arianespace
service & solutions

LAUNCH KIT

June 2017

VA237

ViaSat-2

EUTELSAT 172B

esa ViaSat eutelsat cnes

ARIANESPACE TO SERVE THE WORLD CONNECTIVITY WITH TELECOM SATELLITES FOR VIASAT INC. AND EUTELSAT

For its sixth launch of the year, and the third Ariane 5 mission in 2017 from the Guiana Space Center in French Guiana, Arianespace will orbit two satellites: ViaSat-2 for the company ViaSat Inc.; and EUTELSAT 172B for Eutelsat.

ViaSat-2 and EUTELSAT 172B are the 558th and 559th satellites to be launched by Arianespace.

With this 289th mission by the Arianespace family of launchers, Arianespace is serving the global connectivity on Earth.

CONTENTS

ViaSat-2

ViaSat-2 is the second ViaSat, Inc. satellite to be launched by Arianespace. The first was WildBlue-1 in 2006. ViaSat has publicly announced plans to launch a ViaSat-3 class satellite with Arianespace in the future – further extending the partnership between the two companies.

ViaSat is changing the perception of satellite internet, globally. As a broadband services company, ViaSat has set out to advance global connectivity beyond what traditional telecom, wireless, cable or fiber could deliver, by solving one of the hardest communications problems: making the internet accessible and affordable to all.

The ViaSat-2 satellite system was designed to offer high-capacity connectivity and wide coverage, with dynamic flexibility to move capacity to where demand requires it. The ViaSat-2 satellite system is expected to bring considerable improvements in terms of speed, lower costs and extended broadband coverage within its footprint, which includes North and Central America, plus the Caribbean, northern South America, and the aeronautical and maritime routes in the Atlantic Ocean between North America and Europe.

ViaSat-2 offers double the network capacity and seven times more coverage than its predecessor, ViaSat-1, and it will continue to transform the economics and quality of satellite broadband services – delivering the industry's best satellite internet to users on the ground, in the air, or at sea. The satellite system offers approximately 300 Gigabits per second (Gbps) of total network capacity – more capacity than any other communications satellite. With an abundance of network capacity, coupled with a state-of-the-art ground network and industry-best bandwidth economics, ViaSat-2 can significantly improve speeds with an in-orbit cost per bit that is considerably lower than other satellite systems.

Positioned at 70 West, ViaSat-2 will be the highest capacity communications satellite in orbit, and will enable the highest quality internet connections, allowing customers to operate an array of fixed and mobile services including in-flight connectivity, maritime, emergency relief, oil and gas operations, and government applications anywhere within its coverage areas.

After the launch of ViaSat-2, Arianespace has another ViaSat Inc. satellite in its order book for orbiting at a future date.

ViaSat-2 was built by Boeing in El Segundo, California, using a 702HP platform. It will be the 54th Boeing satellite launched by Arianespace, which has three more satellites from this manufacturer in its order book.

EUTELSAT 172B

EUTELSAT 172B will be the 32nd satellite launched by Arianespace for Eutelsat. Both companies have worked side-by-side since 1983, when Arianespace launched the Eutelsat-1 F1 satellite. Including this upcoming launch, more than half of Eutelsat's satellites will have been orbited by Arianespace.

Eutelsat is one of the world's leading and most experienced operators of communications satellites. The company provides capacity on 39 satellites to clients that include broadcasters and broadcasting

CONTACT PRESSE | Claudia Euzet-Hoyau
c.hoyau@arianespace.com
+33 (0)1.60.87.55.11

associations; pay-TV operators; video, data and Internet service providers; enterprises and government agencies.

EUTELSAT 172B will deliver increased capacity for fast-growing applications that include in-flight and maritime connectivity, cellular backhaul, corporate networks, video distribution and government services. It will be located at 172° East, a key neighborhood providing exceptional Asia-Pacific reach over land and sea, from Alaska to Australia.

EUTELSAT 172B will, in particular, feature a new Ku-band multi-beam payload delivering 1.8 Gbps of throughput to serve the world's fastest-growing region for air traffic. Asia-Pacific represents the largest opportunity for in-flight entertainment and connectivity services. The customized High Throughput Satellite (HTS) payload on EUTELSAT 172B will be a major growth platform for in-flight connectivity, notably Panasonic Avionics Corporation – one of the leading suppliers of in-flight entertainment and connectivity services for commercial airlines.

In addition to this HTS payload, the satellite will provide service continuity and improved performance via C- and Ku-band payloads connected to a range of footprints serving the Asia-Pacific markets as well.

Arianespace also has two other Eutelsat satellites in its order book for future launches.

EUTELSAT 172B is the first all-electric telecommunications satellite built in Europe. This key enabling technology has been implemented by Airbus in Toulouse, using the new all-electric Eurostar E3000 EOR (Electric Orbit Raising) platform.

The high-power satellite relies exclusively on electric propulsion for orbit raising and all on-station maneuvers. It also features technological innovations such as the Multi-Port Amplifier (MPA) to distribute power between spot beams in direct response to surges in capacity on-board aircraft; deployable robotic arms to orientate and control plasmic thrust direction during the approximately four-month ride to geostationary orbit; and 3D-printed components.

It is the first satellite with this platform to be launched by Arianespace, which has 15 other Airbus-built satellites in its order book.

EUTELSAT 172B is the first all-electric satellite to be launched by Arianespace with Ariane 5.

MISSION DESCRIPTION

Arianespace's third 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 10,865 kg.

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

DATE AND TIME

Liftoff is planned on **Thursday, June 1, 2017**
as early as possible within the following launch window:

> Between 4:45 p.m. and 5:45 p.m., Carlsbad, California,
> Between 7:45 p.m. and 8:45 p.m., Washington D.C. time
> Between 8:45 p.m. and 9:45 p.m., Kourou time in French Guiana
> Between 23:45 and 00:45, Universal Time (UTC) during the night of June 1 to June 2
> Between 01:45 p.m. and 2:45 p.m., Paris time on June 2.

MISSION DURATION

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

41 minutes, 47 seconds.

TARGETED ORBIT

Perigee altitude	Apogee altitude	Inclination
250 km.	35,706 km.	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, 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+202 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):** ViaSat-2
Mass at liftoff: 6,418 kg.

> **Lower payload (CUB):** EUTELSAT 172B
Mass at liftoff: approximately 3,551 kg.

> Long version of the payload fairing

> SYLDA (SYstème de Lancement Double **Ariane)**

VIASAT-2 SATELLITE

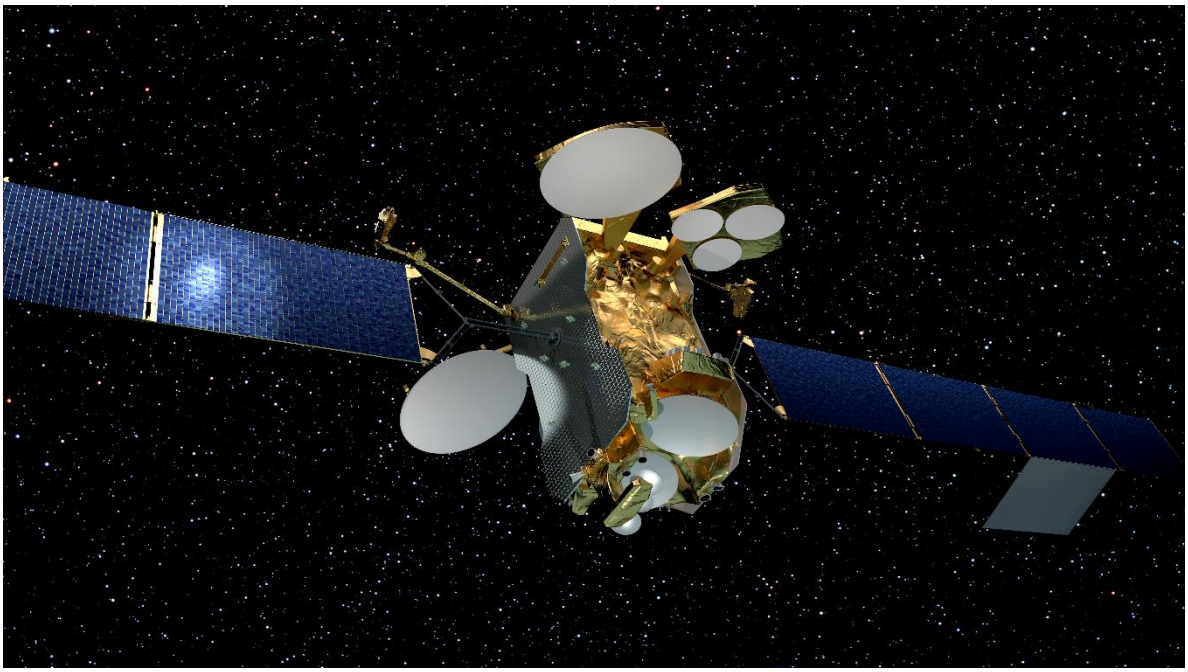
CUSTOMER	**ViaSat Inc.**
PRIME CONTRACTOR	Boeing
MISSION	Telecommunications
MASS AT LAUNCH	6,418 kg.
STABILIZATION	3 axis
DIMENSIONS	6 m x 3 m x 2 m (stowed configuration for launch)
PLATFORM	Boeing 702HP
PAYLOAD	Transponders in Ka band
ONBOARD POWER	18.2 kW (beginning of life) 16.1 kW (end of life)
DESIGN LIFE	More than 14 years
ORBITAL POSITION	70° West
COVERAGE AREA	North America, Latin America, Caribbean and part of South America

PRESS CONTACTS

ViaSat Inc.
Chris Phillips
Director, PR | Corporate Communications
Tel: +1 917 974 1667
e-mail: chris.phillips@viasat.com
Website: viasat.com

BOEING
Joanna.E.Climer
Press officer
Tel : +1 310-364-7113
e-mail: Joanna.E.Climer@boeing.com
Website: boeing.com

EUTELSAT 172B SATELLITE



CUSTOMER	**Eutelsat**
PRIME CONTRACTOR	Airbus Defence and Space
MISSION	In-flight and maritime connectivity, cellular backhaul, corporate networks, video distribution and government services
MASS	3,551 kg. at liftoff
STABILIZATION	3 axis
DIMENSIONS	3.7m x 3.0m x 5.4 m, 39.3m wingspan
PLATFORM	Eurostar E3000e (Electric Orbit Raising)
PAYLOAD	14 C-band transponders, 36 Ku-band transponders and 11 Ku-band HTS spot beams
ONBOARD POWER	13 kW
DESIGN LIFE	More than 15 years
ORBITAL POSITION	172° East
COVERAGE AREA	Asia-Pacific

CONTACTS PRESSE

Eutelsat
Vanessa O'Connor
Director of Corporate Communications
Tel: +33 1 53 98 47 57
e-mail: voconnor@eutelsat.com
Website: eutelsat.com

Airbus
Guilhem Boltz
Press officer
Tel: +33 (0)6 34 78 14 08
e-mail: guilhem.g.boltz@airbus.com
Website: airbus.com

ARIANE 5 ECA LAUNCH VEHICLE

The launcher is delivered to Arianespace by Airbus Safran Launchers as production prime contractor.

54.8 m

Fairing

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

ViaSat-2

(ViaSat Inc.)
Mass: 6,418 kg.

EUTELSAT 172B

(Eutelsat)
Mass: 3,551 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

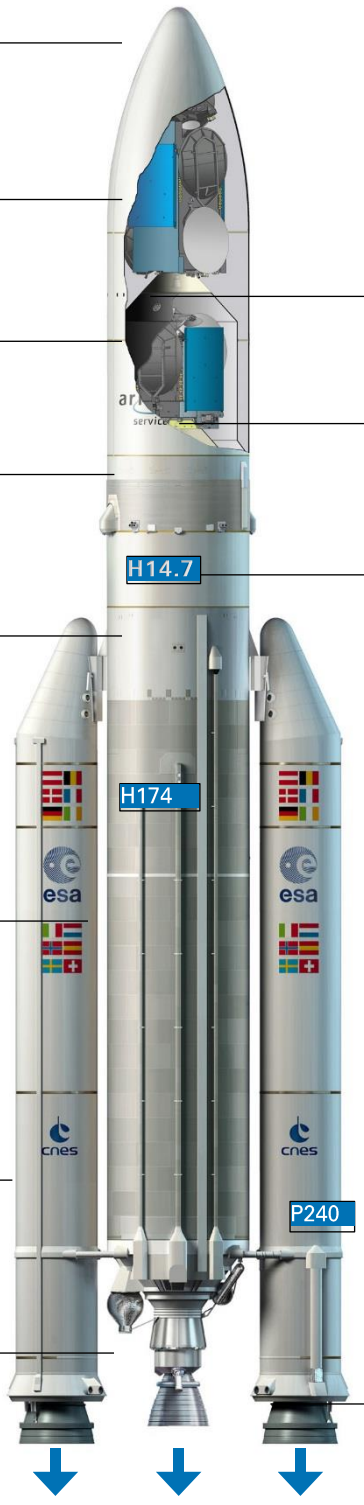
Height: 31 m.
Mass: 188 t.

EAP - Solid rocket boosters

Height: 31.6 m.
Mass: 277 t approx.

Vulcain 2 engine

Thrust: 1,390 kN (in vacuum)
540 sec. of propulsion



780 tons
(total mass at liftoff)

PAS- Payload adaptor (2)

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

SYLDA - Internal structure

7 versions (Height: 4.9 to 6.4 m)
Mass: 400 to 530 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
ViaSat-2 / EUTELSAT 172B

SATELLITE AND LAUNCH VEHICLE CAMPAIGN CALENDAR

DATE	SATELLITE ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
March 11, 2017		Campaign start review EPC unpacking - EPC erection
March 13, 2017		EAP 1 and EAP 2 transfer
March 14, 2017		EPC/EAP integration
March 17, 2017	Arrival in French Guiana of ViaSat-2 and transportation to the Spaceport's S5 payload preparation facility	Erection of ESC-A with Vehicle Equipment Bay
From March 22 to April 23, 2017		*Launch campaign interruption due to social movement in French Guiana*
Starting Monday April 24, 2017		*Resumption of operations*
April 27, 2017	Arrival in French Guiana of EUTELSAT 172B and transportation to the S5 facility	
April 29, 2017	EUTELSAT 172B fitcheck	
May 9, 2017	ViaSat-2 fitcheck	
May 12 to May 15, 2017	ViaSat-2 fueling operations	
May 13 to May 16, 2017	EUTELSAT 172B fueling operations	
May 13, 2017		Transfer from BIL (Launcher Integration Building) to BAF (Final Assembly Building)
May 17, 2017	ViaSat-2 integration on PAS in the S5B hall;	
May 18, 2017	ViaSat-2 transfer to the Final Assembly Building (BAF)	
May 19, 2017	EUTELSAT 172B integration on PAS ViaSat-2 integration on SYLDA	

SATELLITES AND LAUNCH VEHICLE CAMPAIGN FINAL CALENDAR

DATE	SATELLITE ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
Saturday, May 20, 2017	ViaSat-2 encapsulation in the payload fairing EUTELSAT 172B transfer to the Final Assembly Building (BAF)	
Monday, May 22, 2017	EUTELSAT 172B integration on launch vehicle	HM7B engine final inspection
Tuesday, May 23, 2017	Completion of composite integration on launcher and payload checks	
Wednesday, May 24, 2017		Finalization of the composite/launcher integration, and payload checks
Friday, May 26, 2017		Launch rehearsal
Monday, May 29, 2017		Arming of launch vehicle
Tuesday, May 30, 2017		Launch readiness review (RAL), final preparation of launcher and BAF for the chronology
Wednesday, May 31, 2017		Rollout from BAF to Launch Zone, launch vehicle connections and filling of the EPC liquid helium tank
Thursday, June 1, 2017		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/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
T-0	**Ignition of the cryogenic main stage engine (EPC)**
+ 07 s	Ignition of solid boosters (EAP)
+ 07 s	Liftoff
+ 13 s	End of vertical climb, beginning of pitch motion
+ 17 s	Beginning of roll maneuver
+ 2 min 21 s	EAP separation
+ 3 min 22 s	Fairing jettisoned
+ 8 min 12 s	Acquisition by Natal tracking station
+ 8 min 56 s	End of EPC thrust phase
+ 9 min 02 s	EPC separation
+ 9 min 06 s	Ignition of ESC-A stage
+ 13 min 49 s	Acquisition by Ascension tracking station
+ 18 min 24 s	Data acquisition by Libreville tracking station
+ 23 min 06 s	Acquisition by Malindi tracking station
+ 25 min 27 s	Injection
+ 29 min 26 s	**ViaSat-2 satellite separation**
+ 31 min 55 s	SYLDA separation
+ 41 min 47 s	**EUTELSAT 172B satellite separation**
+ 52 min 35 s	End of the 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).

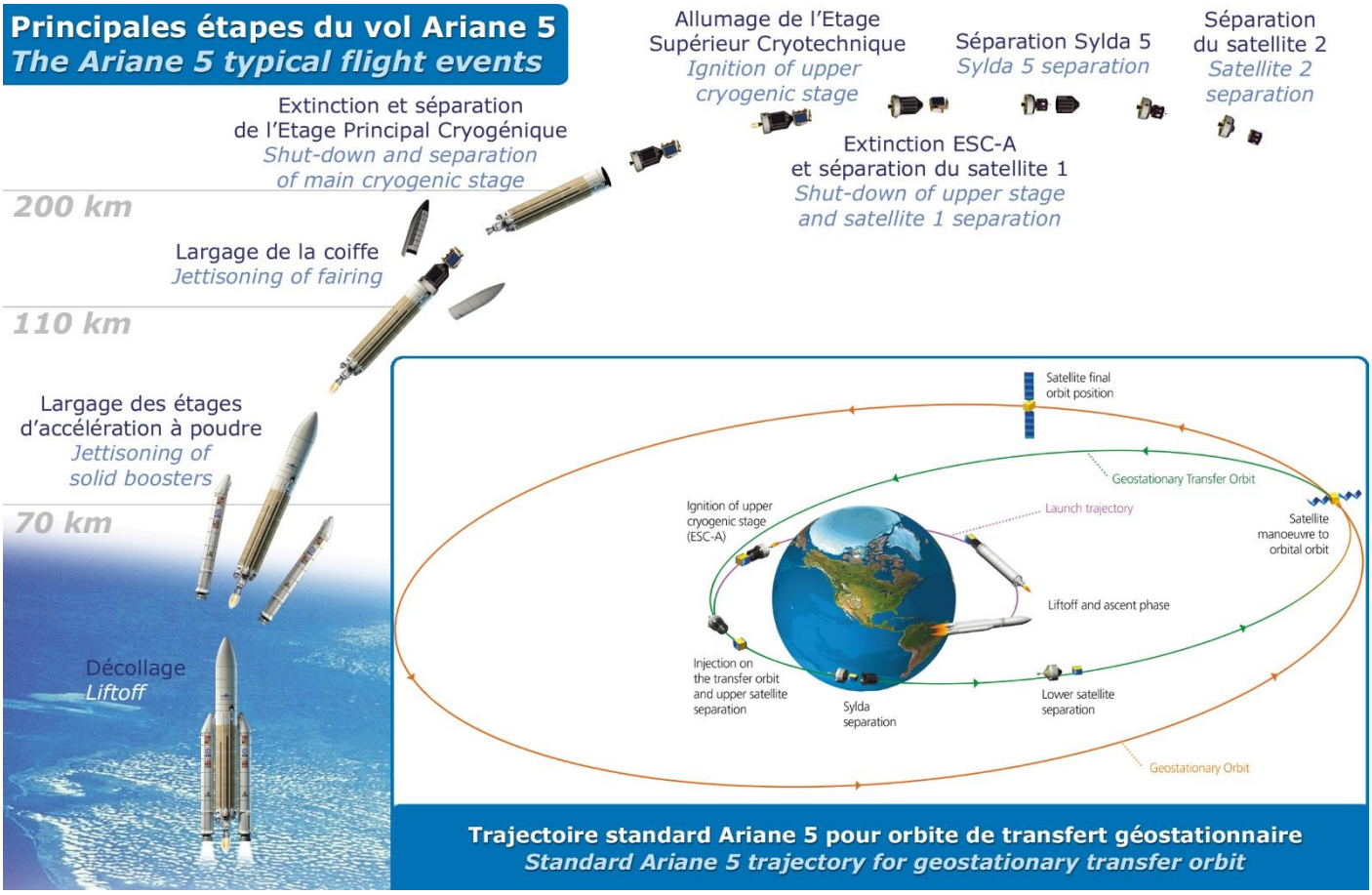
The synchronized sequence starts seven minutes before ignition (T-0). It is primarily designed to perform the final operations on the launcher prior to launch, along with the ultimate checks needed following switchover to flight configuration. As its name indicates, the sequence is fully automatic, and 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).
> 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+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 Airbus Safran Launchers, 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 550-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 1.4 billion euros in 2016.

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 70 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 (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 Safran Launchers - all participating 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 functional checks of the Ariane launcher - built by Airbus Safran Launchers 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), which is operated by the Guiana Space Center (CNES/CSG). Next, Arianespace oversees final assembly of the launcher and integration of satellites in the Final Assembly Building (BAF), followed by transfer of the Ariane launcher to Launch Zone No. 3 (ZL3), and then the final countdown and liftoff - which are managed from the 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.