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LAUNCH KIT

August 2019

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Intelsat 39

EDRS-C

esa

INTELSAT 39
MAXAR

AIRBUS

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

ARIANESPACE TO LAUNCH TWO GEOSTATIONARY SATELLITES WITH ARIANE 5: INTELSAT 39 AND EDRS-C

For its third flight with Ariane 5 this year, Arianespace will orbit two telecommunications satellites for long-term customers: Intelsat 39, for the operator Intelsat; and the EDRS-C satellite, based on a public–private partnership between the European Space Agency (ESA) and Airbus.

Through this mission, Arianespace highlights its ability to be at the service of innovative satellite solutions for commercial and institutional needs.

Intelsat 39

Intelsat 39 will be the 61st satellite launched by Arianespace for Intelsat since the first mission at its service in 1983. It will replace Intelsat 902 (launched by Arianespace in 2001) at 62 degrees East.

The Intelsat 39 telecommunication satellite is designed with both wide and high-powered steerable spot beams to meet the needs of broadband networking, video and government customers across Africa, Asia, Europe, the Middle East and Indian Ocean region. The steerable spot beams provide flexibility within the payload and enable customers to rapidly and efficiently respond to shifts in geographic or application requirements. The satellite features C-and Ku-band capabilities to provide additional scale for Intelsat's Flex managed service and enhance mobile connectivity for aero, maritime and government users operating across these regions.

Intelsat 39 is a powerful platform that will enable mobile network operators, enterprises and internet service providers to deliver faster and more efficient connectivity services. It will also provide government entities with the ability to expand connectivity to more remote areas and continue to narrow the digital divide. Intelsat 39 is based on the powerful 1300 platform, which has the flexibility to support a broad range of applications and technology advances, including electric propulsion.

Intelsat 39 was built by Maxar in Palo Alto, California. Maxar is a leading provider of innovative spacecraft systems with deep experience in building and integrating some of the world's most powerful and comprehensive spacecraft.

Intelsat 39 will be the 57th satellite based on a Maxar 1300 platform launched by Arianespace.

EDRS-C

The EDRS-C satellite is the second node of the SpaceDataHighway network. The SpaceDataHighway is the world's first "optical fiber" network in the sky based on cutting-edge laser technology. It is a unique network of geostationary satellites permanently fixed over a network of ground stations that can transmit data at a rate of 1.8 Gbit/s It will help to improve environmental and security monitoring, disaster response and crisis management.
As a result, Arianespace once again ensures its leading mission to offer an independent access to space for European flagship programs.

The SpaceDataHighway system will relay larger volumes of image data in a secure way. From its position in geostationary orbit, the SpaceDataHighway system relays data collected by observation satellites to Earth in near-real-time, a process that would normally take several hours. It thus enables the quantity of image and video data transmitted by observation satellites to be tripled and their mission plan to be reprogrammed at any time and in just a few minutes.

Launched into a geostationary orbit at 31° East, EDRS-C will be able to connect low-orbiting observation satellites via laser at a distance up to 45,000 km., as well as intelligence UAVs or mission aircraft.

The SpaceDataHighway is a public–private partnership between the European Space Agency (ESA) and Airbus, with the laser terminals developed by Tesat-Spacecom and Germany's DLR Aerospace Center. Airbus owns, operates and provides services for the SpaceDataHighway. The EDRS-C satellite platform is supplied by OHB System AG.

In addition, a hosted payload - HYLAS 3 - was provided by Avanti Communications under a contract with ESA as a customer-furnished item to OHB.

EDRS-C/HYLAS 3 will be: the 132th satellite launched for Airbus by Arianespace, the 26th satellite based on an OHB platform; and the 4th Avanti payload to be launched by Arianespace.

CONTENTS

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MISSION DESCRIPTION

Arianespace's third Ariane 5 ECA launch of 2019 will place its satellite passengers into geostationary orbit.

The launcher will be carrying a total payload of approximately 10,661 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 **Tuesday, August 6, 2019** as early as possible within the following launch window:

- **Between 3:30 p.m. and 5:51 p.m.** Washington DC time
- **Between 4:30 p.m. and 6:51 p.m.** Kourou, French Guiana time
- **Between 19:30 and 21:51** Universal Time (UTC)
- **Between 9:30 p.m. and 11:51 p.m.** Paris time

MISSION DURATION

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

33 minutes, 31 seconds.

TARGETED GEOSTATIONARY ORBIT

Perigee altitude
250 km.

Apogee altitude
35,786 km.

Inclination
4.5 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.

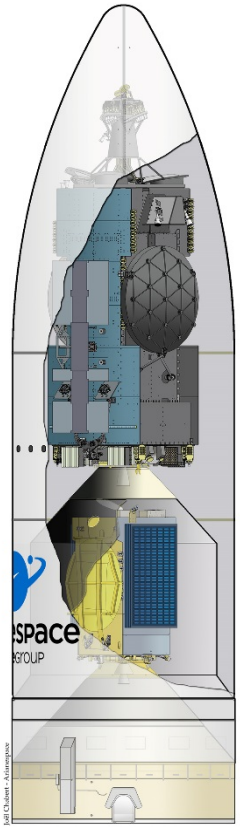
The fairing protecting the payload is jettisoned at T+197.2 seconds.

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): Intelsat 39**
  Mass at liftoff: 6,600 kg.
- **Lower payload (CUB): EDRS-C**
  Mass at liftoff: 3,186 kg.
- **Long version of the payload fairing**
- **SYLDA (Système de Lancement Double Ariane)**



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Intelsat 39

CUSTOMER	**Intelsat**
MANUFACTURER	**Maxar Technologies**
MISSIONS	**Video distribution and connectivity services for broadband networking and government customers; mobility services for aero, maritime and government customers**
MASS AT LAUNCH	6,600 kg.
PLATFORM	LS1300
ORBITAL POSITION	62° East
BATTERIES	3 x Li-Ion
PAYLOAD	C-band and Ku-band
COVERAGE AREA	Africa, Europe, Asia, Middle East and Asia + connectivity over the Indian Ocean region
DESIGN LIFE	>15 years

PRESS CONTACTS

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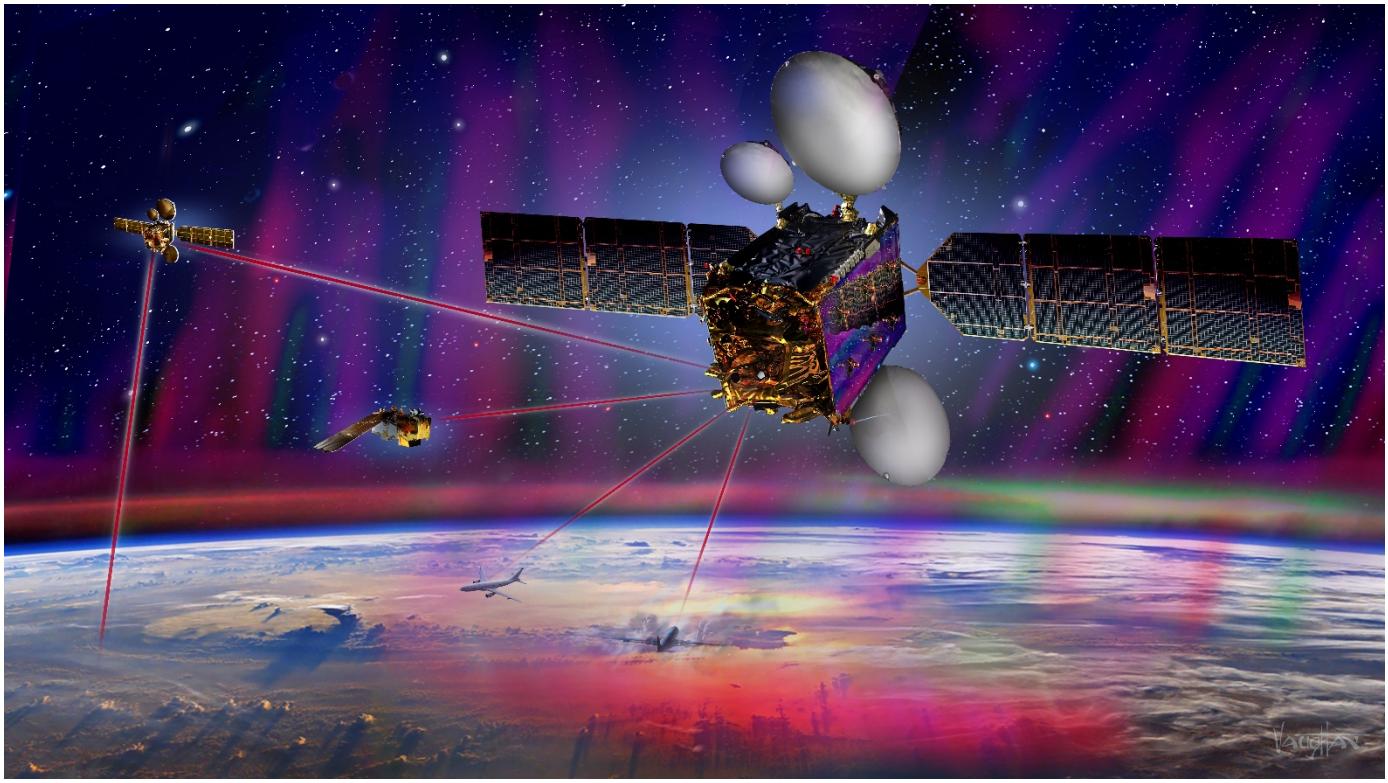
EDRS-C



CUSTOMERS	**Airbus DS GmbH**
MANUFACTURER	**OHB System AG**
MISSION	**Telecommunications**
MASS AT LAUNCH	3,186 kg.
ORBITAL POSITION	31° East
PLATFORM	SmallGEO bus
STABILIZATION	3 axis stabilized
BATTERIES	Li-Ion
PAYLOAD	Laser Communications terminal and Ka-band
COVERAGE AREA	Africa, Europe, Latin America and the Middle East
DESIGN LIFE	15 years

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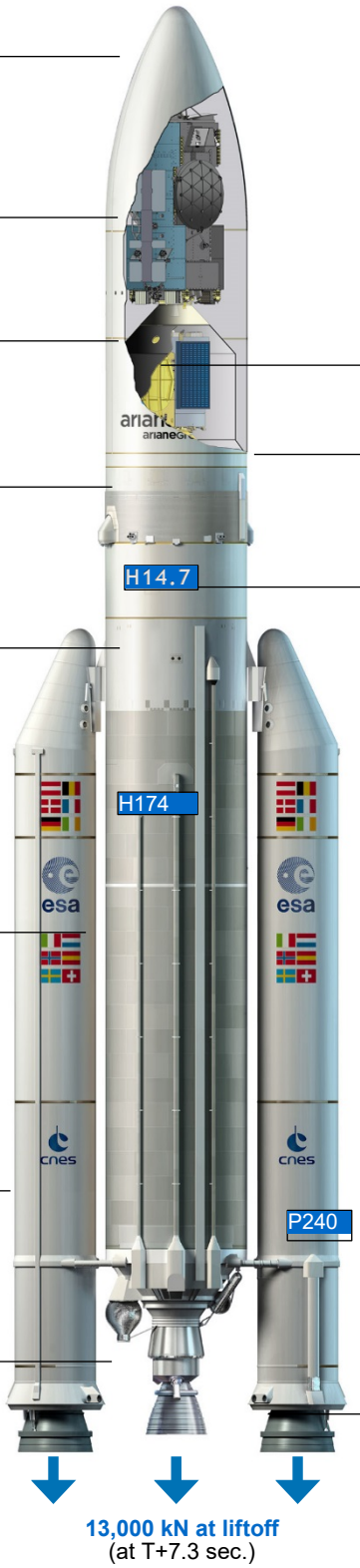
ARIANE 5 ECA LAUNCH VEHICLE

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

51.03 m.



Fairing

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

Intelsat 39

Maxar
Mass: 6,600kg.

EDRS-C

OHB
Mass: 3,186 kg.

Vehicle Equipment Bay

Height: 1.13 m.
Mass: 970 kg.

HM-7B engine

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

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

780 metric tons
(total mass at liftoff)

PA - Payload adaptor (2)

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

SYLDA - Internal structure

Mass: 440 kg.

ESC-A - Cryogenic upper stage

Height: 4.71 m.
Mass: 19 t.

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

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.)

LAUNCH CAMPAIGN - ARIANE 5
Intelsat 39
EDRS-C

SATELLITE AND LAUNCH VEHICLE CAMPAIGN CALENDAR

DATE	SATELLITES ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
From June 12 to 15, 2019		Campaign start review EPC unpacking and erection
June 14, 2019		EAP 1 & 2 transfer to the BIL (Launcher Integration Building)
June 17 , 2019		EPC/EAP integration
June 20, 2019	Arrival EDRS-C in French Guiana and transfer by road to the Spaceport's S5C payload preparation facility	
June 21, 2019		Erection of ESC-A and vehicle equipment bay installation
June 24, 2019	Arrival of Intelsat 39 in French Guiana and transfer by road to the Spaceport's S5C payload preparation facility	
July 5, 2019		Transfer from BIL to BAF (Final Integration Building)
July 5 & 8, 2019	Intelsat 39 fueling operations	
July 9, 2019	Intelsat 39 integration on payload adaptor	
July 10, 2019	Intelsat 39 transfer to the BAF	
July 10 & 12, 2019	EDRS-C fueling operations	
July 11, 2019	Intelsat 39 integration on SYLDA	

SATELLITE AND LAUNCH VEHICLE CAMPAIGN FINAL CALENDAR

DATE	SATELLITES ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
Friday, July 12, 2019	Payload fairing encapsulation on SYLDA (with Intelsat 39 inside	
Thursday, July 18, 2019	EDRS-C integration on payload adaptor, EDRS-C transfer to the BAF	
Monday, July 29, 2019	EDRS-C integration on launch vehicle	
Tuesday, July 30, 2019	Composite (Intelsat 39 under fairing) integration on launch vehicle	HM7B engine final inspection
Wednesday, July 31, 2019		Finalization of the composite/launcher integration
Thursday, August 1 , 2019		Dress rehearsal
Friday, August 2 , 2019		Launch readiness review (LRR) Arming of launch vehicle
Saturday, August 3, 2019		Final preparation of launcher and BAF for chronology
Monday, August 5, 2019		Roll-out from BAF to the Launch Pad, launch vehicle connections and filling of the EPC liquid helium tank
Tuesday, August 6, 2019		Start of launch countdown, EPC and ESC-A filling with liquid oxygen and liquid hydrogen

COUNTDOWN AND FLIGHT SEQUENCE

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.

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

T-0	Reference time
+ 01 s	Ignition of the cryogenic main stage (EPC)
+ 07.05 s	Ignition of solid boosters (EAP)
+ 07.3 s	Liftoff
+ 12.7 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 17 s	Fairing jettisoned
+ 8 min 03 s	Acquisition by Natal tracking station
+ 8 min 42 s	End of EPC thrust phase
+ 8 min 48 s	EPC separation
+ 8 min 52 s	Ignition of ESC-A stage
+ 13 min 47 s	Acquisition by Ascension tracking station
+ 18 min 23 s	Acquisition by Libreville tracking station
+ 23 min 08 s	Acquisition by Malindi tracking station
+ 25 min 32 s	Extinction of ESC-A stage
+ 25 min 34 s	Injection
+ 29 min 09 s	**Intelsat 39 satellite separation**
+ 31 min 06 s	SYLDA separation
+ 33 min 31 s	**EDRS-C satellite separation**

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).

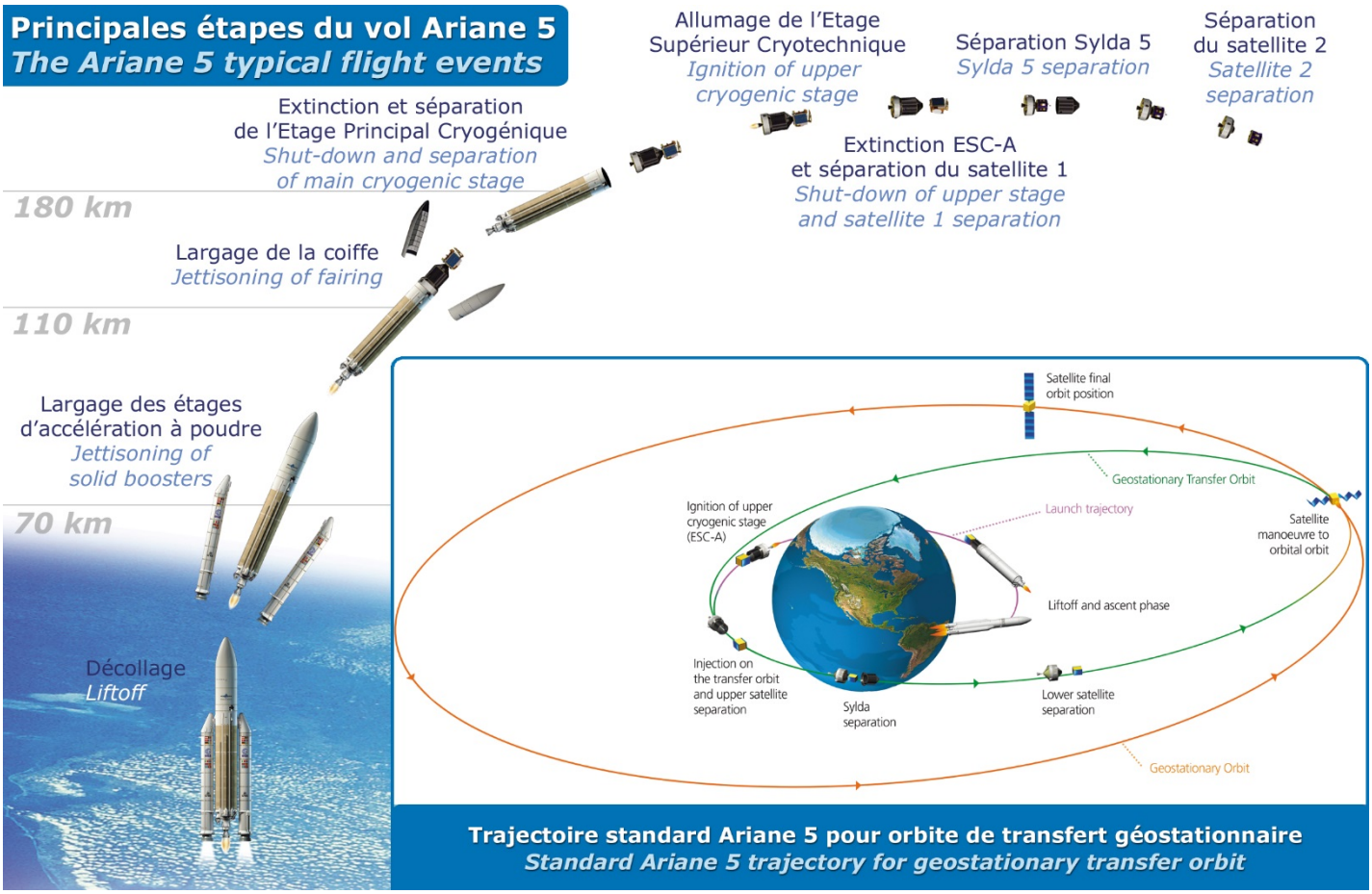
The synchronized sequence starts seven minutes before ignition (T-0). It is primarily designed to perform the final operations on the launcher prior to launch, along with the ultimate checks needed following switchover to flight configuration. As its name indicates, the sequence is fully automatic, and 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.



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 580 launch contracts and launched more than 600 satellites. More than half of the commercial satellites now in service around the globe were launched by Arianespace. The company posted sales of approximately 1.4 billion euros in 2018.

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 710 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 (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 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.