European Security and Defence Assembly
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DOCUMENT A/2071 17 June 2010

FIFTY-EIGHTH SESSION

Military aspects of space: early warning and ELINT satellites – reply to the annual report of the Council

REPORT

submitted on behalf of the Technological and Aerospace Committee
by Yves Pozzo di Borgo, Rapporteur (France, EPP/CD Group)

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Report transmitted to: the President of the Council of WEU; the Secretary-General of the WEU; the President of the Council of the European Union; the High Representative of the Union for Foreign Affairs and Security Policy; the President of the European Commission; the EU Commissioner for institutional relations and communication strategy; the Presidents/Speakers and the Chairmen of the Foreign Affairs, Defence and European Affairs Committees of the 39 national parliaments represented in the Assembly; the Presidents of the Parliamentary Assembly of the Council of Europe, the NATO Parliamentary Assembly, the OSCE Parliamentary Assembly, the Baltic Assembly, the Nordic Council, the Parliamentary Assembly of the Black Sea Economic Cooperation, the CIS Parliamentary Assembly; the President of the European Parliament; the Secretaries General of the Parliamentary Assemblies of the Council of Europe, NATO and the OSCE.

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[1] Adopted by the Committee on 20 May 2010.

RECOMMENDATION 862[2]

on military aspects of space: early warning and ELINT satellites – reply to the annual report of the Council

The Assembly,

(i) Noting the migration of growing numbers of increasingly advanced military capabilities to space, through the development of weapons systems whose performances are not simply enhanced but directly enabled by space support;

(ii) Noting that space now has a distinct strategic dimension, which has led to the definition of a European space policy by the different EU actors: the Commission and the European Space Agency (ESA);

(iii) Considering that the Commission's White Paper on Space stresses the need for the Common Security and Defence Policy (CSDP) to have access to space-based systems and services, both because of their strategic capabilities and because they confer a capacity for autonomous decision-making;

(iv) Stressing also, as stated in the same document, that security and military users have very specific requirements and that it is necessary to reconcile the military and civil use of space assets;

(v) Noting, furthermore, that no single EU member state will ever have the means to develop and use the full range of necessary capabilities;

(vi) Noting that, according to the White Paper, Europe will need to develop systems and services in the field of signals intelligence, early warning and space-based surveillance;

(vii) Considering that defence has the effect of providing political, economic and technical impetus to space activities;

(viii) Noting that defence space programmes have more exacting technical and operational requirements than civil space programmes, with specific applications such as early warning and electromagnetic intelligence (ELINT);

(ix) Welcoming the fact that the Helios satellite system has shown that European cooperation on military space is possible;

(x) Noting that this system has proved its effectiveness, since 40% of images now result from joint requests as against 17% in 1997;

(xi) Considering that nowadays the only effective way of conducting a major space policy is on the basis of international cooperation, which provides a range of expertise and enables working methods to be compared, new avenues for the use of space applications to be explored, and more space missions to be undertaken as a result of cost-sharing;

(xii) Noting with satisfaction that a joint process of reflection among a number of countries has given rise to the publication of a major document (known by its French acronym BOC) setting out common operational needs, enabling cooperation to be launched on the MUSIS programme;

(xiii) Recalling that MUSIS is a governmental programme, the aim of which is to harmonise future European optical and radar observation systems and eventually to replace all existing military components;

(xiv) Stressing that the main aim of this programme is to move beyond the simple exchange of military intelligence to a situation in which users from the participating countries have free access to all available space-based assets in a transparent and coherent fashion;

(xv) Recalling that the EU Satellite Centre in Torrejón should be given sufficient financial resources to address all those challenges, bearing in mind that, as the Assembly has pointed out on numerous occasions, a budget increase of some 20% should enable it to double its capacity;

[2] Adopted by the Assembly on 17 June 2010 at the 4th sitting.

(xvi) Considering the launch by the European Space Agency of the preparatory programme for the Space Situational Awareness (SSA) project, the aim of which is to support independent European use of and access to space, through the supply of timely quality data concerning the space environment, threats and the sustainable use of outer space;

(xvii) Stressing that the applications of the SSA programme are space surveillance, in order to obtain information about space debris and all space objects, the detection of possible threats and understanding the space meteorological environments;

(xviii) Wondering about the information that such a system could supply, as this is susceptible to dual use (identifying hostile acts against certain satellites or concerning the presence of suspicious satellites in space) and could provide an input into the formulation of a "space deterrence" concept which is essentially a defence mission and, in principle, outside the remit of the European Space Agency;

(xix) Welcoming the success of the French Spaceborne Early Warning Demonstrator programme SPIRALE which in addition to the detection and identification of missile launches also enables the monitoring of natural phenomena like volcanic eruptions or of certain industrial installations, as well as space and air surveillance;

(xx) Welcoming also the progress made with France's ELINT demonstrator programme ESSAIM;

(xxi) Noting, finally, the fundamental importance of European cooperation on space for the future of the space sector in Europe, which, if it is evident for civilian activities, is even more the case for the military space sector,

RECOMMENDS THAT THE COUNCIL OF WESTERN EUROPEAN UNION AND THE COUNCIL OF THE EUROPEAN UNION

1. Encourage a process of reflection within the appropriate structures, in particular the Political and Security Committee (PSC) and the European Defence Agency (EDA) on Europe's requirements and capabilities in the military space sector, in particular in the fields of early warning and electromagnetic intelligence (ELINT);

2. Ensure that the responsibility for implementing the strategic guidelines defined within the PSC and EU Council is entrusted to the EDA and envisage, for that purpose, creating a directorate in charge of defence-related space issues in general;

3. Encourage a dialogue between the member states and the French authorities with a view to their possible participation in the follow-up to the French Spaceborne Early Warning Demonstrator programme SPIRALE;

4. Encourage dialogue also among member states on the French Electromagnetic Intelligence Demonstrator programme ESSAIM with a view to possible European cooperation on the future CERES operational programme;

5. Study, in that regard, the industrial agreement established between EADS and Thales on CERES which is open to cooperation from third countries;

6. Bear in mind that cooperation, particularly in the defence sector, is vital for the future of space activities in Europe;

7. Involve the general public to an even greater degree in the European space effort which is a source of progress and would appear to be the best answer we have in the face of a future characterised by diminishing natural resources and inevitable climate change;

8. Bear in mind that the creation of an early warning and electromagnetic intelligence capability constitutes a major and necessary step towards giving Europe strategic autonomy in the field of proliferation control of weapons of mass destruction and their delivery systems.

EXPLANATORY MEMORANDUM

submitted by Mr Yves Pozzo di Borgo, Rapporteur (France, EPP/CD Group)

I. Introduction

1. In his report entitled "Weapons in space"[3] our colleague Alan Meale noted that what makes satellites more important today than in the past is the unprecedented increase in the number of military systems that are wholly or partially dependent on them. Indeed, in recent years there has been migration of growing numbers of increasingly advanced military capabilities to space, through the development of weapons systems that are not simply enhanced but directly enabled by space support. This trend has gradually led military planners to similarly treat space as a conventional operational medium, as with the air, sea or land, and various countries have begun discussing the possibility of creating a space command.

2. Today it is clear that space has a strategic dimension which has led to the definition of a European space policy by the different EU actors: the Commission and the European Space Agency (ESA).

3. In November 2003, the European Commission submitted a White Paper on Space.[4] Chapter 3.4, entitled "Space as a contribution to CFSP, the ESDP and to the anticipation and monitoring of humanitarian crises" points the way forward, stating that the challenge is "to mobilise EU decision making to reinforce space technologies in support of security and defence policy requirements" and that there is an opportunity "to supplement existing space-based capabilities in Europe and examine new ones needed for establishing a credible security capability with high EU added value".

4. Firstly the paper underlines the need for ESDP to have access to space-based systems and services, both because of their strategic capabilities and because they confer a capacity for autonomous decision-making. It also stipulates that since security and military users have very specific requirements, it is necessary to reconcile the military and civil use of space assets. The paper goes on to point out that no single EU member state will ever have the means to develop and use the full range of potential and necessary capabilities, hence the advantage of establishing various forms of cooperation at EU level.

5. Our Assembly's recent report on MUSIS[5] (Multinational Space-based Imaging System) shows that such cooperation is not always feasible, even in a sector as sensitive as that of security and defence, and especially if that cooperation – as in the case of MUSIS – is based on joint operational requirements.

6. The White Paper also states that in addition to the telecom and observation satellites that are already used for security and defence purposes, further developments are needed in the field of global monitoring, positioning and navigation, as well as that of synchronisation and communications, signal intelligence, early warning and space surveillance, in order to meet the security objectives of the EU. It is further stipulated that with regard to signals intelligence, early warning and space surveillance, Europe will also need to develop systems and services in the fields of:

- Signals intelligence required to monitor electromagnetic activities;
- Early detection of activities leading to missile proliferation;
- Space surveillance with a view to giving the EU an autonomous capacity to detect and identify space objects.

[3] See Document 1932 adopted on 21 June 2006: "Weapons in space", report submitted on behalf of the Technological and Aerospace Committee by Alan Meale (United Kingdom, Socialist Group), Rapporteur.

[4] Space: a new European frontier for an expanding Union – An action plan for implementing the European Space Policy. Brussels, 11 November 2003. COM (2003) 673 final.

[5] See Document 2025 adopted on 3 December 2008: "Multinational Space-based Imaging System (MUSIS): European space cooperation for security and defence", report submitted on behalf of the Technological and Aerospace Committee by Rodoula Zissi (Greece, Socialist Group), Rapporteur.

7. Finally, the Commission says it is prepared to contribute to assessing existing capacities and future requirements and to identifying the additional investments needed for the development of a comprehensive EU space-based defence and security capability.

8. Already in its report entitled "A joint European space strategy: security and defence aspects",[6] the Technological and Aerospace Committee had recommended,[7] among other things, "the need to study Russia's offer of cooperation on satellite programmes and more specifically the proposal it submitted to NATO regarding a joint space centre initially for the purpose of identifying and monitoring ballistic launches and, in the longer term, intercepting non-strategic launches" and "widening the range of the Centre's[8] tasks so that it can begin to develop a battlefield management capability which requires:

– the use of remote-sensing, meteorological and communications tools, as well as electronic surveillance and, in the longer term, early-warning capabilities".

II. European space cooperation

Helios

9. The Helios[9] satellite system has shown that European cooperation on military space is possible. The principle underlying this form of cooperation between France, Italy and Spain is based on joint exploitation. Images are programmed according to their operational relevance, right of use and the urgency of the request.

10. All participant countries can order pictures confidentially but shared images are also ordered to optimise utilisation time and avoid duplication. This method of working has proved its effectiveness since nowadays 40% of images are the outcome of joint requests as against 17% in 1997.

11. The success of the Helios I satellite suggested that the programme would attract more partners and that Italy and Spain would step up their participation in the Helios II[10] programme but this was not to be and at one stage it looked as though France would have to fund that major project on its own. However, on 13 July 2001 Belgium joined the Helios II programme, becoming France's first partner, with a right to a 2.5% share of the satellite images.

12. On 6 December 2001 Spain also joined the programme with the same percentage share. Under the arrangement Spain was to complement its Helios I facilities so that it could programme and receive Helios II images at the highest level of secrecy. The additional facilities went into operational service at Torrejón (Madrid) before the launch of the first Helios II satellite in the first half of 2004.

The Franco-Italian agreement on the COSMO-SkyMed dual-use satellite system

13. The Pleiades dual-use optical satellite programme, designed by France to succeed the Spot 5 and Helios II systems, and the Cosmo-SkyMed constellation, designed by Italy to give it a much-

[6] See Document 1738 adopted on 20 June 2001: "A joint European space strategy: security and defence aspects", report submitted on behalf of the Technological and Aerospace Committee by Erich Maass (Germany, Federated Group), Rapporteur.
[7] Recommendation 691 paragraphs 1 *(h)* and 2 *(d).*
[8] Originally the WEU Satellite Centre, today the EU Satellite Centre.
[9] See Document 1393 adopted on 8 November 1993: "The development of a European space-based observation system: Part II", report submitted on behalf of the Technological and Aerospace Committee by Jean Valleix (France, Federated Group), Rapporteur.
[10] See Document 1525 adopted on 14 May 1996: "WEU and Helios 2", report submitted on behalf of the Technological and Aerospace Committee by Christian Lenzer (Germany, Federated Group), Rapporteur.

needed all-weather capability, offered a clear opportunity for synergy. On 29 January 2001 France and Italy therefore signed a cooperation agreement[11] on a major optical and radar observation satellite programme comprising:

– an optical component, developed under French prime contractorship, consisting of two satellites launched in 2005 and 2006 and the necessary ground facilities;

– a radar component, developed under Italian prime contractorship, consisting of four satellites launched in 2003 and 2005 and the necessary ground facilities;

– a user ground segment, developed jointly by France and Italy, for mission planning and control, and data acquisition and processing.

14. Such a system is guaranteed to protect defence interests in terms of security and ensure that priorities accorded to mission requests are complied with. It also meets civil and commercial user requirements in terms of global operational capability, speed of access and image quality. It can be used by several categories of user: public, institutional, private and commercial.

15. As the system has to give priority in its provision of services to users answerable to the defence ministries of both countries, it has to operate within a number of defence-related constraints and comply with certain requirements such as the planning of daily missions, confidentiality, security of communications, access to raw data in civil archives and the use of defence ministry products under government control, this being exercised by government-appointed security bodies.

16. At the present time it would seem that any major space policy has to be based on international cooperation because this not only provides a range of expertise but also enables working methods to be compared, new avenues for the use of space applications to be explored, and more space missions to be undertaken as a result of cost-sharing.

Common operational needs

17. Taking these experiences as a starting point discussions took place first between France, Germany, Italy and Spain and subsequently Belgium and Greece, giving rise to the publication of a major document in 2001 on common operational needs, with a view to a European system of global observation by satellite for security and defence purposes, better known by its French acronym BOC.

18. Although only an outline of possible forms of future cooperation among states in the area of earth observation for security and defence purposes, the document marked a new and essential stage in building “Space Europe”.

19. The six BOC signatory states finally took a decision in December 2006 to initiate studies for the joint realisation of a future space imaging facility for security and defence purposes, known as MUSIS (Multinational Space-based Imaging System).

MUSIS (Multinational Space-based Imaging System)

20. MUSIS[12] is a governmental programme, the aim of which is to harmonise future optical and radar observation systems and eventually to replace all existing military components.

21. The main idea behind the programme is to move beyond the simple exchange of military intelligence images that takes place today among the European states and to give the users from the participating countries free access to all space-based assets and to make these available in a transparent and coherent fashion. It is an ambitious and highly challenging project. Establishing

[11] See Document 1789 adopted on 5 June 2002: “Developing a European space observation capability to meet Europe’s security requirements”, report submitted on behalf of the Technological and Aerospace Committee by Edward O’Hara (United Kingdom, Socialist Group) and Sam Cherribi (Netherlands, Liberal Group), Rapporteurs.

[12] See Document 2025 adopted on 3 December 2008: “Multinational Space-based Imaging System (MUSIS): European space cooperation for security and defence”, report submitted on behalf of the Technological and Aerospace Committee by Rodoula Zissi (Greece, Socialist Group), Rapporteur.

effective cooperation in an area as sensitive as that of intelligence is obviously no easy undertaking. Despite the experience already gained by the majority of the participating states in the Helios programme, MUSIS is far more ambitious in scope.

22. Nevertheless, your Rapporteur feels that it is only right to raise questions about an initiative which, while perfectly in keeping with the European dream and notwithstanding other industrial considerations, appears to focus on the means before even considering the ends.

23. Indeed, if Europe nurtures the ambition of putting a system such as MUSIS to political and operational use, it is only logical to look first at how it uses the tools already at its disposal.

The European Union Satellite Centre, Torrejón, Spain

24. In this regard, the Torrejón Satellite Centre is revealing of what has not been and of what could be done. Before embarking on such a highly ambitious venture as MUSIS, it is essential to give the Centre the (inexpensive) resources it needs and provide it with something other than American commercial imagery[13] which is slow to acquire and cannot be used for tactical intelligence. It is necessary to reflect on how to make better use of the Centre and above all human, operational and technical lessons learned should be applied so as to acquire some perspective on the actual form a European space observation capacity might take.

25. It should be added that the Centre has signed memoranda of understanding (MOUs) with those countries participating in the Helios and COSMO-SkyMed programmes giving it access to their satellite images. A similar agreement is due to be signed with Germany for access to imagery from its SAR-Lupe satellite system. However, problems sometimes occur when it comes to implementing such agreements.

26. It is worth recalling here Assembly Recommendation 830[14] which underlined that in order for the Satellite Centre to have access to high-resolution radar images, it was necessary to sign protocol agreements with Germany and Italy allowing it to use SAR-Lupe and COSMO-SkyMed satellite images. It also recommended increasing the number of experts dedicated to the interpretation of images and providing the Centre with a sufficient budget for that purpose, considering that a 20% increase in its current budget (of 15 million euros) should enable it to double its capacity.

The European Space Situational Awareness Programme

27. In November 2008, the space ministers of the ESA member states, meeting in The Hague, decided to launch a preparatory programme as part of the Space Situational Awareness (SSA) project. The aim of the three-year preparatory programme, which has a budget of 55 million euros, is to support European independent use of and access to space for research or services, by providing timely and quality data on the space environment, threats and for the sustainable use of outer space.[15]

28. The functions of the programme fall into three broad categories:

- space surveillance in order to obtain information about space debris and all space objects;
- detection of possible threats and anticipation of the consequences for space activities generally;
- understanding the space meteorological environment, which includes monitoring and predicting the effects of radiation, ionospheric disturbances and geomagnetic anomalies.

29. Since space is now a major arena for a growing number of states in the struggle for power, a space situational awareness capacity has become an absolute necessity. Furthermore, since all satellite operators, both civil and military, have an interest in monitoring space debris, it is a genuine dual-use capacity. On the other hand, there are question marks over the dual-use aspect of the information such

[13] Landsat 4, 5 and 7 and IKONOS.
[14] Recommendation 830 on a Multinational Space-based Imaging System (MUSIS): European space cooperation for security and defence (Document 2025 adopted on 3 December 2008).
[15] See Document 2035 adopted on 6 May 2009: "Space situational awareness", report submitted on behalf of the Technological and Aerospace Committee by Edward O'Hara (United Kingdom, Socialist Group), Rapporteur.

a system could provide on the identification of hostile acts against certain satellites or on the presence of suspicious satellites in space. This is essentially a defence mission which might lead to the formulation of a "space deterrence" concept and which, in principle, is not strictly within the remit of the European Space Agency. Space situational awareness is therefore an area that requires proper reflection. Of course ESA was right to put this matter before its member states for decision, but your Rapporteur feels it is appropriate for this process of reflection to include an analysis of the "defence and security" aspect.

III. Space and defence

30. Defence has the effect of providing political, economic and technical impetus to space activities. It should be stressed that general applications in most space sectors such as communications, surveillance, navigation and positioning are dual-use. However, defence space programmes have more exacting technical and operational requirements than civil space programmes in terms of resistance, lifespan, manoeuvrability, redundancy and quick replacement. Some applications such as early warning and electromagnetic intelligence are specific to the military space sector and finally there are new fields such as space weapons, a topic previously studied by the Technological and Aerospace Committee.[16]

Early warning

31. Early warning represents the global and permanent capacity to detect, locate and identify all ballistic missile launches and flight and ground tests. It is part of the ballistic missile defence (BMD) capability. Early warning has space and ground components which can be supplemented by other maritime and air surveillance and monitoring systems.

32. Early warning is also useful for identifying and monitoring the movements and trajectories of celestial bodies (asteroids and comets, for example), a function mainly carried out by the ground component and ground-based radars.

33. At the present time, there are only two operational space-based early warning systems in existence:

- the United States' Defense Support Programme (DSP, 1997-2007, being updated, and the Space-Based Infrared System, SBIRS, 2008); and
- Russia's early warning system.

The Defense Support Program (DSP)

34. The DSP is the advance early warning system of the North American Aerospace Defense Command (NORAD) for the detection of ballistic missile launches and nuclear explosions. The system uses a constellation of infrared, geostationary optical satellites to provide round-the-clock cover. The programme began in 1970 and is based on the earlier Missile Defense Alarm System (MIDAS) dating back to 1960.

35. The Satellite Early Warning System (SEWS)[17] consists of five satellites, three of which provide a frontline operational service with two additional spacecraft available as backups should problems emerge with the primary satellites. The effectiveness of the system was proven during the Gulf war (1990-1991). Indeed, the DSP detected the launch of Iraqi Scud missiles during Operation Desert Storm, providing timely warning to the armed forces and civilian populations of Israel and Saudi Arabia.

36. To date, 23 of the 25 planned satellite launches have taken place. The last two were cancelled because of the implementation of the SBIRS programme which is to replace the DSP. The continuous upgrading of these satellites has meant the DSP has been able to provide precise and reliable data in

[16] See Document 1932 adopted on 21 June 2006: "Weapons in space", report submitted on behalf of the Technological and Aerospace Committee by Alan Meale (United Kingdom, Socialist Group), Rapporteur.
[17] FAS: Space Policy Project, Military Space Programs. http://www.fas.org

response to constantly changing requirements and specifications. These improvements have enhanced satellite capability and survivability and prolonged their working life.

37. The United States National Missile Defense (NMD) Program envisaged a three-phase development schedule, starting in 1996. Phase 1 covered the interceptor and radar systems; phase 2, the placing in high and low orbit respectively of the early warning satellite systems (SBIRS-High and -Low). The infrared system consists of five SBIRS-High satellites in geostationary or elliptical orbit (so as to afford coverage of the North Pole) and by 2010 24 SBIRS-Low orbiting satellites should complete the early warning system. The original cost estimate for the SBIRS-Low constellation was 10.6 billion US dollars but predictably programme costs have continued to rise.

The Russian early warning system

38. The space segment of the Russian early warning system is currently composed of five operational satellites including three in highly elliptical orbit (HEO) and two in geostationary orbit (GEO).[18] The Cosmos 2422, 2430 and 2446 satellites launched in 2006, 2007 and 2008 respectively were designed to detect ballistic missile launches from American territory but cannot detect missile launches from the sea or from other regions.

39. The Cosmos 2379 and 2440 geostationary satellites launched in 2001 and 2008 respectively are able to identify missiles against an earth background. The system is not yet fully operational.

40. The three HEO satellites are positioned in such a way as to be able to detect launches from American soil for 18 hours a day. The configuration of the GEO satellites does not allow an all-weather round-the-clock coverage of American territory, but does cover launches from the northern Atlantic.

41. Finally, the system transmits information in real time to the Serpukhov command where it is processed before being passed on to the 3rd Space and Missile Defense Army in Solnetchogorsk, near Moscow. The early warning system's ground segment is composed of two stations, each with one or several radars. Five of those stations are located outside Russia (one each in Kazakhstan, Azerbaijan and Belarus and two in Ukraine).

IV. SPIRALE

42. SPIRALE is the French Spaceborne Early Warning Demonstrator programme. EADS Astrium, the prime contractor, is in charge of the ground segment for satellite control and image processing, as well as the integration and in-orbit exploitation of the satellites, while Alcatel Space is responsible for the satellite development.

43. The demonstrator, known by its French acronym SPIRALE (which stands for Système préparatoire infrarouge pour l'alerte avancée – preparatory infrared early warning system) concerns the delivery and operation of a complete system for the collection and analysis of infrared images against an earth background with a view to the detection of ballistic missiles during their boost phase, just after launch.

44. The space segment is composed of two 120 kg satellites in an elliptical orbit. The purpose of the demonstrator is to pave the way for a future operational space-based optical early warning programme which in addition to being a strategic link in a ballistic missile defence programme will contribute to other operational missions, in the field of proliferation monitoring, for instance. The cost of the demonstrator (with two satellites) was 124 million euros for the period 2005-2009.

45. The two satellites (SPIRALE A and B) were launched by Ariane 5 on 12 February 2009. Indeed, an early warning system must be composed of several satellites for triangulation and trajectography purposes, plus the command and control system. The satellites are placed in geostationary orbit and the system is completed with ground radars. The ground segments for satellite control and operation are located in Toulouse and, as explained above, are being operated by EADS Astrium on behalf of the French procurement authority DGA during the exploitation phase.

[18] Early warning – Russian strategic forces. http://russianforces.org

46. The SPIRALE demonstrator is reported to be a complete success: it has confirmed the feasibility of an initial operational capability to be put in place only in 2019 (the cost of an operational programme with two satellites is estimated at some 700 to 800 million euros).

V. Space-based electromagnetic intelligence (ELINT)

47. Electromagnetic intelligence refers to the information obtained by intercepting communications. It calls for a mastery of advanced technologies in the fields of telecommunications, IT, electronics, signal-processing, cryptology, mass data processing, transcription and translation.

48. Space-based ELINT systems cannot in principle intercept communications and signals transmitted underground (via cables or optical fibres, for example). In 2008 only the United States and Russia had operational electromagnetic intelligence satellites, and only to a limited extent.

49. Since the 1990s, however, France has been trying to develop an ELINT capability that could eventually serve as the basis for a European space-based ELINT system. The ESSAIM technology demonstrator, whose predecessors were the French programmes CERISE (1995) and CLEMENTINE (1999), is being used to develop that capability.

50. On 18 December 2004 Ariane 5 launched a cluster of four ESSAIM satellites. In 2007, France launched its ELISA programme (ELectronic Intelligence by Satellite) with four satellites to be launched in 2010 at a cost of 110 million euros. The ESSAIM demonstrator exploitation phase is scheduled to end during the course of the same year.

51. Feedback from the CERISE, CLEMENTINE, ESSAIM and ELISA programmes is providing input for the launch and entry into service (2009-2016) of an operational programme known as CERES (Capacité de renseignement électromagnétique spatial – spaceborne electromagnetic intelligence capability) at a cost of 350 to 450 million euros (depending on the configuration, whether it is for seven or 10 years, and the specifications). The budget for military space programmes stood at 380 million euros in 2009 and according to the military programming law for the period 2009-2014 should, on average, double every year up to 2020.

ESSAIM

52. The ESSAIM system (“essaim” means “swarm”) is composed of four 120 kg microsatellites flying in formation at a distance of several hundred kilometres from each other. The satellite cluster, travelling in low, circular and quasi sun-synchronous orbit at an altitude of 700 km and a speed of more than 25 000 km/h, passes over the same spot on the globe four times every 24 hours, analysing electromagnetic emissions for a period of some 10 minutes. The system thus provides quasi-permanent global coverage.

53. These operations require two ground stations: one managed by the French space authority CNES in Toulouse and the other by the French procurement authority at the Centre de l’électronique de l’armement (CELAR, weapons electronics centre) at Bruz near Rennes. The CELAR ground station, in charge of mission programming, sends a work programme to the CNES ground station where it is transformed into mission orders.

54. The satellites receive their mission orders as they fly over Toulouse and activate their receivers to gather the data as they fly over the area under surveillance. Flying over the CELAR station they download the stored data to it, and there it is analysed by the DGA experts.

55. The major companies involved in the ESSAIM programme are joint prime contractors EADS Astrium (for the system) and Thales Airborne Systems (for the payload and user ground segment). CNES is a subcontractor and supplier of the ground control segment. The cost of the system is estimated at 80 million euros.[19]

[19] Source: DGA, Reports AN and S on France’s defence budget.

56. Finally, it is important to underline the complementarity of such systems with optical satellites. This means that there are real opportunities for cooperation, albeit, for the moment, among only a very small number of countries.

VI. Some thoughts on the possibilities for European cooperation in the field of early-warning and ELINT

57. With a view to a space-based early warning system, the SPIRALE demonstrator is for the moment a great success. The system was approved by the French procurement authority DGA in April 2009. The demonstration, conducted ahead of schedule, confirmed the feasibility, at this stage, of an initial operational capability. After intensive debate it was decided that this capability would only enter into service in 2019.

58. The SPIRALE demonstrator will be finished in autumn 2010. It is therefore urgent to prepare for the development of a space-based warning system – an essential component of any advanced early warning system – making use of the specific highly advanced capabilities currently being developed with SPIRALE. The relevant skills need to be maintained in order to prepare this future programme under the best possible conditions.

59. The French armed forces staff and procurement authority (DGA) have defined the objective and drawn up the technological and industrial roadmap. It is therefore urgent to earmark a specific industrial budget as of this year in order to consolidate the prospects for this programme and prepare for the future.

60. Above and beyond its prime objective of detecting and identifying missile launches, a future spaceborne warning system could make a useful contribution to space and air-based surveillance and to the monitoring of natural phenomena like volcanic eruptions or of certain industrial installations.

61. In the field of electromagnetic intelligence the ELISA demonstrator (surveillance of radar emissions) is due to be launched in spring this year. It will have a lifetime of at least three years. A key development in 2010 will be the launch in the middle of the year of the CERES programme design phase. To meet the deadline for its entry into operational service in 2016 and eliminate the waiting time for users – who will no longer have the data from the demonstrators beyond that date – an industrial agreement open to third parties has been found between EADS-Astrium and Thales. Nothing stands in the way of a rapid launch of this programme for which the need has been confirmed in recent months. So far Sweden and Greece have been identified as European partners.

62. It is clear that European space cooperation is vital for the future of the space sector in Europe. This is true for civilian activities and is even more the case for the military space sector. Only from space can we observe our planet. The use of space is the best answer we have with regard to the risks and threats to our environment, with natural resources becoming increasingly scarce and climate change now broadly accepted as a fact.

63. European public opinion must be made to understand how space contributes to human welfare and progress. The civilian space sector is at the spearhead of technological development, the military space sector even more so.

64. Cooperation on early warning systems appears to be difficult because only a few countries have expressed an interest. It should nonetheless be stressed that the SPIRALE demonstrator programme will be coming to an end in autumn 2010 and that it makes sense to guarantee the development of an early warning programme, if possible in cooperation, so that the French expertise in this sector is maintained. One may ask what the point of an early warning programme is when we know that we do not have the means to respond to a ballistic missile threat. The answer is that such a technology would enable us to be independent from other nations: the day Europe decides to acquire a missile defence capability, the first stage will already be in place. Finally, it is necessary to determine the military requirement in this area at European level and to involve the European Defence Agency in the discussion.

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