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A dual launch for direct-to-home TV broadcasting

Arianespace will boost two direct TV broadcast satellites into orbit on its fourth launch of the year: ProtoStar 1 for American operator ProtoStar Ltd. and BADR-6 for Middle-East operator Arabsat.

The choice of Arianespace by major satellite communications operators and manufacturers is clear international recognition of the company's top-quality launch services.

Ariane 5 is the only commercial launcher in service today capable of simultaneously launching two payloads.

The innovative ProtoStar I satellite will bring high-definition direct-to-home TV transmissions as well as broadband Internet to the entire Southeast Asian region.

ProtoStar I was built by Space Systems/Loral in Palo Alto, California, using an FS1300 platform. Fitted with 16 Ku-band transponders and 38 C-band transponders, ProtoStar 1 will be positioned at 98.5 degrees East. It will weigh approximately 4,200 kg at launch.

ProtoStar I will be the 33rd Space Systems/Loral satellite to be launched by Arianespace.

BADR-6 will be the sixth Arabsat satellite to be launched by Arianespace.

BADR-6 was jointly built by EADS Astrium and Thales Alenia Space using a Eurostar 2000+ platform. Weighing about 3,400 kg at launch, it is equipped with 24 C-band and 20 Ku-band transponders. It is designed to provide direct TV broadcasting services for the entire Middle East and North Africa from its orbital position at 26 degrees East. Along with other satellites in the Badr constellation, BADR-6 will provide direct TV broadcasts to more than 130 million TV viewers stretching from Morocco to the Persian Gulf, and over a large part of sub-Saharan Africa.

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

1. Mission profile

The 184th Ariane mission will launch two satellites: the ProtoStar 1 high-definition direct broadcast satellite for new operator ProtoStar Ltd. and the BADR-6 direct broadcast satellite for operator Arabsat.

This will be the 40th Ariane 5 launch.

The launcher will be carrying a total payload of 8,639 kg, including 7,537 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	***35 922 km at injection***
Inclination	***2° degrees***

The lift-off is scheduled on the night of July 4 to 5, 2008 as soon as possible within the following launch window:

Launch opportunity

	Universal time (GMT)	*Paris time*	*Riyad time*	*Kourou time*	*Washington time*
Between	*09:47 pm*	*11:47 pm*	*12:47 am*	*6:47 pm*	*5:47 pm*
and	*10:21 pm*	*00:21 am*	*01:21 am*	*7:21 pm*	*6:21 pm*
on	*July 4, 2008*	*July 4-5, 2008*	*July 5, 2008*	*July 4, 2008*	*July 4, 2008*

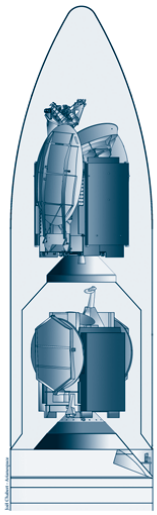
Configuration of Ariane payload

The ProtoStar 1 satellite was built by Space Systems/Loral for the operator ProtoStar.

Orbital position : 98.5° East

The BADR-6 satellite was built jointly by EADS Astrium and Thales Alenia Space for the operator Arabsat.

Orbital position: 26° East.



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2. Range operations campaign: ARIANE 5 - PROTOSTAR I & BADR-6

Satellites and launch vehicle campaign calendar

Ariane activities	*Dates*	*Satellites activities*
Campaign start review	*May 13, 2008*	
EPC Erection	*May 13, 2008*	
EAP transfer and positionning	*May 15, 2008*	
Integration EPC/EAP	*May 15, 2008*	
ESC-A and VEB Erection	*May 20, 2008*	
	May 26, 2008	*Arrival in Kourou of PROTOSTAR I and beginning of preparation campaign in building S5 C*
	May 28, 2008	*Arrival in Kourou of BADR-6 and beginning of preparation campaign in building S5 C*
	June 13 & 16, 2008	*BADR-6 filling operations in S5 A building*
Roll-out from BIL to BAF	*June 19, 2008*	
	June 16 & 19, 2008	*PROTOSTAR I operations in S5 B building*

Satellites and launch vehicle campaign final calendar

J-11	*Friday, June 20*	*PROTOSTAR I integration on adaptor (ACU)*
J-10	*Saturday, June 21*	*PROTOSTAR I transfer to Final Assembly Building (BAF)*
J-9	*Monday, June 23*	*PROTOSTAR I integration on Sylda and B A D R - 6 integration on adaptor*
J-8	*Tuesday, June 24*	*Fairing integration on Sylda - BADR-6 transfer to Final Assembly Building (BAF)*
J-7	*Wednesday, June 25*	*BADR-6 integration on launcher*
J-6	*Friday, June 27*	*Upper composite integration with PROTOSTAR I on launcher*
J-5	*Saturday, June 28*	*ESC-A final preparations and payloads control*
J-4	*Monday, June 30*	*Launch rehearsal*
J-3	*Tuesday, July 1*	*Arming of launch vehicle*
J-2	*Wednesday, July 2*	*Launch readiness review (RAL) and final preparation of launcher*
J-1	*Thursday, July 3*	*Roll-out from BAF to Launch Area (ZL), launch vehicle connections and filling of the EPC liquid Helium sphere*
J-0	*Friday, July 4*	*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.

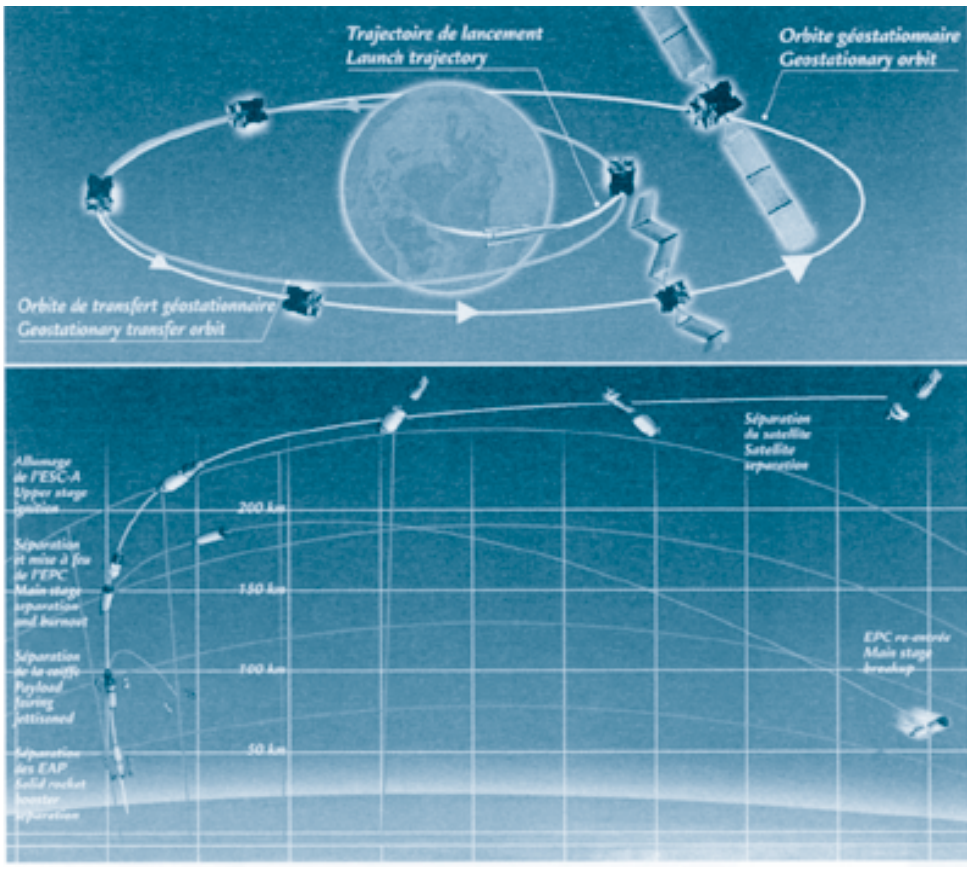
Time		*Events*
– 11 h	*30 mn*	*Start of final countdown*
– 7 h	*30 mn*	*Check of electrical systems*
– 4 h	*50 mn*	*Start of filling of main cryogenic stage with liquid oxygen and hydrogen*
– 3 h	*20 mn*	*Chilldown of Vulcain main stage engine*
– 1 h	*10 mn*	*Check of connections between launcher and 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)*	*0.084*	*36*
	+ 17 s	*Beginning of roll manoeuvre*	*0.333*	*74*
+ 2 mn	*20 s*	*Jettisoning of solid boosters*	*65.7*	*1975*
+ 3 mn	*15 s*	*Jettisoning of fairing*	*105.1*	*2208*
+ 7 mn	*36 s*	*Acquisition by Natal tracking station*	*164.6*	*5075*
+ 8 mn	*57 s*	*Shut-down of main cryogenic stage*	*163.0*	*6889*
+ 9 mn	*02 s*	*Separation of main cryogenic stage*	*163.3*	*6915*
+ 9 mn	*07 s*	*Ignition of upper cryogenic stage (ESC-A)*	*163.5*	*6917*
+ 13 mn	*24 s*	*Acquisition by Ascension tracking station*	*164.4*	*7501*
+ 18 mn	*14 s*	*Acquisition by Libreville tracking station*	*201.5*	*8293*
+ 23 mn	*18 s*	*Acquisition by Malindi tracking station*	*475 .4*	*9116*
+ 24 mn	*55 s*	*Shut-down of ESC-A / Injection*	*643.7*	*9363*
+ 27 mn	*37 s*	*Separation of PROTOSTAR I satellite*	*1058.5*	*9019*
+ 29 mn	*17 s*	*Separation of Sylda 5*	*1358.0*	*8787*
+ 35 mn	*39 s*	*Separation of BADR-6 satellite*	*2773.7*	*7835*
+ 45 mn	*40 s*	*End of Arianespace Flight mission*	*5305.7*	*6538*

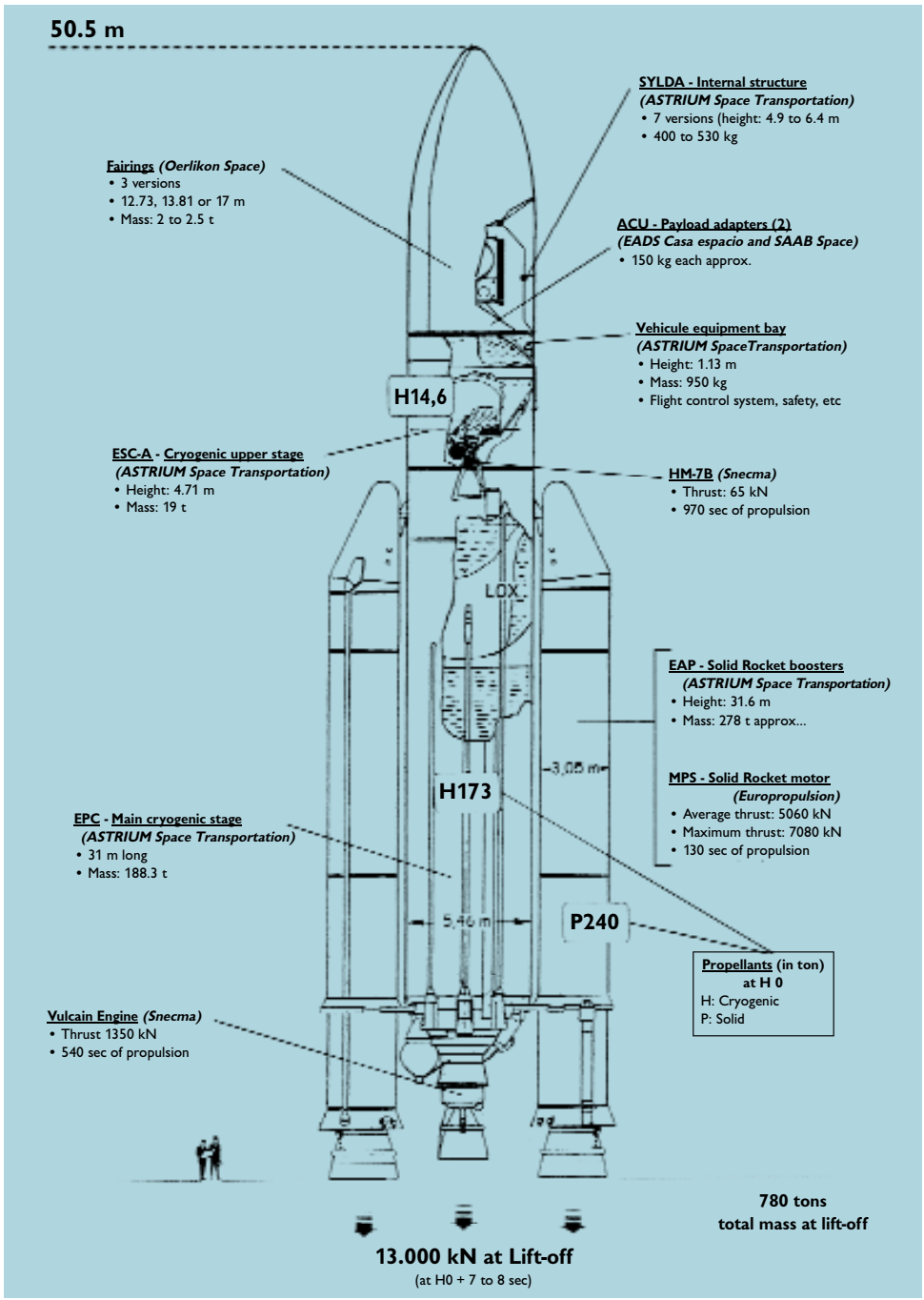
4. Flight trajectory of PROTOSTAR I & BADR-6

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 9363 meters/second, and will be at an altitude of about 644 kilometers.
The fairing protecting the PROTOSTAR I & BADR-6 spacecraft is jettisoned shortly after the boosters are jettisoned at about T+195 seconds.

Standard Ariane 5 trajectory for geostationary transfer orbit



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



6. The PROTOSTAR I satellite

Customer	ProtoStar Ltd	
Prime contractor	*Space Systems Loral (SS/Loral)*	
Mission	*High Definition TV and broadband Internet*	
Mass	*Total mass at lift-off*	*4,191 kg*
	Dry mass	*1,774 kg*
Stabilization	*3 axis stabilized*	
Dimensions	*3.8 x 2.4 x 2.1 m*	
Span in orbit	*31.1 m*	
Platform	*FS 1300*	
Payload	16 Ku-band transponders and 32 C-band transponders,	
On-board power	*7 730 W (beginning of life)*	
Life time	*15 years*	
Orbital position	*98.5° East*	
Coverage area	*South East Asia, India*	

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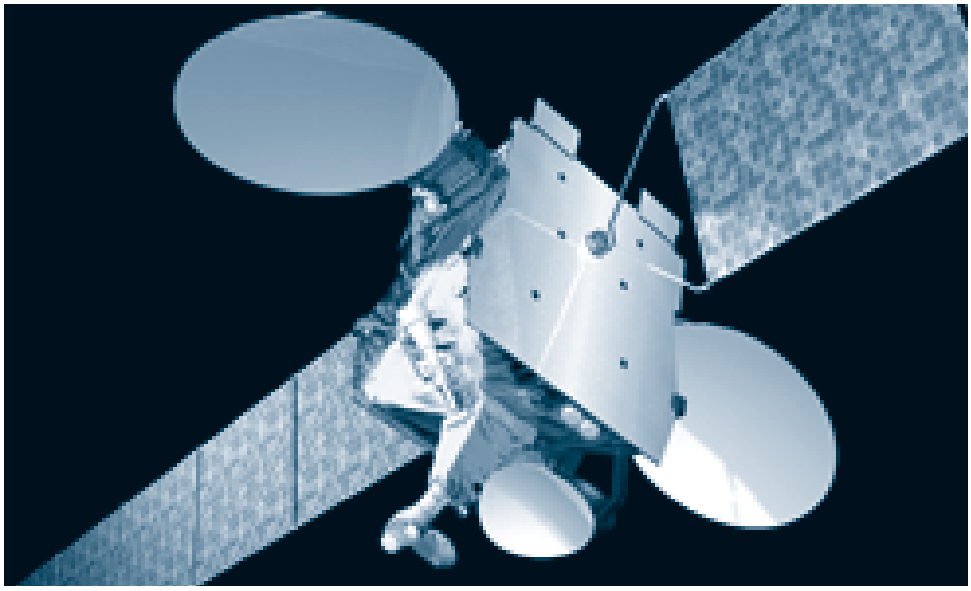
7. The BADR-6 satellite



Customer	**ARABSAT**	
Prime contractor	*Astrium*	
Mission	*Telecommunications, multimedia and Internet*	
Mass	*Total mass at lift-off*	*3,346 kg*
	Dry mass	*1,510 kg*
Stabilization	*3 axis stabilized*	
Dimensions	*2.9 x 1.75 x 2.5 m*	
Span in orbit	*32 m*	
Platform	*Eurostar 2000 +*	
Payload	*20 Ku band transponders and 24 C band transponders*	
On-board power	*7 800 W (beginning of life)*	
Life time	*15 years*	
Orbital position	*26° East*	
Coverage area	*Middle East, Persian Gulf Countries, Sub-saharan Africa*	

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Appendix 1. Arianespace PROTOSTAR I & BADR-6 launch key personnel

In charge of the launch campaign			
Mission Director	*(CM)*	*Thierry WILMART*	*ARIANESPACE*
In charge of the launch service contract			
Ariane Payload Manager	*(RCUA)*	*Jérôme RIVES*	*ARIANESPACE*
Ariane Deputy Mission Manager	*(RCUA/A)*	*Michael CALLARI*	*ARIANESPACE*
In charge of* PROTOSTAR I *satellite			
Satellite Mission Director	*(DMS)*	*Graig GAVIN*	*PROTOSTAR*
Satellite Program Manager	*(CPS)*	*Eric ELLER*	*SS/LORAL*
Satellite Preparation Manager	*(RPS)*	*Roy CARLISLE*	*SS/LORAL*
In charge of* BADR-6 *satellite			
Satellite Mission Director	*(DMS)*	*Adulhal ALHASSANI*	*ARABSAT*
Satellite Program Manager	*(CPS)*	*Serge GUENASSIA*	*ASTRIUM*
Satellite Preparation Manager	*(RPS)*	*Stéphane REYNAL*	*ASTRIUM*
In charge of the launch vehicle			
Launch Site Operations Manager	*(COEL)*	*Daniel GROULT*	*ARIANESPACE*
Ariane Production Project Manager	*(CPAP)*	*Pierre-Yves TISSIER*	*ARIANESPACE*
In charge of the Guiana Space Center (CSG)			
Range Operations Manager	*(DDO)*	*Emmanuel SANCHEZ*	*CNES/CSG*
Range Operations Deputy	*(DDO/A)*	*Thierry VALLEE*	*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 296 launch contracts and launched 259 satellites. More than two-thirds of the commercial satellites now in service worldwide were launched by Arianespace.
The company posted sales of more than 900 million euros in 2007, and stayed in the black for the fifth year in a row.
At January 1, 2008, Arianespace had 292 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 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.