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# Transatlantic co-operation on European anti-missile defence

REPORT

submitted on behalf of the Technological and Aerospace Committee
by Mr. Atkinson, Rapporteur

ASSEMBLY OF WESTERN EUROPEAN UNION
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1. Adopted unanimously by the committee.

2. *Members of the committee:* Mr. *Lopez Henares* (Chairman); MM. Lenzer, *Borderas* (Alternate for Mr. Palacios) (Vice-Chairmen); MM. Arata, *Atkinson*, Biefnot, Blaauw, Mrs. Blunck, MM. Böhm, Coviello, *Curto*, Mrs. Gelderblom-Lankhout, Mrs. *Guirado*, MM. Jeambrun, Le Grand, Litherland (Alternate: *Alexander*), Lorenzi, *Marshall*, Poças Santos, Pozzo, Roger (Alternate: *Galley*), Sarens, *Theis*, Sir Donald Thompson, MM. *Valleix*, Wolfgramm.

N.B. *The names of those taking part in the vote are printed in italics.*

## *Draft Recommendation*

### *on transatlantic co-operation on European anti-missile defence*

The Assembly,

*(i)* Recognising the need for Europe to determine the risks for its security of the proliferation of ballistic technologies in the countries of the third world and in particular in the Mediterranean and the Middle East;

*(ii)* Recalling the need for the discussion already started in WEU to be taken further in order to contribute to identifying these risks and their effects on Europe and for giving this discussion real impetus;

*(iii)* Taking into consideration the need for European countries to reach a joint position on anti-missile defence, in order to avoid a dangerous delay in relation to the evolution of the threat;

*(iv)* Recalling its earlier conclusions on the need to envisage a system of protection which takes account of European needs and also of work done in this area by the United States;

*(v)* Considering the many advantages that co-operation in the widest sense and based on equality between the transatlantic partners could obtain for the two sides in the area of anti-missile defence;

*(vi)* Considering however that certain programmes launched by the United States, such as THAAD, have reached a very advanced stage, which precludes co-operation from the outset;

*(vii)* Recalling moreover that the missile technology control régime provides for the signatory countries to strengthen the principles upheld by that agreement through their respective legislations;

*(viii)* Taking into account the differences now separating countries that used to be members of Cocom in identifying the countries which constitute a strategic threat to their security;

*(ix)* Considering that the countries which are at present establishing the bases of the new Cocom must reach a consensus, particularly with regard to prohibition of certain transactions with given countries or for a specific purpose;

*(x)* Considering that the system which is to succeed Cocom must have as its main objective to prevent the countries constituting a true proliferation risk and a real threat to regional stability from procuring conventional armaments and associated technology;

*(xi)* Judging necessary that agreements directed to this end should be concluded as quickly as possible;

*(xii)* Emphasising the importance for WEU to define a joint policy for the exportation of armaments;

*(xiii)* Taking account of the need to take the necessary steps as soon as possible for preparing a conference on security and co-operation in the Mediterranean (CSCM),

RECOMMENDS THAT THE COUNCIL

1. Give the Assembly precise information about progress made in the study being conducted by the Special Working Group on European anti-missile defence;

2. Let the Assembly know whether a meeting of experts has been held in order to prepare an analysis of risks and, if so, what conclusions were drawn from that meeting;

3. Ask member countries to strengthen in their respective legislations the principles upheld by the MTCR;

4. Encourage the adoption in member countries of a joint position on the definition of the countries that constitute a strategic threat to their security;

5. Seek a consensus among member countries on the bases of the régime to replace Cocom;

6. Promote among member countries the introduction in the very near future of a joint policy towards the exportation of armaments to third countries;

7. Speed up examination of the development of a European space-based observation system and the taking of decisions in that respect;

8. Create a study group on a European early warning system;

9. Discuss the possibilities of co-operation between the United States and Europe on anti-missile defence; such co-operation should be on a basis of equal partnership in development and production and might cover the following areas:

*(a)* programmes on an endo-atmospheric system currently under study in Europe and the United States and which might possibly lead to joint implementation of a single programme;

*(b)* exo-atmospheric systems;

*(c)* airborne systems, adapted in any event, to European Rafale and Eurofighter combat aircraft;

*(d)* study of the possibility for Europe to adopt a joint position on the possible procurement of the American THAAD programme;

10. Reach a joint position on the various possibilities described above in the interests of Europe and our transatlantic allies.

11. Establish contacts between WEU and the BMDO for discussion of the problems already described.

## *Explanatory Memorandum*

*(submitted by Mr. Atkinson, Rapporteur)*

### *I. Introduction*

1. In November 1992, the Technological and Aerospace Committee adopted the report by Mr. Lenzer (Document 1339) on anti-ballistic missile defence, the main aim of which, as the report stated was "...to draw the attention of the Council and the public to a problem of a new kind that makes it necessary for Europe to assess the risks to its security that may arise from the increasing proliferation of ballistics technology in third world countries, particularly those along Europe's southern and south-eastern flanks".

2. The conclusions of the above report revealed the need to open up an in-depth discussion which would contribute to identifying the nature of these risks and also to understanding their possible implications for Europe and the urgency for our continent to reach a joint position on anti-missile defence, so as to avoid a dangerous time-lag in relation to the development of the threat.

3. A few months later, in April 1993, the Technological and Aerospace Committee organised a symposium in Rome on anti-missile defence for Europe, which made a very important contribution to the above debate.

4. The first conclusion to be drawn from this symposium was the need to create a space-based observation and early warning system, following which an anti-missile defence system could subsequently be chosen. Furthermore, the conclusions stressed the need for the WEU Assembly to formulate "recommendations regarding a protection system with due regard to European requirements and taking into account the work already done by the United States. This might lead to a cooperative system, perhaps drawing other countries into what might be a security partnership. First, however, there would have to be risk assessment and risk description. In a second stage, WEU member countries should define their security requirements and pool the means at their disposal to find an appropriate answer to the different risks. In doing this it was obvious that Europe also had to consider the American offer of participation in a global protection system. Technical options could not replace political decisions. But a policy could function only if it had operational leeway and for this it needed technical and military options. It was therefore necessary to come to grips with reality".

5. The Council's reply to Recommendation 533 on anti-ballistic missile defence was fully consistent with the opinion of the Assembly on the need for assessment of the risks for Europe of the development of ballistic capabilities and the proliferation of ballistics technology in countries close to Europe's southern and south-eastern flanks. The Council indicated, moreover, that a global antimissile protection system (GPS) was an item for discussion on the Special Working Group's agenda.

6. In response to the Assembly's recommendation that a European position be established on the United States' projected global protection against limited strikes (GPALS), the Council stated that the establishment of such a position should necessarily be preceded by an in-depth study of the questions relating to a global protection system.

7. The first part of the thirty-ninth annual report of the Council to the Assembly (1st January - 30th June 1993) states that the work of the Special Working Group had been in large measure devoted to the development of the American initiatives for a global protection system and to anti-missile defence in Europe and that "discussion centred on the assessment of the risks which Europe might face and the implications for Europeans of American thinking on this matter. The group noted with great interest the content of the contributions made at the Assembly's seminar in Rome on 20th and 21st April and the conclusions of that seminar".

8. The subject continued to have priority on the agenda of the Special Working Group as the second part of the thirty-ninth annual report of the Council to the Assembly indicates. This states that among its tasks the Special Working Group continued to be engaged in more detailed European thinking on an anti-missile defence system.

9. The report also states that given the change of direction in American government policy (after Mr. Clinton's arrival in the White House), the group decided to stop using the term "GPS" in its documents and to take over the term "anti-missile defence" used by the Assembly.

10. Finally the group agreed that WEU should concentrate on the defence aspects, having regard to the work carried out in other bodies on non-proliferation, and recommended to the Council that a meeting of experts be held to prepare a risk

analysis. The resulting document would then be submitted to the Special Working Group.

11. In this context the present report proposes to present a series of suggestions that might contribute to establishing transatlantic co-operation with a view to a European anti-missile defence, and would also take the fullest account of the declaration of heads of state and of government participating in the North Atlantic Council summit meeting in Brussels on 10th and 11th January 1994. Since this meeting, which recognised the existence of a European security and defence identity and endorsed its development, there has been steady progress towards greater and ever closer co-operation between NATO and WEU.

12. In drawing conclusions about the timeliness and viability of co-operation in the abovementioned area, the present document will take account of work undertaken under the missile technology control régime (MTCR) and the proliferation of missile technology; it will analyse the strategic defence initiative and global protection against limited strikes and the present policy of the United States as regards an anti-missile defence system; lastly, it will study current initiatives by NATO and the WEU member countries in the area of anti-ballistic missile defence.

### *II. The missile technology control régime (MTCR) – the proliferation of missile technology*

13. Although the committee has already made a study of MTCR (Document 1305: Arms export policy, 30th April 1992, Rapporteur: Mr. Aarts) it is fully relevant at this juncture to recall certain aspects of this report and bring certain information it contains up to date.

14. The first such aspect is that the MTCR is not a treaty but an unofficial agreement and the actual controls remain the national responsibility of the individual participating countries. It is therefore an agreement, the implementation of whose established rules rests solely on the good will of the countries party to it.

15. The principles established under the agreement are not intended – and this is explicitly stated – to impede national space programmes or international co-operation in such programmes as long as such programmes do not contribute to delivery systems for weapons of mass destruction. The purpose of the agreement is to limit the risks of proliferation of weapons of mass destruction (i.e. nuclear, chemical and biological) by controlling transfers that could contribute to supplying technology used in the production of such weapons.

16. The agreement, initially signed in April 1987, was revised in early 1993. Although originally the agreement referred to control of technologies to handle a 500 kg payload over a range of 300 km, the present text makes no reference to either payload or range. The signatory countries, and logically therefore, firms inside their territories, are to refrain from supplying another country with any hardware or technology for use in missile manufacture, regardless of payload or range.

17. Your Rapporteur is informed that the following countries are at present members of the missile technology control régime: Argentina, Austria, Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States; these include the seven countries that signed in 1987. Other states have declared their adherence to the principles of the MTCR or are in the process of doing so; these include Brazil, China, the Czech Republic, Indonesia, Romania, Russia and South Africa. It should be noted that all the member countries of the European Union and those that will presumably form part of the Union from 1995 are members of the MTCR.

18. The MTCR covers transfers of equipment and technology relevant to missiles. In the evaluation of transfer applications the following factors will be taken into account:

*(i)* the prevention of proliferation of weapons of mass destruction;

*(ii)* the capabilities and objectives of the missile and space programmes of the recipient state;

*(iii)* the significance of the transfer in terms of the potential development of systems for producing weapons of mass destruction;

*(iv)* the assessment of the end use of the transfers, including the assurance of the recipient state that they will be used only for the purpose stated, that neither such use nor the items transferred will be modified or duplicated without the prior consent of the supplier government and that neither the items nor any replicas nor derivatives will be retransferred without the consent of the supplier government.

The MTCR provides that governments should enforce these principles through their respective national legislations.

19. Despite the fact, noted previously, that many countries are already party to the MTCR or have stated their intention of joining in future, and despite the importance of these countries, the fact of the matter is that this control mechanism, which is certainly unique of its kind, is not entire-

ly fulfilling its objectives, even though the MTCR admittedly constitutes a major obstacle to attempts by certain countries to acquire such equipment and technologies.

20. According to data provided by the United States Defence Department, the current situation of third world countries in relation to theatre ballistic missiles is that shown in the following table:

| | |
|---|---|
| 250 km to 600 km | Afghanistan (Scud-B)<br>China (M-11, M-9)<br>DPRK (Scud-B, Scud C)<br>Egypt (Scud-B)<br>India (Prithvi)<br>Iran (Scud-B, Scud-C)<br>*Iraq (Scud-B, Al-Hussein)<br>Israel (Jericho-1)<br>Libya (Scud-B)<br>Pakistan (Hatf-2, M-11, **Hatf-3**)<br>Syria (Scud-B, Scud-C, **M-9**)<br>Yemen (Scud-B) |
| > 600 km | ***Iraq (Al-Abbas)**<br>**Taiwan (Tien Ma)** |
| 1 000 km to 1 500 km | DPRK (No Dong-1)<br>Israel (Jericho-2)<br>**South Africa (Arniston)** |
| 2 000 km to 5 000 km | China (CSS-2, CSS-5, JL-1 SLBM)<br>**DPRK (Taepodong-1, Taepodong-2)**<br>**India (Agni)**<br>***Iraq (Tammuz-1)**<br>Saudi Arabia (CSS-2) |
| > 5 000 km | China (CSS-3, CSS-4) |

**In Development.**
*** Prohibited.**

21. Moreover since the demise of Cocom (Co-ordinating Committee for Multilateral Export Controls) at the start of 1994, differences over a successor organisation to take over its responsibilities are beginning to surface between the former Cocom members (Australia, Japan and NATO members except for Iceland), as the Americans and Europeans are unable to reach agreement on the aims of export controls.

22. In the first place there seem to be differences of opinion about which countries constitute strategic threats. This means that a wide multilateral consensus has to be achieved which takes account of specific transactions that may not be licensed for a given destination or particular end-use. Moreover there is apparently as yet no agreement on the list of items to be subject to controls.

23. The new successor régime to Cocom will have to be directed towards conventional armaments and their related technology, and concentrate on those countries that represent proliferation risks and threats to regional stability – which from the United States' point of view means countries such as Libya, Iraq, Iran and North Korea.

24. Adherence to the new régime will be open only to countries that already belong to existing multilateral non-proliferation régimes, the MTCR, the Australian Group (biological and chemical weapons) and the Nuclear Suppliers Group and which additionally subscribe to armaments control standards such as the START agreements.

25. It therefore seems obvious and necessary for the partners on either side of the Atlantic to reach specific agreements as soon as possible, making an effective contribution to controlling real and potential threats that will inevitably be amplified if there is no suitable joint response on our part.

26. The United States is currently opposed to Russia and other countries of the former Soviet Union being founder members of any new successor organisation to Cocom, because, according to Washington, these countries continue to supply armaments to hostile countries (mainly Russia which supplies Iran), basically on account of their desperate need for cash. During his recent visit to Washington in late September 1994, President Yeltsin gave an undertaking to end Russian arms sales once outstanding contracts (some dating from 1988) were fulfilled.

27. The most recent and obvious example of such a threat has been North Korea, a country which has pushed itself far beyond its true economic capacity in order to acquire a nuclear capability together with ballistic missiles such as the Taepodong 1 and 2 – the latter, with a possible range of over 3 000 km, reported to be available quite soon (and consequently available for export).

28. The European Union for its part is preparing to draw up regulations for armaments exports. It is seeking to establish a community system for armaments exports to third countries. Your Rapporteur has learnt that work is being done on product lists on which products are to be counted as dual-use and the régime that should govern them. The legal principles which are to apply have yet to be clarified.

29. From the above, it is quite clear that export controls are not an entirely effective solution for avoiding ballistic missile proliferation. The MTCR and the new Cocom will be useful tools, provided there is no hesitation about their being interpreted more rigorously and an attempt is made to win the support of the largest number of countries possible for their principles.

30. In short, the range of measures for avoiding the risk of proliferation, or at least reducing it as far as possible must be directed primarily towards prevention, with the assistance of political and economic measures, measures for preventing technology transfer (MTCR, new Cocom ...), preventive military action and also deterrence measures implying the threat of reprisals and protection including active and passive defence.

31. All of the foregoing must be accompanied by confidence-building and regional security measures, as this committee has observed already in the report referred to earlier (Document 1305) at least as far as Asia is concerned and, to a far lesser degree, South America. In the Mediterranean and the Near and Middle East, the situation is far more problematic and complex and the idea referred to elsewhere of a CSCM (or Conference on Security and Co-operation in the Mediterranean) could be helpful in contextualising the problem as part of the process of analysis and search for a solution.

### *III. United States policy on missile defence systems*

32. On 23rd March 1983, President Reagan announced the strategic defence initiative (SDI), a long-term technology research programme consistent with the 1972 anti-ballistic missile (ABM) treaty, to examine the feasibility of developing defences against ballistic missile attacks and to attempt to create a space shield which would render nuclear weapons "impotent and obsolete". The SDI was devised as an alternative to the mutually assured destruction (MAD) doctrine which, for several decades, had based deterrence on the threat of massive retaliation and subsequent destruction of United States and Soviet societies. The mission of SDI was to redefine deterrence by giving the United States (and its allies) the means to protect people and military assets from Soviet attacks.

33. The Reagan administration established the SDI programme in January 1984 and in April 1984 the Strategic Defence Initiative Organisation (SDIO) was chartered to manage the efforts of the Department of Defence (DoD). The administration's first SDI budget submission to Congress requested $2 billion for FY1985 and Congress authorised a total of $1.621 billion. By 1985, SDI had become the Department of Defence's largest single research and development programme.

34. In January 1985, a White House paper acknowledged that, while the ultimate objective was still a defensive system which would protect the population of the United States directly, the more immediate goal was to make nuclear retaliation more effective. Under this rationale, SDI would help deter a nuclear attack by complicating Soviet planners' efforts to destroy American nuclear forces in a first strike. Together with air defences, effective defences against ballistic missiles would substantially lower the possibility of nuclear war.

35. Much of the technology needed for SDI was already under way before 1983, which allowed the programme to move quickly to a high funding level. The army already had a substantial ballistic missile defence (BMD) technology programme moving forward in surveillance and tracking, interceptor missiles and terminal battle management. The air force and the Defence Advanced Research Projects Agency (DARPA) had several technology development programmes under way in directed energy weapons (DEW) and space surveillance. At least 25 Department of Defence programmes were aggregated and restructured to form the SDI programme.

36. A breakthrough in BMD technology occurred in June 1984 when Lockheed's homing overlay experiment (HOE) successfully intercepted and destroyed a mock ballistic missile warhead in the midcourse phase of its flight. This non-nuclear intercept was the first such experiment demonstrating the homing guidance system and the potential of kinetic energy weapons (KEW) to destroy ballistic missiles and their warheads by colliding with them at great speeds. HOE, managed by the army's ballistic missile defence systems command, represented a decade of research and development, data-processing and optical technology. This experiment laid the foundation for the exo-atmospheric re-entry vehicle interceptor system (ERIS), a technology researched under the SDI programme.

37. Other key experiments included:

- in September 1985, a ground-based directed energy experiment using the mid-infrared advanced chemical laser (MIRACL) device conducted at the White Sands missile range: the target, a Titan booster rigged to simulate a thrusting booster, was successfully destroyed by the laser. SDIO also conducted the first successful demonstration of the ability to track a sounding rocket in space with a low-power, ground-based laser after adjusting the beam for atmospheric distortion;
- in April-June 1986, a series of flexible lightweight agile guided experiments (FLAGE): these kinetic energy experiments demonstrated the guidance technologies necessary to intercept a warhead both in and beyond the earth's atmosphere;
- in July 1986, SDI's first particle beam experiment irradiated a miniature re-

entry vehicle with a high-intensity proton beam, demonstrating that the explosive contained in the re-entry vehicle was highly vulnerable to the particle beam.

38. In 1987, the Heritage Foundation published a study arguing that the SDI programme was still too vaguely defined. The paper proposed an architecture for the SDI consisting of a three-tier system with space- and land-based components capable of destroying ICBMs at various stages in their flight. This near-term, kinetic-kill, layered strategic defence system would cost approximately $100 to $121 and would include:

- space-based kinetic-kill vehicles targeted at the incoming missile's boost phase and post-boost phase;
- a ground-based component, similar to Lockheed's exo-atmospheric re-entry interceptor system (ERIS), to shoot down missiles in the mid-course of their trajectories;
- a terminal defence, similar to McDonnell Douglas's high endo-atmospheric interceptor (HEDI), to destroy those few missiles which get through the other two layers;
- radar sensors of different types for each of the three layers, to track and target ICBMs;
- battle management and command, control and communications (BM/C$^3$) capabilities to guide and manage the overall system.

39. The study recognised DEW (lasers and particle beams) as having the potential to fulfil SDI's mission but it pointed out that those technologies would require ten to fifteen years of research and development before deployment.

40. The SDI programme was given a structure and a strategy. The goal of the programme was reduced to "near-term deployment of limited ballistic missile defences as a hedge against Soviet breakout of the ABM treaty" (SDIO report to Congress on the SDI, April 1988). The "Paul Nitze criteria" of military effectiveness, survivability and cost-effectiveness at the margin was introduced as a prerequisite to deployment. The administration defined and adopted a specific SDI deployment concept for the 1990s and beyond, referred to as "phased development". The strategic defence system (SDS) envisaged by the Department of Defence would be the culmination of several different SDI deployment phases consisting of ever-evolving SDI technologies.

41. Phase one of the SDS consisted of space-based kinetic energy interceptors to attack ballistic missiles and warheads in the boost and post-boost phases. For that purpose, various sensors would be used during the various phases of flight, as recommended by the Heritage Foundation study:

- a sensor system concept called boost surveillance and tracking system (BSTS) would be used to track missiles in the boost phase;
- for intercept during the post-boost and mid-course phase outside the atmosphere, two other sensor system concepts would be required: *(i)* a space surveillance and tracking system (SSTS) – an orbiting satellite sensor; and *(ii)* a ground-based surveillance and tracking system (GSTS) – a system that launches sensors into space by rocket booster after warning of an attack from the BSTS;
- a ground-based radar (GBR) would provide a late mid-course and terminal phase sensor system to track and discriminate re-entry objects that have survived the defences in the boost, post-boost and mid-course phases.

42. An exo-atmospheric re-entry vehicle interceptor system (ERIS) would be used on the ground to complement the space-based interceptor (SBI). The SBI concept was eventually superseded by a smaller, low-cost, mass-produced, individually-deployed space-based interceptor called Brilliant Pebble. A constellation of these smaller interceptors would be deployed in space, revolutionising the SDI architecture (see Appendix I). Reportedly, the phase one system was supposed to take out 50% of the Soviet SS-18s launched and about 30% of the total attack. Deployment of this system would have to be done in sub-phases due to budget and technology constraints.

43. Follow-on system concepts, to be used in phases two and three of the SDS included:

- space-based neutral particle beam (NPB) weapons;
- a high endo-atmospheric defence interceptor (HEDI);
- an airborne optical system (AOS);
- a ground-based radar (GBR);
- a space-based laser (SBL);
- a ground-based hypervelocity gun (HVG); and
- a ground-based laser (GBL).

(see Appendix II).

44. As early as March 1985, the administration emphasised that the SDI programme was designed to enhance allied security as well as United

States security and sollicited allied participation. Belgium, Canada, Denmark, France and Norway declared that they would not participate in the SDI. However, their private industry could contract directly for SDI work. Other countries signed agreements regarding government and industrial participation in the SDI: the United Kingdom signed a memorandum of understanding (MOU) with the United States on 6th December 1985, followed by West Germany in March 1986, Israel in May 1986, Italy in September 1986 and Japan in July 1987. The Netherlands signed a memorandum of agreement (MOA) in July 1987. At the beginning of 1988, eighty contracts had been awarded to foreign companies for a total of $127.2 million (not including foreign subcontractors).

45. The SDI played a significant rôle in the United States-Soviet arms control negotiations: it prompted the USSR to reopen the START talks. From 1985 onwards, the United States and the Soviet Union held several rounds in Geneva to negotiate a strategic arms reduction treaty (START I) aimed at reducing each side's nuclear warheads by half. Between 1985 and 1991, United States and Soviet differences over the SDI programme caused an impasse in the START negotiations, but SDI was one of the key factors which led the Soviets to begin serious discussions on arms reduction and eventually to sign the START treaty in July 1991. The SDI also played a significant rôle in the intermediate nuclear forces (INF) negotiations leading to the signing of the INF treaty in December 1987. The administration consistently argued that a major objective of the SDI programme was to provide arms control leverage over the Soviet Union.

46. At the beginning of 1990, responding to changes in the international and domestic climate, the SDIO began redefining its plans for the development of strategic and theatre defences. Former United States defence and space talks chief negotiator Henry Cooper was hired by Defence Secretary Dick Cheney to review the SDI programme and recommend how it could be revised to meet the changing international scenario and the new threats, i.e., the decreasing threat of a massive Soviet nuclear attack and the increasing threat of a third world attack.

47. Mr. Cooper developed a plan called global protection against limited strikes (GPALS). The goal of GPALS was to protect the United States completely from an unauthorised, accidental or third world nuclear attack of up to 200 warheads or re-entry vehicles. The plan also envisaged the improvement and co-ordination of theatre defences with the United States strategic defence and emphasised global protection in addition to deterrence. In July 1990, Henry Cooper became SDIO's director to carry out his plan and, in January 1991, President Bush endorsed the change to GPALS.

48. The GPALS anti-missile system concept consisted of three distinct defensive spheres:

*(i)* theatre missile defence (TMD), composed of stand-alone defences against theatre/tactical ballistic missiles;

*(ii)* national missile defence (NMD), providing national coverage to the United States including Alaska and Hawaii, in about six United States deployment areas, and involving space and mobile ground-based sensors as well as about 750 ground-based interceptors (GBIs)-about half the number required to meet SDI's phase one objectives;

*(iii)* global missile defence (GMD) elements, i.e., the space-based interceptors that would assist the two ground-based systems. This element would be a constellation of about 1000 kinetic-kill vehicles known as Brilliant Pebbles.

49. About 50 space-based sensors would provide early warning, cueing, some discrimination, and kill assessment to both the theatre and the United States system. The two ground systems would also have GBRs to measure object slowdown as it hit the atmosphere to help distinguish light and heavy objects. The system realigned the GSTS (a ground-based infrared sensor probe that can be launched on demand in case of attack) as a technical back-up to both Brilliant Eyes and GBRs.

50. The first step in the three-tier GPALS plan was the development of theatre defences because theatre defence technologies were more mature than those needed for a United States or global defence, and also because theatre forces in a changing international scenario faced a more immediate threat from ballistic missiles than the United States homeland. The initial plan envisaged an improved theatre defence deployed in the mid-1990s and the United States and global systems in place by the end of the century. SDIO emphasised that the elements of the GPALS system "could be deployed sequentially, and need not await the development of an entire system. Nor would the deployment of [the] system be contingent on the technical maturity of follow-on systems", as was the case with phase one of SDI. However, SDIO promised that research on follow-on technologies would continue to be funded. While still relying on space assets for surveillance and communication, GPALS represented a shift away from a space-based shield to a ground-based defence.

51. In 1991, members of the Senate Armed Services Committee (led by Sam Nunn and John

Warner) started crafting a compromise which would push theatre and ground-based ABM treaty-compliant United States defences to deployment while providing research funds for Brilliant Pebbles. The result was the Missile Defence Act of 1991, which for the first time put Congress on record as supporting deployment of a United States missile defence (see Appendix II). The act endorsed the concept of a limited defence designed to protect the United States against limited ballistic-missile threats. One of the key provisions was a mandate to develop NMD by 1996 or as soon as the technology would be ready. The single United States defensive site was to contain 100 GBIs and to be fully compliant with the ABM treaty. The act also called for robust funding for Brilliant Pebbles and other follow-on technologies. However, in April 1992, Mr. Nunn contended that the SDIO was spending too much on its plan for space-based assets (Brilliant Pebbles and Eyes) at the expense of the ground-based systems that Congress wanted. The FY 1993 Department of Defence authorisation revised the Missile Defence Act by dropping the 1996 target deployment date and reiterating that the goal of the United States was to abide by the ABM treaty. While the Senate Armed Services Committee urged the administration to "pursue vigorous changes" to the ABM treaty, it directed SDIO "to plan the architecture for the initial, treaty-compliant ABM site on the basis of the treaty as now constituted and not as it may be revised". The new target date for deployment was postponed to 2002. In April 1992, Mr. Cooper estimated the cost of GPALS at about $35 billion for 5 to 7 sites, Brilliant Eyes and BM/C$^3$.

52. With the election of Bill Clinton as President, United States policy on missile defence systems shifted significantly away from the strategic emphasis of previous Republican administrations. Shrinking defence budgets, the lessons drawn from the Gulf war, major changes on the international scene and a new political orientation all contributed to placing the pursuit of effective TMD on top of the priority list. The Clinton administration put GPALS on hold in favour of TMD – involving the protection of a smaller area against tactical ballistic missiles (as opposed to ICBMs) – while relying more on the non-proliferation treaty (NPT) and on the strengthening of the MTCR to discourage the proliferation of ballistic missiles and weapons of mass destruction. The main task of theatre ballistic missile defences was to protect expeditionary forces deployed by the United States and its allies.

53. In early 1993, the Secretary of Defence restructured the SDIO and renamed it the Ballistic Missile Defence Organisation (BMDO). The BMD programme was restructured to respond to the "here and now" theatre ballistic-missile threat and to an uncertain, but evolving, threat to the United States. It was founded upon the President's endorsement of the 1993 Department of Defence bottom-up review (BUR) and on the Missile Defence Act (MDA) of 1991 as subsequently amended in FY1993 and 1994 national defence authorisation legislation. As amended, the MDA directed the administration to "maintain the option to deploy an ABM system capable of providing a highly-effective defence of the United States against limited attacks of ballistic missiles and to provide highly-effective theatre missile defences to forward deployed and expeditionary elements of the armed forces of the United States and as appropriate to friends and allies". The BUR, in its assessment of the ballistic missile threat, pointed out that both deliberate or accidental launches from China or the former Soviet Union (FSU) were highly unlikely. As for potentially hostile third world nations, the possibility of a limited, long-range ballistic missile threat some time in the first decade of the next century could not be excluded. The BUR also identified a new, more urgent threat: the proliferation of shorter-range ballistic missiles armed with nuclear, biological, or chemical warheads. It stated that, "in recognition of the low probability of a long-range ballistic missile attack from the FSU or China, but to preserve a hedge against acquisition or indigenous development of a long-range ballistic missile capability by another potentially hostile nation, national missile defence (NMD) efforts were designated as a second priority relative to TMD".

54. The overall TMD programme objectives of the Clinton administration were to field a TMD capability rapidly by upgrading existing systems and developing more advanced systems for acquisition later in this decade. The proposed budget to support those goals was $12 billion for FY1995-1999. The BMDO requested a budget of $3 250 million for FY1995, including $1 770 million for TMD research and development and $270 million for TMD procurement efforts. An array of service programmes reinforced the joint and combined nature of the TMD mission. The TMD initiative (TMDI) involved the army, navy and air force and included several core programmes:

- Patriot advanced capability level-3 (PAC-3), an upgrade of the PAC-2 which was used against the modified Iraqi Scud missiles during the Gulf war. PAC-3 would provide greater lethality, range and accuracy, and more effective capability against tactical ballistic missiles. The first PAC-3 systems should be fielded by FY1998;
- navy lower-tier TMD (Aegis/Standard Missile-2 Block IVA). The navy and BMDO have been co-operatively working to develop an enhancement to the Aegis/SM air defence system which

would provide a sea-based tactical ballistic missile defence capability (similar to that provided by the PAC-3);

- theatre high altitude area defence (THAAD). As the most critical element in the "core", THAAD represents the first TMD system which has been designed to match fully the existing ballistic missile threat. The THAAD system would allow multiple shot opportunities to intercept longer-range and more capable theatre ballistic-missile threats. It has been developed for endo-atmospheric and exo-atmospheric defence and consists of interceptor missiles, launchers, BM/C$^3$I units, and a theatre missile defence ground-based radar (TMD-GBR). It would provide approximately twenty times the capability of existing air defence assets, employing the latest hit-to-kill technology. The Department of Defence would like to give THAAD the capability to intercept short-range or *tactical* missiles with a range of up to 3 500 km travelling at up to 5 km/second – only slightly less than the speed of a *strategic* vehicle (6 to 7 km/second). It would operate as an autonomous weapon system, but it is required to be interoperable with lower-tier defences. THAAD thus represents the centrepiece of a two-tiered defence system. $495.69 million were requested in FY1995 for the THAAD programme and deployment of the objective THAAD system was planned for FY2002. However, a prototypical THAAD battery as a user-operational evaluation system (UOES) should be developed at the end of the demonstration/validation phase in 1996 for early operational assessment and possible deployment should a contingency arise. Provision of the UOES has been a major thrust and priority of the TMD programme.

55. The abovementioned two-tiered defence system would rely on a theatre missile defence ground-based radar (TMD-GBR) as well as on a command and control centre. The TMD-GBR would provide surveillance and fire control support for the THAAD missile system and cueing support to lower-tier systems such as Patriot. It would utilise state-of-the-art radar technology in order to provide a capability to perform threat classification against theatre tactical ballistic missiles and kill assessment after intercept. As for battle management and command, control and communication capabilities, BMDO has taken the lead to establish an architecture upon which all the services can build and to ensure an effective and joint BM/C$^3$I. The National Test Facility (NTF) at Falcon AFB, Colorado, centrepiece of the National Test Bed (NTB), is the only facility under direct control of the BMDO and seeks to provide the comprehensive capability to compare, evaluate and test alternative SDS key technologies (such as BM/C$^3$) in a system-level context. The NTB network of research facilities currently has sixteen remote nodes linked together and located throughout the United States.

56. Additional TMD efforts will involve concept exploration activities for a potential sea-based upper-tier wide area defence system. Sea-based upper-tier technologies include the light-weight exo-atmospheric projectile (LEAP). The LEAP-equipped SM-2 would follow the abovementioned Block IVA. By the end of 1994, the BMDO will conduct the first at-sea exo-atmospheric experimental intercepts, designated FTV-3 and FTV-4. Other TMD efforts include defence for manoeuvring ground forces (corps SAM, a new mobile air and missile defence system), and a boost phase interceptor system (airborne boost phase intercept) which would offer the potential to destroy attacking missiles over enemy territory and would be effective particularly against advanced delivery system countermeasures. It is worth noting that these three programmes are competing for funds since the TMD programme will only fund a single new system (starting FY1998).

57. The new TMD programme as a whole has incorporated some technologies and components derived from the SDI programme but, for the most part, space-based elements have been shelved or put on hold. In August 1994, an agreement on how to structure a demonstrator programme for an endo-atmospheric missile interceptor to destroy ballistic targets in the boost phase was reached by the air force, the BMDO and the Office of the Secretary of Defence (OSD). Despite possible funding difficulties, Defence Secretary John Deutch approved the plan which relies heavily on existing technologies. The United States air force and the BMDO emphasised that the boost phase interceptor (BPI) would supplement other portions of a layered ballistic missile defence such as Patriot or THAAD.

58. In August, the Senate Appropriation Committee chopped BMDO's budget to $2.5 billion and changed programme elements: Patriot and the extended range interceptor (ERINT) risk reduction programme obtained more money than requested; THAAD lost money for some flight tests; sea-based area theatre ballistic missile defence also suffered a reduction; TMD-GBR funds were increased to make sure that good radar systems are available to support THAAD; and finally, BM/C$^3$I funds were held to FY1994 levels. As far as NMD is concerned, the committee consolidated all national missile defence technology readiness programmes in a single new pro-

gramme element and funding was reduced. Funding for follow-on TMD technologies was also reduced compared to the administration's request. The Senate panel transferred $120 million in Brilliant Eyes funding to the air force and earmarked $50 million for a high-energy laser research programme outside of BMDO. The panel declared that early deployment of Brilliant Eyes in the next five years coupled with no NMD technology demonstrations would not be consistent with the BUR. It also recommended that BMDO continue developing and testing more mature technologies, such as ERIS and LEAP, rather than concentrating on miniaturising interceptors and kill vehicles. This represents a direct attack on Brilliant Pebbles and a clear indication that United States ballistic missile defence will increasingly emphasise ground-based systems to the detriment of space-based concepts.

### *IV. Anti-missile defence – architecture and systems*

59. After more than twenty years of technical investigation of this area, more particularly in the United States but in Europe too, the nature of the specific systems required or needing to be developed has become clear in recent years, together with their effectiveness and relative interest, allowing a distinction to be drawn between what is feasible now and areas for research.

60. The table given in Chapter II shows two types of threat: the first is the threat of a theatre attack from missiles with a range of under 1 000 km, calculated statistically as between 300 and 600 km. The other is a strategic threat from missiles with a much greater range.

61. Theatre missiles are normally fired from mobile launchers. The target area of these missiles is necessarily more restricted if merely for reasons of their range. Strategic missiles, if not launched from submarines, as is the case for Russia, are fired from fixed silos, usually located well within the borders of the enemy country.

62. Two different defence systems to counter two types of threats can be envisaged on the basis of the following systems:

*(i)* Endo-atmospheric systems, mainly:

- American systems: Patriot, the PAC-3 version of which is currently being developed from the Erint missile and Corps SAM currently in the study phase;
- European systems: the German TLVS, in its study phase, and the Franco-Italian SAMP/T, also under study, based on the anti-aircraft SAMP/T combining the Aster missile with either Empar or Arabel radar systems for naval and earth applications respectively;
- Russian systems: SA-10 and SA-11 which have been operational for some years.

63. Endo-atmospheric systems protect the nerve centres of the armed forces: headquarters, communication centres and military bases and surrounding areas of from 5 to 15 kilometres. These systems are designed to counter theatre missiles of up to a 1 000 km range and their effectiveness is very weak against missiles in the 2 000 km range. The Russian SA-12 is effective against missiles with a 3 000 km range.

64. These systems are mobile and generally have a dual anti-missile and anti-aircraft function.

*(ii)* Endo-exo-atmospheric systems: the only current project is the American THAAD programme in its development phase. THAAD (theatre high altitude area defence) with its ground-based radar, is heavy but transportable nevertheless. It protects an area of 100-200 km in diameter against missiles in the 300-3 000 km range.

*(iii)* Exo-atmospheric systems: at present these systems exist only in the study phase or as prototypes. They are based on the LEAP (light exo-atmospheric projectile) concept, which, with a velocity of the order of 4 km per second, can defend an area 2 000 in diameter against missiles with a 1 000 km plus range, in other words strategic and no longer theatre missiles.

65. In general the systems under study here are sea-based using for example the SM-2 missile equipped with Aegis fire control. These systems can be based on land but are difficult to transport.

66. Three or four systems based in the Mediterranean would be sufficient to protect the greater part of Europe against threats from the south and south-east. Nevertheless, to be fully effective, these systems require enormously powerful radar systems which must have fixed locations. The ranges of the ship-based Spy radar systems equipped with Aegis are far less effective.

*(iv)* Boosted interceptor systems: these systems, unlike those preceding, are airborne on Eurofighter or Rafale aircraft and require very little infrastructure. Each aircraft in flight can block an enemy missile in its initial launch phase if the missile is fired at a distance of a few hundred kilometres or so from the plane. These scenarios are theatre scenarios where the dimensions

of the firing areas are between 200 and 400 km and are within firing range of their target (600-800 km maximum).

67. Antimissile missiles are relatively light and allow the plane to undertake other defence missions at the same time. Moreover, they can be used against strategic missiles, provided they are within range of the firing point, which is possible if at the same time there is a declared in-theatre crisis involving the enemy country.

*(v)* Early warning systems: All the systems studied above operate satisfactorily provided one has access to early warning systems. The only existing systems are Russian and American (DSP) but these only operate with strategic or long-range theatre missiles. Projects are being studied in Europe and in the United States for warning systems that are effective against all missiles, including theatre ballistic missiles (Esat in Europe, Alarm in the United States). These are all space-based systems and are of varying complexity depending on the size of the area under observation.

68. One or two geostationary satellites are enough for continuous observation of a sensitive launch area of 2 000 km × 2 000 km. The zone to be observed can be determined from earth and changed in a few hours over one third of the earth's surface observed from an altitude of 36 000 km.

69. This early warning system may include purposes other than active anti-missile defence. In particular it permits surveillance of countries guilty of proliferation by identifying the nature of their fire: tests or fire against other countries, including when Europe is not involved. The system can also determine the type of missile used.

70. It is thus possible to detect launch areas to an accuracy of 1-5 km depending on the a priori information available about the missile launched; it is therefore possible to confirm that one country rather than another has launched a missile and to strengthen the deterrent attitudes European countries might possibly adopt.

71. Identification of the launch area also allows operational units to take action against batteries or to destroy launch systems by means of conventional bombers or laser or cruise missiles.

72. The early warning system also allows the target areas and the approximate arrival time to be identified, thus triggering the necessary warning systems and all possible passive defence measures.

73. Thanks to these different systems Europe can build one or several defence architectures:

– a theatre defence architecture could be established with a minimum number of endo-atmospheric systems over each potential flash-point, preferably associated with an early warning system. To these might be added airborne systems (with which some aircraft are equipped) and three or four THAAD units, depending on theatre size;

– a defence architecture protecting Europe might be made up of THAAD systems defending major centres and towns with three or four sea-based exo-atmospheric systems and an early warning system with three fixed ultra long-range radar systems. Airborne systems may also be used in the event of initial in-theatre engagements.

### *V. Present-day co-operation on theatre missile defence (TMD)*

74. In line with the report to Congress on the plan to co-ordinate development and implementation of theatre missile defence programmes with allies, the United States Department of Defence has established a series of priorities for the ballistic missile defence (BMD) programme. The highest of these involves the development and deployment of TMD systems to meet growing threats from ballistic missiles directed towards United States troops, allies and friends. According to the Department of Defence, the United States is seeking to co-operate in developing its anti-missile defence programme in development and deployment of theatre defences with allies who share the problems arising from proliferation of ballistic missiles.

75. The Department of Defence approached international participation in the development and deployment of TMD systems by building on bilateral research and development programmes, which aimed to encourage sharing of advanced technologies and, at the same time, achieve a better understanding of political and military factors capable of influencing the defence architecture in various regions around the globe. Moreover, such participation provided America's allies and friends with further knowledge enabling them to make their own decisions on the basis of their anti-missile defence requirements.

76. The result of this co-operation over research and development programmes has been wider agreement on the likelihood and impact of the use of missiles in theatre conflict and on the need for an effective response to the threat. This latter point was brought home forcibly by the Gulf conflict. Indeed, the interest in theatre anti-missile defence dates principally from that time. This interest has been shown in unilateral and multilateral actions, principally through the thin-

king developed or now being developed by NATO and by WEU.

77. Israel and Japan, countries facing immediate threat, might be regarded as cases in point. Israel, in co-operation with the United States, has developed a BMD programme based on the Arrow missile and has prompted Japan, for its part, to enter into bilateral discussions with the United States on anti-missile defence, basically in the light of the threat from North Korea.

78. In the following pages, consideration will be given to the activities of various European countries in relation to BMD. Also, in NATO, a group of member states (Canada, France, Germany, Italy, the Netherlands, Norway, the United Kingdom and the United States) has established an ad-hoc working group under the Conference of National Armaments Directors, exclusively to try and find ways of co-operating in TMD programmes. Additionally, NATO has already made several studies on BMD.

79. The Department of Defence wishes to capitalise on all of this interest through all possible modalities of co-operation through an approach tailored to varying circumstances, taking account of national programmes and plans and the capabilities of each nation.

80. Inter alia, the following possible actions have been identified:

- sharing early-warning formulae;
- continued bilateral and multilateral co-operation on research and development;
- improving present anti-missile defence capabilities;
- strengthening participation in joint development and joint production programmes;
- subsequent deployment of advanced capabilities.

81. All of the above should lead to increased regional security, cost reduction, an improvement in security relations and greater operational interoperability with regard to national defence procurement and deployment plans.

82. The Department of Defence's TMD programme is based on an evolutionary development of anti-missile defence capabilities. This would imply improving Patriot capabilities by deploying the PAC-3 and adding the standard missile Block IVA on to present Aegis capabilities to provide a sea-based lower tier defence against short-range theatre ballistic missiles.

83. The talks that the Department of Defence is engaged in with countries that operate with American export equipment, produce American systems under licence or are simply considering joint development or future equipment purchase are based on this same strategy.

84. The Department of Defence's plan to co-ordinate the development and commissioning of TMD programmes shown in the following table seeks to avoid duplication, reduce cost and increase interoperability.

TABLE 1

***Approach for allied participation***

| | Time | Activity |
|---|---|---|
| | Now | Identify and consolidate current studies, plans, programmes |
| "Build upon/improve existing capabilities" | Near Term | Pursue improved early warning and tracking capability |
| Incremental enhancement | | |
| Interoperability | | Pursue improved communication/data transmission |
| | | Improve/develop lower tier defences |
| "Qualitative new capability" | Longer Term | Expand/improve lower tier defences |
| "Defence-in-depth" | | Develop/deploy area defense capability |

85. This plan is based on the defence needs worked out by the political and military authorities. The co-ordination process ensures that TMD is integrated into the existing air defence and air space command/control systems. The plan takes account of the analyses by NATO's Advisory Group on Aerospace Research and Development (AGARD) and the BMDO-supported missile defence architecture studies for Europe, the Middle East and Japan, along with other reports such as those prepared by the NATO Industrial Advisory Group (NIAG).

86. The short- and medium-term programme identifies the potential for immediate low-cost, low-development, feasible improvements to existing systems and/or operational concepts that will result in measurable improvement to early-warning and TMD capabilities. The following table shows those countries (allies and friends of the United States) with one or more existing systems able to provide an infrastructure for an advanced TMD capability.

TABLE 2

***Friends and allies: existing TMD-related capabilities***

| Nation | TPS-59 FPS-117 | Hawk | Patriot | AWACS | Aegis |
|---|---|---|---|---|---|
| Belgium | XXXXXX | XXXXXX | | | |
| Canada | XXXXXX | | | | |
| Denmark | | XXXXXX | | | |
| France | | XXXXXX | | XXXXXX | |
| Germany | XXXXXX | XXXXXX | XXXXXX | | |
| Greece | | XXXXXX | | | |
| Iceland | XXXXXX | | | | |
| Italy | XXXXXX | XXXXXX | | | |
| Luxembourg | | | | | |
| Netherlands | | XXXXXX | XXXXXX | | |
| Norway | | XXXXXX | | | |
| Portugal | | XXXXXX | | | |
| Spain | | XXXXXX | | | |
| Turkey | XXXXXX | | | | |
| United Kingdom | XXXXXX | | | XXXXXX | |
| United States | XXXXXX | XXXXXX | XXXXXX | XXXXXX | XXXXXX |
| Sweden | | XXXXXX | | | |
| NATO | | | | XXXXXX | |
| Egypt | XXXXXX | XXXXXX | | | |
| Israel | | XXXXXX | XXXXXX | | |
| Jordan | | XXXXXX | | | |
| Kuwait | XXXXXX | XXXXXX | Contract | | |
| Saudi Arabia | XXXXXX | XXXXXX | XXXXXX | XXXXXX | |
| UAE | | XXXXXX | | | |
| Japan | | XXXXXX | XXXXXX | XXXXXX | XXXXXX |
| Singapore | | XXXXXX | | | |
| South Korea | XXXXXX | XXXXXX | | | |
| Taiwan | XXXXXX | XXXXXX | | | |

87. Short- and medium-term strategy consists of building on the capabilities shown in the above table, in approving them and in introducing further new capabilities. Thus, the Department of Defence considers that the first element of its plan for international co-ordination should include statement of all existing early-warning capabilities and the existing planned and possible future means of sharing information on these systems. To summarise, this would include the following:

- examination of space-based sensors and the means of sharing their data;
- identifying ground- and sea-based sensor capabilities for theatre surveillance (United States and foreign) and associated modifications to enable improved detection and tracking of missiles;
- pursuing a possible modification of airborne surveillance systems. The United States is at present trying to develop a co-operative programme with NATO, the United Kingdom and France which already have E-3 AWACS;
- determination of the adequacy of existing battle management/command, control, communications and intelligence ($BMC^3$) systems;
- the identification of evolutionary command and control operational concepts;
- the distribution of improved early-warning information which could significantly enhance the performance of fielded TMD systems, particularly as the TMD systems themselves are improved;
- planned modification of Patriot beyond the fielded PAC-2 with consultations centred on allied plans to incorporate short-term improvements for PAC-2 and their planning for PAC-3;
- Hawk improvements and the intent of some of the nations that currently deploy improved Hawk to upgrade their systems with the improvements planned by the United States marine corps;
- upgrades will be made to the Aegis combat system, to support detection, tracking and engagement of theatre ballistic missiles using the SM-2 Block IVA missile;
- Aegis standard missile Block IVA or an indigenous missile incorporating similar TBMD capabilities.

88. The long-term plan will be based on the achievements of the short- and medium-term plan with the objective of further enhancing lower tier capabilities and adding the upper tier capability necessary to account for advanced theatre missiles for both *(a)* defence-in-depth of military forces and *(b)* territorial theatre defence.

89. In the Department of Defence's view, the earlier allied nations and friends become involved in the programme, the better the opportunities for co-operation. When discussions are held early in the development of a programme, the opportunities for joint development and production are greater. Participation later in the programme may be restricted to licence production, purchase of a system or development of a system variant with the addition of allied technology.

90. At the present time, the United States Corps SAM programme is in the concept definition phase, providing, according to the American authorities, an opportunity for international participation. It is possible during this phase to harmonise allied and United States requirements, define responsibilities and contributions and negotiate the terms and conditions of requisite international agreements.

91. Conversely, the THAAD (theatre high-altitude area defence) high-priority programme, now in its demonstration and validation phase, for the time being offers little opportunity for foreign involvement. Although limited participation might be possible, it would not be possible to accommodate interruptions for negotiations or modifications to the prime contract.

92. Foreign participation would be possible at and beyond the engineering and manufacturing development stage. In short, the Department of Defence considers that initiating early discussions on co-operation enables both sides to reduce costs, avoid a duplication of effort and improve operational concepts. In its view, such discussions would not be detrimental to established plans for improving capabilities in the force structure as quickly as possible.

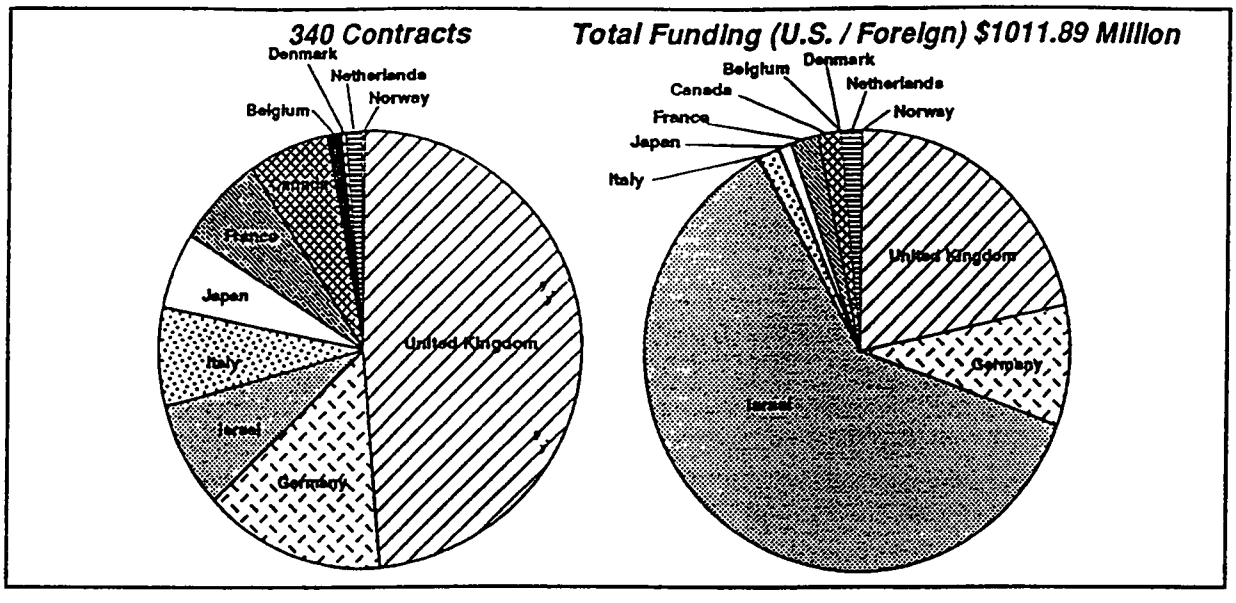
93. The present position is that activities with allies have tended to move from research and development towards development and procurement programmes.

94. Since 1985, there has been allied participation in technical co-operation in research and development programmes. Memorandums of understanding were signed at the time between the United States and Germany, Italy, Israel, Japan and the United Kingdom for strategic defence initiative research. In addition, memorandums of agreement were signed with France, the Netherlands and the SHAPE technical centre.

95. The table hereafter shows total foreign participation since the beginning of the programme.

TABLE 3

*Foreign participation*




96. The next table shows the major co-operative programmes with allies; all of which refer to research and development activities.

TABLE 4

*Major cost share co-operation arrangements with allies*

| Country | Programme | Total value $ million | United States/ ally funding (approximate) |
|---|---|---|---|
| United Kingdom .. | Data fusion | 26.00 | 42%/58% |
| United Kingdom .. | 2 flight test series | 65.0 | 59%/41% |
| United Kingdom .. | Extended air defence test bed | 19.20 | 58%/42% |
| United Kingdom .. | Artificial intelligence | 3.50 | 80%/20% |
| Israel..... | Arrow experiment | 158.00 | 80%/20% |
| Israel..... | Arrow continuation experiment (ACES) | 322.00 | 72%/28% |
| Israel..... | System engineering and integration | 3.15 | 75%/25% |
| Israel..... | Theatre missile defence (TMD) test bed | 33.00 | 72%/28% |
| Israel..... | TMD test bed enhancement | 5.20 | 80%/20% |
| Israel..... | TMD test bed experiment programme | 6.00 | 50%/50% |
| Israel..... | Hypervelocity launcher programme | 4.06 | 75%/25% |
| Israel..... | Boost phase intercept (BPI) | 5.7 | 75%/25% |
| France..... | Free electron laser (FEL) MOA | 6.50 | 90%/10% |
| Netherlands ..... | Hypervelocity gun test | 17.25 | 30%/70% |
| SHAPE..... | EADTB | 32.30 | 59%/41% |
| France..... | EADSIM | .68 | 35%/65% |

97. Since 1985, the United Kingdom and the United States have co-operated on BMD research experiments, flight trials and information exchanges under an overarching memorandum of understanding. This co-operation is at both government and industry level.

98. The United Kingdom Government is now about to proceed with a study to determine national BMD requirements including TMD for protection of its military forces deployed abroad.

99. The United States Department of Defence will work closely with the United Kingdom Ministry of Defence to ensure "that the government modalities associated with possible co-operation on or direct sales of United States TMD systems are properly reflected in their study result... American contractors will be invited to support British industry as part of the United Kingdom stragegy effort. Their requirements will necessarily include area defences".

100. Co-operation between the United States and Germany in anti-missile programmes began with the implentation of the United States-German Roland Patriot agreement in 1984. Currently, the German and United States Defence Ministries are working together to ensure harmonisation of requirements between the German TLVS (tactical air defence system) programme and the American Corps SAM. BMDO and the army will also work closely with the German Ministry of Defence with respect to their plan for the incorporation of PAC-3 with their existing systems.

101. France, in concert with Italy, has an ongoing effort to develop an improved air defence system with a TMD capability based on the future surface-to-air family of missiles. This system will use the Aster missile and Arabel and Empar radars.

102. Earlier this year, France and Italy suggested a data exchange agreement with the United States to facilitate improved operability with Corps SAM. France is also studying the possibility of developing an upper tier TMD system.

103. France's defence white paper accords greater importance to BMD. Accordingly, the French have embarked on a five-year BMD technology programme which provides for the possibility of co-operation with other countries.

104. At the beginning of this chapter, reference was made to the extended air defence/theatre defence ad hoc Working Group established by the NATO Conference of National Armaments Directors. The group is composed of interested nations with resources to contribute to TMD and its aim is to exchange views on the tactical ballistic missile threat to the alliance and to define future methods of collaborating in TMD.

105. Topics under discussion at present include early warning, BMC[3] (battle management, command, control, communications), lethality, infrared plume phenomenology, Hawk upgrades and upgrades to existing air defence systems such as putting an infrared search and track sensor on AWACS aircraft.

### *VI. Opportunities for co-operation*

106. When we speak of co-operation this should, in our view, cover development and production as pursued in Europe between Europeans. Europe should adopt a definite position towards such co-operation if it wishes it to be genuinely profitable for the continent and to bring all partners together on an equal footing.

107. The various systems set out hereafter might give rise to intra-European co-operation and co-operation between Europe and the United States.

*(i) Early warning systems*

An early warning system might be implemented at European level under the auspices of WEU or for its use. The system might thus include a European early warning and data communication network, interoperable with American systems.

*(ii) Endo-atmospheric systems*

As we have already seen, international discussions are now being held on three-way co-operation between the United States, Germany and France which would allow co-ordination of the SAMP/T, TLVS and Corps SAM programmes or even the joint development of a single programme, international Corps SAM.

*(iii) Endo-exo-atmospheric systems*

Given that the development of THAAD is already very far advanced in the United States, collaboration in this area is hardly feasible. Europe might envisage purchasing systems from the United States although this transaction might not cover the early warning or command systems.

*(iv) Exo-atmospheric systems*

In this area co-operation may be envisaged between European countries and possibly with the United States. This would involve the installation of an interceptor system against strategic missiles directed against Europe. Without dismissing the possibility of American participation, it might reasonably be thought that co-operation between Europeans might prove adequate and satisfactory.

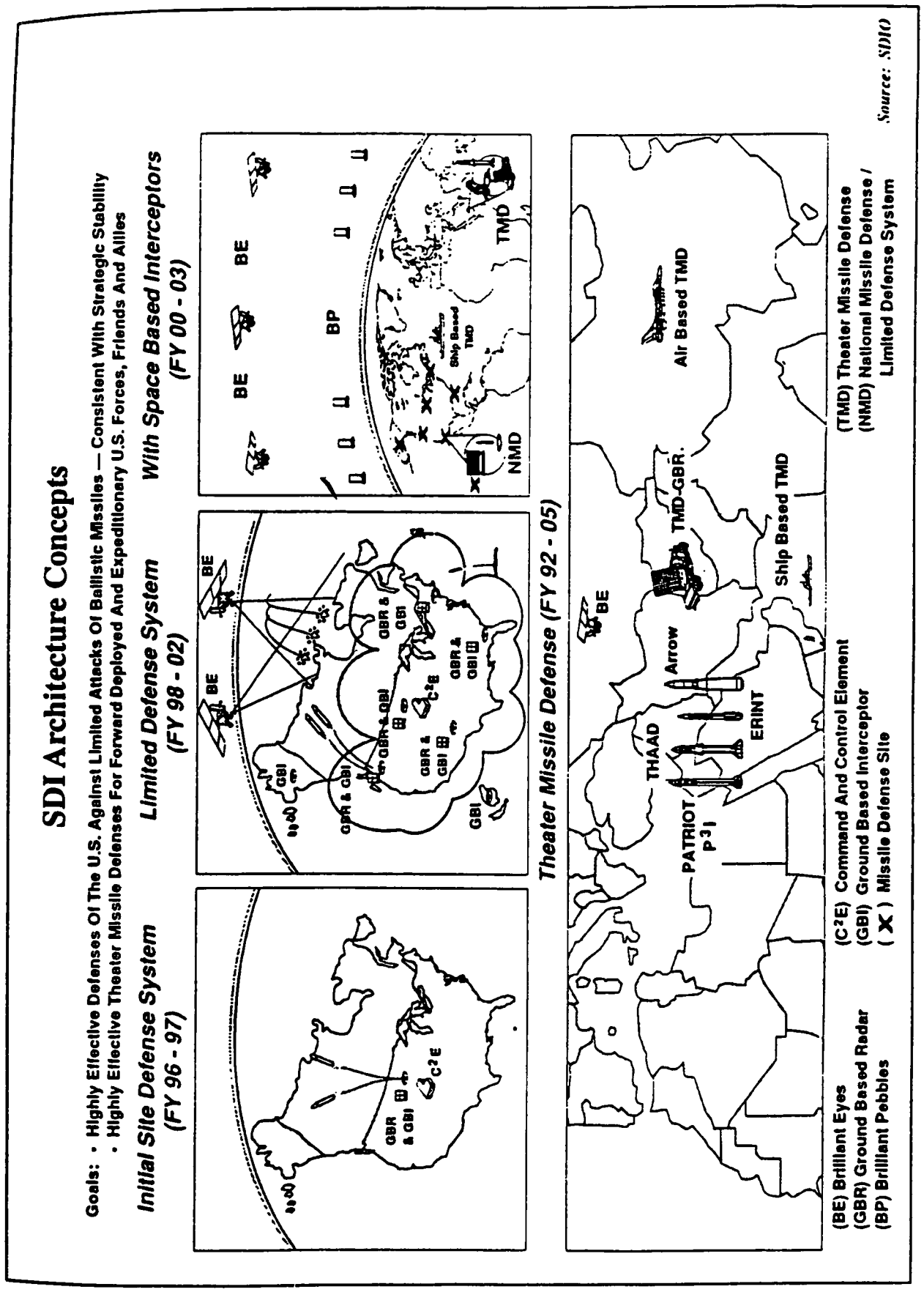
*(v) Airborne systems*

In this instance also, collaboration with our transatlantic allies is possible, with a view to developing a missile and airborne optical sensors adapted to European Rafale and Eurofighter aircraft.

108. In short, it should be stressed that WEU should first stimulate a debate on a European early warning system to follow up the studies which have already been started on developing a European space-based observation system; this European early warning system, which would naturally be implemented through co-operation, should be followed by another system of exo-atmospheric and airborne defence corresponding to agreed priorities, either for protecting Europe itself or its troops in-theatre.

109. The success or failure of our action in the face of this challenge will no doubt depend on the achievement of the foregoing through European and/or transatlantic co-operation.

APPENDIX I


SDI Architecture Concepts
Goals: • Highly Effective Defenses Of The U.S. Against Limited Attacks Of Ballistic Missiles — Consistent With Strategic Stability
• Highly Effective Theater Missile Defenses For Forward Deployed And Expeditionary U.S. Forces, Friends And Allies
Initial Site Defense System (FY 96 - 97)
Limited Defense System (FY 98 - 02)
With Space Based Interceptors (FY 00 - 03)
Theater Missile Defense (FY 92 - 05)
BE
BP
GBR & GBI
GBI
NMD
TMD
Ship Based TMD
Air Based TMD
THAAD
Arrow
PATRIOT PAC-3
ERINT
TMD-GBR
(BE) Brilliant Eyes
(GBR) Ground Based Radar
(BP) Brilliant Pebbles
(C²E) Command And Control Element
(GBI) Ground Based Interceptor
( X ) Missile Defense Site
(TMD) Theater Missile Defense
(NMD) National Missile Defense / Limited Defense System
Source: SDIO

# APPENDIX II

TABLE 1-2

***Fundamental Missions of Strategic Defense***

| *Enhance Deterrence* |
|---|
| – Deny Soviet confidence in ability to plan or execute a successful attack<br>– Influence Soviet correlation of forces |
| *Limit Damage to the U.S., its Forces and its Allies* |
| – Protect U.S. assets from Soviet attack<br>– Preserve U.S. ability to sustain and support its allies<br>– Defeat limited or unauthorized attacks |
| *Deny Soviet War Aims* |
| – Deny "maintain continuity of CPSU control"<br>– Deny "defeat and occupy NATO"<br>– Deny "neutralize the United States"<br>– Deny "dominate the postwar world" |

TABLE 2-1

***Phase 1 System Concepts***

| *System element* | *Function* |
|---|---|
| Boost Surveillance and Tracking System (BSTS) | – Detection of missile launches<br>– Acquisition and tracking of boosters and PBVs<br>– Kill assessment |
| Space-Based Surveillance and Tracking System (SSTS) | – Acquire and track PBVs, RVs, and ASATs<br>– Discrimination |
| Ground-Based Surveillance and Tracking System (GSTS) | – Acquisition<br>– Tracking<br>– Discrimination |
| Space-Based Interceptor (SBI) | – Disabling of boosters, PBVs, RVs and ASATs<br>– Sensors on carrier vehicle (CV) could provide enhanced mid course sensor capability |
| Exoatmospheric Reentry Vehicle Interceptor System (ERIS) | – Disabling of RVs in late midcourse |
| Battle Management/Command and Control, and Communications (BM/C3) | – Man-in-the-loop control<br>– Engagement management<br>– Maintaining track data<br>– Target assignment<br>– Communications |

TABLE 2-2

***Follow-on System Concepts***

| *System elements* | *Functions* |
|---|---|
| Space-Based Neutral Particle Beam (NPB) Weapon | – Interactive discrimination<br>– Disabling of boosters, PBVs, RVs and ASATs |
| High-Endoatmospheric Defense Interceptor (HEDI) | – Disabling of RVs after reentry |
| Airborne Optical System (AOS) | – Midcourse and terminal acquisition and tracking |
| Ground-Based Radar (GBR)* | – Terminal acquisition and tracking<br>– Discrimination |
| Space-Based Laser (SBL) | – Disabling of boosters and ASATs<br>– Interactive discrimination |
| Ground-Based Hypervelocity Gun (HVG) | – Disabling RVs in terminal phase |
| Ground-Based Laser (GBL) | – Disabling of boosters |

* GBR is being considered as an option for Phase 1

## APPENDIX III

### *Missile Defense Act of 1991*

*Goal*

- Deploy an ABM system, including one or an adequate additional number of ABM sites and space-based sensors, that is capable of providing a highly effective defense of the US against limited attacks of ballistic missiles.
- Maintain strategic stability.
- Provide highly effective theater missile defenses to forward deployed and expeditionary elements of US forces and to US friends and allies.

*Initial Deployment (INMD)*

- Develop for deployment by the earliest date allowed by the availability of appropriate technology, or by FY 96, a cost effective, operationally effective, and ABM treaty compliant ABM system at a single site as the initial step toward deployment of the ABM system described in the 1991 Missile Defense Act
  - 100 ground-based interceptors (the design of which will be determined by competition and down selection)
  - fixed, ground-based ABM battle management radars
  - optimum utilization of space sensors including sensors capable of cueing ground-based ABM interceptors and providing initial targeting vectors.

*Limited Defense System (NMD)*

- Development of systems, components and architectures for a deployable ABM system capable of providing a highly effective defense of the US against limited strikes, but below a threshold that would bring into question strategic stability
  - includes activities necessary to develop and test systems, components, and architectures capable of deployment by FY 96 as part of an ABM treaty compliant initial site defense system
  - for purposes of planning, evaluation, design, and effectiveness studies, such programs, projects and activities may take into consideration both the current limitations of the ABM treaty and modest changes to its numerical limitations and its limitations on the use of space-based sensors.

*Theater Missile Defenses (TMD)*

- Aggressively pursue the development of advanced theater missle defense systems with the objective of down selecting and deploying such systems by the mid-1990s.
- Capable of defending forward-deployed and expeditionary elements of the armed forces of the United States.
- Cooperation with friendly and allied nations in the development of theater defenses against tactical or theater ballistic missiles.

*ABM Treaty Negotiations*

- Congress recognizes the president's call for "immediate" concrete steps to permit the deployment of defenses against limited ballistic missile strikes and the Soviets undertaking to consider such proposals from the US on non-nuclear ABM systems.
- Congress urges the president to pursue immediate discussions with the Soviets on the feasibility and mutual interests of amendments to the ABM treaty to permit
  - additional ground sites and interceptors
  - increased use of space sensors for BM/$C^3$
  - clarification of development and testing
  - flexibility for advanced ABM technology.

*Space-based Interceptors (GMD)*

- Conduct research on space-based kinetic-kill interceptors and associated sensors that could provide an overlay to ground-based ABM interceptors.
- Robust funding for research and development, for follow-on technologies, including Brilliant Pebbles, is required.
- Deployment of Brilliant Pebbles is not included in the initial plan for the limited defense system architecture.
- Report on conceptual and burden sharing issues associated with deploying space-based interceptors (including Brilliant Pebbles) for the purpose of providing global defenses against ballistic missile attacks.

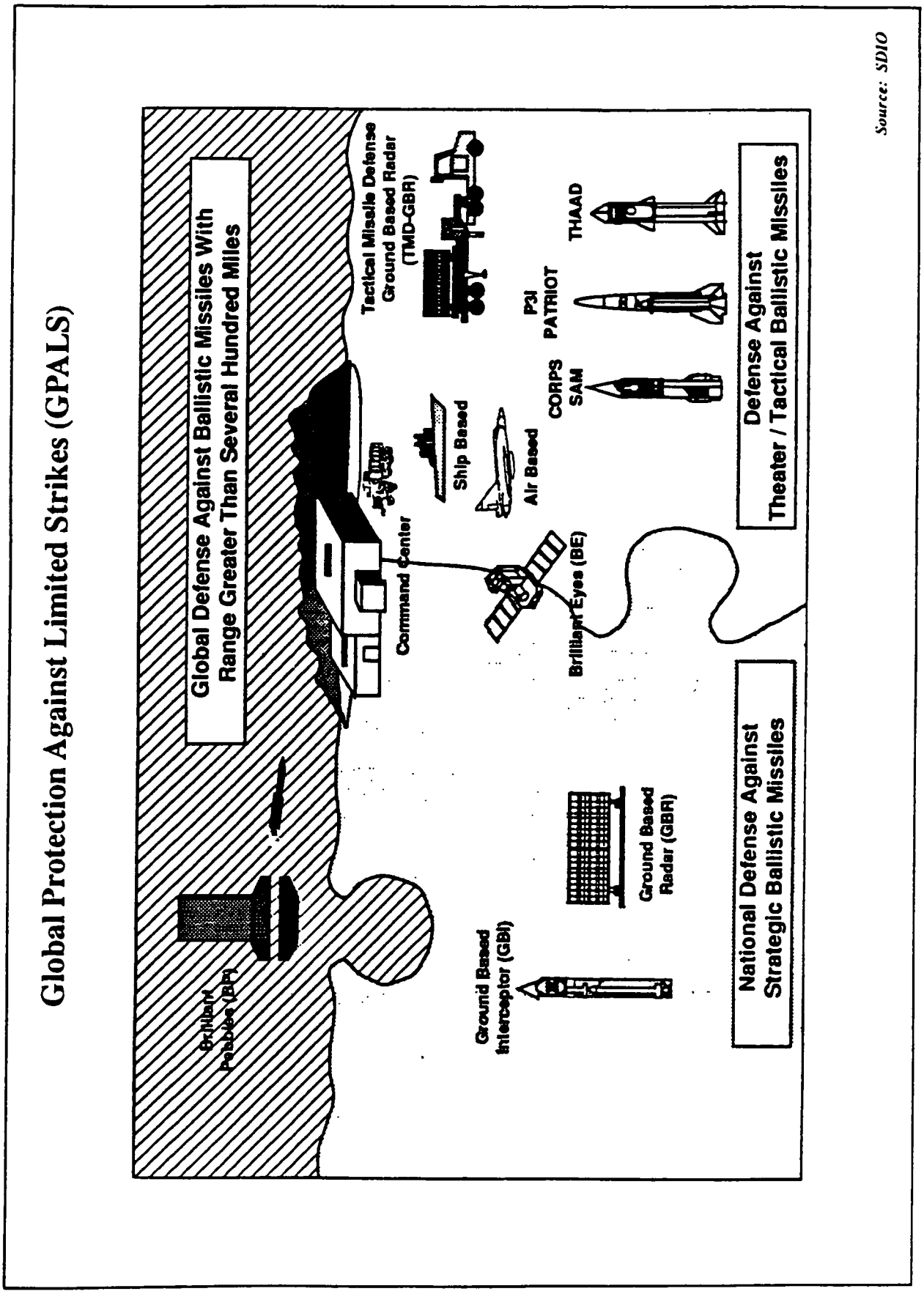
*Review of Deployment Options*

- Interim report due May 94 on progress of negotiations.
- Assess progress and consider options to the US as now exist under the ABM treaty.

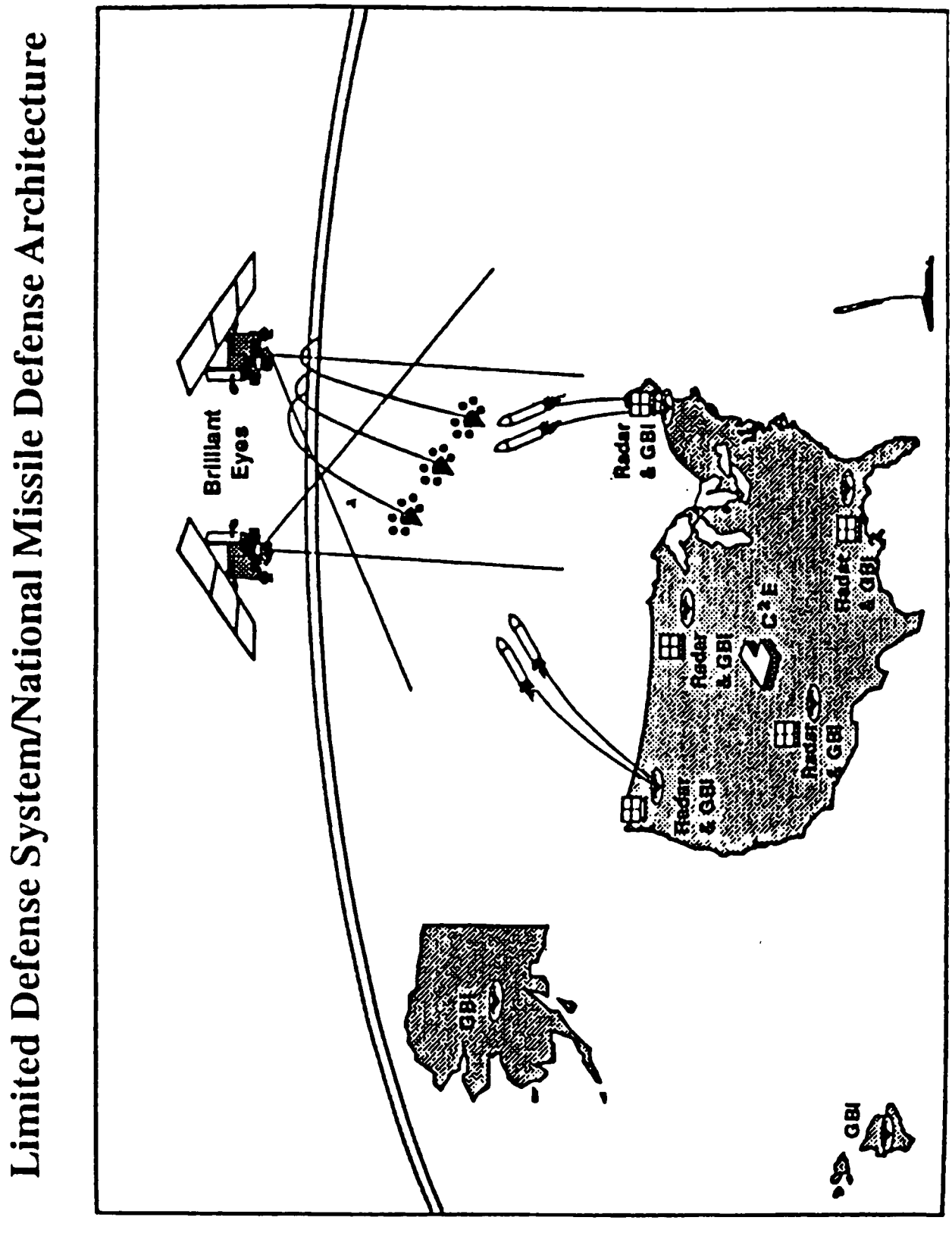
*Deployment Plan*

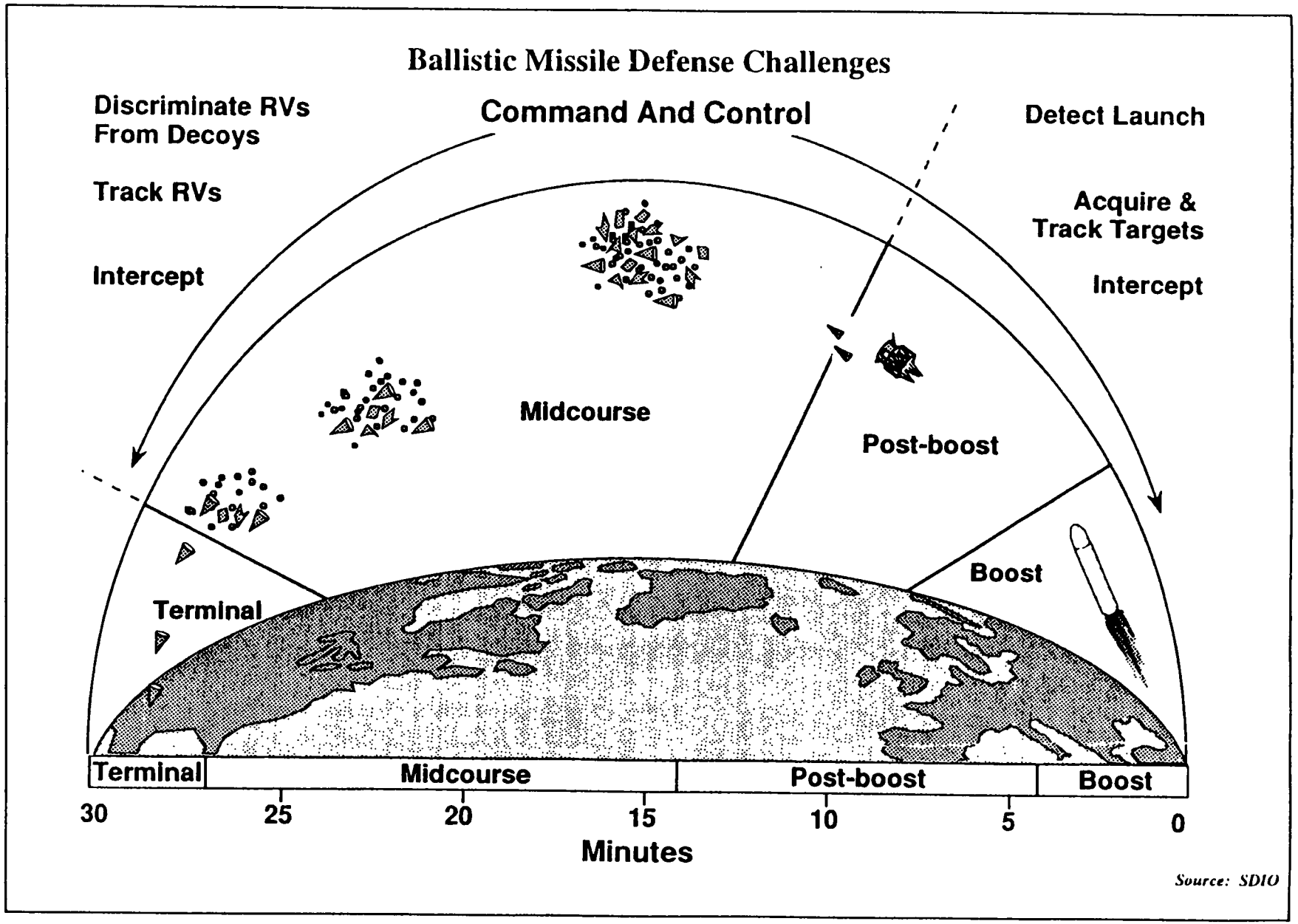
- Within 180 days, submit deployment Plan for TMD systems and the ABM system established by the goals of the 1991 missile defense act.

APPENDIX IV


Global Protection Against Limited Strikes (GPALS)
Global Defense Against Ballistic Missiles With Range Greater Than Several Hundred Miles
Tactical Missile Defense Ground Based Radar (TMD-GBR)
Ship Based
Air Based
P3I PATRIOT
THAAD
CORPS SAM
Command Center
Brilliant Eyes (BE)
Brilliant Pebbles (BP)
Ground Based Interceptor (GBI)
Ground Based Radar (GBR)
Defense Against Theater / Tactical Ballistic Missiles
National Defense Against Strategic Ballistic Missiles
Source: SDIO

APPENDIX V


Limited Defense System/National Missile Defense Architecture
Brilliant Eyes
Brilliant Eyes
Radar & GBI
Radar & GBI
Radar & GBI
C²E
Radar & GBI
Radar & GBI
GBI
GBI
GBI


Ballistic Missile Defense Challenges
Discriminate RVs From Decoys
Track RVs
Intercept
Command And Control
Detect Launch
Acquire & Track Targets
Intercept
Midcourse
Post-boost
Boost
Terminal
Terminal
Midcourse
Post-boost
Boost
30
25
20
15
10
5
0
Minutes
Source: SDIO



APPENDIX VI

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