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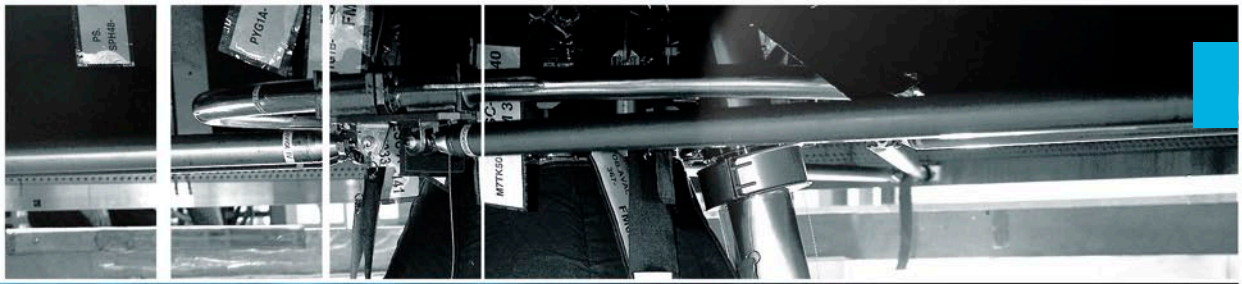
September
2015



VA 226

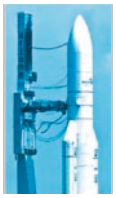
Sky Muster
ARSAT-2

esa

nbn

ARSAT

cnes



VA 226

Sky Muster - ARSAT-2

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ARIANE 5: A STRATEGIC LAUNCH FOR TWO GREAT NATIONS IN THE SOUTHERN HEMISPHERE, AUSTRALIA AND ARGENTINA

On its ninth launch of 2015 from the Guiana Space Center in French Guiana and the fifth Ariane 5 mission this year, Arianespace will be launching satellites for two major countries in the southern hemisphere to enhance their satellite telecommunications services: Sky Muster for the Australian operator nbn, and ARSAT-2 for the Argentine operator ARSAT. With this strategic launch for the Australian and the Argentine governments, Arianespace proudly supports two new regional operators.

Sky Muster and ARSAT-2 will be the 517th and 518th satellites to be launched by Arianespace

Sky Muster

Sky Muster will be the first satellite orbited by Arianespace for the Australian wholesaler **nbn**, owned by the Commonwealth of Australia. **nbn**'s key objective is to ensure all Australians have access to fast broadband as soon as possible, at affordable prices and at least cost to taxpayers. **nbn**'s primary role is to enable Australia's greater participation in the digital economy and to help bridge the digital divide – between young and old, city and country, and between Australia and the rest of the world.

Sky Muster designed to enable **nbn** to deliver broadband services to more than 200,000 rural and remote Australians. It will extend coverage to the entire country, including Norfolk, Christmas, Macquarie and Cocos islands.

A second **nbn** satellite is also scheduled for launch by Arianespace.

Built by SSL of Palo Alto, California using a 1300 platform, Sky Muster is the 52nd GEO platform built by SSL (and predecessor companies) to be orbited by Arianespace.

Arianespace has 12 more SSL satellites to be launched.

ARSAT-2

ARSAT-2 will be the second satellite orbited by Arianespace for the Argentine operator ARSAT, following ARSAT-1's successful launch in October 16, 2014.

ARSAT-2 is the second in a series of geostationary (GEO) satellites that gives Argentina its own space telecommunications system. ARSAT-2 will provide American countries with direct-to-home television (DTH), Internet access services for its reception on VSAT antennas, data transmission and IP telephony.

ARSAT-2 is the second GEO satellite to be built in Argentina, specified by the national telecommunications company ARSAT, who also did the technical and programmatic management of the entire project. The Argentine high-technology company, INVAP was the manufacturer of various components and responsible for the design and integration of the satellite.

As with the ARSAT-1 satellite, the Launch and Early Orbit Phase (LEOP) will be performed from ARSAT's Benavídez Ground Station. It will be the second time that a Latin American country will run an operation of this kind.

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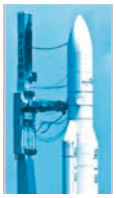

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Sky Muster - ARSAT-2

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MISSION DESCRIPTION

The 5th Arianespace Ariane 5 launch of the year will place the Sky Muster and ARSAT-2 satellites into a geostationary transfer orbit.

The launcher will be carrying a total payload of 10,203 kg.

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

Targeted orbit
Perigee altitude : 250 km
Apogee altitude : 35,786 km
Inclination : 6 degrees

Liftoff is planned on **Wednesday, September 30, 2015** as soon as possible within the following launch window:

- Between 05:30 pm and 07:15 pm, Kourou time
- Between 05:30 pm and 07:15 pm, Buenos Aires time
- Between 08:30 pm and 10:15 pm, Universal Time (UTC)
- Between 10:30 pm and 00:15 am, Paris time, October 1st, 2015
- Between 06:30 am and 08:15 am, Melbourne time, October 1st, 2015.

The launch at a glance

The launcher's attitude and trajectory are controlled by the two onboard computers, located in the Ariane 5 vehicle equipment bay (VEB).

About seven seconds after start of the 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.

The fairing protecting the payload is jettisoned at T+220 seconds.

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 splashes down off the coast of Africa in the Atlantic Ocean (in the Gulf of Guinea). At orbital injection, the launcher will have attained a velocity of approximately 9,365 meters/second, and will be at an altitude of 640 kilometers.

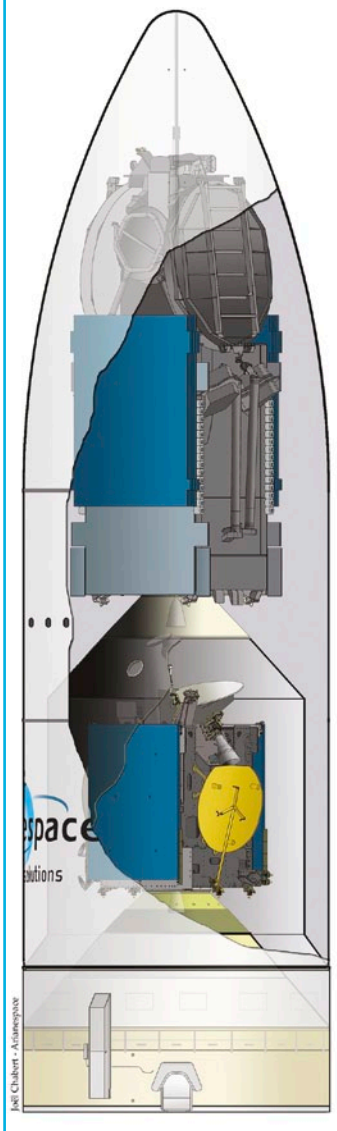
Payload configuration

Upper payload (CUH): Sky Muster
Mass at liftoff 6,440 kg.

Lower payload (CUB): ARSAT-2
Mass at liftoff 2,977 kg.

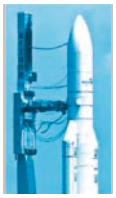
Long version of the payload fairing

Long version of the SYLDA (SYstème de Lancement Double Ariane)



Mission duration

The nominal duration of the mission (from liftoff to separation of the satellites) is:
32 minutes and 28 seconds.



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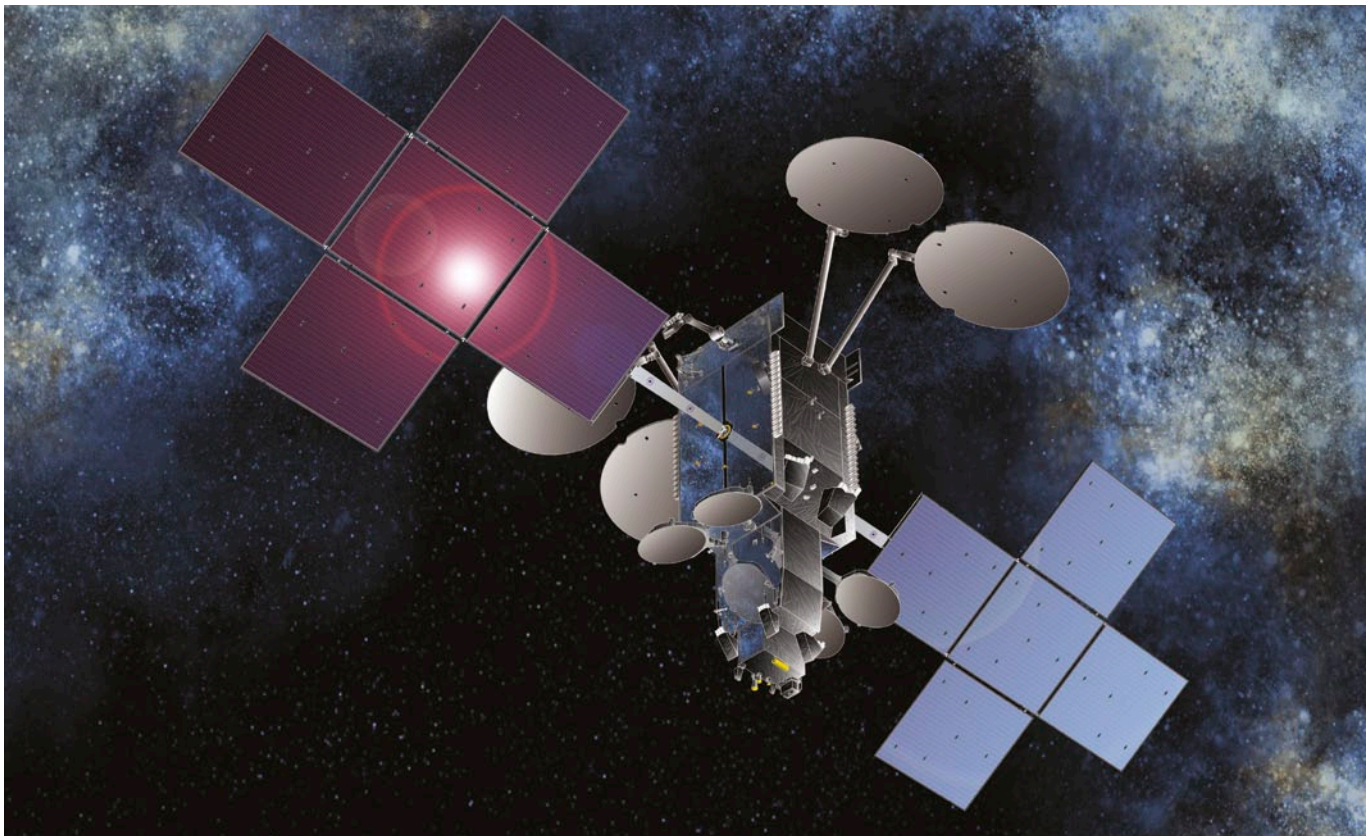
Sky Muster



Customer	**nbn**
Prime contractor	**SSL**
Mission	**High-speed broadband services**
Mass	**6,440 kg at liftoff**
Stabilization	**3 axis**
Dimensions	**8.5 x 3 x 3.5 m**
Platform	**1300**
Payload	**202 Ka-Band transponders**
Onboard power	**16.4 kW (end of life)**
Design life	**More than 15 years**
Orbital position	**135° to 150° East**
Coverage area	**Australia, including Norfolk, Christmas, Macquarie and Cocos islands**

PRESS CONTACT:

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ARSAT-2

Customer	**ARSAT**
Prime contractor	**INVAP**
Mission	**Telecommunication**
Mass	**2,977 kg at liftoff**
Stabilization	**3 axis**
Dimensions	**2,9 x 1,8 x 2,2 m**
Platform	**Specific**
Payload	**26 Ku-Band transponders and 10 C-band transponders**
Onboard power	**4.6 kW (end of life)**
Design life	**15 years**
Orbital position	**81° West**
Coverage area	**The Americas, from Argentina to Canada**

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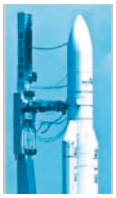

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Sky Muster - ARSAT-2

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ARIANE 5-ECA LAUNCH VEHICLE

54.8 m

780 tons
(total mass at liftoff)

Fairing
(RUAG Space)
- 17 m
- Mass: 2.4 t

Sky Muster
(nbn)
- Mass: 6,440 Kg

ARSAT-2
(ARSAT)
- Mass: 2,977 Kg

Vehicle Equipment Bay
(Airbus Defence and Space)
- Height: 1.13 m
- Mass: 970 kg.

ESC-A - Cryogenic upper stage
(Airbus Defence and Space)
- Height: 4.71 m
- Mass: 19 t

EPC - Cryogenic main stage
(Airbus Defence and Space)
- Height: 31 m
- Mass: 188 t

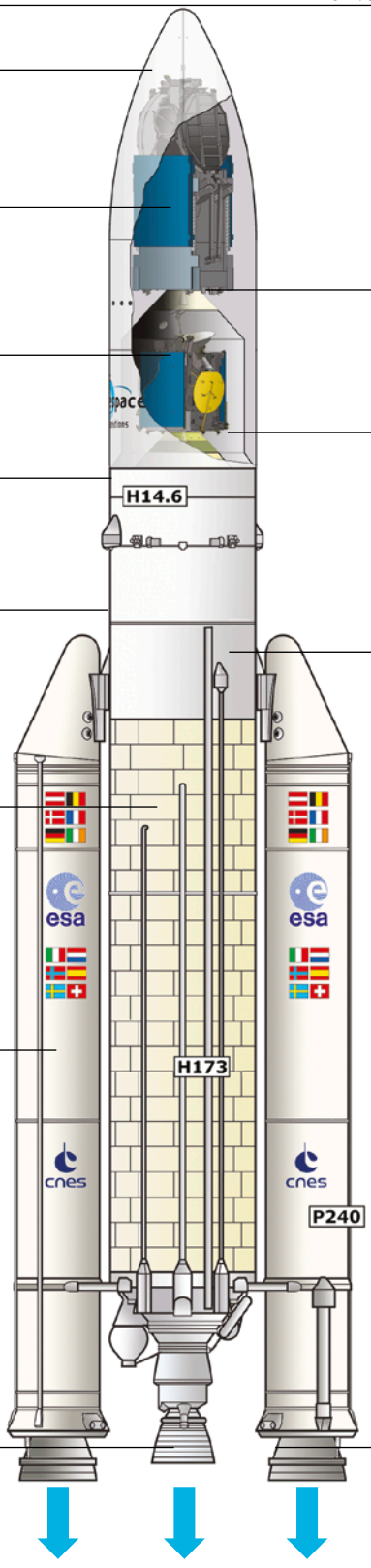
EAP - Solid Rocket Boosters
(Airbus Defence and Space)
- Height: 31.6 m
- Mass: 277 t approx.

Vulcain 2 Engine
(Snecma)
- Thrust: 1,390 kN (in vacuum)
- 540 sec of propulsion

ACU - Payload adaptor (2)
(RUAG Space or Airbus Defence and Space)
- Mass: approx. 140 kg each

SYLDA - Internal structure
(Airbus Defence and Space)
- 7 versions (Height:4.9 to 6.4 m)
- Mass: 400 to 530 kg.

HM-7B engine
(Snecma)
- Thrust: 67 kN (in vacuum)
- 945 sec of propulsion



Propellants (in metric tons) at T-O
H : Cryogenic
P : Solid

MPS - Solid Rocket Motor (SRM)
(Europropulsion)
- Average thrust: 5,060 kN
- Maximum thrust: 7,080 kN (in vacuum)
- 130 sec of propulsion

13,000 kN at Lift-off
(at T+7.3 sec.)

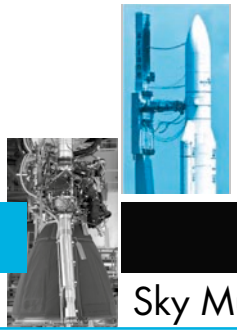
LAUNCH CAMPAIGN: ARIANE 5 - Sky Muster - ARSAT-2

Sky Muster - ARSAT-2 and launch vehicle campaign calendar

Date	Satellite activities	Launch vehicle activities
August 11-13, 2015		Campaign start review EPC erection EAP transfer and positioning
August 13, 2015		EPC/EAP integration
August 18, 2015		ESC-A erection and equipment bay integration
August 19, 2015	Arrival in Kourou of ARSAT-2; beginning of preparation in building S5C	
August 25, 2015	ARSAT-2 fitcheck	
August 26, 2015	Arrival in Kourou of Sky Muster; beginning of preparation in building S5C	
August 27, 2015	Sky Muster fitcheck	
September 7, 2015	ARSAT-2 transfer to S5A	
September 8, 2015	Sky Muster transfer to S5B	
September 9-14, 2015	Sky Muster fueling operations	
September 9, 2015		Transfer from BIL (Launcher Integration Building) to BAF (Final Assembly Building)
September 10-14,2015	ARSAT-2 fueling operations	
September 15, 2015	Sky Muster integration on the ACUH adaptor	
September 18, 2015	Sky Muster transfer to Final Assembly Building (BAF) and ARSAT-2 integration on the ACUB	
September 19, 2015	Sky Muster integration on SYLDA	

Sky Muster - ARSAT-2 launch vehicle campaign final calendar

Date	Satellite activities	Launch vehicle activities
Saturday, September 19, 2015	ARSAT-2 transfer to Final Assembly Building (BAF)	
Sunday, September 20, 2015	Sky Muster's encapsulation in the payload fairing	
Monday, September 21, 2015	ARSAT-2 integration on launcher	
Tuesday, September 22, 2015	ARSAT-2 encapsulation and composite integration with Sky Muster on launcher	
Wednesday, September 23, 2015		Completion of composite integration on launcher
Thursday, September 24, 2015		ESC-A final preparations and launch rehearsal
Monday, September 28, 2015		Arming of launch vehicle and launch readiness review (RAL) and final preparation of launcher
Tuesday, September 29, 2015		Rollout from BAF to Launch Zone, launch vehicle connections and filling of the EPC liquid helium tank
Wednesday, September 30, 2015		Start of launch countdown, EPC filling with liquid oxygen and liquid hydrogen



COUNTDOWN AND FLIGHT SEQUENCE

The countdown comprises all final preparation steps for the launcher, the satellites/spacecraft and the launch site. If it proceeds as planned, the countdown leads to ignition of the main stage engine, then the two boosters, for a liftoff at the targeted time.

The countdown culminates in a synchronized sequence, 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 nominal liftoff window, then the launch will be delayed by one, two or more days, depending on the problem involved, and the solution developed.

TIME	EVENT
- 11 h 30 mn	Start of final countdown
- 07 h 30 mn	Check of electrical systems
- 04 h 50 mn	Start of filling of main cryogenic stage with liquid oxygen and hydrogen
- 03 h 20 mn	Chilldown of Vulcain main stage engine
- 01 h 10 mn	Check of connections between launcher and telemetry, tracking and command systems
- 7 mn	"All systems go" report, allowing start of synchronized sequence
- 4 mn	Tanks pressurized for flight
- 1 mn	Switch to onboard power mode
- 05 s	Cryogenic arm opening command
- 04 s	Onboard systems take over
- 03 s	Two inertial reference systems switch to flight mode

T-O	Ignition of the cryogenic main stage engine (EPC)
+ 07 s	Ignition of solid boosters (EAP)
+ 07 s	Liftoff
+ 12 s	End of vertical climb, beginning of pitch motion
+ 17 s	Beginning of roll maneuver
+ 2 mn 21 s	EAP separation
+ 3 mn 21 s	Fairing jettisoned
+ 8 mn 10 s	Acquisition by Natal tracking station
+ 8 mn 51 s	End of EPC thrust phase
+ 8 mn 57 s	EPC separation
+ 9 mn 01 s	Ignition of ESC-A stage
+ 13 mn 48 s	Acquisition by Ascension tracking station
+ 18 mn 24 s	Acquisition by Libreville tracking station
+ 23 mn 06 s	Acquisition by Malindi tracking station
+ 25 mn 06 s	End of ESC-A thrust phase / Injection
+ 27 mn 59 s	**Sky Muster satellite separation**
+ 29 mn 50 s	Sylda 5 separation
+ 32 mn 28 s	**ARSAT-2 satellite separation**
+ 49 mn 36 s	End of Arianespace mission

ARIANE 5 ECA MISSION PROFILE

The launcher's attitude and trajectory are entirely controlled by the two onboard computers in the Ariane 5 vehicle equipment bay (VEB).

The synchronized sequence starts 7 minutes before 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, the sequence is fully automatic, and is performed concurrently by the onboard computer and by two redundant 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, they handle 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 liftoff operations. It:

- Starts the ignition sequence for the Vulcain main stage engine (T-0).
- Checks engine operation (from T+4.5 to T+7.3 sec).
- Commands ignition of the solid boosters for immediate liftoff at T+7.3 seconds.

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

Ariane 5-ECA trajectory

ARIANESPACE AND THE GUIANA SPACE CENTER

Arianespace, the world's first launch services company

Arianespace was founded in 1980 as the world's first launch Services & Solutions company. Arianespace now has 20 shareholders from 10 European countries (including Airbus Safran Launchers, CNES and all European companies participating in the production of Ariane launchers). Since the outset, Arianespace has signed over 450 launch contracts and launched 500-plus satellites. More than two-thirds of the commercial satellites now in service worldwide were launched by Arianespace. The company posted sales of 1.399 million euros in 2014.

As of March 1, 2015, Arianespace had 322 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 services to satellite operators from around the world, including private companies and government agencies. These services call on three launch vehicles:

- The Ariane 5 heavy launcher, operated from the Guiana Space Center in French Guiana.
- The Soyuz medium launcher, currently in operation at the Guiana Space Center and the Baikonur Cosmodrome in Kazakhstan.
- The Vega light launcher, also operated from the Guiana Space Center.

Building on its complete family of launchers, Arianespace has won over half of the commercial launch contracts up for bid worldwide in the past two years. Arianespace now has a backlog of more than 70 satellites to be launched.

The Guiana Space Center: Europe's Spaceport

For 40 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 base operations, such as radars, telecom network, weather station, receiving sites for launcher telemetry, etc.
- Payload processing facilities (ECPU), in particular the S5 facility.
- Ariane, Soyuz and Vega launch complexes, comprising the launch zones and launcher integration buildings.
- Various industrial facilities, including those operated by Regulus, Europropulsion, Air Liquide Spatial Guyane and Airbus Defence and Space - all involved in the production of Ariane 5 components. A total of 40 European manufacturers and local companies are involved in operations.

Europe's commitment to independent access to space is based on actions by three key players: the European Space Agency (ESA), the French CNES space agency and Arianespace. ESA is responsible for the Ariane, Soyuz and Vega development programs. Once these launch systems are qualified, ESA transfers responsibility to the operator 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.

The French CNES space agency has several main responsibilities at the Guiana Space Center. It designs all infrastructure and, on behalf of the French government, is responsible for safety and security. It provides the resources needed to prepare the satellites and launchers for missions. Whether during tests or actual launches, CNES is also responsible for overall coordination of operations and it collects and processes all data transmitted from the launcher via a network of receiving stations to track Ariane, Soyuz and Vega rockets throughout their trajectories.

Arianespace in French Guiana

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 Airbus Defence and Space 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 (CNES/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 deploys a top-flight team and technical facilities to ensure the launchers and their satellite payloads are 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.