A launch for science

For its second launch of the year, Arianespace will orbit two scientific satellites for the European Space Agency: the Herschel space telescope and the Planck scientific observatory.

The two satellites are being launched towards the Lagrange Point (L2), once again demonstrating the operational capabilities of Ariane 5. This is the only launch vehicle on the commercial market today capable of launching two payloads simultaneously, and handling a complete array of missions, from commercial launches into geostationary orbit, to scientific missions into special orbits.

ESA's selection of Ariane 5 also confirms Arianespace's position as the benchmark provider of launch Service & Solutions, guaranteeing independent access to space for everybody in the space industry, including national and international agencies, private and government operators.

Herschel space telescope: A follow-on to the ISO (Infrared Space Observatory) program, the Herschel space telescope has two main objectives: observation of the "cold" Universe, in particular the formation of stars and galaxies; and studying the chemical composition of celestial bodies and the molecular chemistry of the Universe. Herschel's mirror, at 3.5 meters in diameter, will be the largest ever deployed in space. The spacecraft will weigh about 3,400 kg at launch.

Planck scientific satellite: The Planck scientific observatory is designed to analyze the remnants of the radiation that filled the Universe immediately after the Big Bang, which we observe today as the cosmic microwave background. Planck will provide vital information concerning the creation of the Universe and the origins of the cosmic structure. It will weigh 1,920 kg at launch.

The Herschel space telescope and the Planck scientific observatory were both built by Thales Alenia Space.

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

1. Mission profile

The 188th Ariane mission will launch two scientific satellites for the European Space Agency (ESA): the Herschel space telescope and the Planck scientific observatory.

This will be the 44th Ariane 5 launch.

The launcher will be carrying a total payload of 6,001 kg, including 5,322 kg for the two satellites, which will be released separately into their targeted orbit.

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

Injection orbit

Perigee altitude	**270 km**
Apogee altitude	**1 193 622 km at injection**
Inclination	**6° degrees**

The lift-off is scheduled on the day of May 14, 2009 as soon as possible within the following launch window:

Launch opportunity

	Universal time (GMT)	*Paris time*	*Kourou time*	*Washington time*	*Moscow time*
Between	*1:12 pm*	*3:12 pm*	*10:12 am*	*09:12 am*	*5:12 pm*
and	*2:07 pm*	*4:07 pm*	*11:07 am*	*10:07 am*	*6:07 pm*
on	*May 14, 2009*	*May 14, 2009*	*May 14, 2009*	*May 14, 2009*	*May 14, 2009*

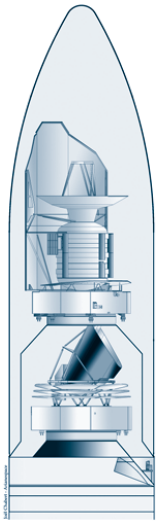
Configuration of Ariane payload

The Herschel space telescope was built by Thales Alenia Space for the European Space Agency (ESA).

Satellite position : Lagrange Point (L2)

The Planck scientific observatory was built by Thales Alenia Space for the European Space Agency (ESA).

Satellite position : Lagrange Point (L2)



2. Range operations campaign: ARIANE 5 - HERSCHEL & PLANCK

Satellites and launch vehicle campaign calendar

Ariane activities	*Dates*	*Satellites activities*
Campaign start review	*February 5, 2009*	
EPC Erection	*February 5, 2009*	
EAP transfer and positionning	*February 5-6, 2009*	
Integration EPC/EAP	*February 9, 2009*	
ESC-A and VEB Erection	*February 11, 2009*	
	February 11, 2009	*Arrival in Kourou of HERSCHEL and beginning of preparation campaign in building S1 B*
	February 18, 2009	*Arrival in Kourou of PLANCK and beginning of preparation campaign in building S5 B*
Roll-out from BIL to BAF	*March 9, 2009*	
	April 9-10, 2009	*HERSCHEL filling operations in S5 A building*
	April 15-16, 2009	*PLANCK operations in S5 B building*

Satellites and launch vehicle campaign final calendar

J-12	*Tuesday, April 21*	*PLANCK transfer to Final Assembly Building (BAF)*
J-11	*Wednesday, April 22*	*PLANCK integration on launcher*
J-10	*Monday, April 27*	*Sylda integration on launcher*
J-9	*Wednesday, April 29*	*HERSCHEL transfer to the BAF*
J-8	*Thursday, April 30*	*HERSCHEL integration on Sylda*
	Friday, May 1	*Start of HERSCHEL filling operations with liquid helium (on launcher)*
J-7	*Tuesday, May 5*	*HERSCHEL filling operations with liquid helium*
J-6	*Wednesday, May 6*	*HERSCHEL filling operations with liquid helium*
J-5	*Thursday, May 7*	*Launch rehearsal & HERSCHEL filling operations with liquid helium*
	Saturday, May 9	*Launch Readiness Review (RAL). End of HERSCHEL filling operations with liquid helium*
J-4	*Sunday, May 10*	*Fairing Integration*
J-3	*Monday, May 11*	*Arming of launch vehicle & final preparation of launcher*
J-2	*Tuesday, May 12*	*Arming of launch vehicle & final preparation of launcher* *Final Launch Readiness Review (RAL)*
J-1	*Wednesday, May 13*	*HERSCHEL final preparation before final chronology* *Roll-out from BAF to Launch Area (ZL) & launch vehicle connections* *Filling of the EPC liquid helium sphere*
J-0	*Thursday, May 14*	*Launch countdown including EPC and ESC-A filling with liquid oxygen and liquid hydrogen*

3. Launch countdown and flight events

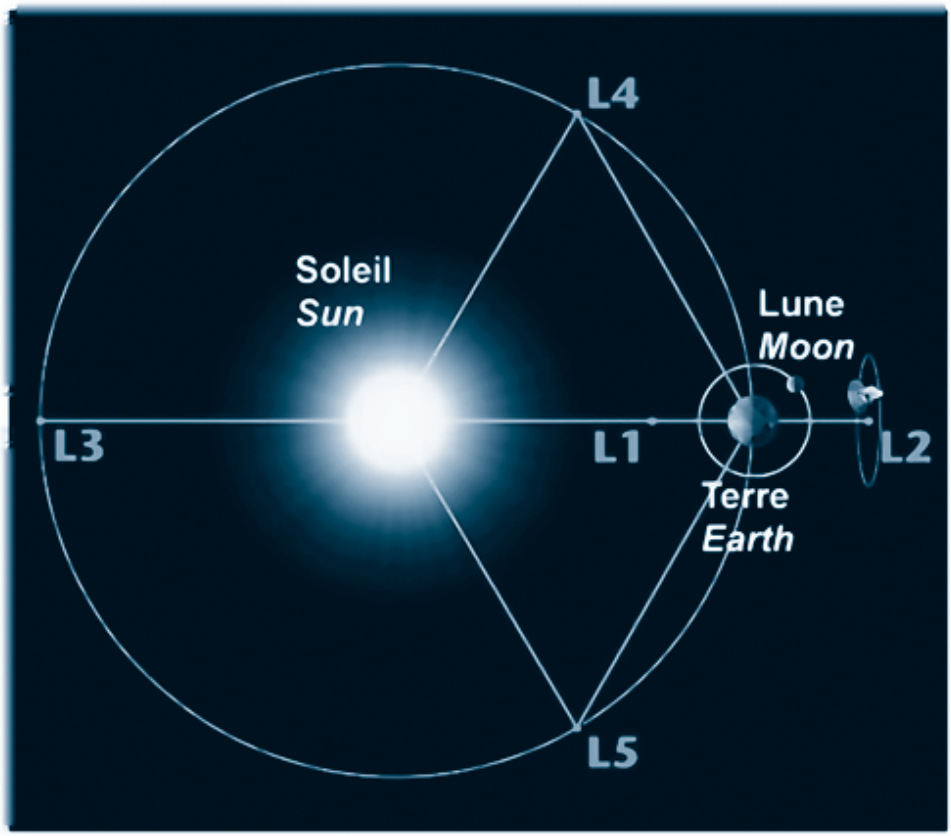
The countdown comprises all final preparation steps for the launcher, the satellites and the launch site. If it proceeds as planned, the countdown leads to the ignition of the main stage engine, then the two boosters, for a liftoff at the targeted time, as early as possible in the satellites launch window.
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)*	*0.087*	*37*
	+ 17 s	*Beginning of roll manoeuvre*	*0.338*	*75*
+ 2 mn	*18 s*	*Jettisoning of solid boosters*	*68.2*	*2008*
+ 4 mn	*03 s*	*Jettisoning of fairing*	*145.3*	*2508*
+ 6 mn	*57 s*	*Acquisition by Natal tracking station*	*217*	*4448*
+ 8 mn	*55 s*	*Shut-down of main cryogenic stage*	*214.5*	*7032*
+ 9 mn	*01 s*	*Separation of main cryogenic stage*	*213.1*	*7062*
+ 9 mn	*05 s*	*Ignition of upper cryogenic stage (ESC-A)*	*211.9*	*7066*
+ 13 mn	*46 s*	*Acquisition by Ascension tracking station*	*158*	*7920*
+ 17 mn	*48 s*	*Acquisition by Libreville tracking station*	*209.4*	*8675*
+ 22 mn	*25 s*	*Acquisition by Malindi tracking station*	*534*	*9505*
+ 24 mn	*29 s*	*Shut-down of ESC-A / Injection*	*852.4*	*9967*
+ 25 mn	*58 s*	*Separation of HERSCHEL satellite*	*1142.2*	*9798*
+ 27 mn	*24 s*	*Separation of Sylda 5*	*1479.6*	*9576*
+ 28 mn	*29 s*	*Separation of PLANCK satellite*	*1722.8*	*9423*
+ 48 mn	*10 s*	*End of Arianespace Flight mission*	*7826.3*	*6984*

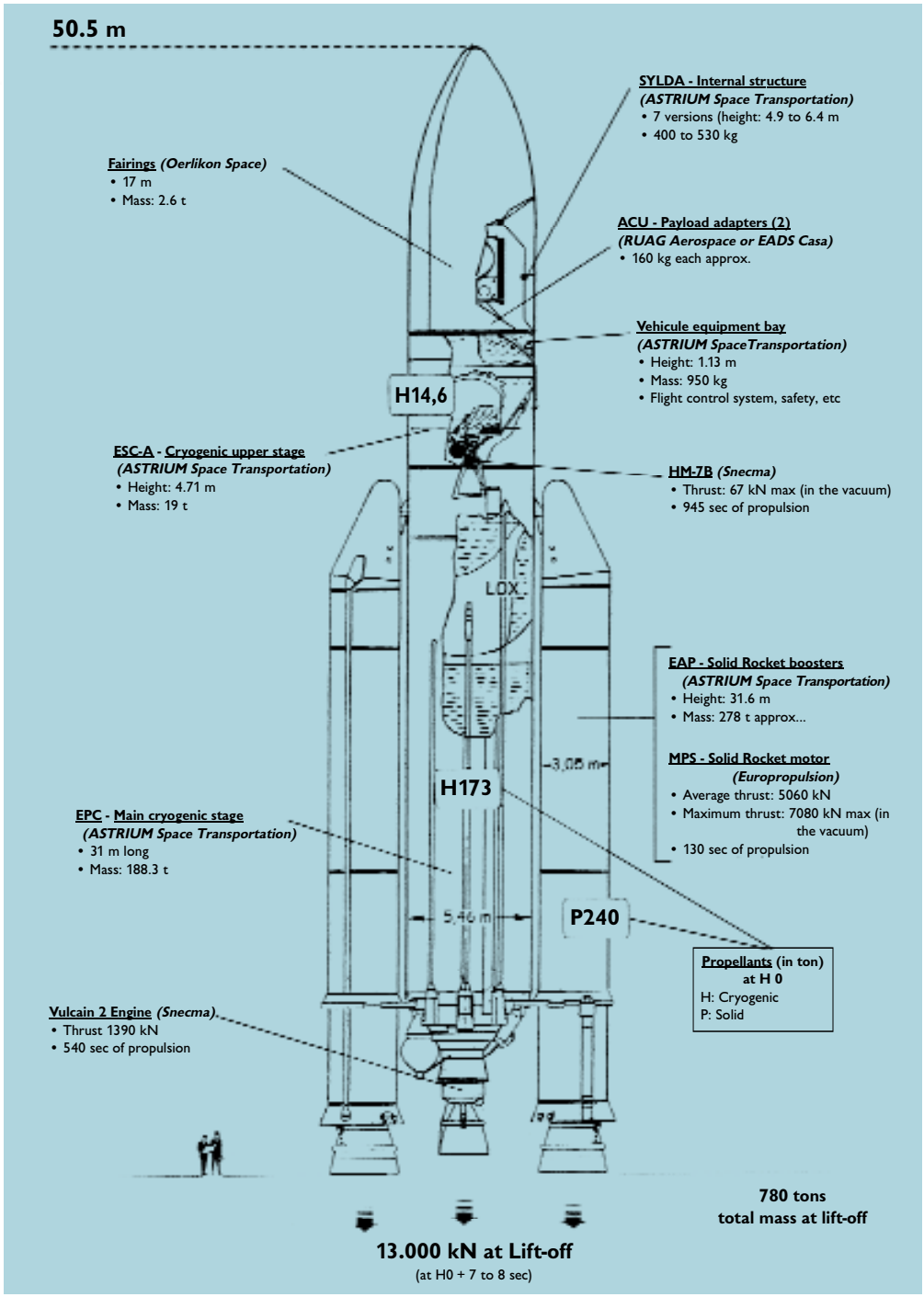
4. Flight trajectory of HERSCHEl & PLANCK

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 9967 meters/second, and will be at an altitude of about 852 kilometers.
The fairing protecting the HERSCHEL, PLANCK spacecraft is jettisoned shortly after the boosters are jettisoned at about T+243 seconds.

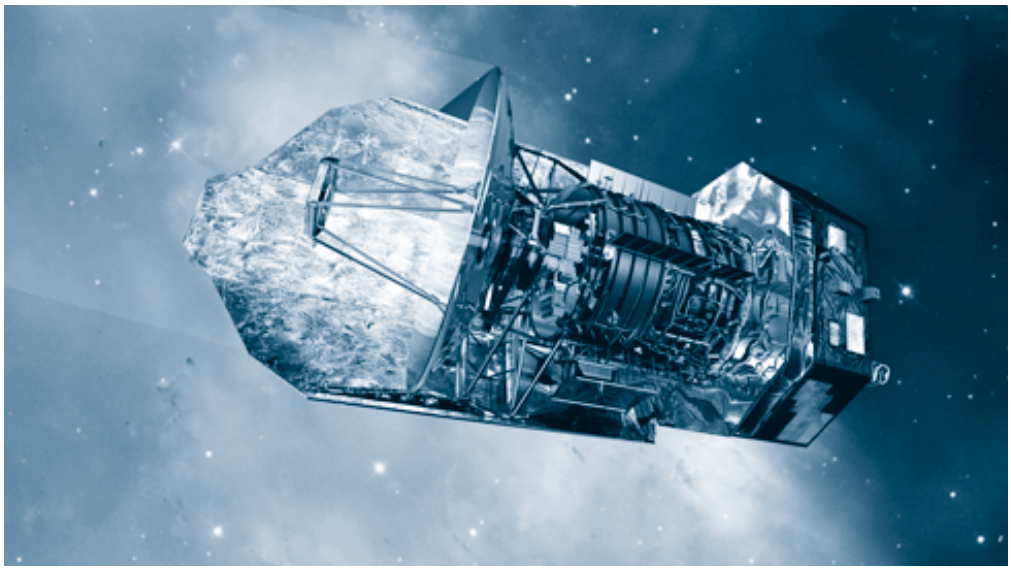


L2 = Point de Lagrange 2
L2 = Lagrange Point 2

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



6. The HERSCHEL satellite



Customer	**ESA, EUROPEAN SPACE AGENCY**
Prime contractor	*Thales Alenia Space*
Mission	*Observation of the « cold » Universe, study of the chemical composition of the atmosphere around celestial bodies and the molecular chemistry of the Universe.*
Mass	*Total mass at lift-off 3.402 kg*
Stabilization	*3 axis stabilized*
Dimensions	*7.5 m (Height)* *4.5 m (Diameter)*
Payload	A telescope of 3,5 m of diameter A superfluid helium cryostat (2K) containing the 3 instruments, PACS, SPIRE and HIFI
On-board power	*1 450 W (end of life)*
Life time	*3.5 years*
Orbital position	*L2 Lagrange Point*

Press Contact:
ESA Media Relations Office
Tel: +33 1 5369 7155 - Fax : +33 1 5369 7690
e-mail: media@esa.int

7. The PLANCK satellite

Customer	ESA, EUROPEAN SPACE AGENCY
Prime contractor	*Thales Alenia Space*
Mission	*To study the origins of the Universe by observing the Cosmic Microwave Background (CBM)*
Mass	*Total mass at lift-off* *1.921 kg*
Stabilization	*Spin (1rpm)*
Dimensions	*4.2 m (Height)* *4.2 m (Diameter)*
Payload	*1 telescope and 2 scientific instruments (HFI and LFI)*
On-board power	*1 816 W (end of life)*
Life time	*21 months*
Orbital position	*L2 Lagrange Point*

Press Contact:
ESA Media Relations Office
Tel: +33 1 5369 7155 - Fax : +33 1 5369 7690
e-mail: media@esa.int

Appendix 1. Arianespace HERSCHEL & PLANCK launch key personnel

In charge of the launch campaign			
Mission Director	*(CM)*	*Philippe ROLLAND*	*ARIANESPACE*
In charge of the launch service contract			
Ariane Payload Manager	*(RCUA)*	*Luca CHIECCHIO*	*ARIANESPACE*
Ariane Deputy Mission Manager	*(RCUA/A)*	*Patrick LOIRE*	*ARIANESPACE*
In charge of HERSCHEL satellite			
Satellite Mission Director	*(DMS)*	*Thomas PASSVOGEL*	*ESA*
Satellite Mission Deputy Director	*(DMS/A)*	*Flemming PEDERSEN*	*ESA*
Satellite Program Manager	*(CPS)*	*Ulrich GAGEUR*	*ESA*
Satellite Preparation Manager	*(RPS)*	*Yvan ROCHE*	*TAS*
In charge of PLANCK satellite			
Satellite Mission Director	*(DMS)*	*Thomas PASSVOGEL*	*ESA*
Satellite Mission Deputy Director	*(DMS/A)*	*Flemming PEDERSEN*	*ESA*
Satellite Program Manager	*(CPS)*	*Osvaldo PIERSANTI*	*ESA*
Satellite Preparation Manager	*(RPS)*	*Norbert SIVIELLE*	*TAS*
In charge of the launch vehicle			
Launch Site Operations Manager	*(COEL)*	*Jean-Pierre BARLET*	*ARIANESPACE*
Ariane Production Project Manager	*(CPAP)*	*Didier AUBIN*	*ARIANESPACE*
In charge of the Guiana Space Center (CSG)			
Range Operations Manager	*(DDO)*	*Thierry VALLEE*	*CNES/CSG*
Range Operations Deputy	*(DDO/A)*	*Damien SIMON*	*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.

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 more than 300 launch contracts and launched 267 satellites. More than two-thirds of the commercial satellites now in service worldwide were launched by Arianespace.
The company posted sales of 955,7 million euros in 2008, and stayed in the black for the fifth year in a row.
At January 1, 2009, Arianespace had 309 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 end of 2009.
- The Vega light launcher, to be launched from the Guiana Space Center starting in 2010.

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 more than 40 satellites to be launched.

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.