What's wrong with SDI?

Paul Doty

Star Wars in a Nuclear World. By Lord Zuckerman.
William Kimber, London: 1986. Pp.226. £12.50.

In a recent examination of 'Star Wars', Professor Harvey Brooks observed:

> Considered as an example of American science policy, the Strategic Defense Initiative (SDI) seems virtually unique. There is no parallel from the rich and diverse menu of the past that can provide a plausible model for the probable evolution and fate of SDI as a piece of 'big science'.

The most expensive scientific and technical undertaking in history was launched in 1983 with almost no assessment, analysis or advice from those best placed to give it. As Lord Zuckerman points out, the White House Science Council and its chairman, who was science advisor to the President, were ignorant of the decision and the President's speech announcing it until five days before its delivery. The project manager of the main effort to be folded into SDI learned of the decision only on the day of the speech. Thus the Iranian 'missiles-for-hostages' caper was not the first failure of the advisory systems that were thought to guide Presidential decision-making in this administration.

It is therefore most fitting that the dean of British science advisors has set forth his views on this extraordinary and most ambitious enterprise. This he does in the longest of the nine essays that make up *Star Wars in a Nuclear World*. But the title of the book is nevertheless misleading because the other eight essays cover a much broader range. Three are concerned directly with the nuclear world; the remainder with the role of science advising in both Britain and the United States during the Second World War and especially in the post-War period, the 40 years in which Zuckerman has been a continuing presence in Whitehall.

In the book, Zuckerman's overarching concern is how to connect the essential knowledge of specialists to the scientifically uneducated political leadership and how to choose wisely what new technologies justify heavy government investment. Again and again he shows the importance of introducing the advice at the right time, the irrelevance of quantification when qualitative issues are dominant and the overriding nature of the political process which advising serves. The essays are in the best tradition of the genre: historically informed, well researched and thought-out, pungently stated and delivered with style. I liked "The Politics of Outer Space" best. It adds much insight to what is in any case a remarkable book, and allows the author to share his pessimism over the future of command technology, that is the institutionalization of technological change for state purposes.

The essay on Star Wars (Chapter 4) delineates clearly the main technical weaknesses of SDI. This is done mostly as a commentary and critique on the debate among experts in the United States in 1984 and 1985. The choice of experts is well informed, the presentation fair, the verdict on the ultimate benefit of the enterprise negative:

> ...if one were to regard SDI as a bargaining chip, one would also have to accept that the US will gain only if it throws it away. ... Even if SDI were to confound its critics and succeed in the sense that its separate components could be fitted together in a working system, the United States and the West would lose, not only because the USSR would have devised measures for defeating a space-based ballistic missile defence, but because there are other ways than land-based ICBMs ... whereby the US could be threatened with nuclear devastation.

Still, important points are not covered. One is the economic costs. Even the research and development phase is destined to outrun the entire cost of the Apollo programme with its 15 missions. The cost of deploying any high performance system that can now be envisaged is near the trillion dollar level and its continuous maintenance and upgrading would be a crippling drain on the defence budget. The opportunity costs are in the same high range. For example, a disproportionately large fraction of the best scientists and engineers will be taken from tasks that may be more productive, militarily or otherwise. Many projects will be put aside to meet the relentless demands of SDI. The spin-offs from such expenditure will be there, to be sure, but they will not compare to the technology that could be developed with the same funds funnelled directly to more useful ends — there is simply not much scope for application in civilian life of the technologies, such as heavy space lift and space-based proton accelerators, that SDI would develop. The vulnerability of whatever is deployed, and the relatively low cost of countermeasures, is touched upon but not developed in a sufficiently convincing manner.

Another item that is usually overlooked in evaluating strategic defences is their destabilizing effect both on East–West relations and in upsetting the military balance. The most obvious interpretation of the extreme opposition from the Soviet Union is that it wants to be spared the expense of competing in this new dimension of warfare and will see the failure to bargain away SDI as a strategy for disrupting its programme for economic reform. If a strategic defence system, even of limited pretension, were deployed on either side it would elicit an increase in strategic offence on the other, as Secretary Weinberger has reminded us, as well as a step-up in efforts to match or to counter such a system. Moreover, if at some distant time both sides possessed such systems the grounds for suspicions would be vastly multiplied over those with which we deal so imperfectly today. The claims of the effectiveness of the other side's system would be unconstrained because the capability of any system would remain unknown to either side since no realistic testing would be possible. The uncertainty in the military balance under these conditions would dwarf the most extreme claims of imbalance that we hear today.

Zuckerman foresees the elements in the debate that are now becoming clear. One is the growing recognition that what is proposed is indeed a 'supersystem' in systems engineering jargon, as C. A. Zraket pointed out in a recent paper in *Science*; that is, an aggregate of systems with hundreds or thousands of nodes interconnected over huge geographical areas and too complicated, dynamic and interactive for its performance to be understood *ab initio* no matter how much analysis is performed on it. Another is the crucial role to be played by the SALT I Anti-Ballistic Missile (ABM) Treaty. The US administration's attempt to reinterpret the treaty so as to permit testing and development of space-based ABM systems, despite the opposite intent of the treaty, justifies the fear that the treaty will be broken as the first of a sequence that could go on to ravage the Outer Space Treaty and the Limited Test Ban Treaty if nuclear explosives are to be developed for use in space.

Finally, Zuckerman raises the crucial question of whether a democracy can sustain the heavy expenditure involved for the very long time required when the outcome, in contrast to the Apollo programme for example, is so vague and uncertain. Indeed, the most striking current development is the restructuring of SDI to concentrate on short-term demonstrations of a prosaic nature at the cost of reducing the effort to develop exotic systems. The clear reason for this is to wrest maximum funding from an increasingly reluctant Congress.

Unfortunately, the European reaction to SDI receives only scant treatment. For the most part, European governments have acquiesced and public opposition to SDI is largely uninformed. It is only at this late hour that one foreign minister (Herr Genscher of West Germany) has taken a stand against the plans to erode the ABM Treaty. All of this is the essence of science advising too. Even though strategic defence stands no chance of becoming an effective country-wide shield, the effort to develop it can have profound and far-reaching political consequences. Reading Zuckerman's book might persuade some who have stood aside to enter the fray. If not, they will have benefited from a remarkable tutorial on how science serves as the seed-bed of technology, and on the Anglo-American experience in choosing what technologies to integrate into their respective social, political and military structures. □

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In the corridors of power

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Science, Technology, and Public Policy. By Richard Barke. *CQ Press, 1414 22 Street NW, Washington, DC 20037:1986. Pp.245. Pbk $10.95.*

In the United States today, at least 50 federal agencies deal, in one way or another, with science and technology, and technical issues have come to pervade American governmental policy. Richard Barke, a political scientist on the faculty of the University of Houston, rightly stresses that science and technology enter policy in two different ways. One is policy for science and technology — that is, policy to call forth new technologies and to advance scientific knowledge. The other is policy that uses them to achieve particular goals, for example, a clean environment. Federal science and technology policy in the former sense is a product of the Second World War, which, in its aftermath, yielded wide-ranging federal patronage of research and development (R&D) through agencies such as the National Science Foundation, the Atomic Energy Commission (most of whose functions have been taken over by the Department of Energy) and the Office of Naval Research. Currently, the richest and most powerful federal patron of R&D is the Defense Department, which accounts for about 70 per cent of federal funds spent for the purpose.

Federal policy that uses science and technology dates back well into the nineteenth century, when, for example, the management of western settlement drew in part upon geological surveys. It expanded in the twentieth century as the federal government began to exploit expert knowledge for the conservation of natural resources and the regulation of foods and drugs. What has made scientific knowledge currently so pervasive in federal policy-making is the passage in the past 20 years of laws to strengthen environmental protection, occupational health and safety, public health and medicine, and consumer protection. In 1985, 33 statutes required federal agencies to consider risk and ways to reduce it. Under the circumstances, R&D has become an instrument — in certain respects, a weapon — of policy. As regards environmental matters, for example, R&D makes regulation possible; its absence — as the Reagan administration recognized when, in its early days, it sought to cut the research budget of the Environmental Protection Agency — can undermine or destroy regulatory efforts.

Yet, despite the double significance of science and technology in federal affairs, there is no single, overarching policy for them. (American policy for science and technology, it has been remarked, is to have no policy.) There is, rather, an array of polic*ies* that cover the multifarious technically related areas in which the federal government is engaged.

Barke argues that, for all this diversity, federal science and technology policies can be analysed with a certain degree of commonality because they are all subject to the constraints of law, knowledge, coordination and politics. He takes that analysis as his task here, while conceding that "devising a formal theory of public policy ... is analogous to the attempts of nuclear physicists to discover a grand unified theory of the four known forces of the universe" (p.153). Barke does not pretend to arrive at any conclusion about how particular technical policies — or, *a fortiori*, the aggregate of them — come to be made. But he does provide a very useful primer on the institutions, practices and problems of science and technology policy-making, and his treatment is salted with illuminating and thought-provoking insights.

Through the 1960s, the President and the federal bureaucracy held the upper hand in science and technology policy-making. The President not only enjoyed control of the budgetary agenda and centralized authority over his administration; he could also call upon a richly knowledgeable corps of technical advisors within the bureaucracy and could command the services of distinguished people outside of it, a power symbolized by the creation, in 1957, of the President's Science Advisory Committee (PSAC). Though PSAC has been transformed and demoted, the President retains the services of the bureaucracy, including the Office of Management and Budget, whose reach is immense and whose internal examiners include a number of PhDs in the sciences.

However, Congress is better equipped now than it was in the 20 years or so after the Second World War to check and balance the power of the White House. Both the House and the Senate have an extensive committee structure devoted to different aspects of science and technology, and defence R&D has become the special concern of subcommittees in the Armed Services Committees in the two houses. Congress can also turn to several omnibus support agencies, notably the Congressional Budget Office and the Office of Technology Assessment, which enjoys burgeoning Congressional confidence and which, while not really a match for the White House advisory apparatus, still provides valuable analyses and reports on diverse topics ranging from the effects of nuclear war to drug bio-equivalence.