arianespace
Service & Solutions

Launch services for United States and Japan

For its third launch of the year, Arianespace will orbit two telecommunications satellites: SPACEWAY 3 for US operator Hughes Network Systems, LLC and BSAT-3a for US manufacturer Lockheed Martin Commercial Space Systems, within the framework of a turnkey contract for Japanese operator Broadcasting Satellite System Corporation (B-SAT).

Ariane 5 is the only operational launcher in the commercial market capable of launching two payloads simultaneously. With a capacity of nearly 10 tons injected into geostationary transfer orbit, the Ariane 5 ECA provides Arianespace clients with even greater performance, flexibility and competitiveness, backed by the world's best launch service.

SPACEWAY 3 is a Ka-band satellite to be operated by Hughes Network Systems, LLC (Hughes) of the US. This spacecraft will be used to provide a new and exciting range of satellite broadband services to enterprises, government, and consumers throughout North America. Its innovative design includes onboard dynamic multibeam switching to deliver bandwidth on demand and direct site-to-site mesh networking. With SPACEWAY 3, Hughes is entering a new era as a satellite operator, strengthening its global leadership in providing broadband satellite networks and services.
Built by Boeing Satellites Systems, Inc. in El Segundo, California, SPACEWAY 3 has a liftoff mass of approximately 6,075 kg.

BSAT-3a was built by Lockheed Martin Commercial Space Systems at its Newtown, Pennsylvania plant, using an A2100 A platform. With a mass at liftoff of 1,980 kg, it will be positioned at 110 degrees East longitude and has a design life in excess of 13 years.
Equipped with twelve 130-watt Ku-band channels, eight operating at one time, BSAT-3a is optimized to provide direct TV links for the entire Japanese archipelago from its geostationary orbit.
BSAT-3a is the sixth satellite launched for B-SAT Corporation by the European launcher and the 38th Lockheed Martin launched by Arianespace.

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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 177th Ariane will orbit two telecommunications satellites: SPACEWAY 3 for US operator Hughes Network Systems, LLC, and BSAT-3a for US manufacturer Lockheed Martin Commercial Space Systems within the framework of a turnkey contract for Japanese operator Broadcasting Satellite System Corporation (B-SAT).

This will be the 33rd launch of an Ariane 5 rocket.

The launcher lift performance for this flight is 8,848 kg, of which 8,042 kg is the weight of the satellites to be put into their respective 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	***2° degrees***

The lift-off is scheduled on the night of August 14 to 15, 2007 as soon as possible within the following launch window:

Launch opportunity

	Universal time (GMT)	*Paris time*	*Washington time*	*Kourou time*	*Tokyo time*
Between	*11:44 pm*	*01:44 am*	*7:44 pm*	*8:44 pm*	*8:44 am*
and	*00:21 am*	*02:21 am*	*8:21 pm*	*9:21 pm*	*9:21 am*
on	*August 14/15, 2007*	*August 15, 2007*	*August 14, 2007*	*August 14, 2007*	*August 15, 2007*

Configuration of Ariane payload

The SPACEWAY 3 satellite was built by Boeing Satellites Systems, Inc. in El Segundo, California for US operator Hughes Network Systems, LLC (Hughes).
Satellite position: 95° West

The BSAT-3a satellite was built by Lockheed Martin Commercial Space Systems (LMCSS) at Newtown, Pennsylvania (United States) for Japanese operator Broadcasting Satellite System Corporation (B-SAT).
Satellite position: 110° East.

2. Range operations campaign: ARIANE 5 - SPACEWAY 3/BSAT-3a

Satellites and launch vehicle campaign calendar

Ariane activities	*Dates*	*Satellites activities*
Campaign start review	*June 25, 2007*	
EPC Erection	*June 25, 2007*	
EAP transfer and positionning	*June 26, 2007*	
Integration EPC/EAP	*June 27, 2007*	
ESC-A Erection	*July 3, 2007*	
Integration equipement bay	*July 4, 2007*	
	July 10, 2007	*Arrival in Kourou and begining of SPACEWAY 3 preparation campaign in building S1 B*
	July 12, 2007	*Arrival in Kourou and begining of BSAT-3a preparation campaign in building S5 C*
Roll-out from BIL to BAF	*July 25, 2007*	
	July 24-26, 2007	*SPACEWAY 3 filling operations in S5A building*
	July 25-27, 2007	*BSAT-3a filling operations in S5B building*

Satellites and launch vehicle campaign final calendar

J-10	*Monday, July 30*	*SPACEWAY 3 integration on adaptor (ACU)*
J-9	*Tuesday, July 31*	*SPACEWAY 3 transfer to Final Assembly Building (BAF)*
J-8	*Wednesday, August 1*	*SPACEWAY 3 integration on Sylda and BSAT-3a integration on adaptor*
J-7	*Thursday, August 2*	*Fairing integration on Sylda - BSAT- 3a transfer to Final Assembly Building (BAF)*
J-6	*Friday, August 3*	*BSAT- 3a integration on launcher*
J-5	*Monday, August 6*	*Upper composite integration with SPACEWAY 3 on launcher*
J-4	*Tuesday, August 7*	*ESC-A final preparations and payloads control*
J-3	*Wednesday, August 8*	*Launch rehearsal*
J-3 bis	*Thursday, August 9*	*Arming of launch vehicle*
J-2	*Friday, August 10*	*Launch readiness review (RAL) and final preparation of launcher*
J-1	*Monday, August 13*	*Roll-out from BAF to Launch Area (ZL), launch vehicle connections and filling of the EPC liquid Helium sphere*
J-0	*Tuesday, August 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.

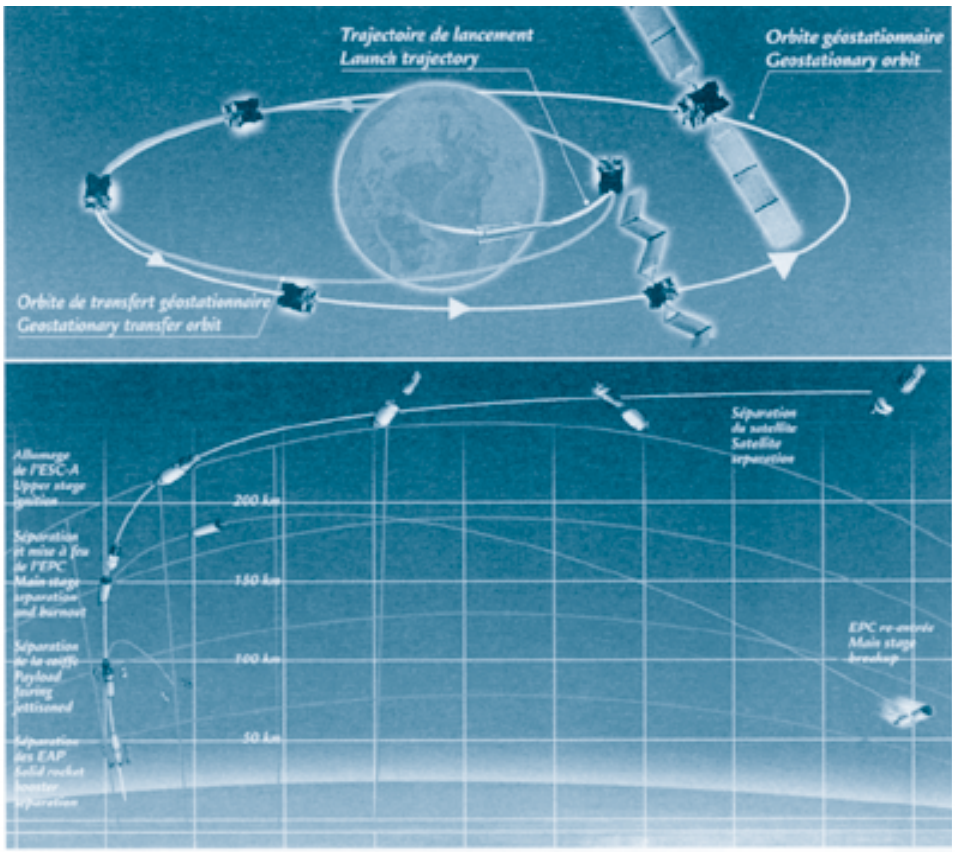
Time		*Events*
– 11 h	*30 mn*	*Start of final countdown*
– 7 h	*30 mn*	*Check of electrical systems*
– 4 h	*50 mn*	*Start of filling of main cryogenic stage with liquid oxygen and hydrogen*
– 3 h	*20 mn*	*Chilldown of Vulcain main stage engine*
– 1 h	*10 mn*	*Check of connections between launcher and 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)*	*0.082*	*36*
	+ 17 s	*Beginning of roll manoeuvre*	*0.332*	*74*
+ 2 mn	*20 s*	*Jettisoning of solid boosters*	*66.8*	*1950*
+ 3 mn	*09 s*	*Jettisoning of fairing*	*105.0*	*2173*
+ 7 mn	*27 s*	*Acquisition by Natal tracking station*	*177.2*	*4958*
+ 8 mn	*57 s*	*Shut-down of main cryogenic stage*	*175.5*	*6875*
+ 9 mn	*03 s*	*Separation of main cryogenic stage*	*175.7*	*6902*
+ 9 mn	*07 s*	*Ignition of upper cryogenic stage (ESC-A)*	*175.8*	*6904*
+ 13 mn	*25 s*	*Acquisition by Ascension tracking station*	*170.1*	*7535*
+ 18 mn	*18 s*	*Acquisition by Libreville tracking station*	*186.1*	*8307*
+ 23 mn	*20 s*	*Acquisition by Malindi tracking station*	*414.6*	*9194*
+ 24 mn	*52 s*	*Shut-down of ESC-A / Injection*	*557.5*	*9435*
+ 27 mn	*38 s*	*Separation of SPACEWAY 3 satellite*	*950.0*	*9154*
+ 32 mn	*06 s*	*Separation of Sylda 5*	*1814.5*	*8537*
+ 34 mn	*10 s*	*Separation of BSAT-3a satellite*	*2261.6*	*8253*
+ 47 mn	*32 s*	*End of Arianespace Flight mission*	*5651.1*	*6603*

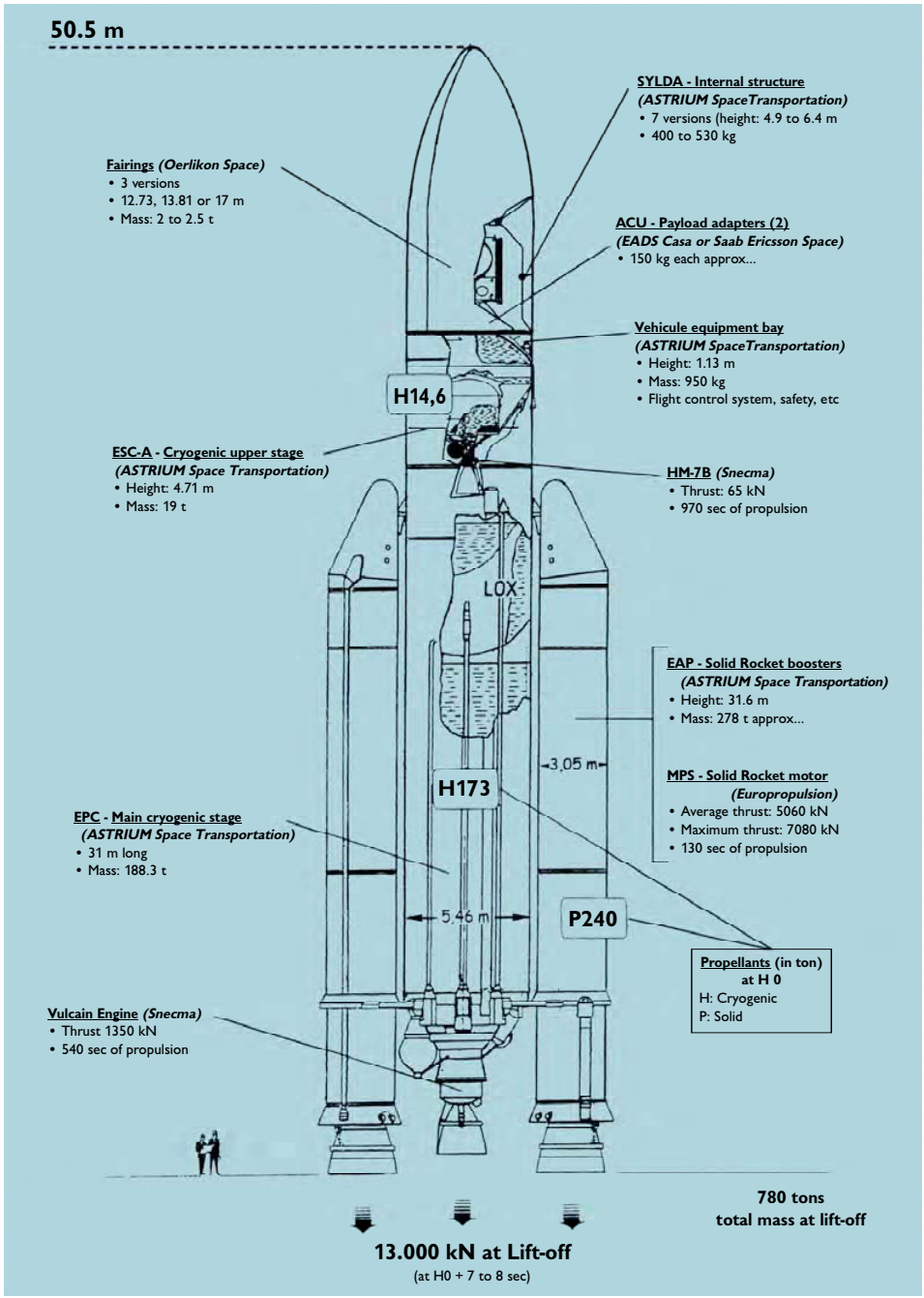
4. Flight trajectory

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 9435 meters/second, and will be at an altitude of about 557 kilometers.
The fairing protecting the SPACEWAY 3/BSAT-3a spacecraft is jettisoned shortly after the boosters are jettisoned at about T+189 seconds.

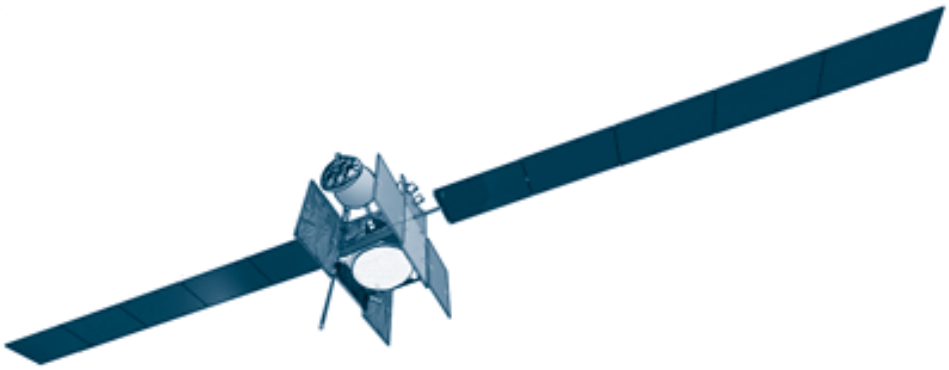
Standard Ariane 5 trajectory for geostationary transfer orbit



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



6. The SPACEWAY 3 satellite



Customer	**HUGHES NETWORK SYSTEMS, LLC**	
Prime contractor	*Boeing Satellite Systems, Inc.*	
Mission	*Telecommunications*	
Mass	*Total mass at lift-off*	*6 075 kg*
	Dry mass	*3 655 kg*
Stabilization	*3 axis stabilized*	
Dimensions	*5.1 x 3.2 x 3.4 m*	
Span in orbit	*40.9 m*	
Platform	*BSS 702 - 2000*	
Payload	*Digital Signal Processor with 10Gbps router*	
On-board power	*12.8 KW (end of life)*	
Life time	*+12 years*	
Orbital position	*95° West*	
Coverage area	*Conus, Alaska, Hawaï*	

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7. The BSAT-3a satellite

Customer	***LOCKHEED MARTIN COMMERCIAL SPACE SYSTEMS (USA) for B-SAT Corporation (JAPAN)***	
Prime contractor	*LMCSS*	
Mission	*Direct to Home television satellite*	
Mass	*Total mass at lift-off*	*1 980 kg*
	Dry mass	*927 kg*
Stabilization	*3 axis stabilized*	
Dimensions	*3.8 x 1.9 x 1.9 m*	
Span in orbit	*14.65 m*	
Platform	*A2100 A*	
Payload	*12 130-watt Ku band channels, 8 operating at one time*	
On-board power	*2,8 KW (end of life)*	
Life time	*+13 years*	
Orbital position	*110° East*	
Coverage area	*Japan*	

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Appendix 1. Arianespace SPACEWAY 3/BSAT-3a 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)*	*Jérôme RIVES*	*ARIANESPACE*
Ariane Deputy Mission Manager	*(RCUA/A)*	*Michael CALLARI*	*ARIANESPACE*
In charge of SPACEWAY 3 satellite			
Satellite Mission Director	*(DMS)*	*Bob BUSCHMAN*	*HNS*
Satellite Program Manager	*(CPS)*	*Mark SMITH/Christina MARAGAY*	*BSSI*
Satellite Preparation Manager	*(RPS)*	*Anthony RAINEY*	*BSSI*
In charge of BSAT-3a satellite			
Satellite Mission Director	*(DMS)*	*Joe PULKOWSKI*	*LMCSS*
Satellite Program Manager	*(CPS)*	*George BUSACCA*	*LMCSS*
Satellite Preparation Manager	*(RPS)*	*Rick HEGG*	*LMCSS*
In charge of the launch vehicle			
Launch Site Operations Manager	*(COEL)*	*Daniel GROULT*	*ARIANESPACE*
Ariane Production Project Manager	*(CPAP)*	*Denis SCHMITT*	*ARIANESPACE*
In charge of the Guiana Space Center (CSG)			
Range Operations Manager	*(DDO)*	*Bruno GILLES/Emmanuel SANCHEZ*	*CNES/CSG*
Flight Safety Officer	*(RSV)*	*Fleur LEFEVRE*	*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 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.