LETTERS

U.S. Nuclear Policy

I was pleased to see R. Jeffrey Smith's efforts to come to grips with the national policy interactions between defensive and offensive strategic programs in his articles "The search for a nuclear sanctuary (I)" (News and Comment, 1 July, p. 30) and "The search for a nuclear sanctuary (II)" (News and Comment, 8 July, p. 133). The complexity of these interactions makes thinking and writing about them a challenge, but precisely this kind of intellectual effort is required if the nation is to reach consensus on President Reagan's goal of founding strategic stability on mutual survival rather than mutual destruction.

The second article is of particular interest because it provides ample illustration of what awaits the unwary reader. For example, one must beware equating capabilities that are under development with operational capabilities that are in the field. While the United States may still be superior to the Soviet Union in ballistic missile defense (BMD) technology, we cannot discount the fact that the Soviets have a deployed, operational BMD system around Moscow. Moreover, the Soviet Union spends considerably more than the United States on BMD research and development each year. This investment is paying off in narrowing the technological gap in BMD, as well as in the Soviet Union's program to upgrade the capabilities of the existing system. One must also beware equating an inability to attain an ultimate objective with absolute uselessness. While the current Soviet BMD system may not be able to ward off a heavy attack on Moscow, it has a considerable level of effectiveness against a lesser attack.

This sort of confusion also interferes with our understanding of offensive capabilities. Smith writes that the only U.S. penetration aid currently deployed is chaff, but then treats the impressive penetration technologies the U.S. Air Force is testing, or plans to test, as if they were already deployed. He does not consider the admitted vulnerability of U.S. ICBM's. U.S. policy is not to strike first, and even deployed penetration capabilities have no effect if they are destroyed before they can be launched.

One must also avoid assuming that the Soviets do not have the capabilities needed to achieve their purposes because they have not developed certain types of technology (for example, penetration technology) as fully as the United States has. History demonstrates that the Soviets develop the forces they consider necessary to their interests when they are needed. The fact that the United States has had no operational BMD capability since 1976 could be a large factor in the asserted Soviet lag in penetration technology. Another possibility lies in one Soviet approach to closing technological gaps by using alternative technologies or approaches. Perhaps this is the case in the realm of penetration technology. With the Soviet edge in ICBM throw-weight (the size of the payload a missile will carry), perhaps the easiest approach for the Soviets would be merely to multiply the number of warheads each missile carries.

Overall, the thrust of Smith's articles seems to be that vigorous U.S. strategic defense and offense programs are inimical to one another and to prospects for effective arms reductions and control. That is wrong, and I believe there is a growing sense among strategists that the synergism in a better balance between offense and defense is strategically stabilizing. I do admit that there needs to be more exploring of this area.

The most serious problem with the two articles is that Smith does not attribute seriousness to the President's stated strategic arms reduction objectives and the approaches he has proposed for achieving them. As a result, rather than being subjected to enlightening analysis and criticism, those objectives are dismissed with assertions that they will be disadvantageous or will not work. Most troubling is that Smith seems to present these approaches as a move by the United States toward a first-strike capability against the Soviet Union: From the first article's lead paragraph, "the United States will by roughly the year 2000 have the capability to attack the Soviet Union without fear of devastating nuclear retaliation." From the second article, "The aggressive and provocative U.S. effort to develop a foolproof missile defense, and to defeat any Soviet missile defense," and "An impregnable defense in combination with an invulnerable offense—which the Pentagon openly seeks—may well give the United States a real first-strike capability."

This is new dress for the old argument that deployment of an effective BMD system by the United States would be strategically destabilizing. The crux of the argument is that such a deployment would be perceived by the Soviets as a shield from behind which the United States could launch a first strike with

relative impunity. However, the argument does not consider that such a deployment should also be perceived as a basis for arms reduction: It would (i) limit damage if deterrence fails and (ii) ensure the survival of retaliatory forces in the event of a disarming first-strike attempt against those forces. In the first instance, damage limitation as an incentive for a preemptive first strike is removed. The second supplies an incentive for strategic offensive force levels below first-strike requirements, as a force with guaranteed survivability need only be large enough for a retaliatory attack.

In any event, I applaud the efforts of *Science* to keep the discussion going.

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Major General Heiberg has left the Navy out of his analysis of U.S. retaliatory needs and strategic vulnerabilities. It is true that penetration aids are of little value if the missiles that use them are destroyed in a preemptive attack. This explains why one of the key penetration technologies—the maneuvering warhead—was developed for use with the Navy's survivable force of submarine-launched ballistic missiles. No one questions that such missiles would retaliate effectively "in the event of a disarming first-strike attempt."

Heiberg also states that the BMD system deployed around Moscow has a "considerable level of effectiveness" against a half-hearted attack. It seems doubtful, however, that the United States would ever attack Moscow half-heartedly.

Finally, Heiberg suggests that, because the Soviets have an edge in ballistic missile throw-weight, they could easily overwhelm a U.S. BMD simply by using more warheads. If this is true, how will deployment of such a system significantly "limit damage [to U.S. forces] if deterrence fails," as Heiberg asserts?

—R. JEFFREY SMITH

Health Effects of Power Lines

Eliot Marshall, in his article on Project ELF (News and Comment, 12 Aug., p. 630), refers to pertinent work on health hazards from power-line fields and states that "in one of the most frequently cited studies, the investigators . . . never troubled to measure the intensity of the supposed cancer-causing electromagnetic fields they were interested in."

As the authors of that study (*1*), we would like to point out that we made extensive measurements of the power-line magnetic fields that were our concern (*1, 2*). But it was not possible to measure the particular fields experienced by our subjects while they were developing cancer, as that was up to 30 years before our work began.

Measuring fields today at addresses previously occupied by our subjects would be one way to estimate exposures retroactively [this method has recently been used, with results that support ours (*3*)]. However, magnetic fields from power lines (unlike the corresponding electric fields) vary with power consumption, so there are wide hourly, seasonal, and long-term changes in those magnetic fields. Even getting an accurate profile of present-day exposure is a laborious task; extrapolating into the past is unavoidably uncertain.

We therefore chose to estimate the historical exposures by identifying wiring configurations indicating high magnetic field exposure (that is, large-diame-