the United States had introduced the first model of models of stealth technology, This plan included a bomber aircraft F117. It was a successful achievement for USAF and the bomber was good and it was also known as 'Nighthawk'.

Working Principles of STEALTH Technology

Before knowing how the STEALTH technology works, we first have to understand that how the RADAR works. For basics, we all know that radar is a device which sends the electromagnetic waves to an

obstruction and the waves returns from the obstruction. By that process, the information of the position, the size and other parameters become known to the radar user. It is mainly used to detect the obstruction.

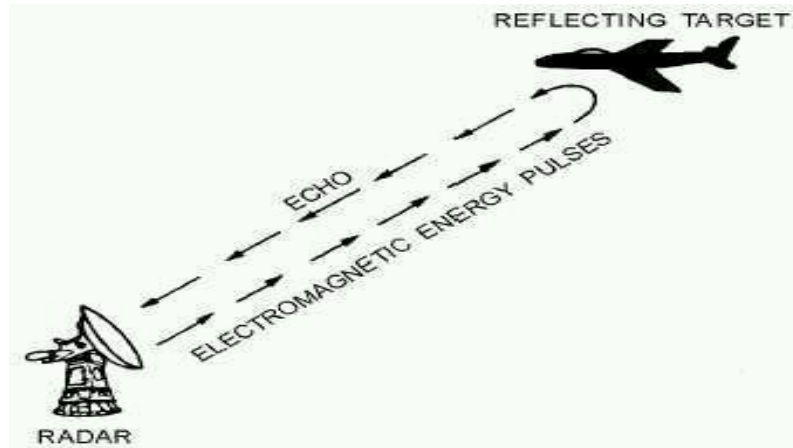


Fig.1. Working of the RADAR

In Fig. 1, the working of the RADAR is shown. When any obstruction comes in the range of the radar, a dot appears the screen and it helps to track the obstruction.

In that area, the Radar Cross Section (RCS) has an important role. If the Obstruction has a very less RCS then it is very difficult to track it which contains stealth technology. The radar cross-section of an object is the domain intercepting that amount of power which, when scattered isotropically, creates an echo equal to that received from the object.

Stealth technology follows the principle of deflecting the RADAR waves. This can be done by either

1. Absorbing radio waves (RAM coatings)
2. Deflecting radio waves (Shaping of the surfaces)

Absorbing radio waves

Radar Absorbent Material (RAM) coatings plays an important role in the application of materials which can absorb electromagnetic waves on the aircraft. These coatings are specially designed materials made from the dielectrics, composites which absorb the electromagnetic waves which fall on them for making the aircraft stealthy. To increase the absorption of radio and electromagnetic waves, the paint has pyramidal structure in some cases for avoiding the waves. The pyramid shapes are used to make the angles in a manner that can increase the number of returns a wave makes from the object. With every return, the wave loses energy to the coating material and that is why it exits with lower signal strength. Other coating of absorbers is available and this can be applied in flat sheets by using an increasing gradient of carbon loadings in several layers.

Deflecting radio waves (Shaping of the surfaces)

Shaping includes designing the object in such a way that the radio waves, instead of being reflected back along the same path are bounced and dispersed in several directions. This is achieved by using a good angled flat surfaces or special curved surfaces which can be able to conduct the radio wave along its exterior and by that way it does not give a reflection in return.

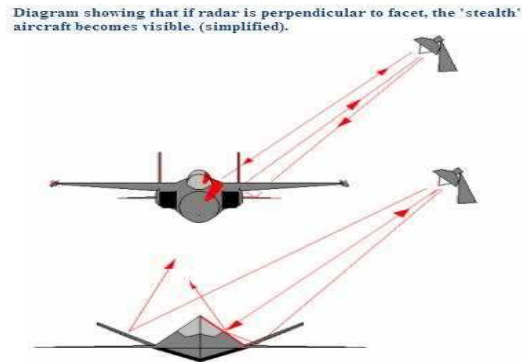


Fig. 2 Deflection of the waves

The stealth technology is used for reconnaissance, interception, attacking and bombing. Fig. 2 has shown the deflection of the waves. Some typical examples of stealth aircraft, ground vehicles and warships have been shown below



Fig. 3.A F22 Raptor with Stealth ability and the one of the 5th gen combat proven aircraft.



Fig. 4.A Russian stealth tank concept



Fig. 5.A stealth US navy destroyer

Advantages of Stealth technology:

1. In present world and in near future, stealth technology will enhance the power of the military.
2. In future, the stealth technology will become more advanced.
3. By the proper use of it, many new technological concepts can emerge.

Disadvantages of Stealth technology:

1. Specialized hanger is needed for this technology.
2. Air-conditioned hanger is required.
3. Special pilots are needed to drive.
4. It is hard to adopt for many countries.

Conclusion

In the near future, it can be a game changer into military strength of any country. Being evaded by radars, the aircrafts and the warships can make more impact hit to the target. Our country India is also bringing the first indigenous 5th generation fighter aircraft Hal AMCA. It is the designing phase. Every technology has its own countermeasures and so defensive systems are also upgrading. In that time, some countries are making good radars which can able to identify the stealth aircraft The SAMs (Surface to air missile) and other air defense systems are emerging. The research on 6th generation fighter has begun to start so that the Stealth technology becomes more accurate and advanced.

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