

VA243  
September 2018



Horizons 3e  
Azerspace-2/Intelsat 38







# VA243

Horizons 3e  
Azerspace-2/Intelsat 38



## FLIGHT VA243: THE 100<sup>TH</sup> ARIANE 5 WILL CARRY HORIZONS 3e AND AZERSPACE-2/INTELSAT 38 FOR INTELSAT, SKY PERFECT JSAT AND AZERCOSMOS

For its sixth launch of the year, Arianespace will orbit two telecommunications satellites using an Ariane 5 from the Guiana Space Center (CSG): Horizons 3e for Intelsat and its partner SKY Perfect JSAT Corporation; along with Azerspace-2/Intelsat 38, for Azercosmos and Intelsat.

With this 300<sup>th</sup> mission of its three-member launcher family – and the 100<sup>th</sup> utilizing the European-developed heavy-lift Ariane 5 – Arianespace once again serves the ambitions of leading satellite operators, both globally and regionally.

### Horizons 3e

To be installed as Ariane 5's upper passenger on Flight VA243, Horizons 3e is owned by a joint venture between Intelsat and SKY Perfect JSAT, marking the fourth collaboration between the two companies.

Horizons 3e completes the Intelsat Epic<sup>NG</sup> network's global coverage, bringing the next level of high-throughput services to the Asia-Pacific region and expanding coverage in the Pacific Ocean. The all-digital Horizons 3e payload represents a continued evolution of the award-winning Intelsat Epic<sup>NG</sup> platform. It features full beam interconnectivity in C- and Ku-bands and also includes a multipoint amplifier that optimizes power across the satellite, enabling a power adjustment of each spot beam to better meet a customer's throughput demands. This feature brings additional efficiency and flexibility to address regional and application requirements for broadband, mobility and government customers operating in the Asia-Pacific and Pacific Ocean.

The 6,441-kg. satellite will provide 30 gigabits per second of bandwidth for fixed and mobile customers, and it is to be stationed at the 169° East orbital location to replace Intelsat 805.

Horizons 3e will be the 60<sup>th</sup> Intelsat satellite, as well as the 20<sup>th</sup> for SKY Perfect JSAT, to be launched by Arianespace – and as such, it embodies more than 35 years of shared success in the unique partnership between Intelsat, SKY Perfect JSAT Corporation and Arianespace.

Chicago-headquartered Boeing is the prime contractor of Horizon 3e. It is the 56<sup>th</sup> satellite from this manufacturer to be launched by Arianespace.

### Azerspace-2/Intelsat 38

Azerspace-2/Intelsat 38 is a multi-mission satellite to be located at 45° East.

For the second time, Arianespace will support the development of Azercosmos – the premier satellite operator in the South Caucasus region – by launching Azerbaijan's second geostationary satellite, **Azerspace-2**. It will be Azercosmos' second telecommunications satellite and is to expand on the current capacity of Azerspace-1. Azerspace-2 will also increase the coverage area and spectrum of services provided by Azercosmos. The satellite's planned orbital position is only one degree away from the current Azerspace-1 orbital location at 46° East, which creates favorable opportunities for existing and new customers to start expanding their current satellite solutions.

The satellite will offer enhanced capacity, coverage and service offerings to support growing demand in the region for Direct-to-Home (DTH), government and network services in Europe, Central and South Asia, the Middle East and Sub-Saharan Africa.

It is ideally designed for smaller antennas and has cross-connectivity between East Africa, West Africa and Central Africa, Europe and Central Asia.

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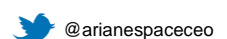
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Azerspace-2/Intelsat 38



**Intelsat 38** will provide Ku-band capabilities and deliver continuity of service for the Intelsat 12 satellite located at 45° East. The satellite will host leading Direct-to-Home television platforms for the fast-growing Central and Eastern Europe and Asia-Pacific regions. It will support the growth objectives of customers operating in these regions. Intelsat 38 will also provide critical broadband connectivity for corporate network and government services in Africa.

Built by California-based SSL, a Maxar Technologies Company, Azerspace-2/Intelsat 38 offers 35 active transponders in Ku-band. Its designed lifetime is more than 15 years.

It will be the 65<sup>th</sup> satellite based on an SSL platform to be launched by Arianespace.

### Ariane 5's 100<sup>th</sup> launch

Flight VA243 will be a significant milestone in the operational career of Ariane 5, marking the 100<sup>th</sup> liftoff of this workhorse vehicle, as well as the 300<sup>th</sup> launch for Arianespace's family of launchers – which consists of the heavy-lift Ariane 5, the medium Soyuz and lightweight Vega.

Following Flight VA243, Ariane 5 will have reached 98.1% of reliability in more than 22 years in service (under the AMSSA method) – which is a remarkable performance for Europe's heavy lift launcher.

The Horizons 3e and Azerspace-2/Intelsat 38 satellites will be the 206<sup>th</sup> and 207<sup>th</sup> satellites launched on Ariane 5, respectively.



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## MISSION DESCRIPTION

Arianespace's fourth Ariane 5 ECA launch of the year will place both of its satellite passengers into geostationary transfer orbit.

The launcher will be carrying a total payload of approximately 10,827 kg.

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

### DATE AND TIME



Liftoff is planned on **Tuesday, September 25, 2018** as early as possible within the following launch window:

- > Between **5:53 p.m. and 6:38 p.m.**, Washington, D.C. time
- > Between **6:53 p.m. and 7:38 p.m.**, in Kourou, French Guiana time
- > Between **21:53 and 22:38.**, Universal Time (UTC)
- > Between **11:53 p.m. and 12:38 a.m.**, Paris time during the night of September 25 - 26
- > Between **1:53 a.m. and 2:38 a.m.**, Baku time on September 26, 2018
- > Between **6:53 a.m. and 7:38 a.m.**, Tokyo time on September 26, 2018

### MISSION DURATION



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

**42 minutes, 17 seconds.**

### TARGETED TRANSFER ORBIT



Perigee altitude  
**250 km.**



Apogee altitude  
**35,726 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.

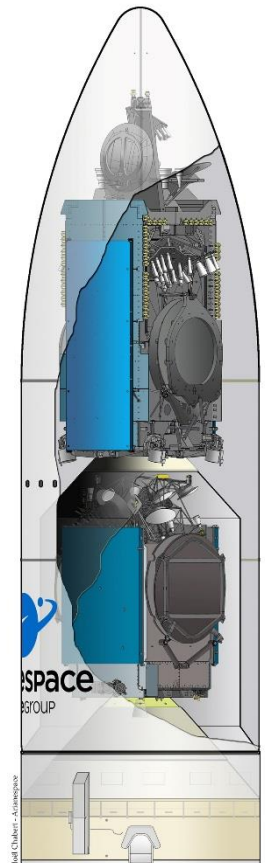
The fairing protecting the payload is jettisoned at T+197 seconds.

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 9,498 meters/second, and will be at an altitude of 639 kilometers.

### PAYLOAD CONFIGURATION

- > **Upper payload (CUH): Horizons 3e**  
Mass at liftoff: 6,441 kg.
- > **Lower payload (CUB): Azerspace-2/Intelsat 38**  
Mass at liftoff: 3,500 kg.
- > **Long version of the payload fairing**
- > **SYLDA (Système de Lancement Double Ariane)**



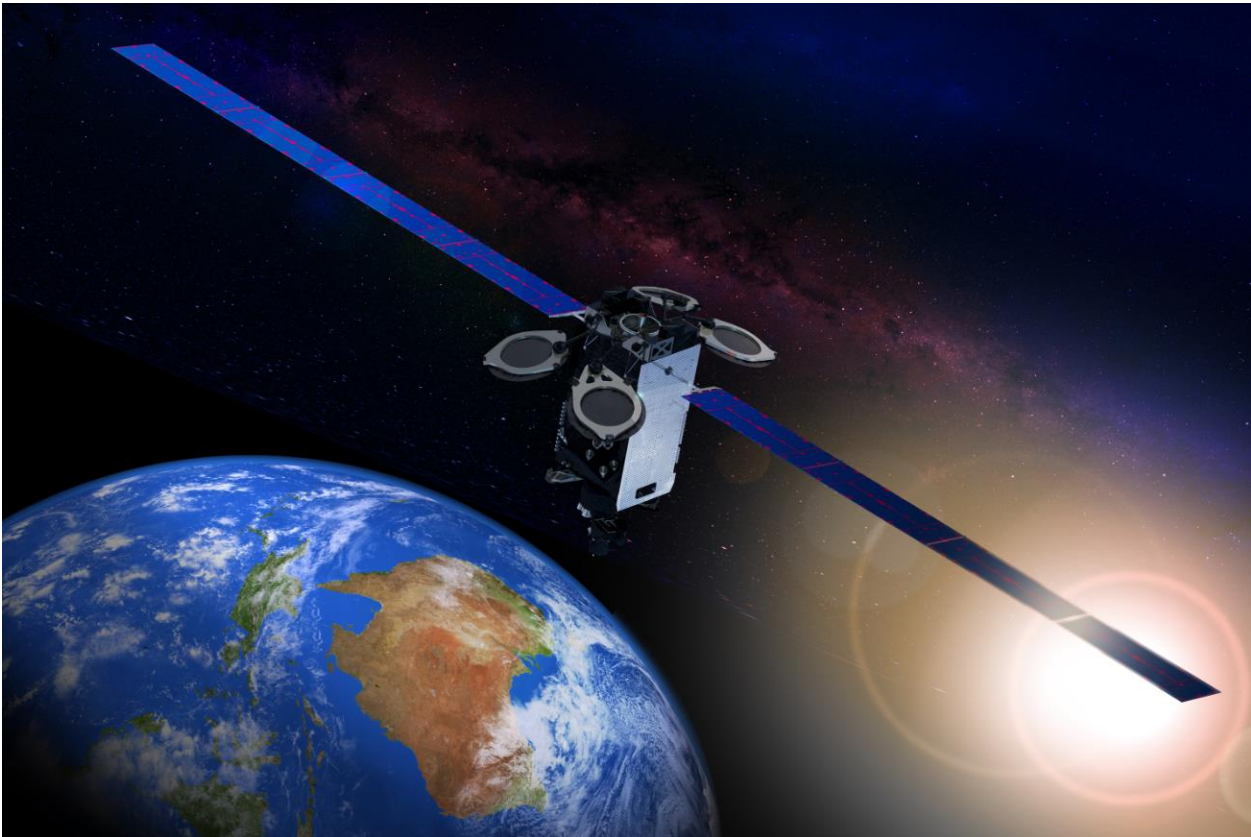


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Azerspace-2/Intelsat 38**



## Horizons 3e SATELLITE



<b>CUSTOMER</b>	<b>INTELSAT and SKY Perfect JSAT</b>
<b>PRIME CONTRACTOR</b>	Boeing
<b>MISSION</b>	Next generation fixed and mobile communications
<b>MASS AT LAUNCH</b>	6,441 kg. at liftoff
<b>STABILIZATION</b>	3 axis
<b>PLATFORM</b>	702 MP
<b>PAYLOAD</b>	High throughput C-and Ku-band transponders
<b>ONBOARD POWER</b>	DC Power 18.5kW (BOL)
<b>DESIGN LIFE</b>	15 years
<b>ORBITAL POSITION</b>	169° East Longitude
<b>COVERAGE AREA</b>	Asia-Pacific and the Pacific Ocean Regions

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## Azerspace-2/Intelsat 38 SATELLITE



<b>CUSTOMER</b>	<b>Azercosmos and Intelsat</b>
<b>PRIME CONTRACTOR</b>	SSL, a Maxar Technologies company
<b>MISSION</b>	Communications
<b>MASS</b>	3,500 kg. at liftoff
<b>STABILIZATION</b>	3 axis
<b>PLATFORM</b>	1300
<b>PAYLOAD</b>	Ku-band satellite
<b>ONBOARD POWER</b>	13.7 kW (end of life)
<b>DESIGN LIFE</b>	15 years
<b>ORBITAL POSITION</b>	45° East Longitude
<b>COVERAGE AREA</b>	Europe, Asia and Africa

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# ARIANE 5 ECA LAUNCH VEHICLE

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

54.8 m.

### Fairing

(RUAG Space): 17 m.  
Mass: 2.4 t.

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

### Horizons 3e

(Intelsat/SKY Perfect JSAT)  
Masse: 6,441 Kg.

### PA - Payload adaptor (2)

(RUAG Space or Airbus)  
Mass: approx. 140 kg. each

### Azerspace-2/Intelsat 38

(Azercosmos/Intelsat)  
Masse: 3,500 Kg.

### SYLDA - Internal structure

7 versions (Height: 4.9 to 6.4 m.)  
Mass: 500 to 530 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

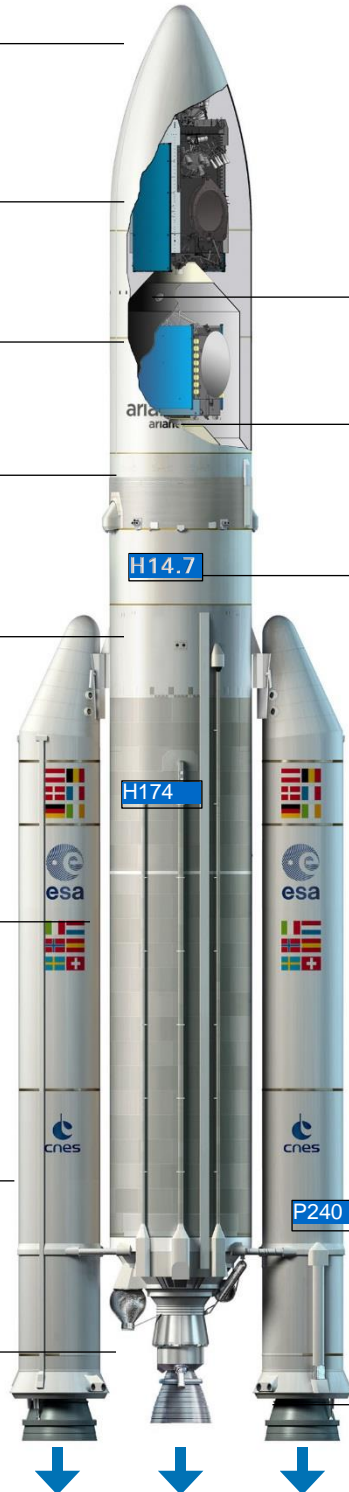
Height: 31.6 m.  
Mass: 277 t. approx.

### Vulcain 2 engine

Thrust: 1,390 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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## LAUNCH CAMPAIGN - ARIANE 5 Horizons 3e - Azerspace-2/Intelsat 38

### SATELLITES AND LAUNCH VEHICLE CAMPAIGN CALENDAR

DATE	SATELLITE ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
<i>Spring 2018</i>		<i>1st phase of the launch campaign</i>
<b>August 6 , 2018</b>	Arrival in French Guiana of Azerspace-2/Intelsat 38 and transportation to the S3B	
<b>August 8 , 2018</b>	Arrival in French Guiana of Horizons 3e and transportation to the S5A	
<b>August 17, 2018</b>		Transfer from BIL-BAF
<b>August 25 to 30, 2018</b>	Horizons 3e fueling operations	
<b>August 27 to 29, 2018</b>	Azerspace-2/Intelsat 38 fueling operations	
<b>August 31, 2018</b>	Horizons 3e integration on payload adaptor	
<b>September 03, 2018</b>	Horizons 3e transfer to the Final Assembly Building (BAF)	
<b>September 04, 2018</b>	Horizons 3e integration on SYLDA	
<b>September 05, 2018</b>	Payload fairing integration on SYLDA (with Horizon 3e)	
<b>September 12, 2018</b>	Azerspace-2/Intelsat 38 integration on payload adaptor	

### SATELLITES AND LAUNCH VEHICLE CAMPAIGN FINAL CALENDAR

DATE	SATELLITE ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
<b>Thursday, September 13, 2018</b>	Azerspace-2/Intelsat 38 transfer to the Final Assembly Building (BAF)	
<b>Friday, September 14, 2018</b>	Azerspace-2/Intelsat 38 integration on launch vehicle	HM7B engine final inspection
<b>Monday, September 16, 2018</b>	Completion of composite integration on launcher and payload checks	
<b>Tuesday, September 18, 2018</b>		Finalization of the composite/launcher integration, and payload checks
<b>Wednesday, September 19, 2018</b>		Launch rehearsal
<b>Thursday, September 20, 2018</b>		Arming of launch vehicle
<b>Friday, September 21, 2018</b>		Launch readiness review (LRR), final preparation of launcher and BAF for the chronology
<b>Monday, September 24, 2018</b>		Rollout from BAF to Launch Zone, launch vehicle connections and filling of the EPC liquid helium tank
<b>Tuesday, September 25, 2018</b>		Start of launch countdown, EPC and ESC-A filling with liquid oxygen and liquid hydrogen





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## 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 shifts outside of 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 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
+ 17.1 s	Beginning of roll maneuver
+ 2 min 19 s	EAP separation
+ 3 min 19 s	Fairing jettisoned
+ 8 min 10 s	Acquisition by Natal tracking station
+ 8 min 55 s	End of EPC thrust phase
+ 9 min 01 s	EPC separation
+ 9 min 05 s	Ignition of ESC-A stage
+ 13 min 51 s	Acquisition by Ascension tracking station
+ 18 min 77 s	Data acquisition by Libreville tracking station
+ 23 min 10 s	Acquisition by Malindi tracking station
+ 25 min 29 s	Injection
+ 28 min 19 s	<b>Horizons 3e satellite separation</b>
+ 35 min 56 s	SYLDA separation
+ 42 min 17 s	<b>Azerspace-2/Intelsat 38 satellite separation</b>



# 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:

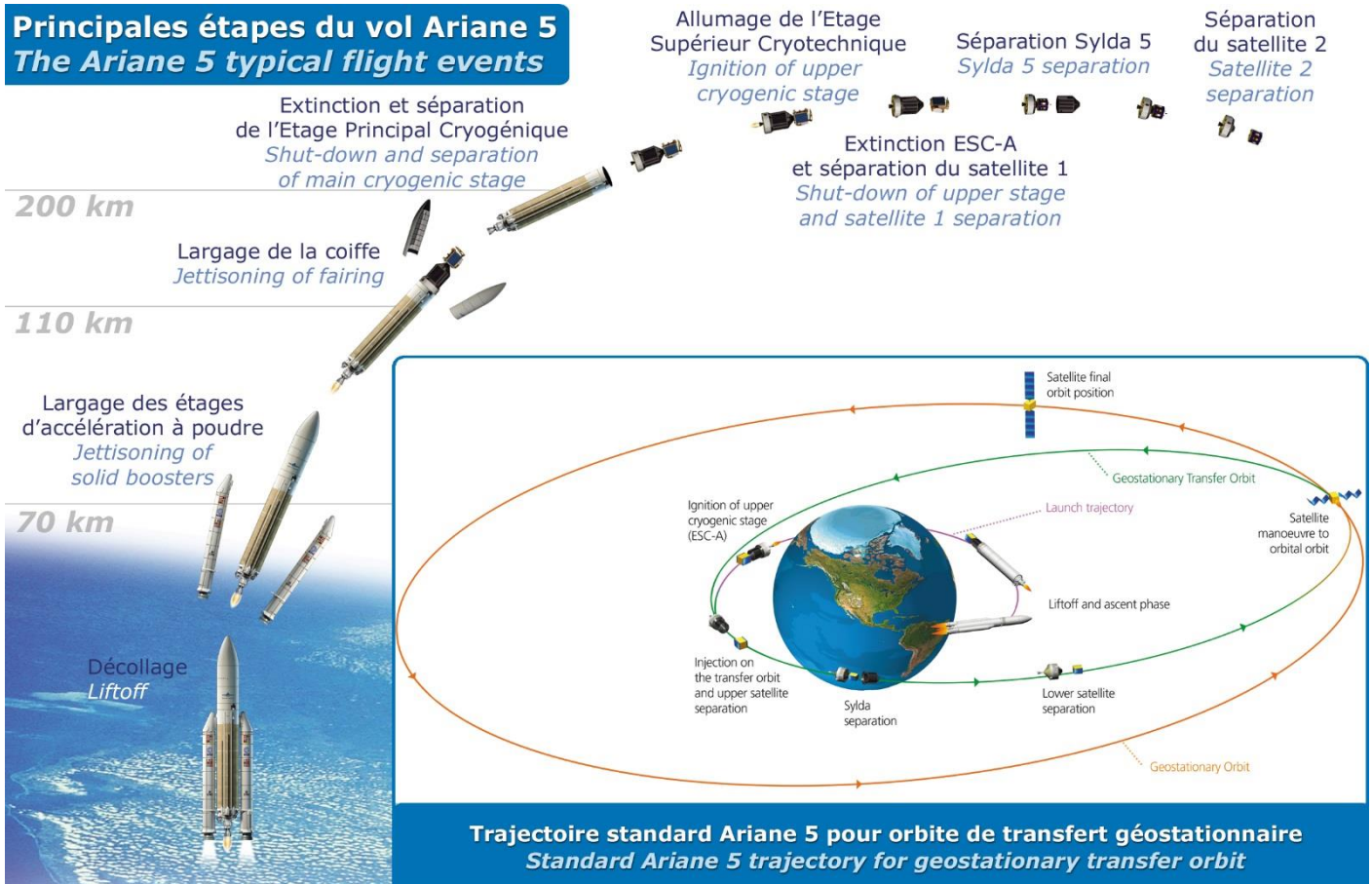
- > Startup of water injection in the flame trenches and exhaust guide (T-30 sec).
- > Hydrogen aspiration for chilldown of the Vulcain engine in the exhaust guide (T-18 sec).
- > Burn-off of hydrogen used for chilldown (T-5.5 sec).

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.**

### Principales étapes du vol Ariane 5 The Ariane 5 typical flight events





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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 17 other shareholders from the European launcher industry.

Since the outset, Arianespace has signed over 530 launch contracts and launched 570-plus satellites. More than half of the commercial satellites now in service around the globe were launched by Arianespace. The company posted sales of approximately 1.3 billion euros in 2017.

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 commercial launch contracts up for bid worldwide in the past two years. Arianespace now has a backlog of more than 700 satellites to be launched.

### THE GUIANA SPACE CENTER: EUROPE'S SPACEPORT

For more than 40 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.