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What You Don't See Is What You Get

By Bill Sweetman

IN THE NAME of national security, tens of billions of dollars in defense spending are being hidden from public scrutiny so that we can build war planes that are equally invisible to our enemies. This program is called Stealth.

Already concealed from most public accounting are at least 50 Lockheed strike fighters that probably cost about $40-$50 million apiece; a new General Dynamics cruise missile program that is expected to cost about $7 billion; and the most expensive warplane ever built, Northrop's Advanced Technology Bomber (ATB), with expected program costs between $35 billion and (according to hostile sources) $80 billion.

The Pentagon considers Stealth to be so sensitive that it will not say what the Northrop bomber or the General Dynamics cruise missile will look like or when they will enter service. So that nobody can guess these dates from the way money flows into the program, the Pentagon has classified all the cost figures as well. In the case of the Lockheed fighter, the Pentagon bluntly refuses to acknowledge that the plane exists at all.

The Pentagon has classified these weapons because they are based on a radical departure in warplane design. Instead of using height, speed, defensive maneuvers, weapons or electronic radar jammers to protect themselves from attack, Stealth airplanes and missiles are designed to avoid detection by radar or other detection devices.

Here is why the Pentagon believes we need Stealth. In order for, say, the new B1B bomber to have its best chance of surviving against the Soviet Union's elaborate air defense system, it would fly barely 250 feet off the ground. But the terrain which hides the bomber from the defenses also hides the targets from the bomber. To hunt for a target such as a mobile ICBM, the B1B must climb to a better vantage point, exposing itself to attack. In a few years, too, it will be vulnerable to new Soviet airborne radars that can pick out low-flying targets against the "clutter" from the ground below them.

These ground-hugging tactics might not be enough for fighter-bomber pilots in Europe if they had to attack targets such as airfields, command bunkers and surface-to-air missile sites. The Soviet military has built up so much firepower around these targets that no strike force could escape without massive losses.

Stealth may be the answer to these problems. It aims at making the attacker virtually invisible to radar and other electronic detection devices without which defensive fighters, surface-to-air missiles and guns are impotent.

Why does it all have to be so secret? It is partly a matter of tradition. The first truly Stealth aircraft were unmanned spy planes and were developed in secret because their intended missions were covert. When a practical manned Stealth fighter became a possibility, its development was entrusted to a section of Lockheed called the Skunk Works, where secrecy is basic to the management doctrine. By the late 1970s, Stealth was beginning to emerge from the shadows, and details of the technology might well have become public knowledge had Jimmy Carter been re-elected in 1980.

As it was, Stealth became the first test of the Reagan/Weinberger philosophy: If in doubt, classify; if doubt remains, upgrade the classification. It could also become the first test of that policy's ability to withstand congressional and public opposition. The Stealth bomber may be able to hide from the Soviet Union's air defenses, but it may be too big to hide from Capitol Hill.

While the secrecy surrounding Stealth has precluded most discussion of the subject, reports of progress with Stealth aircraft have appeared in the aerospace and defense press from time to time and in technical papers presented at open industry meetings, most of which took place before the Reagan information freeze. While the information is fragmentary, it can be pieced together with context gleaned from unclassified textbooks. The latter also help to screen the disinformation issued by unidentifiable sources in the past few years.

Stealth is not a single magic trick but a means of designing a warplane so that its "signature" or "observables" are drastically reduced. A plane's radar reflections are the most important, but emissions of light, heat or sound are significant, too.

Most conventional aircraft are ideal radar targets. They present large flat surfaces, such as the body sides and vertical fin, at right angles to the direction from which most radar waves are likely to arrive. They have large intakes and exhausts for their engines, which trap and re-reflect radar waves. They are festooned with bombs and fuel tanks, which tend to create "corner reflectors." (Sheet-metal devices using the same principle are attached to small boats to make them more visible to radar.)

There are a few basics to designing a Stealth aircraft. Bombs and fuel must be carried internally; the engines must be concealed behind long, curved inlet and exhaust ducts, and vertical flat surfaces should be eliminated. (The B1 bomber's sinuous shape reflects some of this thinking, although it is not a Stealth design.) This does not sound too complicated, but the snag lies in a formula called the "radar range equation." This states that cutting the radar image of a target in half knocks no more than an insignificant 15 percent off the detection range. The benefits of Stealth are not felt at all until the radar image is cut by at least 90 percent.

This calls for the use of special radar-absorbent materials ranging from plastic-based coatings to complex sandwiches of fiber glass and chemically treated foam. Most of them contain an electrically resistant "active ingredient" such as carbon or one of a family of iron products called ferrites. The objective is to draw the energy out of the radar wave as it penetrates the material, just as food in a microwave oven absorbs radar waves and converts them into heat.

Another problem is that gaps, sharp corners and sudden changes in the conductivity of the airplane's skin will produce radar echoes. Stealth airplanes must have a smooth and seamless finish; they are likely to make most conventional aircraft look like tractors.

Radar is not the only signature to worry about. Stealth aircraft use special exhausts to mix the hot carbon dioxide from their engines with cool outside air; hot carbon dioxide has an infrared signature that can betray an airplane at ranges of almost 100 miles. Chemical additives have been developed to discourage the formation of contrails. Also, a Stealth aircraft cannot give itself away with the electronics it uses to find targets—they have to be disguised as well.

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