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(Second Part)

The development of a European space-based observation system – Part III

REPORT

submitted on behalf of the Technological and Aerospace Committee
by Mr. Valleix, 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 the development of a European space-based observation system – Part III

The Assembly,

(i) Stressing the importance of control over space beyond the earth's atmosphere in the global management of crises;

(ii) Noting that Europe still does not have operational means of observation and detection by satellite with the military capabilities necessary for strengthening its defence;

(iii) Stressing the need for the WEU countries to equip themselves with independent space-based means of observation and detection in order to be able to take appropriate measures in the event of crises affecting Europe's interests;

(iv) Concerned over the future implications for European security of the proliferation of ballistics technology in the Mediterranean region;

(v) Recalling Recommendations 410, 482, 523, 533 and 555 in which the Assembly requests that the Council:

(a) set clear European space policy objectives and priorities;

(b) reach decisions on further steps for establishing a full-scale European verification satellite system;

(c) design the planned system in such a way as to contribute to the security of WEU member countries and to be useful to other organisations with a European, Atlantic or international vocation;

(d) assess without delay the risks to Europe stemming from the proliferation of ballistic and nuclear technology;

(e) take appropriate decisions to avoid the slowing-down or paralysis of activities entrusted to the study management team and the industrial consortium commissioned to design WEU's main observation system;

(vi) Stressing the importance of equipping Europe with early-warning and navigational satellite systems necessary for the efficient operation of a European anti-missile defence system;

(vii) Aware of the high cost of space-based systems and the need for close co-operation between states, industry and scientific circles for these projects to succeed;

(viii) Noting with regret the absence of consensus in the Council over the necessary development of the work of the satellite centre and starting the programme for the main observation system;

(ix) Deploring that the Council provides so little and such inadequate information on WEU's space policy,

RECOMMENDS THAT THE COUNCIL

1. Commence examination of a European space defence policy, taking all aspects of the problem into account;

2. Take the decisions necessary for the development of the satellite centre and for starting work on the main observation system, on the basis of a strategic analysis of what is at stake in the medium and long term;

3. Instruct its Space Group to begin a study of a European space-based defence system, paying particular attention to the need for communications, early-warning and navigational satellites and their protection;

4. Develop its contacts with the space industries of the member countries and with ESA in order to obtain information on current programmes and technologies that might be useful for implementing a European space-based defence system;

5. Foster co-operation in early-warning and navigational satellites with the United States and Russia on a basis of reciprocity and without jeopardising the independence of European systems;

6. Examine the expediency of creating a European space defence agency in WEU with responsibility in this area;

7. Keep the Assembly better informed of its decisions on WEU's space policy.

Explanatory Memorandum

(submitted by Mr. Valleix, Rapporteur)

I. Introduction

1. Space questions are a permanent thread running through the debates and activities of the Assembly of WEU. In recent years, the interest in space-related issues has led to quite considerable progress in terms of practical achievements.

2. In the early nineties, events in Europe and in the Gulf led to a vigorous resurgence of the debate on the expediency of Europe [1] having a space-based observation system allowing it to affirm its rôle as a world power.

3. With the signature of the CFE-1 and CFE-1A agreements, the question of the verification and control of the process of arms reduction in Europe assumed paramount importance since on its reliability depended the success of commitments entered into by the two opposing military alliances, the Atlantic Alliance and the Warsaw Pact.

4. The European states, primarily concerned by this process, found themselves in a somewhat uncomfortable position, being dependent largely on American satellite data [2], which led to difficulties over sharing the information thus gathered. This situation helped to intensify discussions on the need for Europe to have its own observation satellites for military purposes.

5. This was the context in which a symposium, organised by the Assembly of WEU on the subject " Observation satellites – a European means of verifying disarmament " was held in Rome on 27th and 28th March 1990, during the course of which the different aspects of the question were examined in depth [3]. Following this initiative, the Technological and Aerospace Committee submitted a report on the findings of the symposium at the June 1990 session, which was adopted by the Assembly.

6. In Recommendation 482, resulting from this report, the Assembly stressed " the need for Western European nations to develop an autonomous European verification satellite capability in order to meet their responsibilities in a changing security situation... ". It recommended that the Council " decide as a matter of urgency on the establishment of a WEU satellite image-processing and interpretation agency; " and " reach decisions on further steps for establishing a full-scale European verification satellite system without delay... " [4].

7. The Council replied positively to the recommendation, stating that a group of experts had been tasked to make concrete proposals and that a detailed report had been submitted to the Council and adopted at its meeting of 10th December 1990. It stated also that " the establishment of a WEU satellite centre ... would be an important factor in European co-operation on space-based observation. "

8. Moreover " feasibility studies should also be launched so that a European satellite surveillance system can be set up without delay, with a view to the verification of arms control agreements and to the monitoring of crises and ecological problems. " [5].

9. The will expressed to make progress in military space matters was largely due to the Gulf crisis and the lessons drawn from it regarding the use of observation satellites and the conduct of military operations. Participation of European forces in monitoring the embargo and subsequently in air- and land-based actions revealed how very dependent they were on satellite intelligence supplied by the United States. This contributed to awareness of the need to act at European level in order to be able to respond to future crises using European space-based means. The relative detachment of the United States in the face of the crisis in former Yugoslavia also served to strengthen these views.

10. Thus the Council, meeting at Vianden (Luxembourg) on 27th June 1991, decided to " set up a satellite data interpretation centre whose immediate task would be to train European experts ... to compile and process accessible data and to make those data available to member states, particularly within the framework of verification ... crisis-monitoring and environmental monitoring. " Moreover, the ad hoc Sub-Group on Space was assigned the task of pursuing " studies

1. The word Europe is used here to designate the European Union, WEU and European members of NATO.

2. With the exception of France, which has a space policy independent of those of the then major powers.

3. Observation satellites – a European means of verifying disarmament; Symposium, Rome, 27th and 28th March 1990, Office of the Clerk of the Assembly of WEU.

4. Document 1230, 25th May 1990; Rapporteur: Mr. Lenzer.

5. Document 1276, 29th May 1991, reply of the Council to Recommendation 482.

on the possibilities for medium- and long-term co-operation on a European satellite observation system. "[6].

11. The Vianden decision and the Satellite Centre, its structure and operation have already been mentioned in two previous reports on the development of a European space-based observation system. With this third part, the debate is far from being closed, but it is important to review European achievements and co-operation in military space matters, the better to understand what is the way forward and the choices to be made to make this ambitious project a reality, the success of which will largely depend on a credible common European security and defence policy worthy of the name.

II. Military satellite programmes

12. The Gulf crisis provided a graphic illustration of the use of satellites, both civil and military, in crisis-management and the conduct of military operations. Intensive use of this medium contributed greatly to the success of the United Nations coalition and the very low loss of life and equipment on the United Nations side.

13. Of the range of hardware used, covering a wide spread of tasks: observation, monitoring, communications, navigation and meteorology, two types of satellites played a major rôle: optical or radar intelligence satellites and communications satellites.

14. The former enabled continuous monitoring of Iraqi military forces on the ground, either by identifying strategic targets (command centres, air and missile bases, industrial complexes, etc.) or military detachments in the theatre of operations, identifying their equipment and the number of personnel.

15. The latter provided contact between the (political) decision-making centres and the military units based in the Gulf area, thousands of miles apart, and allowed orders to be relayed and action reports to be received in real time.

16. This system of observation and communication satellites operating in tandem emerged as one of the aspects necessary for the conduct of peace-keeping or peace-enforcement missions, sometimes taking place at vast distances from decision-making centres and sometimes in geographic and climatic environments somewhat hostile to the direct presence of military units or their presence in sufficient number (lack of forward positions, for example).

(i) Observation and communications satellites

17. The military uses of space are very varied and can be summarised briefly as follows: information-gathering, telecommunications, navigation (global positioning system), meteorology, oceanography, space-based surveillance (analysis and identification of orbiting objects and tracking) and early-warning systems (anti-missile, nuclear explosion detection), in all of which observation and communications play a very important rôle.

(a) Observation systems

18. There are basically two types of observation system: optical and radar. In the first group are satellites with visible optical and/or infrared sensors with various degrees of resolution, approximately ten metres in the case of the European Spot satellite, one metre in the case of the Helios 1 satellite and less than a metre for the American systems KeyHole, KH 11 and KH 11S[7]. Optical reconnaissance satellites are nonetheless subject to two limitations: first, atmospheric turbulence imposes a resolution limit of some 10-15 cm; second, and not the least important, they can be used only in clear weather. These satellites are primarily strategic intelligence tools.

19. Radar observation provides images of a different nature and texture to those of visible images. For example, radar imaging allows one to detect camouflaged or buried targets which would have remained undetected by optical satellites and also barbed wire networks or certain decoys. Resolution varies, that of the American Lacrosse satellite lies within a range of 0.60 to 3 metres[8]. The radar satellite's all-weather capability makes it a prime tactical intelligence instrument and a necessary complement of the optical satellite. The limitations of this system are its high cost, its processing requirements on the ground and the difficulty of interpreting radar images.

(b) Communications

20. Satellites provide communications over very long distances, without requiring rigid infrastructure. The two main types of satellites are telecommunications and relay satellites. The first of these may be geostationary, in other words stationary over a given point of the globe, or non-geostationary; in the case of geostationary satellites, communications can be transmitted inside its area of radio-electrical cover; in the case of non-geostationary satellites, communications are discontinuous – the satellite receives signals from a given point and retransmits them while overflying another.

6. Document 1282, 14th October 1991: first part of the thirty-seventh annual report of the Council – communiqué of the WEU Ministerial Council on 27th June 1991.

7. International Defense & Technologies, No. 7, page 26, December 1991.

8. Idem.

21. Geostationary relay-satellites transmit between low-satellites in low orbit and a satellite data-receiving station situated at a point on earth. Thus, three relay satellites orbiting around the earth provide a constant link between the observation satellite and a land-based receiving station.

22. Satellite communications have distinct qualitative advantages over earth-bound communications as follows:

- increased projection capability over very short spaces of time, while remaining in contact with decision-making centres;
- ability to offer high-capacity, good quality communications;
- ability to guarantee secure links, even in the event of aggression;
- possibility of broadcasting information to isolated units over vast geographic areas.

23. Military satellite communications have existed in Europe for more than twenty years. The British Skynet programme launched in 1969 was the first, followed by NATO in 1976, France's Syracuse system in 1984 and Spain's Hispasat/ Secomsat in 1992.

(ii) National military space programmes in Europe

24. Research and development of civil and military space-based systems is a long-term and extremely costly process, the outcome of which is uncertain. For a space programme to be successful, the necessary human, technical and financial resources must be made available and the aims of the programme clearly defined.

25. In WEU, only France and the United Kingdom have space-based military programmes that are operational. These cover telecommunications and, in the case of France, observation by satellite. Spain and Italy have also embarked on studies and programmes for acquiring space-based facilities for military use in a more modest framework and, frequently, in co-operation with other countries.

(a) France

26. France's military space policy was specifically designed to be independent of the space-based capabilities of the United States and Russia. Moreover, its telecommunications and observation satellites provide links between metropolitan France and French military forces stationed in many regions of the world thousands of kilometres distant.

27. To these considerations of a political and military nature are added a major research and development component, the economic spin-off from which is substantial and has made France a civilian and military space power in Europe.

(i) The Syracuse programme

28. In 1964 the French Délégation ministérielle pour l'armement started the first studies on satellite systems for military use. However, it was not until 1979 that the first French military space telecommunications programme, known as Syracuse (radio communications system by satellite), came into operation.

29. This system's first military payload was taken on board the civilian satellite Telecom I on 1st August 1984. Further launches followed in 1985 (Telecom IB) and 1988 (Telecom IC). The Syracuse II programme was launched in 1988. This involved an improved telecommunications payload on board Telecom II satellites commissioned in late 1991.

(ii) The Helios programme

30. In 1977 the preliminary studies were carried out for the Samro military optical observation satellite, in parallel with the launch of the Spot civilian programme, which obtained 30% funding from the ministry of defence.

31. 1986 saw the start of the Helios programme, which was opened to co-operation from Italy in 1987 (14%) and Spain in 1988 (7%). The first Helios observation satellite is to be launched in February 1995. A Helios II programme is being studied, but financial difficulties are an obstacle to its implementation (costs are in the region of 8 billion francs and, to date, no other European country has come forward as a partner). Helios II is scheduled to be launched into orbit by the year 2000 and could have a resolution of 50 cm (compared with 1 metre for Helios II).

32. Alongside the Syracuse and Helios programmes, France has commenced design studies for the Osiris and Zenon satellites. Osiris is a high resolution radar observation satellite for specific observation tasks, on a continuous basis, irrespective of atmospheric conditions. Osiris will be fully complementary to the Helios optical observation satellites. France wishes other European countries to become associated with the project, especially Germany, to which overtures have been made.

33. Zenon is a military electronic surveillance satellite providing electromagnetic surveillance for collecting data on the preparation of military operations and locating radars. Unlike Osiris, where European co-operation is to be invited, Zenon, because of its specific tasks, is intended solely for national use.

(b) The United Kingdom

34. Unlike France, which is committed to a complex military space programme, the United Kingdom has concentrated its efforts on military space-based telecommunications through the Skynet programme.

35. Studies were carried out in the sixties on a system of telecommunications by satellite. In 1969 and 1970, the two satellites in the first generation, Skynet I, were launched, but the second launch failed. In January and November 1974, Skynet II satellites replaced the first generation which ceased to be operational in 1972.

36. In 1980, the decision was taken to produce the Skynet IV series, Skynet III having never materialised. In 1982, the Falklands war contributed to revealing the gaps in British satellite communications. Only one Skynet II satellite was operational at the time and was poorly placed to cover the route to the Falklands followed by British naval forces. To guarantee communications, the United Kingdom had to use American space-based facilities and it would seem that the United States also provided the United Kingdom with satellite images of the region.

37. Awareness of this deficiency contributed to the development of the Skynet IV system and to a study being launched on a space-based intelligence satellite, the Zircon programme, which seems to have been abandoned in 1987[9]. Three Skynet IV satellites were launched in 1988, 1989 and 1990 and were used during the Gulf crisis to provide communications between British forces stationed in the region and the United Kingdom.

38. In 1994, contracts were signed for the development and launch of two new Skynet IV satellites (series 2) and studies were begun on a new generation, Skynet V, to replace Skynet IV next century. According to the United Kingdom authorities European co-operation will be invited for this new project.

39. Nor has the United Kingdom neglected space-based observation, as might be assumed from a comparison of its progress in space-based technology with that of France. In point of fact, the British presence in this field is assured by close collaboration with the United States.

40. This collaboration takes place partly at the level of industry, the British technology and defence industries having a long tradition of co-operation with their American counterparts[10], and partly through intelligence within the framework of the 1947 agreements on co-ordination of intelligence-gathering. In this area the British authorities probably receive information from various American optical and radar observation, surveillance and early-warning satellites. The United Kingdom thus has satellite intelligence at its disposal without having to bear alone the management and maintenance costs of a space-based observation system.

(c) Spain and Italy

41. *(i)* The Hispasat/Secomsat programme is Spain's first space-based telecommunications project for civil and military use. It consists of three satellites (two operational and a third in reserve), together with the ground-based logistics necessary for receiving and processing the data obtained. The two satellites were launched by Ariane rocket in September 1992 and July 1993. Spain has thus acquired a communications system similar to the French Syracuse system, in other words a civilian satellite supplemented by components for military use. Hispasat/Secomsat has had its baptism of fire in Bosnia-Herzegovina where it relays communications between the Spanish UNPROFOR forces and Spain.

42. *(ii)* The Italian Sicral project is a satellite telecommunications programme with defence and civil protection applications. Participation of Italian forces in United Nations operations in Bosnia-Herzegovina, Mozambique and Somalia has revealed the need for a satellite communications system to monitor their action. The Sicral system will provide national, European and international cover of Italian armed forces and will be managed from ground-based military control stations under the supervision of Italy's combined headquarters. In principle, it should be operational before the year 2000.

43. In spite of the efforts and progress achieved, it is clear that no European country alone is able to acquire a minimal military satellite system providing adequate space-based cover for its national defence requirements. Only France is pushing forward on all fronts, but with increasingly limited resources. Co-operation between European countries will be an unavoidable necessity if any savings are to be made in the cost of programmes and overlapping national systems are to give way to a European military space-based policy.

III. Prospects for co-operation in Europe

44. European countries (in the broad sense) have developed co-operation networks for military and civilian programmes at both state and industry level with varying degrees of success.

9. According to certain sources, Zircon may have been launched under cover of a Skynet IV satellite and could well be operational – Military Technology, Volume XVI, No. 6/92, page 17.

10. The United Kingdom was the United States' initial foreign partner for projects linked to the strategic defence initiative and has co-operated in subsequent anti-missile defence projects.

Europeans are carrying out joint space programmes, both at international level with Intelsat and Inmarsat, and at regional level with ESA, in fields ranging from earth observation to meteorology and including environmental and sea-bed monitoring, telecommunications, etc.

45. The results are far less impressive on the military side, largely due to differences in perception. France sees space-based technology, (together with nuclear weapons) as the means of affirming its status as a regional and international political and military power, hence its military space programme, which is backed by a viable industrial base (Aérospatiale and Matra, to name but two companies, are at the forefront of technology in the field, not merely in Europe but in the rest of the world as well) and a national vision of the military use of space [11].

46. The United Kingdom is engaged in three-pronged development of its military space activities: the Skynet telecommunications satellite (of United Kingdom design), NATO (the NATO satellites are replicas of the Skynet satellites) and co-operation with the United States. This last aspect enables the United Kingdom to share military space technologies and information with the United States, as for instance in the framework of anti-missile defence.

47. In June 1994, for example, two microsatellites, STRV-1A and STRV-1B (space technology research vehicles), manufactured by the British Defence Research Agency were launched by Ariane rocket, with American Ballistic Missile Defence Organisation [12] experimental material on board.

48. Limited financial and technical capabilities or doubts in the face of challenges offered by the military use of space make it difficult for the other European countries to engage in real co-operation and the formulation, in the longer term, of a European military space policy.

(i) Co-operation between WEU countries

49. Of the WEU member countries, four are currently engaged in or have plans for military space-based observation and telecommunications programmes: France, Italy, Spain and the United Kingdom. The other members also have a presence, since all of them participate in the activities of the WEU Satellite Centre and the work of the study management team [13].

(a) Inter-state co-operation

50. The Helios observation programme was the first real test of European co-operation in military space-based observation satellites, bringing together France, Italy and Spain. The Helios project was launched by France in 1986, joined by Italy and Spain (with their respective contributions of 14% and 7% of the financing of the overall budget of F 8-10 billion. Helios's specification (resolution of 1 metre as compared with approximately 10 metres for Spot) makes it unique in Europe and it is surprising that France and its Helios programme have not attracted the interest of other partners within WEU – doubtless because of political and economic considerations.

51. Nevertheless, the success of co-operation in the framework of Helios I appears to be a special case, considering the fate of Helios II. France has not, in point of fact, succeeded in finding other partners for this second generation satellite, incorporating technologies more advanced than those of its predecessor [14], as Italy and Spain did not wish to commit themselves to it.

52. The Osiris radar satellite project seems likely to be of interest to Germany but no concrete decisions have been taken. Moreover, the cost of German reunification, which has already had implications for the budget and various ESA programmes, has put a brake on any major commitments by that country to civilian and military space developments.

53. However, the possibility acknowledged by the Constitutional Court [15] of German military units being posted outside the NATO area within the framework of United Nations operations raises the issue of communications and intelligence and might be an argument in favour of German participation in European observation and communications satellite projects.

54. The United Kingdom and France also co-operate in the Eumilsatcom and Inmilsat space programmes.

55. Eumilsatcom is a programme for a future military satellite communications system intended to replace the Skynet and Syracuse systems in the twenty-first century. Germany, Italy, the

11. Medium- and long-term forecasts for space are drawn up by the Groupe d'études spatiales (Special Study Group) of the Ministry of Defence and compiled in a classified document, the Plan Pluriannuel Spatial Militaire (long-term military space plan). The first version of this plan dates back to 1984 and the plan is updated every two years.

12. The body which succeeded the Strategic Initiative Defence Organisation in 1991-1992 and which is responsible for study and design of anti-missile defence in the United States.

13. The activities of the Satellite Centre and the study. management team are described in a previous report of the committee: the development of a European space-based observation system – Part II, Document 1393, Rapporteur – Mr. Valleix (Recommendation 555).

14. Helios II was supposed to have a resolution of some 50 cm which would place it at the level of American satellites of the same category.

15. Decision of 12th July 1994.

Netherlands and Spain have also been invited to participate.

56. Inmilsat is an international military project for communications by satellite [16]. The United States is also associated in this project, along with France and the United Kingdom. Eumilsatcom and Inmilsat are now in their study phases.

57. However, it must be acknowledged that despite the number of projects, there are few examples of inter-state co-operation and those that exist would appear to result from a case-by-case approach rather than an overall strategy for the future, due to the lack of a common perception of the challenges involved in the military use of space and its advantages for a defence Europe. In the framework of WEU, an embryonic form of space-based co-operation has been started with the establishment of the WEU Satellite Centre and the pursuit of a feasibility study on a satellite observation system.

(b) WEU's main observation system

58. Alongside the Satellite Centre, whose present tasks are to demonstrate the applications of space imagery for monitoring disarmament treaties, crises and the environment, to train a nucleus of analysts for interpreting images and develop computer techniques for the interpretation of images and to supply member states with operational image interpretation products, a study management team exists, with responsibility for the feasibility study of WEU's main satellite observation system.

59. This industrial consortium of thirty or so European firms led by the German firm, Dornier (of the DASA aerospace group) is responsible for the feasibility study which is in two parts (approved in February and December 1993). The first examines the choice of possible configurations and the second makes a detailed technical analysis including cost estimates of the configurations best suited to the Centre's needs.

60. Final selection is the responsibility of the WEU Council which is to take a decision on starting the programme for an independent European satellite system in 1995. At the ministerial meeting held at the Kirchberg European Centre, Luxembourg, on 9th May 1994, the ministers tasked the WEU Space Group to prepare " a proposal for decision including the preparation of a draft memorandum of understanding containing detailed specifications... [17] ".

16. Statement on the defence estimates 1994; Chapter IV – defence equipment programme, page 63.

17. WEU Council of Ministers, ministerial meeting of 9th May 1994 (Kirchberg, Luxembourg); Document 1422, 24th May 1994.

61. According to the conclusions of the first part of the study, the elements of the WEU system would be as follows:

(i) The space sector, defined as all satellites in orbit belonging to the system, comprising:

- nominal satellites, operating in low orbit (660-570 km). This category includes two optical satellites and two synthetic aperture radar satellites;
- small satellites (of the optical and SAR type) operating at very low altitude as complements to the nominal satellites. These small satellites may have a resolution and life-span inferior to that of the nominal satellites (approximately five to seven years), but allow a greater number of images to be taken each day across a predetermined area. The number of these small satellites will depend on their life-span, the tasks assigned to them and their availability;
- data-relay satellites in geostationary orbit (approximately 36 000 km) for transmitting images and other data gathered by the low orbit satellites.

62. Clearly, there must be at least two satellites of each type, or better still, three (two operational, one reserve) for the system to be exploited efficiently. This would allow several crisis areas to be monitored on a virtually permanent basis.

(ii) The ground sector, including ground-based facilities and installations necessary for control and use of the system: operating, processing, archiving and interpretation centres; one or more stations for tracking, telemetry and control of the data relay and other satellites; means of communications capable of connecting all the stations, transmitting data and receiving requests for data from political and military authorities.

(ii) Other military space programmes

63. Apart from the instances of co-operation in WEU and inter-state co-operation, other players in the domain of military space in Western Europe, NATO and the European space industries, also have contributions to make.

(a) NATO and space

64. In 1966, the North Atlantic Council decided to begin a study for a NATO satellite communications programme. In 1970, the first satellite, NATO 2A, was launched (the first phase of the programme was devoted to research and testing). In 1971, phase 2 of the NATO programme, relating to ground-based facilities, was completed and a second satellite was placed in orbit. Phase 3 led to the development of the ground sector of the

system which today consists of over twenty fixed and one mobile station and a fourth satellite was launched in November 1984.

65. In January 1987, it was decided to build new satellites based on the model of the British Skynet satellites: NATO IV. Two of these satellites were launched in 1991 and 1993 and will be operational until the year 2000, after which it will be necessary to provide for their replacement.

66. Communications by satellite are taking on special importance with the changes now being made in NATO, particularly as regards the use of its forces in the framework of peace-keeping operations and the greater need for force mobility. According to a document produced by the NATO National Armaments Directors Group (NADs), interoperability between national communications systems must be developed at battalion level and below and between peace-keeping forces in the field and command centres and sea- and airborne support forces. Communications satellites are the ideal means of meeting these requirements because of their wide cover and ability to protect communications [18].

67. However, the future of the NATO satellite system still hangs in the balance. Budget restrictions affecting infrastructure projects and the organisation's new reform programmes have raised questions about pursuing the NATO V programme, intended to take over from the NATO IV satellites. The suggestion that recourse might be had to existing commercial satellites, such as those of Inmarsat, seems increasingly plausible in the absence of any thinking on NATO's space communications policy beyond the year 2000 [19] (the date on which the Skynet IV satellites become obsolete).

(b) Industrial co-operation

68. The European space industries, although more involved in civilian than military programmes, have a very important co-operative rôle to play. The high cost of space systems, international competition between satellite launcher manufacturers, the appearance of new competitors (particularly in Asia) are so many arguments in favour of industrial co-operation.

69. This will not necessarily follow automatically, in the absence of a medium-and long-term policy on civilian and military space matters. However, responsibility for defining such a policy lies with states, while industry must put forward proposals regarding the systems and means necessary to achieve the objectives which have been decided. At present, Europe has a surfeit of space industries, sometimes in partnership, frequently in competition. There are more satellite manufacturers in Europe than in the United States for a market 10% smaller than the American market [20].

70. Because of this, major European firms have started a process of acquisition and mergers with the longer-term objective of creating an industrial space complex able to meet external competition, particularly from the United States, on equal terms. Two examples are worth noting, the acquisition of British Aerospace Space Systems (the manufacturer of the Skynet satellites) by Matra Marconi Space (an Anglo-French company 50% jointly owned by Matra Défense Espace, which manufactures the Helios satellites, and GEC Marconi) and the possible merger of the satellite divisions of Deutsche Aerospace (Germany) and Aérospatiale (France), responsible for the Helios optical systems.

71. Ultimately, this process can only lead to a more rational approach to space matters in Europe, as in the case of the Ariane launcher (Arianespace Consortium) and also the aeronautics industry (Airbus). In regrouping in this way, European industry is in a good position to achieve the necessary harmonisation of procedures and technologies without which European co-operation in space matters cannot advance further.

72. Space industry associations bringing together firms in several countries are also increasingly involved in lobbying governments and the national and European space agencies (ESA).

73. Eucosat, an association made up of twenty or so firms and parliamentarians from seven major countries of the European Union, submitted a project in June 1994 for a European monitoring system by dual-use (i.e. civilian and military) satellite [21]. According to Eucosat, existing or planned observation satellites have certain deficiencies in terms of resolution, all-weather capability (infrared or radar) and the predictability of their return over a given site. Moreover, present ground sectors are not adapted to future needs.

74. To be efficient, an observation system has to be " open ", in other words, capable of exploiting data from civilian and military satellites or air-borne sensors. The ground component must provide comprehensive support to the decision-makers of Europe. The structure of the proposed system is the classical one: optical and radar satellites, small support satellites and relay satellites.

75. The system would be implemented in three phases: the first making use of existing civil and military capabilities (Helios and Spot, for example), the second being the development of new sensors and improving the processing and

18. Space News, Vol. 5; No. 27, page 2; 11th-17th July, 1994.

19. Space News, Vol. 5, No. 35, page 1; 12th-18th September 1994.

20. Defense Magazine, No. 7, page 29; December 1993.

21. Air & Cosmos, No. 1479, page 5; 4th-10th July 1994.

dissemination of information and the third, equipping the system with new satellites, improving the frequency of passes, data-access time and resolution. The anticipated time-scale for completion of the project, more or less in its entirety, is some fourteen years at a cost of F 16-20 billion.

76. Eurospace, which groups some thirty European firms, has presented a programme for small satellites. According to Eurospace, Europe is lacking in launchers suited to small satellites and this gap must be filled to avoid this sector being monopolised by competitors such as the United States. The ESSMI (European small satellite missions) project, although its aims are essentially commercial (small, low-cost satellites are a potential market, but one hampered by the lack of suitable launchers) also has military dimensions, particularly in relation to the projected observation systems (proposed for WEU or by Eucosat), requiring small supporting satellites with flexible launch methods according to need, in the event of crisis. However, for the moment there are no firm projects in view, either at state level or in ESA, because of financial restrictions[22]. In the United States, where the market for small satellites is growing, the military view is that they lend themselves to more flexible use than the larger systems, as they can be launched quite quickly, for a specific mission, in the event of crisis. A system of several small satellites would also make it possible to mitigate the effects of possible failure or destruction of the larger observation and warning satellites[23].

IV. Conclusions

77. Space Europe is a thriving and tangible reality. The launchers, satellite systems and technologies that have been developed confirm the existence of means and know-how equal, if not superior, to those of the other space powers. At the same time, however, technological and commercial success cannot mask one vital issue: the absence of a European space policy, in both its civilian and military dimensions.

78. The success of co-operation over the Ariane rocket, the Spot and ERS-1 earth observation satellites for civil use and other programmes (space probes, meteorological observation, ocean research), is undeniable, despite the fact that certain major projects have been shelved for the time being (for example, the Hermes shuttle). However what is lacking overall is a long-term view and a political and military analysis of the challenges presented by the use of space.

79. Space is also an attribute of power, hence the importance accorded to it by the United States, Russia, France and other nations, such as China, Japan[24] and India. As the Prime Minister of France, Mr. Edouard Balladur, stated, in space co-operation " virtue and necessity coincide since space is a particularly propitious area for building defence Europe "[25].

80. However, there is a wide gulf between fine words and reality, as France's difficulties in finding partners for its Helios II programme or in associating Germany in the Osiris radar satellite project bear witness. Yet both correspond to a need which is not just national but European too.

81. Differences of assessment and financial restrictions mean that space Europe is taking shape only with difficulty, particularly in the military sphere. In the absence of co-operation and the development of a space policy, albeit minimal, efforts undertaken are likely to be affected by short-term considerations, basically of a financial order. Space is undoubtedly a high-cost area, it mobilises technological and human resources which may be lacking in other sectors, it is often difficult for public opinion and indeed decision-makers to grasp any other than the commerical implications, yet the advantages deriving from its use are out of all proportion with the results obtained by the use of more traditional methods.

82. The applications and usefulness of space-based observation systems in armaments control, monitoring proliferation, identifying targets and in telecommunications is already proven, as testified by their intensive use during the Gulf crisis. Today, in the face of manifold crises, from former Yugoslavia to North Korea, space-based technology comes fully into its own, allowing virtually day-to-day monitoring of the situation on the ground, even where a direct presence is difficult or impossible.

83. This being the case, the challenges must first be understood before proceeding further. The high cost of space does not allow wastage at a time when resources are increasingly scarce. Although military and civilian dual-use equipment allows savings to be made, the performance and levels of protection of such equipment[26] are not identical. Furthermore, the missions initially envisaged (disarmament control in Europe, for example) have evolved and new uses of space are opening up, in the area of anti-missile defence, for example. Detection and early-warning satellites

22. Space News, Vol. 5, No. 22, page 4; 30th May-12th June 1994.

23. Space News, Vol. 5, No. 30, page 4; 1st-7th August 1994.

24. Japan has recently embarked upon the study of a military space-based observation and anti-missile early warning system; Space News, Vol. 5, No. 30, page 4, 1st-7th August 1994.

25. Address by Mr. Balladur, Prime Minister of France, to the Institut des Hautes Études de Défense Nationale (IHEDN), Paris, 8th September 1994.

26. Compare Spot's 10 m resolution with that planned for Helios of 50 cm.

are an essential element today for setting up an efficient space-based observation system.

84. In the United States, where early-warning duties were assigned to DSP (defence supporting programme) system satellites, launched in the 1970s and now close to the limit of their operational life, the Pentagon has just proposed a plan for their replacement by more modern satellites, the ALARM (alert locate and report missiles) system to meet the threat of ballistic proliferation. Funds have been allocated to this end by Congress in the 1995 defence budget[27] and the first launches are scheduled for around 2002-2005.

85. Another factor which must be taken into account is the possibility of the emergence in the future of anti-satellite systems, based either on advanced technologies or on less advanced equipment (scrambling systems, use of laser technology). An important debate is in progress in the United States[28], with crucial implications for the future of any European space-based observation system.

86. In a recent document from the American Presidency, entitled " National security strategy of engagement and enlargement ", reference is made to the need for " deterring threats to United States' interests in space and meeting aggression [against space interests] if deterrence fails "[29]. According to Mr. Dunbar Lockwood of the Arms Control Association in Washington, the theatre high-altitude area defence anti-missile system could be modified to intercept satellites instead of missiles[30].

87. Another important area of action is that of navigation by satellite. To date only the United States and Russia have this system of space beacons (Global NavStar and Glonass). These are constellations of several satellites (roughly 24 in either system) enabling users on the ground to determine their exact positions on earth, on the sea and in the air, to ascertain their speed and to obtain time reference. During the Gulf crisis, NavStar was extremely valuable for accurate missile launches, helping to adjust the trajectory of the Tomahawk cruise missiles to which observation satellites had previously transmitted images of the terrain the missiles would overfly[31].

88. With the proliferation of ballistic weapons, particularly in the Mediterranean region, it is becoming necessary to consider the need to acquire an early warning satellite system if Europe is one day to have an efficient anti-missile system (whether from the south or the east, the time between the departure and arrival of a missile in Europe would be extremely short – an argument in favour of a system of detection from the moment of ignition of the missile).

89. Any projected space-based observation system must take account of these factors. Moreover, the area for discussion should perhaps be widened to that of a European space-based defence system, including observation (optical and radar) facilities, relay and communications satellites (providing links between forces answerable to WEU and those of the NATO allies), a system of navigation by satellite, an early-warning system for anti-missile defence and a satellite defence system[32].

90. This space-based system would be completed by a ground sector data receiving station and facilities for processing and transmission of data to political and military decision-makers. Conventional means of detection, radar stations, land or sea based or airborne (for example, on AWACS), would be connected to the system allowing information received to be handled more quickly.

91. To achieve this, it is necessary above all for the major objectives of this system to be identified and the military space-based requirements of all the countries concerned to be co-ordinated. The cost of a space-based defence system far exceeds the resources of a single country and a joint space policy is the only means of achieving its implementation. Recourse to technologies already in use and developed in the context of the civilian space sector, such as launchers, optical equipment, radar and various types of sensors, allow considerable savings to be made, in terms of money and time. Nevertheless, it should not be forgotten that the only European civil space organisation, ESA, has no responsibilities in defence matters.

92. In order to manage the design and implementation of a European space-based defence system, consideration might be given either to giving ESA defence responsibilities (not an easy approach, in view of the differing interests and defence policies of the member countries) or to creating in WEU or between the European countries wishing to participate in such a system, a space-based defence agency with responsibility for supervising and co-ordinating efforts in this

27. The total cost of the ALARM project, coupled with the Brilliant Eyes satellite programme, led by the BMDO – Ballistic Missile Defence Organisation – is estimated at $11 billion up to 2015; Space News, Vol. 5, No. 32, page 4, 15th-28th August, 1994.

28. The White House is opposed to any operational development of an anti-satellite system but advocates.of the latter are still continuing to press their case; Space News, Vol. 36, page 7, 19th-25th September 1994.

29. Defense News, Vol. 9, No. 37, page 20, 19th-25th September 1994.

30. Idem.

31. La guerre en orbite, Serge Grouard, Éd. Economica, page 121.

32. This last point remains controversial but all options should be considered, above all because of high costs, the difficulty of replacing equipment rapidly and the vulnerability of that equipment..

area, conducting studies on the requirements of the system, making proposals and dealing with the implementation of the decisions taken by the participant states.

93. Alongside this technical-type structure, consideration might be given to establishing a European military space command, similar to the United States Military Space Command, formed by the military authorities responsible for space matters in the WEU countries or the countries participating in the space-based defence system. The space defence agency would also be responsible for anti-missile defence in the context of early-warning satellite systems.

94. There is doubtless a long way to go, but defence Europe cannot afford not to engage in serious thinking on the military uses of space if it wishes to avoid remaining in a dependent and vulnerable position in military space matters. Space is necessary for its existence as a power in its own right, commanding credibility and respect, and confident of being able to meet the challenges of the future in its dealings with its adversaries and also its allies.

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