



**arianespace**  
arianeGROUP

LAUNCH KIT

January 2020

**VA251**

**EUTELSAT KONNECT**

**GSAT-30**



जीसैट-३०  
GSAT-30





**VA251**

**EUTELSAT KONNECT  
GSAT-30**



## VA251: ARIANESPACE'S FIRST LAUNCH IN 2020, USING ARIANE 5 AT THE SERVICE OF EUTELSAT AND ISRO

For its initial flight of 2020, Arianespace will orbit two telecommunications satellites using an Ariane 5 launch vehicle from the Guiana Space Center: EUTELSAT KONNECT for the operator Eutelsat; and GSAT-30 for the Indian Space Research Organization (ISRO).

Arianespace will confirm its leadership in the geostationary launch services market segment through this 107th Ariane 5 mission, to be performed as the company celebrates 40 years since its creation.

### EUTELSAT KONNECT

EUTELSAT KONNECT will be the 34th Eutelsat satellite launched by Arianespace since its first mission for this operator, which deployed EUTELSAT-1 F1 in 1983.

Eutelsat Communications is established in Paris, with offices and teleports located around the globe. Eutelsat provides capacity on nearly 40 satellites to clients that include broadcasters and broadcasting associations, pay-TV operators, video, data and internet service providers, enterprises and government agencies.

Once in orbit, EUTELSAT KONNECT will offer total capacity of 75 Gbps and by next autumn will allow the operator to provide Internet access services for companies and individuals alike at up to 100 Mbps. The satellite will help to fight against the digital divide by bringing broadband Internet across 40 countries in Africa and 15 countries across Europe.

In Africa, EUTELSAT KONNECT also will, through the establishment of public Wi-Fi terminals, share Internet access between several users, marketed in the form of coupons that can be paid via mobile phone.

The new EUTELSAT KONNECT satellite features all-electric propulsion and operates in Ka-band. It is the first to use Thales Alenia Space's all-electric Spacebus NEO platform, developed under the Neosat Partnership Project conducted by the European and French space agencies (ESA and CNES). More robust, more modular, more powerful, more innovative, more flexible, this platform is perfectly adapted to operators' expectations in the evolving telecommunication market, and particularly well positioned for very demanding VHTS missions.

EUTELSAT KONNECT will allow the in-orbit validation of the complete end-to-end system of the new Spacebus Neo product line, including the fully-electric orbit-raising phase.

More than half of Eutelsat's satellites have been orbited by Arianespace, which has six more launches confirmed in its books for the coming years by the operator.

EUTELSAT KONNECT will be the 163rd satellite manufactured by Thales Alenia Space to be launched by Arianespace. There are currently five Thales Alenia Space's satellites in Arianespace's backlog.

### GSAT-30

Arianespace will orbit **GSAT-30** on the initial Ariane 5 launch in 2020, after delivering GSAT-31 for ISRO one year ago.

To be installed as flight VA251's lower passenger, GSAT-30 is a telecommunications satellite designed and manufactured by ISRO. To be positioned at a longitude of 83° East, it will provide high-quality television, telecommunications and broadcasting services over Indian mainland and Islands.

GSAT-30 is configured on ISRO's enhanced I-3K platform to provide communications services from geostationary orbit in C- and Ku-band for a lifetime greater than 15 years.

By operating GSAT-30, ISRO will – once again – foster the use of space to help bridge the digital divide in the Indian subcontinent as part of its ambitious space program. These objectives are to develop India by focusing on all types of space applications, including navigation, Earth observation, telecommunications and broadcasts of educational programs, while pursuing science research and planetary exploration.

For more than 30 years, France and India have developed exemplary cooperation in the space field. Since the launch of India's APPLE experimental satellite on Ariane Flight L03 in 1981, Arianespace has orbited 23 satellites and signed 24 launch contracts with the Indian space agency.

The orbiting of GSAT-30 marks another demonstration of the strong bond uniting Europe and India in space cooperation.

GSAT-30 will replace the Insat 4A satellite in orbit.

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# VA251

## EUTELSAT KONNECT GSAT-30



# MISSION DESCRIPTION

Arianespace's first Ariane 5 ECA launch of 2020 will place its satellite passengers into geostationary transfer orbit.

The launcher will be carrying a total payload of approximately 7,888 kg.

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

## DATE AND TIME



Liftoff is planned on **Thursday, January 16, 2020** as early as possible within the following launch window:

- > **Between 4:05 p.m. and 6:00 p.m.** Washington, D.C. time
- > **Between 6:05 p.m. and 8:00 p.m.** Kourou, French Guiana time
- > **Between 21:05 and 23:00** Universal time (UTC)
- > **Between 10:05 p.m. and 12:00 a.m.** Paris time, in the night of January 16 to 17
- > **Between 2:35 a.m. and 4:30 a.m.** New Delhi time, in the morning of January 17.

## MISSION DURATION



The nominal duration of the mission (from liftoff to separation of the satellites) is:

**38 minutes, 25 seconds.**

## TARGETED GEOSTATIONARY ORBIT



**Perigee altitude**  
**250 km.**



**Apogee altitude**  
**35,761 km.**



**Inclination**  
**6 degrees**

## 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 13 seconds, then rotates towards the East. It maintains an attitude that ensures the axis of the launcher remains parallel to its velocity vector to minimize aerodynamic loads throughout the entire atmospheric phase until the solid boosters are jettisoned.

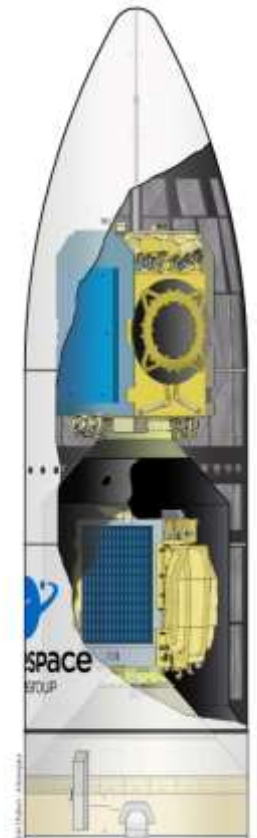
The fairing protecting the payload is jettisoned at T+200 seconds.

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).

## PAYLOAD CONFIGURATION

- > **Upper payload (CUH): EUTELSAT KONNECT**  
Mass at liftoff: 3,619 kg.
- > **Lower payload (CUB): GSAT-30**  
Mass at liftoff: 3,357 kg.
- > **Long version of the payload fairing**
- > **SYLDA (Système de Lancement Double Ariane)**



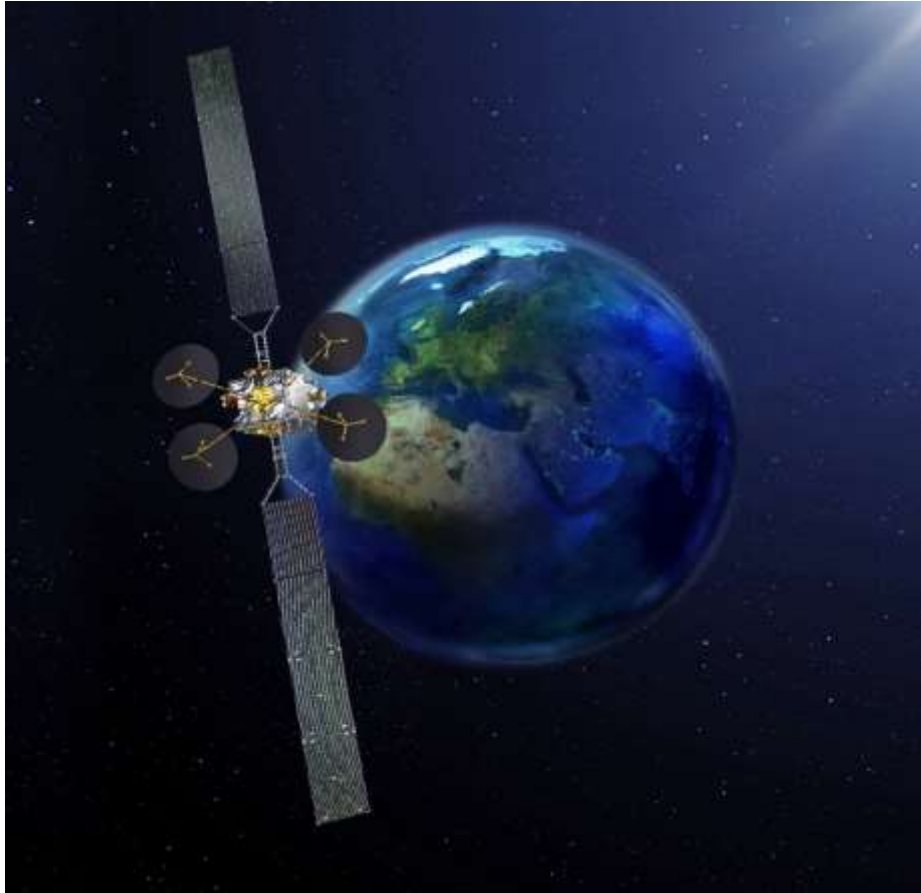


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## EUTELSAT KONNECT satellite



<b>CUSTOMER</b>	<b>Eutelsat</b>
<b>PRIME CONTRACTOR</b>	<b>Thales Alenia Space</b>
<b>MISSION</b>	Telecommunications
<b>MASS AT LAUNCH</b>	3,619 kg.
<b>PLATFORM</b>	SB NEO 100
<b>PROPULSION</b>	Full electric
<b>PAYLOAD</b>	Ka-band
<b>COVERAGE AREA</b>	Africa and Europe
<b>DESIGN LIFE</b>	15 years

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## GSAT-30 satellite



<b>CUSTOMER</b>	<b>ISRO</b>
<b>PRIME CONTRACTOR</b>	<b>ISRO</b>
<b>MISSION</b>	Telecommunications
<b>MASS AT LAUNCH</b>	3,357 kg.
<b>ORBITAL POSITION</b>	83° East
<b>PLATFORM</b>	I-3K
<b>BATTERIES</b>	1 Li-Ion
<b>PROPULSION</b>	Liquid bi-propellant
<b>COVERAGE AREA</b>	Wide coverage in normal C-band; Indian mainland and islands in Ku-band
<b>DESIGN LIFE</b>	More than 15 years

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# ARIANE 5 ECA LAUNCH VEHICLE

The launcher is delivered to Arianespace by ArianeGroup as production prime contractor.

51.03 m.

### Fairing

(RUAG Schweiz AG):  
Height: 17 m.  
Mass: 2.4 t.

**780 metric tons**  
(total mass at liftoff)

### EUTELSAT KONNECT

**EUTELSAT**  
Mass: 3,619 kg.

### PA - Payload adaptor (2)

(Airbus Defence and Space - SAU)  
(RUAG Space AB)  
Mass: approx. 220 kg.

### GSAT-30

**ISRO**  
Mass: 3,357 kg.

### SYLDA - Internal structure

Mass: 440 kg.

### Vehicle Equipment Bay

Height: 1.13 m.  
Mass: 970 kg.

### ESC-A - Cryogenic upper stage

Height: 4.71 m.  
Mass: 19 t.

### HM-7B engine

Thrust: 67 kN (in vacuum).  
945 sec. of propulsion.

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

### EPC - Cryogenic main stage

Height: 31 m.  
Mass: 188 t.

### EAP - Solid rocket boosters

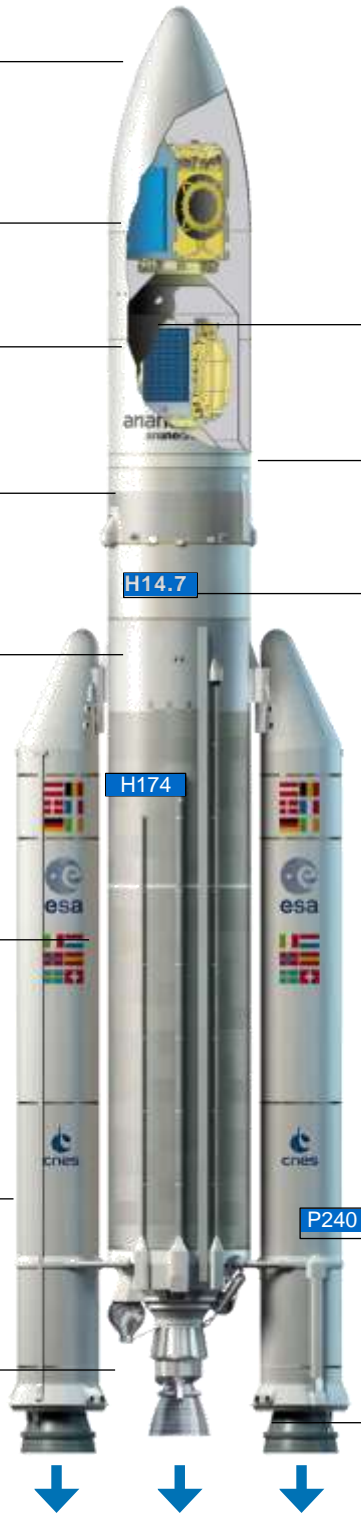
Height: 31.6 m.  
Mass: 277 t. approx.

### Vulcain 2 engine

Thrust: 1,410 kN (in vacuum).  
540 sec. of propulsion.

### MPS - Solid Rocket Motor (SRM)

Average thrust: 5,060 kN.  
Maximum thrust: 7,080 kN (in vacuum).  
130 sec. of propulsion.



**13,000 kN at liftoff**  
(at T+7.3 sec.).



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## EUTELSAT KONNECT GSAT-30



# LAUNCH CAMPAIGN - ARIANE 5: EUTELSAT KONNECT GSAT-30

### SATELLITE AND LAUNCH VEHICLE CAMPAIGN CALENDAR

DATE	SATELLITES ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
November 12 to 13, 2019		Campaign start review EPC unpacking and erection
November 13 and 14, 2019		EAP 1 & 2 transfer to the BIL (Launcher Integration Building)
November 15, 2019		EPC/EAP integration
November 28, 2019	Arrival of EUTELSAT KONNECT in French Guiana and transfer by road to the Spaceport's S5C payload preparation facility	
December 2, 2019	Arrival of GSAT-30 in French Guiana and transfer by road to the Spaceport's S5C payload preparation facility	
December 12, 2019	EUTELSAT KONNECT Transfer to the Spaceport's S5B payload fueling facility	Erection of ESC-A and vehicle equipment bay installation
December 13, 2019	EUTELSAT KONNECT fueling operations GSAT-30 transfer to the Spaceport's S5A payload fueling facility	Transfer from BIL to BAF (Final Integration Building)
December 14, 2019	EUTELSAT KONNECT fueling operations	
December 14 to 17, 2019	GSAT-30 fueling operations	
December 16, 2019	EUTELSAT KONNECT integration on payload adaptor	
December 17, 2019	EUTELSAT KONNECT transfer to the BAF	
December 18, 2019	EUTELSAT KONNECT integration on SYLDA	
December 19, 2019	EUTELSAT KONNECT integration on SYLDA GSAT-30 integration on payload adaptor	

### SATELLITE AND LAUNCH VEHICLE CAMPAIGN FINAL CALENDAR

DATE	SATELLITES ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
Monday, January 6, 2020	Payload fairing encapsulation on SYLDA GSAT-30 transfer to the BAF	
Tuesday, January 7, 2020	GSAT-30 integration on launch vehicle	
Wednesday, January 8, 2020	Composite (EUTELSAT KONNECT under fairing) integration on launch vehicle (GSAT-30 under SYLDA)	
Thursday, January 9, 2020	Upper portion flight configuration set-up	HM7B engine final inspection Finalization of the composite/launcher integration
Friday, January 10, 2020	General dress rehearsal	Dress rehearsal
Monday, January 13, 2020		Final preparation of launcher and BAF for chronology
Tuesday, January 14, 2020		Launch readiness review (LRR) Arming of launch vehicle
Wednesday, January 15, 2020	Functional checkout of the satellites on the launch pad	Roll-out from BAF to the Launch Pad, launch vehicle connections and filling of the EPC liquid helium tank
Thursday, January 16, 2020		Start of launch countdown, EPC and ESC-A filling with liquid oxygen and liquid hydrogen

## COUNTDOWN AND FLIGHT SEQUENCES

The countdown comprises all final preparation steps for the launcher, the satellites and the launch pad. 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.



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## EUTELSAT KONNECT GSAT-30



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 results in the T-0 moving 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	EVENT
- 11 h 23 min	Start of final countdown
- 10 h 33 min	Check of electrical systems
- 04 h 38 min	Start of filling of EPC with liquid oxygen and liquid hydrogen
- 03 h 28 min	Start of filling of ESC-A with liquid oxygen and liquid hydrogen
- 03 h 18 min	Chilldown of Vulcain main stage engine
- 01 h 15 min	Check of connections between launcher and the telemetry, tracking and command systems
- 7 min	"All systems go" report, allowing start of synchronized sequence
- 4 min	Tanks pressurized for flight
-1 min	Switch to onboard power mode
- 05 s	Opening command for the cryogenic arms
- 04 s	Onboard systems take over
<b>T-0</b>	<b>Reference time</b>
+ 01.00 s	Ignition of the cryogenic main stage (EPC)
+ 07.05 s	Ignition of solid boosters (EAP)
+ 07.3 s	Liftoff
+ 12.3 s	End of vertical climb, beginning of pitch motion
+ 17.05 s	Beginning of roll maneuver
+ 32.05 s	End of roll maneuver
+ 2 min 21 s	EAP separation
+ 3 min 19 s	Fairing jettisoned
+ 7 min 30 s	Acquisition by Natal tracking station
+ 8 min 33 s	End of EPC thrust phase
+ 8 min 39 s	EPC separation
+ 8 min 43 s	Ignition of ESC-A stage
+ 13 min 13 s	Acquisition by Ascension tracking station
+ 18 min 06 s	Acquisition by Libreville tracking station
+ 23 min 08 s	Acquisition by Malindi tracking station
+ 24 min 54 s	Extinction of ESC-A stage
+ 24 min 56 s	Injection
+ 27 min 30 s	<b>EUTELSAT KONNECT satellite separation</b>
+ 29 min 00 s	SYLDA separation
+ 38 min 25 s	<b>GSAT-30 satellite separation</b>





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EUTELSAT KONNECT  
GSAT-30



# 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).

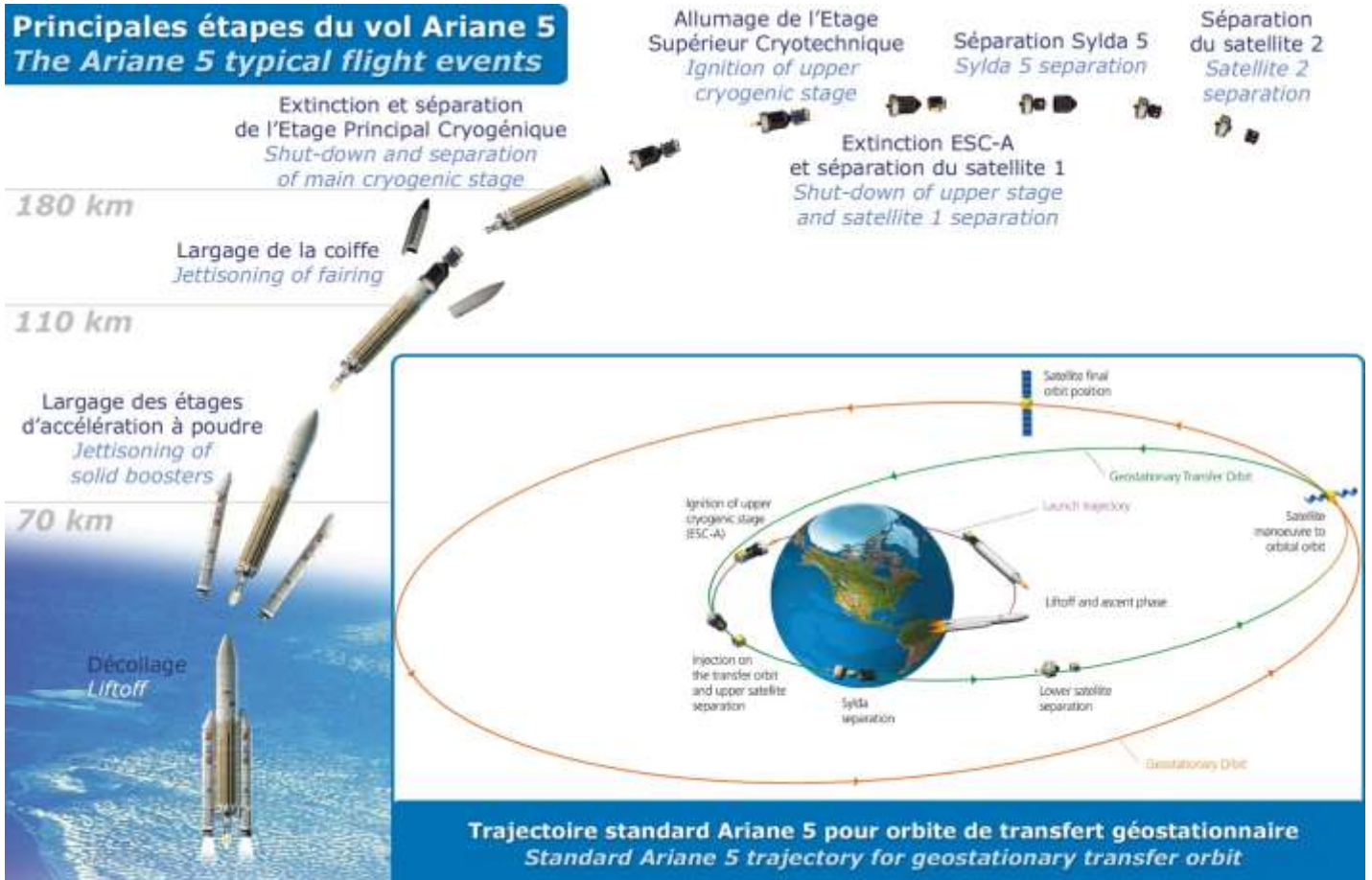
The synchronized sequence starts seven minutes before ignition (T-0). It is primarily designed to perform the final operations on the launcher prior to launch, along with the ultimate checks needed following switchover to flight configuration. As its name indicates, the sequence is fully automatic, and 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 exhaust guide (T-30 sec).
- > Hydrogen aspiration for chilldown of the Vulcain engine in the exhaust guide (T-18 sec).
- > Burn-off 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+6.9 sec).
- > Commands ignition for the solid boosters at T+7.05 sec for 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.





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# 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 is a subsidiary of ArianeGroup, which holds 74% of its share capital; the balance is held by 15 other shareholders from the European launcher industry.

Since the outset, Arianespace has signed over 548 launch contracts and launched more than 616 satellites. More than half of the commercial satellites now in service around the globe were launched by Arianespace. The company posted turnover of approximately 1 billion euros in 2019.

The company's activities are worldwide, with the headquarters in Evry, France (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-lift launcher, operated from the Guiana Space Center in French Guiana.
- > The Soyuz medium-lift launcher, currently in operation at the Guiana Space Center and the Baikonur Cosmodrome in Kazakhstan.
- > The Vega light-lift launcher, also operated from the Guiana Space Center.

Building on its complete family of launchers, Arianespace has won over half of the GEO commercial launch contracts up for bid worldwide in the past two years. Arianespace now has a backlog of more than 750 satellites to be launched.

## THE GUIANA SPACE CENTER: EUROPE'S SPACEPORT

For more than 50 years, the Guiana Space Center (CSG), Europe's Spaceport in French Guiana, has offered a complete array of facilities for rocket launches. It primarily comprises the following:

- > The 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 (EPCU), 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 ArianeGroup – all participate in the production of Ariane 5 components. A total of 40 European manufacturers and local companies are involved in the launcher 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 Arianespace as the operator. 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 France's space program, the Guiana Space Center has evolved into 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 the 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 checks of the Ariane launcher – which is built under ArianeGroup responsibility as the production prime contractor; coordinates the satellite preparations that are performed in parallel inside the Payload Preparation Complex (EPCU) [which is operated by the Guiana Space Center - CNES/CSG], followed by the payload's integration on the launcher in the Final Assembly Building (BAF); and also works with ArianeGroup teams in charge of the launcher to conduct the final countdown and launch from Launch Control Center 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.