Stealth technology

Technology

Designers develop a particular shape for planes that tended to reduce detection, by directing electromagnetic waves from radars Radar-absorbent material was also tested and made to reduce or block radar signals that reflect off from the surface of planes. Such changes to shape and surface composition form stealth technology as currently used on the Northrop Grumman B-2 Spells" Stealth Bomber". The concept of stealth is to operate or hide without giving enemy forces any indications as to the presence of friendly forces.

This concept was first explored through camouflage by blending into the background visual clutter.. Some military uniforms are treated with Heimlich to reduce their infrared signature. A modern " stealth" vehicle is designed from the outset to have a chosen spectral signature. The degree of stealth embodied In a particular design Is chosen according to the predicted threat capabilities. Principles Stealth technology or LO for " low absorbability" is not a single technology.

It is a combination of technologies that attempt to greatly reduce the distances at which a person or vehicle can be detected; The principles used in Stealth technologies are Radar cross-section (ARCS) reductions Non-metallic airframe Dielectric composites are more transparent to radar, whereas electrically conductive materials such as metals and carbon fibers reflect electromagnetic energy incident on the material's surface. Composites may also contain ferrite's to optimize the dielectric and magnetic properties of a material for its application.

Radar-absorbing material Radar-absorbent material (RAM), often as paints, are used especially on the edges of metal surfaces. While the material and thickness of RAM coatings can vary, the way they work Is the same: absorb radiated energy from a ground or alarm based radar taxation into the coating and convert it to heat rather than reflect it back. Acoustics Acoustic stealth plays a primary role in submarine stealth as well as for ground vehicles.

Submarines use extensive rubber mountings to isolate and avoid mechanical noises that could reveal locations to underwater passive sonar arrays. Early stealth observation aircraft used slow-turning propellers to avoid being heard by enemy troops below. Stealth aircraft that stay subsonic can avoid being tracked the SIR-71 Blackbird indicates that acoustic signature is not always a major driver in aircraft design, although the Blackbird relied more on its extremely high speed and altitude.

One possible technique for reducing helicopter rotor noise is 'modulated blade spacing'. Standard rotor blades are evenly spaced, and produce greater noise at a particular frequency and its harmonics. Using varying degrees of spacing between the blades spreads the noise or acoustic signature of the rotor over a greater range of frequencies. Thermal Low-frequency radar Shaping offers far fewer stealth advantages against low-frequency radar. If the Adair wavelength is roughly twice the size of the target, a half-wave resonance effect can still generate a significant return.

However, low-frequency radar is limited by lack of available frequencies-many are heavily used by other systems, by lack of accuracy of the

diffraction-limited systems given their long wavelengths, and by the radar's size, making it difficult to transport. A long-wave radar may detect a target and roughly locate it, but not provide enough information to identify it, target it with weapons, or even to guide a fighter to it. Noise poses another problem, but that can e efficiently addressed using modern computer technology; Chinese " Antis" radar and many older Soviet-made long-range radars were modified this way.

Visibility The simplest stealth technology is visual camouflage; the use of paint or other materials to color and break up the lines of the vehicle or person. Most stealth aircraft use matte paint and dark colors, and operate only at night. Lately, interest in daylight Stealth (especially by the USAF) has emphasized the use of gray paint in disruptive schemes, and it is assumed that Hide lights could be used in the true to mask shadows in the airframe (in daylight, against the clear background of the sky, dark tones are easier to detect than light ones) or as a sort of active camouflage.

The original 8-2 design had wing tanks for a contrail-inhibiting chemical, alleged by some to be chlorofluorocarbons acid, but this was replaced in the final design with a contrail sensor that alerts the pilot when he should change altitude and mission planning also considers altitudes where the probability of their formation is minimized. In space, mirrored surfaces can be employed to reflect views f empty space toward known or suspected observers; this approach is compatible with several radar stealth schemes.

Careful control of the orientation of the satellite relative to the observers is essential, and mistakes can lead to detestability enhancement rather than

the desired reduction. Infrared An exhaust plume contributes a significant infrared signature. One means to reduce IR signature is to have a non-circular tail pipe (a slit shape) to minimize the exhaust cross-sectional volume and maximize the mixing of hot exhaust with cool ambient air. Often, cool air is deliberately injected into the exhaust flow to boost this process.

Sometimes, the Jet exhaust is vented above the wing surface to shield it from observers below, as in the 8-2 Spirit, and the unsteadily A-10 Thunderbolt II. To achieve infrared stealth, the exhaust gas is cooled to the temperatures where the brightest wavelengths it radiates are absorbed by atmospheric carbon dioxide and water vapor, dramatically reducing the infrared visibility of the exhaust such as fuel inside the exhaust pipe, where the fuel tanks serve as heat sinks cooled by the flow of air along the wings.