

欧州の安全保障に不可欠

Essential to Europe s security

宇宙は軍事観測と予知に有用であることを証明済み  
  
近年、リスクと脅威の増大で宇宙アセットは今まで以上に必要度が増している。

インテリジェンスと通信プログラムの宇宙部分の仕様決定と開発のため CNES は仏防衛省と広範に作業している。

Space has proven its utility in military observation and anticipation as well as in other key defence functions deterrence, protection, prevention and intervention and is central to the strategic security and defence challenges facing our nation. It is also a key enabler for strengthening Europe s military capabilities.

The events of recent years have made space assets more necessary than ever, with the escalation of risks and threats including regional instability, terrorist activity, migrating populations and weapons proliferation. Effective information and knowledge management, shorter decision loops and space surveillance are vital assets in today s geopolitical environment, dominated by power rivalries and expanding military space programmes.

CNES works extensively with the French Ministry of Defence to define and develop the space components of intelligence and communication programmes.

The CNES Defence team maintains a permanent link between the agency s research programmes and the French defence procurement agency (DGA), analyses dual-use civil/military projects and plans to accommodate future defence requirements.

*“ Space plays a crucial role in the war on terror and weapons proliferation, and in the broader effort to establish an international order.”*

宇宙と防衛： 決断の時期

Space and defence: time to decide

2007 年仏防衛省のワーキング・グループは仏国にもっと宇宙を：仏と欧州のための防衛宇宙政策の手引きを発行した。

文書は軍事宇宙のための優先すべき推奨事項を結論づけている。

危機緩和と低減と武力行使のための戦略能力

武力行使をサポートする補完的作戦能力

宇宙監視は中期的に実現されるべき有機的能力と見ることのできる新しいテーマである。

In 2007, a Ministry of Defence working group published a policy document entitled *Donnons plus d Espace à notre Défense : orientations d une politique spatiale de défense pour la France et l Europe* (More space for our defence: guidelines for a space defence policy for France and Europe). This widely circulated document updated the principal guidelines outlined in a previous, classified report, thereby helping to foster broad dialogue between civil, military, industrial and institutional partners in France and Europe.

The document concludes with a set of priority recommendations for military space:

**Strategic capabilities for crisis mitigation and force operations.** In the near term, telecommunications (secure core) and Earth observation for reconnaissance (very-high-resolution imagery). In the medium term, Earth observation for identification (ultra-high resolution), communication interception and early warning (for future missile defence).

**Complementary operational capabilities to support force operations.** In the near term, radar observation, satellite-based mapping, infrared imaging, meteorology and oceanography data, and satellite navigation. In the medium term, non-secure broadband telecommunication network and relay satellites.

**Space surveillance is a new theme viewed as an organic capability to be implemented in the medium term.**

<p>将来の宇宙安全保障と防衛計画に対する優先度に関するこれら政策手引きと付帯決定はまだ承認はされていない。</p> <p>また、2007年1月の中国による衛星攻撃兵器に示されるような新しい脅威の増大する重要性と台頭の下で、2007年に閣僚間のワーキング・グループは宇宙のアセットの安全保障に関連する新しい問題をスタディした。</p> <ul style="list-style-type: none"> <li>• 政治的アプローチは主として国連 COPUOS のような国際的組織を通じて信頼の醸成手段を導入すること</li> <li>• 自然の危険(太陽活動に伴うもの等)と技術的危険(スペースデブリ等)を識別するため欧州レベルでのいつでも使える宇宙監視ネットワークを創る意図をもった前向きなアプローチ</li> </ul> <p><b>防衛作戦における宇宙の役割の地球規模での認識</b></p> <p>2007年1月に中国が衛星攻撃兵器のテストで高度853kmにある機能しなくなった気象衛星「風雲1号」を破壊した時、予期しない事象(大量のスペースデブリ)が起きた。</p> <p>今や多くの国は防衛作戦における宇宙の役割をさらに鋭く気づいている。</p> <p>この点に関し2つの突出した国は米国とロシアである。</p> <p>一方、<b>中国</b>は民間と軍事宇宙の全ての分野で急速な</p>	<p>These policy guidelines and associated decisions on the priorities for future space security and defence programmes have yet to be confirmed. They will be further detailed in the White Paper on Defence (currently being prepared) and the next five year defence spending plan.</p> <p>Also in 2007, an interministerial working group studied the new issues related to security of space assets, given their growing importance and the emergence of new threats, as illustrated by China's anti-satellite weapon test in January. The group recommended a more concerted European approach to space security and surveillance along two lines:</p> <ul style="list-style-type: none"> <li>• A political approach, primarily the implementation of confidence-building measures through international bodies such as the UN Committee on the Peaceful Use of Space (COPUOS).</li> <li>• A proactive approach with the aim of creating an operational space surveillance network at European level to identify natural (linked to solar activity, etc.) and technological hazards (space debris, etc.).</li> </ul> <p><b>Global awareness of space's role in defence operations</b></p> <p>An unexpected event occurred in January 2007 when China tested a kinetic-energy anti-satellite (<b>ASAT</b>) weapon, which destroyed the defunct Feng Yun 1C weather satellite at an altitude of 853 km. Besides creating a huge amount of orbital debris that will remain a threat for years to come (the risk of collision has almost doubled at certain altitudes), this demonstration of destructive capability has fuelled debate around the world. Concerns have been voiced in particular by the US Department of Defense, which since the 1990s has considered satellites as a key element of military strategy and operations.</p> <p>Most nations are now more acutely aware of the role of space in defence operations. The widespread utilization of space (almost 40 states are now believed to have direct access to satellite imagery), industrial advances in civil and dual-use technologies, the increasing affordability of certain systems (microsatellites) and the deployment of anti-satellite weapons in space and on the ground (power lasers) have led national authorities to pay particular attention to space assets and the threats posed to them.</p> <p>The two countries furthest ahead in this respect are the <b>United States</b> and <b>Russia</b>. While the <b>US</b> remains the outright leader in military space and continues to develop space surveillance systems, satellite protection systems and future anti-satellite capabilities, the <b>Russian</b> government has decided to revive efforts to upgrade its own military space capabilities.</p> <p>Meanwhile, <b>China</b> is making rapid progress in all areas of civil and military space. It has</p>
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<p>進歩を続けている。</p> <p>他方、<b>インド</b>は経済発展と画像偵察と撮像を通じて国境をコントロールするのをサポートするため宇宙利用を継続している。</p> <p>最後に、<b>日本</b>は信頼できる打上げロケットをもち光学とレーダの偵察衛星の2つのコンスタレーションを軌道に上げた。</p>	<p>developed an effective and reliable launch system and is ploughing massive resources into new space systems. Indeed, this energetic space policy may ultimately make China the world's second space power.</p> <p><b>India</b> on the other hand continues to utilize space to support its economic development and control its borders through image-based reconnaissance and mapping. There is significant overlap between its civil and military programmes, but India remains hostile to any militarization of space.</p> <p>Lastly, <b>Japan</b> now has a reliable launcher and has orbited two constellations of reconnaissance satellites: one optical, one radar.</p>
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### 欧州における信頼の醸成

### Building trust in Europe

<p><b>欧州の緊密な連携の最初の実</b></p> <p>長年フランスは国家の統制の下で軍事宇宙プログラムを追究したが、時折の連携では主にデータ交換 (SAR-Lupe or COSMO-SkyMed レーダ画像、エリオスの光学画像)あるいはサービス(Syracuse-Sicral 2 の能力)に限られていた。</p> <p>しかし、当面、欧州宇宙政策は幾分漠然として緩く適用されるままである。</p> <p>広い欧州の責任の下で来ると予想される次期デュアル・ユース宇宙プログラムは宇宙監視の分野になる。</p> <p><b>国家主導が現システムを牽引</b></p> <p>仏の欧州パートナーは彼らの宇宙安全保障と防衛システムを導入に顕著な進展を果たした。</p> <p><b>ドイツ</b>は事実上 SAR-Lupe 軍事レーダ衛星コンスタレーションの配備を完了した。</p> <p><b>イタリア</b>、Helios 1(14%)と Helios 2(2.5%)のパートナーは</p>	<p><b>First fruits of closer European cooperation</b></p> <p>For many years, France pursued military space programmes under national control, with occasional cooperation typically limited to the exchange of data (SAR-Lupe or COSMO-SkyMed radar imagery for Helios optical imagery) or services (Syracuse-Sicral 2 capabilities). Recent developments, however, such as the Lisbon Treaty that makes space a new shared competency of the EU and its member states (pending ratification), the Space Council's approval of an EU space policy document in May 2007 and the progressive emergence of the European Defence Agency, point to a more integrated approach to future programmes.</p> <p>Yet for the moment, European space policy remains somewhat vague and loosely applied. In addition, the precedent set by Galileo will undoubtedly lead stakeholders to seek clear and balanced governance before placing a major military space programme under complex multilateral control.</p> <p>The next dual-use space programme expected to come under broad European responsibility is in the area of space surveillance. Preparations for this programme were begun in 2007.</p> <p><b>National initiatives driving current systems</b></p> <p>France's European partners have made significant progress in implementing their space security and defence systems:</p> <p><b>Germany</b> has virtually completed deployment of the SAR-Lupe military radar satellite constellation. Users have expressed full satisfaction with the initial results. Three satellites were launched between December 2006 and March 2008. The fourth and final is scheduled to launch in late 2008. The SARLupe system has a 10-year operational lifespan. The French military now has access to high-resolution SAR-Lupe imagery in exchange for Helios data.</p> <p><b>Italy</b>, France's partner for Helios 1 (14%) and Helios 2 (2.5%), launched the first</p>
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<p>COSMO-SkyMed デュアル・ユース・レーダ衛星に関し 2007年6月に初号機、2007年12月に2号機を打上げた。</p> <p><b>ベルギー</b>、Helios 2 システム(2.5%)、Pleiades デュアル・ユース・システム(4%)のパートナーは2006年 MUSIS スタディに参加した。</p> <p><b>スペイン</b>、Helios 1(14%)と Helios 2(2.5%) Pleiades (3%)のパートナーは、MUSIS スタディの受権者でもある。</p> <p><b>ギリシャ</b>は連携合意文書(2007年初期に批准された)に調印し、Helios 2 システム(2.5%)の開発と利用に参画する。</p> <p><b>Athena-Fidus に関する仏-伊の連携</b> 2006年6月に CNES とイタリア宇宙庁(ASI)によって開始された仏伊 Athena-Fidus デュアルユース衛星プログラムに対する予備的スタディに続いて、2007年11月30日にニースでプログラムを立上げる Lol(目論み書)に署名した。</p> <p>2012年後期に打上げ計画された Athena-Fidus は防衛と民事の政府通信(仏民事保護チーム、伊警察 etc.)の増大する必要を満たすことになる。</p>	<p>COSMO-SkyMed dual-use radar satellite in June 2007 and the second in December. Two other satellites are planned. The first images (in wide-field mode) have been presented to the public. The Turin Agreement of January 2001 provides for the exchange of COSMO-SkyMed and Pleiades imagery. On 30 November 2007, the Italian Ministry of Defence officially signed up to the Athena-Fidus telecommunication programme.</p> <p><b>Belgium</b>, France's partner in the Helios 2 system (2.5%) and the <b>Pleiades</b> dual-use system (4%), joined the <b>MUSIS</b> study in 2006. In late 2007, it also confirmed its commitment to the Athena-Fidus programme.</p> <p><b>Spain</b>, a partner in Helios 1 (7%), Helios 2 (2.5%) and <b>Pleiades</b> (3%), is also a stakeholder in the <b>MUSIS</b> study. Spain has decided to invest in a national satellite-based observation system called <b>Ingenio</b>, which will feature a <b>SeoSat</b> wide-angle optical component (for mapping) and an SAR radar component. Studies began in 2007.</p> <p><b>Greece</b> has signed a cooperation arrangement (ratified in early 2007) for its participation in the development and use of the Helios 2 system (2.5%). It is also contributing to the <b>MUSIS</b> study.</p> <p><b>French-Italian cooperation on Athena-Fidus</b> Following the preliminary studies for the French-Italian Athena-Fidus dual-use satellite programme, initiated by CNES and the Italian space agency (ASI) in June 2006, the two partners signed a Letter of Intent (Lol) in Nice on 30 November 2007 to launch the programme. Athena-Fidus is a collaboration between DGA and CNES on the French side and Segredifesa (general secretariat for defence) and ASI on the Italian side, with the two space agencies responsible for programme oversight.</p> <p>Scheduled to launch in late 2012, Athena-Fidus will meet the growing need for defence and civil government telecommunications (French civil protection teams, Italian police, etc.). The satellite will primarily use the Ka frequency band and will offer high transmission rates. Advanced civil telecom standards will optimize service capacity and availability. The cost-effective user terminals will be derived from COTS products.</p>
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**MUSIS 6ヶ国軍事宇宙プロジェクト**

**MUSIS six-nation military space project**

<p>将来の MUSIS マルチユーザ光学及びレーダ・イメージング・システムはベルギー・仏、独、ギリシャ、伊、及びスペインの間の共同協力スタディであり、これらのパートナーによって管理され共同運営されるかもしれない。</p>	<p>The future <b>MUSIS</b> multi-user optical and radar imaging system (Multinational Space-based Imaging System for surveillance, reconnaissance and observation) is a collaborative study between Belgium, France, Germany, Greece, Italy and Spain, and may also be managed and operated jointly by the six partners. The goal is to pool satellite image acquisition and distribution capabilities while retaining the necessary levels of secrecy for certain sensitive acquisition tasks.</p> <p>In accordance with the common operational requirement defined in 2005, CNES is providing support for the optical space component of this study. Co-funded by CNES and the French defence procurement agency DGA, the feasibility studies and R&amp;T work are nearing completion, ahead of the preliminary definition phase.</p>
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<p><b>2015 年に対する Helios 画像インテリジェンスの後継</b></p> <p>Helios 2B 衛星は 2009 年 3 月打上げ予定で、2004 年後半から軌道にある安定した Helios 2A に加わる。</p> <p>DGA*装備庁は CNES を任命し、Helios 後継(欧州 MUSIS システムの光学部分のスタディを実施させることとした。</p> <p>*DGA = Délégation Générale pour l'Armement 仏国防省の内局</p> <p>2 つの異なる軌道(偵察用に高度 800km,識別用に高度 500km 程度)の3機の同一衛星のシステム構成になる公算である。</p> <p>加えて仏の防衛当局は CNES と共に軌道での寿命の尽きた SPOT 衛星の 2D と 3D の広視野マッピング・ミッションを継続する最良の方法を調べる作業を行っている。</p> <p><b>致命的な増大する EM インテリジェンス能力</b></p> <p>仏軍は 2005 年以来現在まで4機のマイクロサテライトのコンスタレーションからなる Essaim 電磁波監視デモ機を運用している。</p> <p><b>ELISA</b> は 2010 年初頭に <b>Essaim</b> を引き継ぐ。</p> <p><b>Essaim</b> と <b>ELISA</b> は効果的運用に先立つデモ機であるが、後継の <b>CERES</b> は軍隊への十分な作戦的能力を提供できるものとなるうし、通信機能と共に性能が飛躍的に向上したレーダ検知性能を提供する。</p> <p><b>宇宙安全保障の収束点： 3つの優先事項</b></p> <p>2007 年に宇宙を国家と市民の安全保障をサポートするのに利用するスタディが CNES、仏軍事民事ユーザ</p>	<p><b>Helios s image intelligence successor for 2015</b></p> <p>The Helios 2B satellite will launch in March 2009 and join its stable mate Helios 2A, in orbit since late 2004. To assure continued service capacity, the two spacecraft will need to be replaced by 2015.</p> <p>DGA has appointed CNES to conduct the study into Helios s successor: the optical space component of the European <b>MUSIS</b> system. The first part of Phase A feasibility study was completed in September 2007 and was followed by interim studies to optimize the system (image quality, diameter of optics, orbital altitude, etc.), through to mid-2008. Phase B preliminary definition will kick off in early 2009.</p> <p>The likely configuration is a system of three identical satellites in two different orbits: a high orbit (around 800 km) for reconnaissance and a low orbit (in the order of 500 km) for identification.</p> <p>In addition, the French defence authorities are working with CNES to investigate the best way to continue the 2D and 3D wide-field mapping mission of the SPOT satellites once they have reached the end of their orbital lifetime. Due to their narrower field of view, the Helios and future Pleiades satellites will not be able to fully meet this requirement. Various solutions based on European collaboration (most notably with Spain) or on private European systems are under consideration.</p> <p><b>Vital and growing EM intelligence capabilities</b></p> <p>The French military is currently operating the Essaim electromagnetic surveillance capability demonstrator, comprising a constellation of four microsattellites, in service since 2005. The results to date have clearly proven the potential of this type of system. The microsattellites will be progressively incorporated into the broader military intelligence capability, primarily to locate and characterize radar sources.</p> <p><b>ELISA</b> will succeed <b>Essaim</b> in early 2010. This new system will enable monitoring of a broader radio frequency spectrum with greater sensitivity and better radar location accuracy. The <b>ELISA</b> constellation also four satellites is being developed jointly by CNES and DGA.</p> <p>While <b>Essaim</b> and <b>ELISA</b> are effectively pre-operational demonstrators, their successor <b>CERES</b> will be provide a fully operational capability for the armed forces, offering enhanced radar detection performance as well as communication functions. <b>CERES</b> is planned as part of a joint European programme slated for approval under the next five-year defence spending plan.</p> <p><b>Space-security convergence: three priorities</b></p> <p>In 2007, studies into the utilization of space to support the security of nations and citizens continued apace, in close collaboration between CNES, the French military</p>
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<p>(各地域の県、民間防衛/保護機関、海事機関などの緊密な連携が進められた。</p> <p>海洋開発と沿岸の住民とともに海洋の安全保障の懸念は世界貿易の90%に達する。</p> <p>関心地域(沿岸地域、自然と工業的危険の地域、重要なインフラ、その他 EU の利益にからむ重要地域等)の監視は一般的な安全保障と自然と工業的人道的あるいはテロの危険に直面している中で安全保障を保証することを目指す。</p> <p>宇宙システムの安全保障は広い範囲の政治と技術的論議の議題である。</p> <p>これら最初の2つの領域は欧州の第7回 R&amp;D のフレームワーク・プログラムの優先事項に含まれている。</p>	<p>and civil users (local prefectures, directorate of civil defence and protection, directorate of maritime affairs, etc.). Three priority areas in which space can make a significant contribution to security have been identified:</p> <p>Maritime safety and security concerns 90% of world trade, as well as ocean exploitation and coastal populations. Satellite- based radar detection capabilities, automatic identification systems (recording of automatic ship identification signals) and data collection and communication systems provide these critical services beyond the effective range of shore-based facilities (currently 30 to 100 nm from shore, up to 200 nm with next-generation systems).</p> <p>Surveillance of areas of interest (coastal areas, natural and industrial hazard areas, critical infrastructure, other sensitive areas due to EU interests, etc.) aims to guarantee security in general and security of supply in the face of natural, industrial, humanitarian or terrorist hazards. In these areas, space technologies allow rapid mapping of any point on the globe and support higher levels of vigilance.</p> <p>Space system security is the subject of wide political and technological debate. In 2007, consensus was reached on the need to begin work towards a European space surveillance system as soon as possible. The objective is to gather data to complement the information provided by the United States databases on hazardous objects in Earth orbit and thus enhance accuracy. This will allow Europe s commercial and institutional satellites to perform avoidance manoeuvres when necessary (between 0.5 and 1.0 times per year per satellite on average) and with greater precision.</p> <p>These first two areas are included as priorities in Europe s 7<sup>th</sup> Framework Programme for R&amp;D. ESA is studying the issue of space surveillance. A proposed European programme could be approved in 2008.</p>
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**Long-standing ties with the military**

<p>CNES の防衛チームは CNES 理事長、参謀長補佐、仏統合幕僚の計画及び仏装備庁長官補佐からなるハイレベル委員会の監督下にある。</p>	<p>CNES s Defence team is overseen by a high-level committee comprising the CNES President, the Deputy Chief of Staff, Plans of the Joint Staff of the French armed forces, and the Deputy Director of the French defence procurement agency DGA. In addition, CNES is part of the Space Coordination Group (GCE). Led by the Joint Staff, the GCE includes the various entities that use space for security and defence purposes in order to build strategy for future space programmes.</p> <p>This partnership is governed by the CNES/DGA framework agreement of January 2005 and by the Government/CNES multi-year agreement (2005-10), which outlines France s strategic security and defence objectives and corresponding resources. Under these agreements, the French defence authorities have appointed CNES to design and develop the space segments for such programmes as ELISA and <b>MUSIS</b>, among others.</p>
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