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A dual launch for Brazil and the British MoD

Arianespace will boost two satellites into orbit on its fifth launch of the year: the Skynet 5B military communications satellite for the British Ministry of Defence (MoD), through the Astrium company Paradigm and the Star One C1 commercial communications satellite for Brazilian operator Star One, as part of a turnkey contract with Thales Alenia Space.

The latest Ariane launch clearly reflects the strategic importance of Arianespace, which guarantees independent access to space for European governments. Arianespace continues to set the global standard in launch services for all communications operators, whether civil or military.

Skynet 5B will be launched on behalf of Astrium, which is delivering the satellite in orbit to Paradigm. Paradigm offers secure communications services for British armed forces, NATO and other countries that already use Skynet "milsatcom" satellites, including the Skynet 5A satellite launched by Ariane in March 2007. Built by Astrium, using a Eurostar E3000 platform Skynet 5B will weigh about 4,700 kg at launch.

Ariane has already orbited Skynet 4B, 4C, 4E, 4F and 5A for the British MoD and NATO. Arianespace's backlog of orders still includes one more MoD satellite, Skynet 5C.

Skynet 5B is the European launcher's 27th military payload.

Star One C1 will be the seventh Brazilian satellite to use Ariane. Star One is the largest regional satellite service operator in Latin America. Arianespace has one more satellite to be launched for the Brazilian operator, Star One C2.

The Star One C1 satellite was built by Thales Alenia Space using a Spacebus 3000/B3 platform. Weighing about 4,100 kg at launch, it will be positioned at 65 degrees West. Star One C1 is fitted with 28 C-band, 14 Ku-band transponders and 1 X-band transponder, and will provide communications, multimedia and broadband Internet services for South America.

The Ariane 5 launcher fairing bears the inscription «Toulouse 2013 – Capitale européenne de la culture –candidate», as part of the Community of Ariane Cities initiative.

Follow the launch live on the internet broadband
at www.arianespace.com
(starting 20 minutes before lift-off)

1. Mission profile

The 179th Ariane launch will orbit two satellites: the Skynet 5B for Paradigm which provides military communications services to the British Ministry of Defense, and the Star One C1 commercial communications satellite for Brazilian operator Star One.

This will be the 35th Ariane 5 launch.

The launcher will be carrying a total payload of 9,535 kg, including 8,735 kg for the two satellites, which will be released separately into their targeted orbits.

The launch will be from Ariane Launch Complex No. 3 (ELA 3) in Kourou, French Guiana.

Injection orbit

Perigee altitude	***250 km***
Apogee altitude	***35 786 km at injection***
Inclination	***6° degrees***

The lift-off is scheduled on the night of November 9 to 10, 2007 as soon as possible within the following launch window:

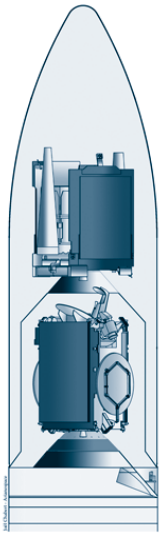
Launch opportunity

	Universal time (GMT)	*Paris time*	*Washington time*	*Kourou time*	*Rio de Janeiro time*
Between	*10:04 pm*	*11:04 pm*	*5:04 pm*	*7:04 pm*	*8:04 pm*
and	*10:59 pm*	*11:59 pm*	*5:59 pm*	*7:59 pm*	*8:59 pm*
on	*November 9, 2007*	*November 9, 2007*	*November 9, 2007*	*November 9, 2007*	*November 9, 2007*

Configuration of Ariane payload

The Skynet 5B satellite was built by Astrium. for Paradigm which provides services to the British Ministry of Defence (MoD).
Orbital position: 53° East.

The Star One C1 satellite was built by Thales Alenia Space, for Brazilian operator Star One.
Orbital position: 65° West



2. Range operations campaign: ARIANE 5 - SKYNET 5B/STAR ONE C1

Satellites and launch vehicle campaign calendar

Ariane activities	*Dates*	*Satellites activities*
Campaign start review	*September 7, 2007*	
EPC Erection	*September 7, 2007*	
EAP transfer and positionning	*September 10, 2007*	
Integration EPC/EAP	*September 11, 2007*	
	September 19, 2007	*Arrival in Kourou and begining of SKYNET 5B preparation campaign in building S1 B*
ESC-A Erection	*September 26, 2007*	
	October 2, 2007	*Arrival in Kourou and begining of STAR ONE C1 preparation campaign in building S1 B*
	October 8-12, 2007	*SKYNET 5B filling operations in S5A building*
Roll-out from BIL to BAF	*October 22, 2007*	
	October 22-24, 2007	*STAR ONE C1 operations in S5B building*

Satellites and launch vehicle campaign final calendar

J-11	*Wednesday, Ocober 24*	*SKYNET 5B integration on adaptor (ACU)*
J-10	*Thursday, Ocober 25*	*SKYNET 5B transfer to Final Assembly Building (BAF)*
J-9	*Friday, Ocober 26*	*SKYNET 5B integration on Sylda and STAR ONE C1 integration on adaptor*
J-8	*Monday, Ocober 29*	*Fairing integration on Sylda - STAR ONE C1 transfer to Final Assembly Building (BAF)*
J-7	*Thuesday, Ocober 30*	*STAR ONE C1 integration on launcher*
J-6	*Wednesday, Ocober 31*	*Upper composite integration with SKYNET 5B on launcher*
J-5	*Friday, November 2*	*ESC-A final preparations and payloads control*
J-4	*Monday, November 5*	*Launch rehearsal*
J-3	*Thursday, November 6*	*Arming of launch vehicle*
J-2	*Wednesday, November 7*	*Launch readiness review (RAL) and final preparation of launcher*
J-1	*Thursday, November 8*	*Roll-out from BAF to Launch Area (ZL), launch vehicle connections and filling of the EPC liquid Helium sphere*
J-0	*Friday, November 9*	*Launch countdown including EPC and ESC-A filling with liquid oxygen and liquid hydrogen*

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3. Launch countdown and flight events

The countdown comprises all final preparation steps for the launcher, the satellites and the launch site. If it proceeds as planned, the countdown leads to the ignition of the main stage engine, then the two boosters, for a liftoff at the targeted time, as early as possible in the satellites launch window.
The countdown culminates in a synchronized sequence (see appendix 3), which is managed by the control station and onboard computers starting at T-7 minutes.
If an interruption in the countdown means that T-0 falls outside the launch window, then the launch will be delayed by one, two or more days, depending on the problem involved, and the solution developed.

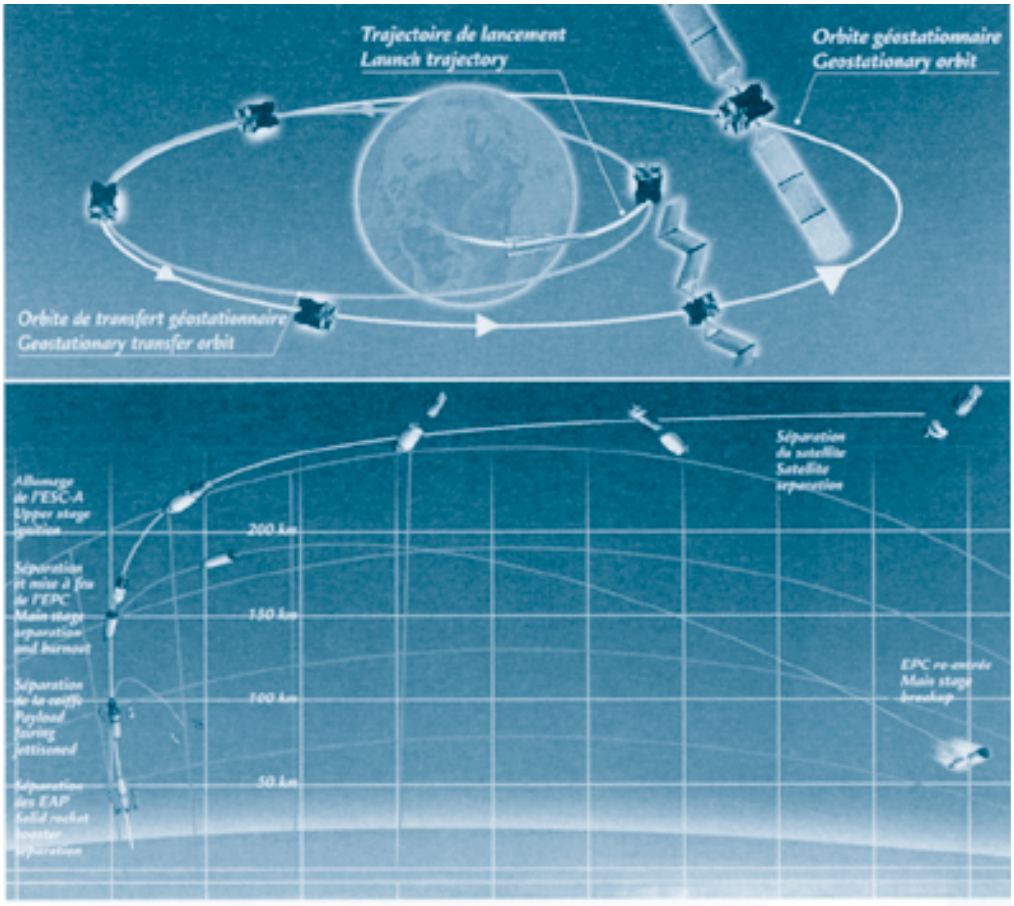
Time		*Events*
– 11 h	*30 mn*	*Start of final countdown*
– 7 h	*30 mn*	*Check of electrical systems*
– 4 h	*50 mn*	*Start of filling of main cryogenic stage with liquid oxygen and hydrogen*
– 3 h	*20 mn*	*Chilldown of Vulcain main stage engine*
– 1 h	*10 mn*	*Check of connections between launcher and telemetry, tracking and command systems*
	– 7 mn 00 s	*"All systems go" report, allowing start of synchronized sequence*
	– 4 mn 00 s	*Tanks pressurized for flight*
	– 1 mn 00 s	*Switch to onboard power mode*
	- 05,5 s	*Command issued for opening of cryogenic arms*
	– 04 s	*Onboard systems take over*
	– 03 s	*Unlocking of guidance systems to flight mode*

HO	*Ignition of the cryogenic main stage engine (EPC)*		*ALT (km)*	*V. rel. (m/s)*
	+ 7,0 s	*Ignition of solid boosters*	*0*	*0*
	+ 7,3 s	*Liftoff*	*0*	*0*
	+ 12,5 s	*End of vertical climb and beginning of pitch rotation (10 seconds duration)*	*0.091*	*37*
	+ 17 s	*Beginning of roll manoeuvre*	*0.332*	*74*
+ 2 mn	*19 s*	*Jettisoning of solid boosters*	*65.5*	*1989*
+ 3 mn	*10 s*	*Jettisoning of fairing*	*105.5*	*2206*
+ 7 mn	*29 s*	*Acquisition by Natal tracking station*	*171.0*	*4945*
+ 8 mn	*58 s*	*Shut-down of main cryogenic stage*	*168.0*	*6886*
+ 9 mn	*04 s*	*Separation of main cryogenic stage*	*168.2*	*6912*
+ 9 mn	*08 s*	*Ignition of upper cryogenic stage (ESC-A)*	*168.3*	*6914*
+ 13 mn	*39 s*	*Acquisition by Ascension tracking station*	*155.3*	*7580*
+ 18 mn	*18 s*	*Acquisition by Libreville tracking station*	*182.2*	*8312*
+ 23 mn	*18 s*	*Acquisition by Malindi tracking station*	*437.8*	*9105*
+ 24 mn	*56 s*	*Shut-down of ESC-A / Injection*	*626.1*	*9377*
+ 27 mn	*12 s*	*Separation of SKYNET 5B satellite*	*958.1*	*9102*
+ 29 mn	*23 s*	*Separation of Sylda 5*	*1348.4*	*8797*
+ 33 mn	*47 s*	*Separation of STAR ONE C1 satellite*	*2292.6*	*8137*
+ 45 mn	*29 s*	*End of Arianespace Flight mission*	*5223.1*	*6578*

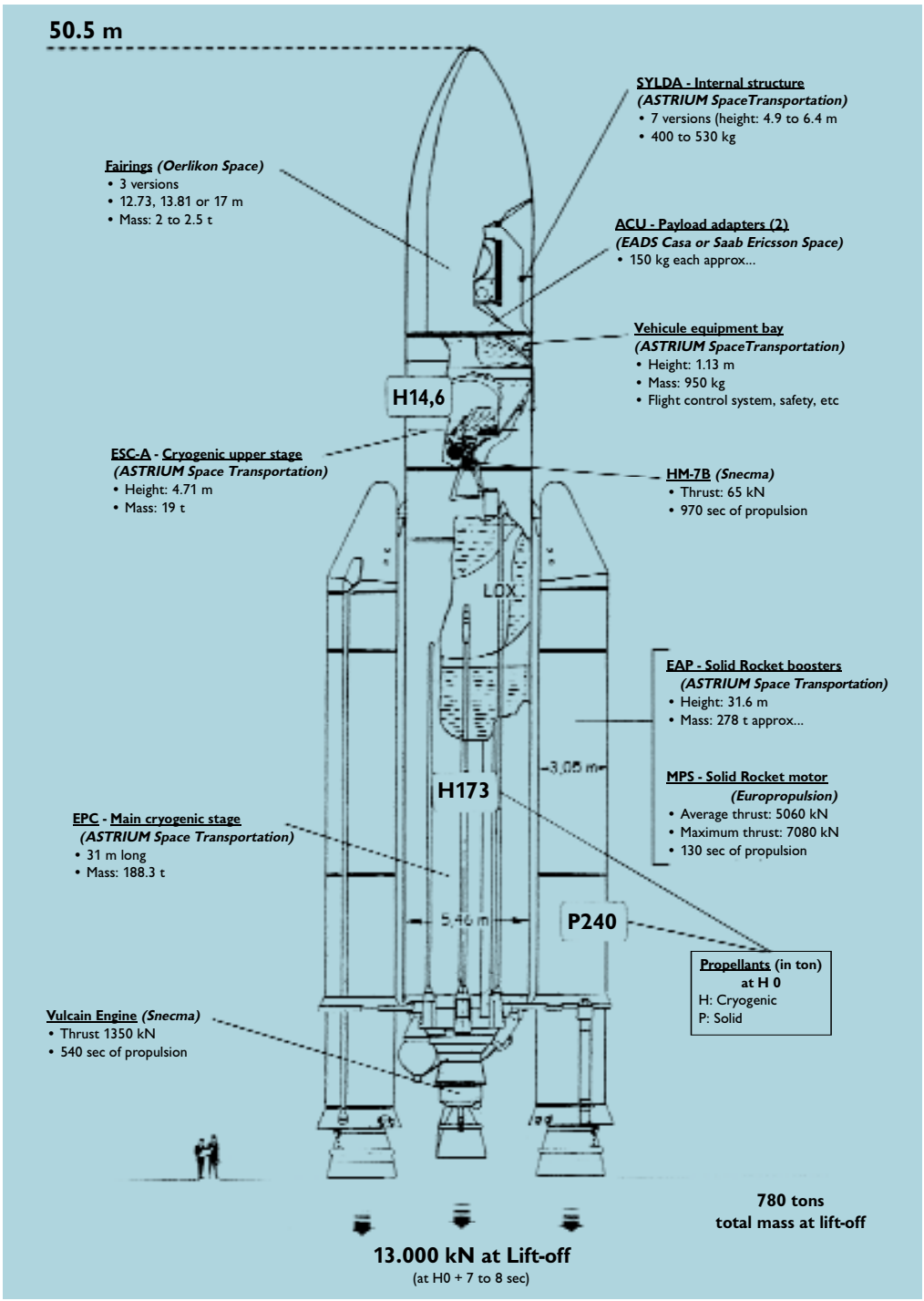
4. Flight trajectory of SKYNET 5B/STAR ONE C1

The launcher's attitude and trajectory are totally controlled by the two onboard computers, located in the Ariane 5 vehicle equipment bay (VEB).
7.05 seconds after ignition of the main stage cryogenic engine at T-0, the two solid-propellant boosters are ignited, enabling liftoff. The launcher first climbs vertically for 6 seconds, then rotates towards the East. It maintains an attitude that ensures the axis of the launcher remains parallel to its velocity vector, in order to minimize aerodynamic loads throughout the entire atmospheric phase, until the solid boosters are jettisoned.
Once this first part of the flight is completed, the onboard computers optimize the trajectory in real time, minimizing propellant consumption to bring the launcher first to the intermediate orbit targeted at the end of the main stage propulsion phase, and then the final orbit at the end of the flight of the cryogenic upper stage.
The main stage falls back off the coast of Africa in the Atlantic Ocean (in the Gulf of Guinea).
On orbital injection, the launcher will have attained a velocity of approximately 9377 meters/second, and will be at an altitude of about 626 kilometers.
The fairing protecting the SKYNET 5B/STAR ONE C1 spacecraft is jettisoned shortly after the boosters are jettisoned at about T+190 seconds.

Standard Ariane 5 trajectory for geostationary transfer orbit



5. The Ariane 5-ECA (Industrial prime contractor: ASTRIUM SpaceTransportation)



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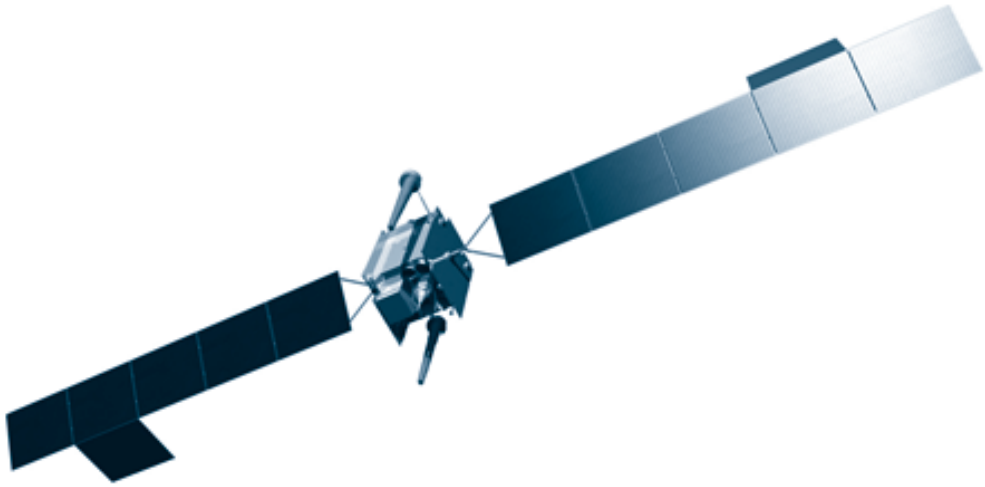
6. The SKYNET 5B satellite



Customer	Astrium for Paradigm	
Prime contractor	*Astrium services*	
Mission	*Secure military communications*	
Mass	*Total mass at lift-off*	*4 635 kg*
Stabilization	*3 axis stabilized*	
Dimensions	*4.5 x 2.9 x 3.7 m*	
Span in orbit	*34 m*	
Platform	*EUROSTAR E3000*	
On-board power	*> 6 kW (end of life)*	
Life time	*15 years*	
Orbital position	*53° Est*	

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7. The STAR ONE C1 satellite

Customer	**Thales Alenia Space for Star One**	
Prime contractor	*Thales Alenia Space*	
Mission	*Telecommunications, multimedia and Internet*	
Mass	*Total mass at lift-off*	*4 100 kg*
	Dry mass	*1 750 kg*
Stabilization	*3 axis stabilized*	
Dimensions	*4.0 x 3.2 x 2.4 m*	
Span in orbit	*22.4 m*	
Platform	*Spacebus 3000 B3*	
Payload	*28 C band transponders, 14 Ku band transponders, 1 X band transponder*	
On-board power	*10 500 W (beginning of life)*	
Life time	*15 years*	
Orbital position	*65° West*	
Coverage area	*South America*	

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Appendix 1. Arianespace SKYNET 5B & STAR ONE C1 launch key personnel

In charge of the launch campaign			
Mission Director	*(CM)*	*Daniel MURE*	*ARIANESPACE*
In charge of the launch service contract			
Ariane Payload Manager	*(RCUA)*	*Alexandre MADEMBA-SY*	*ARIANESPACE*
Ariane Deputy Mission Manager	*(RCUA/A)*	*Michael CALLARI*	*ARIANESPACE*
In charge of SKYNET 5B satellite			
Program Director	*(CU)*	*Patrick WOOD*	*PARADIGM*
Satellite Mission Director	*(DMS)*	*Alan WHYTE*	*ASTRIUM*
Satellite Program Director	*(CPS)*	*Rick GREENWOOD*	*PARADIGM*
Satellite Preparation Manager	*(RPS)*	*Philippe GREMILLON*	*ASTRIUM*
In charge of STAR ONE C1 satellite			
Satellite Mission Director	*(DMS)*	*Jean POURRAT*	*THALES ALENIA SPACE*
Satellite Program Manager	*(CPS)*	*Marcelo LAVRADO*	*STAR ONE*
Satellite Preparation Manager	*(RPS)*	*Pierre-Jean MONICAT*	*THALES ALENIA SPACE*
In charge of the launch vehicle			
Launch Site Operations Manager	*(COEL)*	*Christian LARDOT*	*ARIANESPACE*
Ariane Production Project Manager	*(CPAP)*	*Roland LAGIER*	*ARIANESPACE*
In charge of the Guiana Space Center (CSG)			
Range Operations Manager	*(DDO)*	*Emmanuel SANCHEZ*	*CNES/CSG*
Flight Safety Officer	*(RSV)*	*Stéphane LOUVEL*	*CNES/CSG*

Appendix 2. Launch environment conditions

Acceptable wind speed limits at lift-off range from between 7.5 m/s to 9.5 m/s according to the wind direction. The most critical is a northerly wind. For safety reasons, the wind's speed on the ground (Kourou), and at a high altitude (between 10,000 and 20,000 m) is also taken into account.

Appendix 3. The synchronized sequence

The synchronized sequence starts 7 mn beforre ignition (T-0), it is primarily designed to perform the final operations on the launcher prior to launch, along with the ultimate checks needed following switchover to flight configuration. As its name indicates, it is fully automatic, and is performed concurrently by the onboard computer and by two reduntant computers at the ELA 3 launch complex until T-4 seconds.

The computers command the final electrical operations (startup of the flight program, servocontrols, switching from ground power supply to onboard batteries, etc.) and associated checks. They also place the propellant and fluid systems in flight configuration and perform associated checks. In addition, it handles the final ground system configurations, namely:

- Startup of water injection in the flame trenches and jet guide (T-30 sec).
- Hydrogen aspiration for chilldown of the Vulcain engine in the jet guide (T-18 sec).
- Burnoff of hydrogen used for chilldown (T-5.5 sec).

At T-4 seconds, the onboard computer takes over control of final engine startup and lift-off operations:

- It starts the ignition sequence for the Vulcain main stage engine (T-0).
- It checks engine operation (from T+4.5 to T+7.3 sec).
- It commands ignition of the solid boosters for immediate lift-off at T+7.3 seconds.

Any shutdown of the synchronized sequence after T-7 mn automatically places the launcher back in its T-7 min configuration.

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Appendix 4. Arianespace and the Guiana Space Center

Arianespace was founded in 1980 as the world's first launch Service & Solutions company. Today, Arianespace has 23 shareholders from ten European countries (including French space agency CNES with 34%, EADS with 30%, and all European companies participating in the construction of Ariane launchers).
Since the outset, Arianespace has signed 290 launch contracts and launched 246 satellites. More than two-thirds of the commercial satellites now in service worldwide were launched by Arianespace.
The company posted sales of 983 million euros in 2006, and stayed in the black for the fourth year in a row.
At January 1, 2007, Arianespace had 271 employees, working at the company's headquarters in Evry (near Paris), the Guiana Space Center in French Guiana, where the Ariane, Soyuz and Vega launch pads are located, and offices in Washington, D.C., Tokyo and Singapore.
Arianespace offers launch Service & Solutions to satellite operators from around the world, including private companies and government agencies. These Service & Solutions call on three launch vehicles:
• The Ariane 5 heavy launcher, operated from the Guiana Space Center in Kourou, French Guiana.
• The Soyuz medium launcher. Currently in operation at the Baikonur Cosmodrome in Kazakhstan under the responsibility of Starsem, a Euro-Russian subsidiary of Arianespace, it will be launched from the Guiana Space Center starting in 2009.
• The Vega light launcher, to be launched from the Guiana Space Center starting in 2009.
Arianespace has also signed a mutual backup agreement with Boeing Launch Services and Mitsubishi Heavy Industries, through an entity called the Launch Services Alliance. This arrangement guarantees that customers' payloads will be launched in case the chosen launcher is unavailable for technical reasons.
With its family of launchers and this backup agreement, Arianespace won over half of the commercial launch contracts up for bid worldwide in the last two years. Arianespace now has a backlog of 44 satellites to be launched, as well as four more launches to be handled by Starsem.

The Guiana Space Center: Europe's Spaceport
For over 30 years, the Guiana Space Center (CSG), Europe's Spaceport in French Guiana, has offered a complete array of facilities for rocket launches.
It mainly comprises the following:
• CNES/CSG technical center, including various resources and facilities that are critical to launch bas operation, such as radars, telecom network, weather station, receiving sites for launcher telemetry, etc.
• Payload processing facilities (ECPU), in particular the S5 facility.
• Ariane launch complexes (ELA), comprising the launch zone and launcher integration buildings.
• Various industrial facilities, including those operated by Regulus, Europropulsion, Air Liquide Spacial Guyane and EADS, which contribute to the production of Ariane 5 elements. A total of 40 European manufacturers and local companies are involved in operations.
The Guiana Space Center is preparing to welcome two new launch vehicles, Soyuz and Vega. The Soyuz launch complex (ELS) and the Vega launch complex (SLV) are now under construction.
Europe's commitment to independent access to space is based on actions by three key players: the European Space Agency (ESA), French space agency CNES and Arianespace.
ESA has helped change the role of the Guiana Space Center, in particular by funding the construction of the launch complexes, payload processing buildings and associated facilities. Initially used for the French space program, the Guiana Space Center has gradually become Europe's own spaceport, according to the terms of an agreement between ESA and the french government.
To ensure that the Spaceport is available for its programs, ESA takes charge of the lion's share of CNES/CSG fixed expenses, and also helps finance the fixed costs for the ELA launch complexes.
French space agency CNES plays several roles at the Space Center.
• It designs all infrastructures and, on behalf of the French government, is responsible for safety and security.
• It provides the resources needed to prepare the satellites and launcher for missions.
Whether during tests or actual launches, CNES is also responsible for overall coordination of operations. It collects and processes all data transmitted from the launcher via a network of receiving stations, to track Ariane rockets throughout their trajectory.
In French Guiana, Arianespace is the contracting authority in charge of operating the family of three launchers, Ariane, Soyuz and Vega.
Arianespace supervises the integration and functional checks of the Ariane launcher, built by EADS Astrium as production prime contractor, in the Launcher Integration Building (BIL). It then carries out acceptance tests of the launcher at the same time as satellite preparations in the Payload Preparation Complex (EPCU), operated by the Guiana Space Center (CSG). Arianespace next oversees final assembly of the launcher and integration of satellites in the Final Assembly Building (BAF), followed by transfer of the launcher to Launch Zone No. 3 (ZL3), and then final countdown and liftoff from Launch Complex No. 3 (CDL3).
Arianespace has created a top-flight team and array of technical resources to get launchers and satellites ready for their missions. Building on this unrivalled expertise and outstanding local facilities, Arianespace is now the undisputed benchmark in the global launch services market.