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Anti-Stealth Technology

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Summary

Modern military stealth technology is based on the principle that stealthy craft remain invisible to detecting radar and infrared sensors, especially at long ranges.

Such technology can be entirely nullified by the detecting radar and/or infrared sensors searching, not for the stealthy craft itself, but for the background *behind* the stealthy craft. The stealth craft will then show up in the form of a black or blank silhouette in front of the background.

This is much like the way one can pinpoint with extreme accuracy the location of the moon during a solar eclipse, and track its movement with great precision, even though during a solar eclipse one cannot observe the moon itself.

(***N.B.:*** The remainder of this document describes the detailed methods one might use to detect the background behind stealth craft. Thus it is not necessary to read the entire document in order to grasp the principle of Anti-Stealth Technology, though one may of course do so to dispel all scepticism as to its practicability.)

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Basic Principles of Modern Stealth Technology

Military stealth technology — such as is used, for example, in the *B-2* bomber, the *F-117* fighter-bomber and the *F-22* fighter, and as is intended for the future *Comanche* helicopter, and the next-generation tank which is intended to replace the current *M1A2 Abrams* tank — is based on the principle that the stealthy craft remains invisible to detecting radar and infrared sensors, especially at long ranges.

With respect to radar, this is accomplished, in basic principle, by the stealthy craft absorbing almost all the radar waves emanated by detecting radar sources, and/or reflecting or deflecting the detecting radar in direction(s) other than towards the detecting sensors. With respect to infrared, the objective of stealth is achieved, in basic principle, by the stealthy craft minimising heat from its engines and other heat-emitting spots.

As a result of applying the above principles, detecting sensors searching for a stealthy craft cannot detect any radar or infrared signal emanating from the craft, except perhaps at very close distances, when it may already be too late to do anything about it from a military viewpoint. The craft, therefore, cannot be observed by radar or infrared sensors.

Principle of Nullification of Stealth Technology

This kind of stealth technology can, however, be entirely nullified by the detecting radar and/or infrared sensors searching, not for the stealthy craft itself, but for the background *behind* the stealthy craft!

This is much like the way one can pinpoint with extreme accuracy the location of the moon during a solar eclipse, and track its movement with great precision, even though during a solar eclipse one can't observe the moon itself.

If this principle were applied for detecting stealth craft, any observed eclipsing of the background would indicate that a stealth craft must be located in front of that part of the background which is being eclipsed. Such an eclipsing would show up on the detecting screen or output device in the shape of a black or blank silhouette of the stealth craft.

1. Airborne Method

One way to accomplish the above is for the detecting forces to fly a high-flying aircraft furnished with SLAR (***S**ide-**L**ooking **A**irborne **R**adar*) and/or FLIR (***F**ront-**L**ooking **I**nfra-**R**ed*) equipment to map out the terrain below and to one side, or to the front. If a stealth craft were operating anywhere above the terrain being mapped, a small patch of terrain, which the stealth craft would perforce eclipse, would not be observed on the detecting aircraft's output screen. That particular spot would appear black or blank, and more or less in the shape of a silhouette of the stealth craft: thereby pinpointing the stealth craft's position within the field of vision of the detecting aircraft.

The initial detection of a distant stealth craft might be slow, since until the craft were detected, the equipment would have to scan the entire terrain over which the craft might be located. However, once that location were pinpointed, the craft could be tracked much more swiftly and accurately by zooming in on that location and some of its surrounding area, and scanning only that relatively small part of the field of vision. This would enable the searching equipment to generate much more detailed images of the silhouette of the craft in question, perhaps even identifying the craft by that silhouette.

If, in addition, the SLAR or FLIR equipment were furnished with rangefinder capability (as many such are), the exact position of the stealth craft in three dimensions could also be determined. This would not greatly matter, of course, if the stealth craft were a land vehicle (like a tank); but in the case of aircraft such data could provide very valuable information from a military point of view. And with modern computers this position could be calculated very swiftly indeed: almost instantaneously.

2. Satellite-Based Method

The same method may be used looking down on the battlefield from satellites equipped with radar sensors. Although satellites would be relatively far away from the battlefield — a couple of hundred miles away, or even more — they would be able to remain out of range of most hostile weapons, and thus would not run much risk of being shot down, as might aircraft. Also, satellites would be able to cover a much larger area of the battlefield, thus being in a position to locate and track virtually all hostile stealth craft.

3. Surface-Based Method

Yet another way of detecting a stealth aircraft would be for surface-based radar installations to scan the sky at high apertures and with high sensitivity, such as is done with radio telescopes. (Since such installations would be surface-based, even if they had to be substantially large and/or heavy to adequately accomplish this task, their size and weight would not be a serious deterrent to their accomplishing it.) As is well known to radio astronomers, even in daytime or in bad weather, radio signals from the stars would reach the radar installations uninterrupted. Since the radio map of the stars is by now very well known, it may be assumed that if any star is not observed on the detecting screen or output device, that particular star must be eclipsed by some craft flying above the installation somewhere along the line of sight between the installation and that particular star.

And with very sensitive radio-astronomical equipment, virtually every part of the sky is observed to be covered with stars! Therefore at almost every instant in time, the stealth aircraft would be eclipsing one or another known star.

Even if less sensitive detecting equipment were used, so that the time it took to record the stellar images was greater than the time it took for an aircraft to entirely eclipse a particular star, that star would still show up on the detecting screen somewhat fainter than it would otherwise if it had not been eclipsed by the aircraft for a part of the time it took for the radio waves from it to be gathered. Thus by calibrating the detecting equipment to search for those stars whose radio images appear to be fainter than usual (as determined by standard radio maps of the sky), the position of the eclipsing aircraft could be determined swiftly, even with equipment of less than stellar performance. Indeed the limit of sensitivity of the equipment as a whole would be determined, not by the sensitivity of the radio signal gathering device, but by the sensitivity of the equipment which detects the *difference in intensity* of the actual signals from particular stars compared to their intensity as indicated by the standard radio map of those same stars.

And as with the airborne method, although the initial detection of a distant stealth aircraft might be slow, once its location were pinpointed, the aircraft could be tracked much more swiftly and accurately by zooming in on that location and some of surrounding area.

If more than one detecting installation were used, by a process of triangulation the exact location in three dimensions of all aircraft — friendly as well as hostile — within the fields of vision of the relevant installations could be determined with great accuracy. And as mentioned earlier, with modern computers such a determination could be arrived at almost instantaneously.

With the passage of time, the specific stars being eclipsed by any particular aircraft would change in a manner consistent with the aircraft’s trajectory. Thus by accurately observing the time intervals between sequentially-eclipsed stars, coupled with an exact knowledge of the radio-astronomical map, the aircraft’s trajectory could easily and quickly — almost instantly — be calculated, especially if powerful computers were utilised to calculate it.

If, in addition, the locations of all the friendly aircraft within the field of vision of the installation are also known, it may be assumed that hostile aircraft must be eclipsing those stars not showing up on the screen which cannot be accounted for by friendly aircraft. Thus by a process of elimination, the location of *all* hostile aircraft, and not just hostile *stealth* aircraft, could be determined. This would be an advantage of the surface-based method as opposed to the airborne method described earlier. And, of course, with modern computers all the above calculations could be performed extremely rapidly: almost instantaneously.

Further Advantages of the Surface-Based Method

One further advantage of the surface-based method, as opposed to the airborne method described earlier, is that the detecting installation(s) need not emit any radio signals themselves. Thus it would be impossible for hostile aircraft to home in on their radio emissions in order to destroy the installations, which add to their safety factor: especially if from a visual point of view these installations were also carefully camouflaged.

Another advantage of the surface-based installations would be that they could also be equipped with powerful surface-to-air missiles (SAMs), which could be much larger and possess much greater range and destructive power than air-based missiles for the destruction of hostile stealth aircraft. And since these particular SAMs need not themselves emit any radar signals either, but could merely fly along a narrow beam (say, a laser beam) emanating from the installation which has detected the stealth aircraft, the latter would get no warning that one or more SAMs have been launched against it, and thus would not have a chance to take evasive action.

Conclusion

It is to be appreciated that although several examples have been given above, the main principle behind this Anti-Stealth Technology may be applied in innumerable other ways also. It is therefore not claimed that the above examples are exhaustive, but are only illustrations of the ways the main principle may be applied.

The most effective results are likely to be achieved by a combination of several methods, so as not to rely on only one method of detecting stealth craft.

In addition, it will be appreciated that computers can only get more and more powerful as time passes. And in addition, radar technology is also likely to advance with time, enabling more and more detail from fainter and fainter backgrounds located farther and farther away to be discerned in less and less time. Thus in five or ten years' time, it may be possible to detect stealth craft entirely from satellites and/or light and mobile surface-based installations, making it very hard indeed for the forces possessing stealth technology to keep their "stealth" craft stealthy any more.
In other words, it may not be possible, by the year 2005 or thereabouts, or at the latest by the year 2010, for any military force to take advantage of current military stealth technology. Of course if some new and yet unknown kind of stealth technology, capable of nullifying the effects of the above-described anti-stealth technology, were developed in the interim, that might be another matter altogether. However, it is unlikely that such new kinds of stealth technology can be developed in so short a time.

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