

Piecemeal ballistic missile defence

The US programme of research known as the Strategic Defense Initiative will come to fruition only in the next century (if then), but there may be tangible and awkward results much sooner.

EVER since President Reagan's announcement in March 1983 of the plan for a programme of research on ballistic missile defence, there has been a temptation to assume that the whole programme would come to fruition (or not) all at once. Then, we have assumed, it would fall to a Pentagon committee to recommend (or otherwise) the deployment of an integrated system of anti-missile defence. And then it would be for politicians to take up the question which they have promised must be explored before such a defensive system could be put in place, negotiations with the Soviet Union not least among them. Only then, the argument has gone, would it be decided what should be done with the products of many years of research.

A little thought will show that events cannot follow such a simple course. The objective of the system now being talked about in Washington, in its most flamboyant form, is first to detect hostile ballistic missiles early in their trajectory and then to destroy them by means of several layers of defence. If boost-phase missiles escape attack, there would ideally be means of destroying the components into which they separate, first "buses" containing several warheads and, later, individual re-entry vehicles. Much of the argument of those working on the programme rests on the calculation that the most effective route to a missile defence will be an efficient way of destroying missiles while their booster motors are still burning, and are thus conspicuous targets for the detector satellites equipped with infrared sensors.

To say the least, each successful strike against a hostile missile in this boost stage would get rid of a great many warheads. But it is also generally agreed that the detection problem is also then much easier than during the intermediate stages (when decoys will be an obvious stratagem for the missile launchers to use). Indeed, detection becomes relatively simple again only towards the end of a trajectory, when warheads declare themselves by the heat they generate.

No secret knowledge is required to make reasonable guesses about the sequence in which the various components of this system will become available to the military. The technology for detecting missiles during the boost phase probably requires nothing radically new. Infrared detectors have indeed been used to spot rocket boosters rising through the atmosphere. There is no reason why detection

should not be reasonably efficient at heights above the ground not very different from those at which people operate infrared telescopes, a few kilometres or so.

The practical task will be to incorporate an array of such detectors into a system of satellites and then handle the data that accumulate. Discrimination between real and imagined targets will obviously be a headache. Software designers will be fully stretched. But the first practical by-product of the research programme will be an early warning system of such sophistication that it might have been considered desirable in its own right.

The other almost certain outcome of the research programme is a better system of terminal defence than that planned by the United States in the late 1960s. The idea then was that a fast take-off missile (called "Sprint") would fire nuclear warheads at incoming warheads; now, it seems, people are persuaded that it would be better to send guided mechanical devices at incoming warheads, in the hope that they might be destroyed without killing the people whose defence is the object of the whole exercise.

So the research programme will almost certainly yield two military options for the United States — a much better (in the sense of much earlier) early warning system and a workable system of terminal defence. Whether the research programme will contribute anything else is still an open question.

The important article in last week's *Nature* (23 May, p.286) by Dr Richard Garwin is a generalized expression of the kind of scepticism with which the research programme will have to contend. Any system of satellites intended to be the bases ("battle stations" is the fashionable term) for the means by which targets will be destroyed will have to be much more elaborate than the enthusiasts have been saying. Even quite optimistic assumptions about the efficacy of lasers as means of shooting down hostile missiles imply much larger numbers of battle stations than people have been saying.

The need for a host of satellite battle stations is generally accepted. Because these machines, whatever their armoury (lasers, neutral-beam projectors or rail guns), will have to be in comparatively low orbits to get within striking distance (say 1,000 km) of a booster rising through the atmosphere, the chances are that any single one of them will be the wrong side of the Earth when

needed. But the ballistic missile defence community has sought some comfort in the widely shared belief that the number of satellites required will be proportional only to the square root of the number of potential targets. Garwin disproves that cheerful assumption.

This is the technical nightmare of the whole project. Even though the mass-production cost of making, say, 1,000 battle stations will yield economies of scale, the efficient management of such a system would be a task of quite unprecedented character. Only a means of destroying boosters at much greater range than 1,000 km would bring drastic simplification. Because none of the potential guns has yet emerged as a possible leader, let alone been demonstrated, it seems a fair guess that this part of the programme will be much delayed. No Pentagon committee is going to be making a recommendation to deploy the system this side of the end of the decade. Whether that time will come this century is far from certain.

The consequences of this piecemeal fruition of the various components of the programme are themselves important. If, as seems likely, one early outcome is a feasible system of terminal defence, it seems likely that the United States will follow the Soviet Union in deploying such a system somewhere, presumably in the Minuteman missile fields where the MX missile is now to be deployed. (The Anti-Ballistic Missile Treaty originally offered each side the option of two such systems, later reduced to one.) An orbiting early-warning system, the other likely early product of the research programme, will be diplomatically more perplexing. Quite apart from the formidable technical difficulties of launching, operating and maintaining such a system, there seems very little doubt that it would violate the spirit if not the letter of the treaty.

The result is that, while the Strategic Defense Initiative will not yield tangible results for a decade or more ("if then", as the critics would add), there is every likelihood that some essential parts of the system will be ready for use long before that. So the United States may quite soon find itself having to keep to the promise extracted from the administration by Mrs Margaret Thatcher last December that deployment would depend on talks with the Soviet Union. Raising the questions now, at the arms control talks at Geneva, would be prudent.

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