arianespace
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LAUNCH KIT

February 2020

VA252

JCSAT-17

GEO-KOMPSAT-2B

esa

SKY Perfect JSAT Corporation

KOREA

천리안 2B호
GEO-KOMPSAT-2B

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

VA252: ARIANESPACE AT THE SERVICE OF SKY PERFECT JSAT (JAPAN) AND KARI (KOREA) WITH JCSAT-17 AND GEO-KOMPSAT-2B.

For its third flight of 2020, Arianespace will orbit two telecommunications satellites using an Ariane 5 launch vehicle from the Guiana Space Center: JCSAT-17 for the Japanese operator SKY Perfect JSAT Corporation; and GEO-KOMPSAT-2B for Korea Aerospace Research Institute (KARI).

With this mission dedicated to space applications for telecommunications and environment monitoring, Arianespace once again contributes to the improvement of life on Earth.

JCSAT-17

Since the launch of JCSAT-1 in 1989, SKY Perfect JSAT Corporation and Arianespace have developed a strong relationship of mutual trust.

JCSAT-17 will be the 21st SKY Perfect JSAT satellite to be launched by Arianespace. This geostationary communications satellite will deliver flexible, high-bandwidth communications to users in Japan and the surrounding region.

JCSAT-17 payloads incorporates S-band, C-band and Ku-band transponders, which will provide satellite communication services. The S-band and C-band transponders will serve NTT DOCOMO, Inc., the largest telecommunications company in Japan, for its flexible mobile communications services in Japan and the surrounding region under IRU contract (Indefeasible Right of Use). SKY Perfect JSAT will support NTT DOCOMO's satellite communication services.
SKY Perfect JSAT Corporation is a leader in the converging fields of broadcasting and communications. It is a provider of both multi-channel pay TV broadcasting and satellite communications services and delivers a broad range of entertainment through the SKY PerfecTV! platform – the most extensive in Japan.

Arianespace has been present in Japan for more than 30 years, with the opening of an office in Tokyo in 1986. The relationship of trust forged with Japanese operators and public authorities has enabled the company to win 34 of the 47 launch contracts open to competition. Since 1989, Arianespace has launched an average of one Japanese satellite per year.

JCSAT-17 will also be the 32nd satellite launched by Arianespace for Japan.

Built by Lockheed Martin Space, JCSAT-17 will be the 47th satellite made by this manufacturer to be launched by Arianespace.

GEO-KOMPSAT-2B

GEO-KOMPSAT-2B will be KARI's second satellite as a manufacturer – and its third as a client – to be launched by Arianespace.

The GEO-KOMPSAT-2 program is a national program of the Korean government to develop and operate two civilian geostationary satellites: GEO-KOMPSAT-2A for meteorological and space weather monitoring missions; and GEO-KOMPSAT-2B for Earth environment monitoring and ocean monitoring missions. The GEO-KOMPSAT 2 program also ensures the succession for the COMS program (Communication, Ocean and Meteorological Satellite).
The predecessor satellite, GEO-KOMPSAT-2A, was successfully launched by Arianespace in December 2018.
GEO-KOMPSAT-2B carries two main payloads: GOCI II (Geostationary Ocean Color Imager II), provided by Airbus Defence and Space; and the GEMS (Geostationary Environment Monitoring Spectrometer), provided by Ball Aerospace & Technologies.

For nearly 30 years, Arianespace and Korea's satellite technology research centers have developed a sound relationship, with the launch of both scientific microsatellites and the COMS multi-mission satellite. Arianespace also maintains a fruitful collaboration in terms of commercial telecommunications with the national satellite operator.
In parallel, Arianespace developed a unique partnership with Korean industry. During the 1990s, Korea delivered 22 telemetry boxes for Ariane 5, thus becoming the only non-European partner involved in the Ariane program.

GEO-KOMPSAT-2B will be the eighth satellite launched by Arianespace for South Korea.

Currently, there is one additional KARI satellite in Arianespace's backlog for a future launch.

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MISSION DESCRIPTION

Arianespace's third 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 10,206 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, February 18, 2020,** as early as possible within the following launch window:

> **Between 5:18 p.m. and 6:20 p.m.** Washington, D.C. time,
> **Between 7:18 p.m. and 8:20 p.m.** Kourou, French Guiana time,
> **Between 22:18 and 23:20** Universal time (UTC),
> **Between 11:18 p.m. and 12:20 a.m.** Paris time, in the night of February 18 to 19,
> **Between 07:18 a.m. and 08:20 a.m.** Japan time, in the morning of February 19,
> **Between 07:18 a.m. and 08:20 a.m.** Korea time, in the morning of February 19.

MISSION DURATION

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

31 minutes, 09 seconds.

TARGETED GEOSTATIONARY ORBIT

Perigee altitude	Apogee altitude	Inclination
250 km.	35,786 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 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).

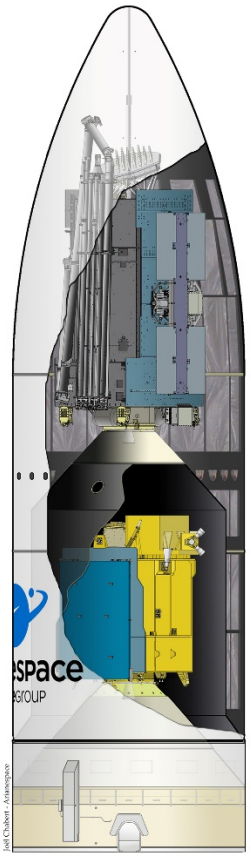
PAYLOAD CONFIGURATION

> **Upper payload (CUH): JCSAT-17**
Mass at liftoff: 5,857 kg.

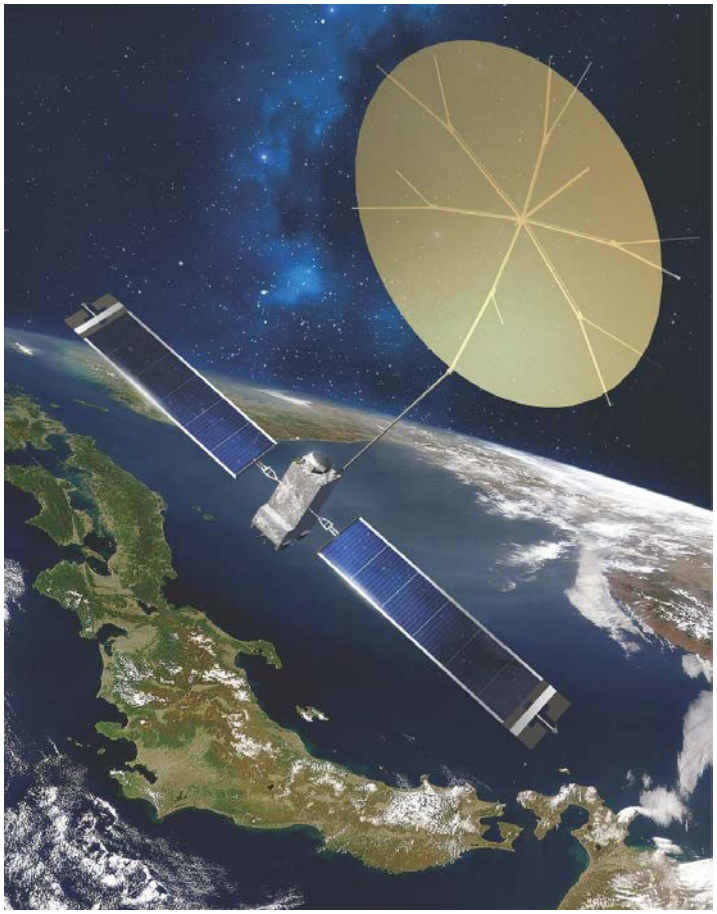
> **Lower payload (CUB): GEO-KOMPSAT-2B**
Mass at liftoff: 3,379 kg.

> **Long version of the payload fairing**

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



JCSAT-17 SATELLITE



CUSTOMER	**SKY Perfect JSAT Corporation**
PRIME CONTRACTOR	**Lockheed Martin Space**
MISSION	Telecommunications
ORBITAL POSITION	136° East
MASS AT LAUNCH	5,857 kg.
PLATFORM	LM 2100™
PROPULSION	Liquid bi-propellant
PAYLOAD	S-, C- and Ku-Band
COVERAGE AREA	Japan, Asia-Pacific region (S-Band and C-Band cover Japan and surrounding waters)
DESIGN LIFE	15 years

PRESS CONTACTS

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GEO-KOMPSAT-2B SATELLITE

CUSTOMER	**Korea Aerospace Research Institute (KARI)**
PRIME CONTRACTOR	**KARI**
MISSION	Earth environment monitoring and ocean monitoring
ORBITAL POSITION	128.2° East
MASS AT LAUNCH	3,379 kg.
PLATFORM	Specific
BATTERIES	1 Li-ion
PROPULSION	Chemical bi-propellant
COVERAGE AREA	Global
DESIGN LIFE	More than 10 years

PRESS CONTACTS

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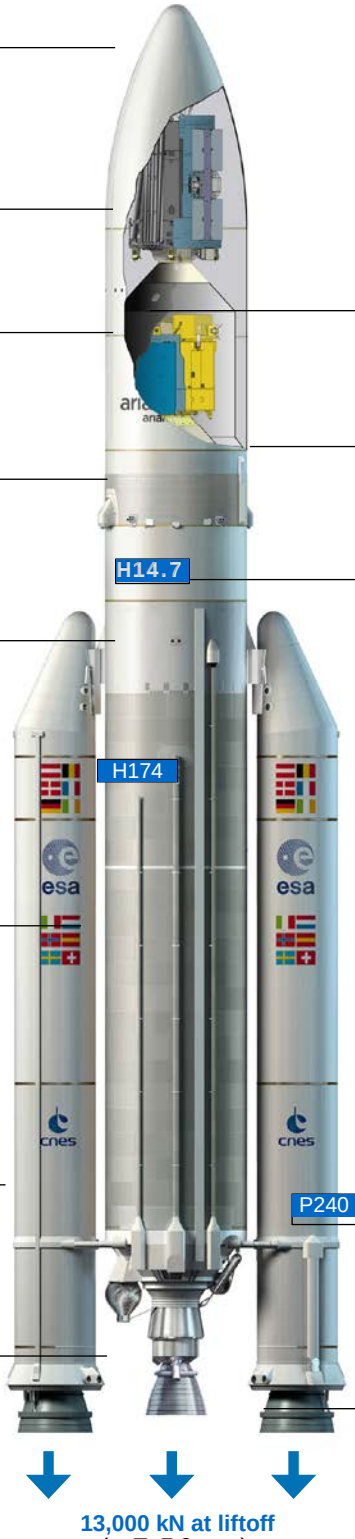
ARIANE 5 ECA LAUNCH VEHICLE

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.

JCSAT-17

SKY Perfect JSAT Corporation
Mass: 5,857 kg.

GEO-KOMPSAT-2B

KARI
Mass: 3,379 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-D - 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:
JCSAT-17
GEO-KOMPSAT-2B

SATELLITE AND LAUNCH VEHICLE CAMPAIGN CALENDAR

DATE	SATELLITES ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
January 6, 2020	Arrival of GEO-KOMPSAT-2B in French Guiana and transfer by road to the Spaceport's S5C payload preparation facility	
January 8, 2020		Campaign start review EPC unpacking and erection EAP 2 transfer to the BIL (Launcher Integration Building)
January 9, 2020		EAP 1 transfer to the BIL (Launcher Integration Building)
January 10, 2020		EPC/EAP integration
January 16, 2020	Arrival of JCSAT-17 in French Guiana and transfer by road to the Spaceport's S5C payload preparation facility	
January 24, 2020	GEO-KOMPSAT-2B transfer to the Spaceport's S5B payload fueling facility	
January 25, 2020	JCSAT-17 transfer to the Spaceport's S5A payload fueling facility	Erection of ESC-D and vehicle equipment bay installation
January 27 to 31, 2020	JCSAT-17 fueling operations GEO-KOMPSAT-2B fueling operations	Transfer from BIL to BAF (Final Integration Building)
February 3, 2020	JCSAT-17 integration on payload adaptor	
February 4, 2020	JCSAT-17 transfer to the BAF	
February 5, 2020	JCSAT-17 integration on SYLDA GEO-KOMPSAT-2B integration on payload adaptor	

SATELLITE AND LAUNCH VEHICLE CAMPAIGN FINAL CALENDAR

DATE	SATELLITES ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
Thursday, February 6, 2020	Payload fairing encapsulation on SYLDA GEO-KOMPSAT-2B transfer to the BAF	
Friday, February 7, 2020	GEO-KOMPSAT-2B integration on launch vehicle	HM7B engine final inspection
Saturday, February 8, 2020	Composite (JCSAT-17 under fairing) integration on launch vehicle (GEO-KOMPSAT-2B under SYLDA)	
Monday, February 10, 2020	Upper portion flight configuration set-up	Finalization of the composite/launcher integration
Wednesday, February 12, 2020	General dress rehearsal	Dress rehearsal
Friday, February 14, 2020		Final preparation of launcher and BAF for chronology Launch readiness review (LRR) Arming of launch vehicle
Monday, February 17, 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
Tuesday, February 18, 2020		Start of launch countdown, EPC and ESC-D 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.

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-D 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
+ 01.00 s	Ignition of the cryogenic main stage (EPC)
+ 07.05 s	Ignition of solid boosters (EAP)
+ 07.3 s	Liftoff
+ 12.6 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 21 s	Fairing jettisoned
+ 8 min 19 s	Acquisition by Natal tracking station
+ 8 min 39 s	End of EPC thrust phase
+ 8 min 45 s	EPC separation
+ 8 min 50 s	Ignition of ESC-D stage
+ 13 min 42 s	Acquisition by Ascension tracking station
+ 18 min 22 s	Acquisition by Libreville tracking station
+ 23 min 12 s	Acquisition by Malindi tracking station
+ 25 min 24 s	Extinction of ESC-D stage
+ 25 min 26 s	Injection
+ 27 min 40 s	**JCSAT-17 satellite separation**
+ 29 min 21 s	SYLDA separation
+ 31 min 09 s	**GEO-KOMPSAT-2B 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).

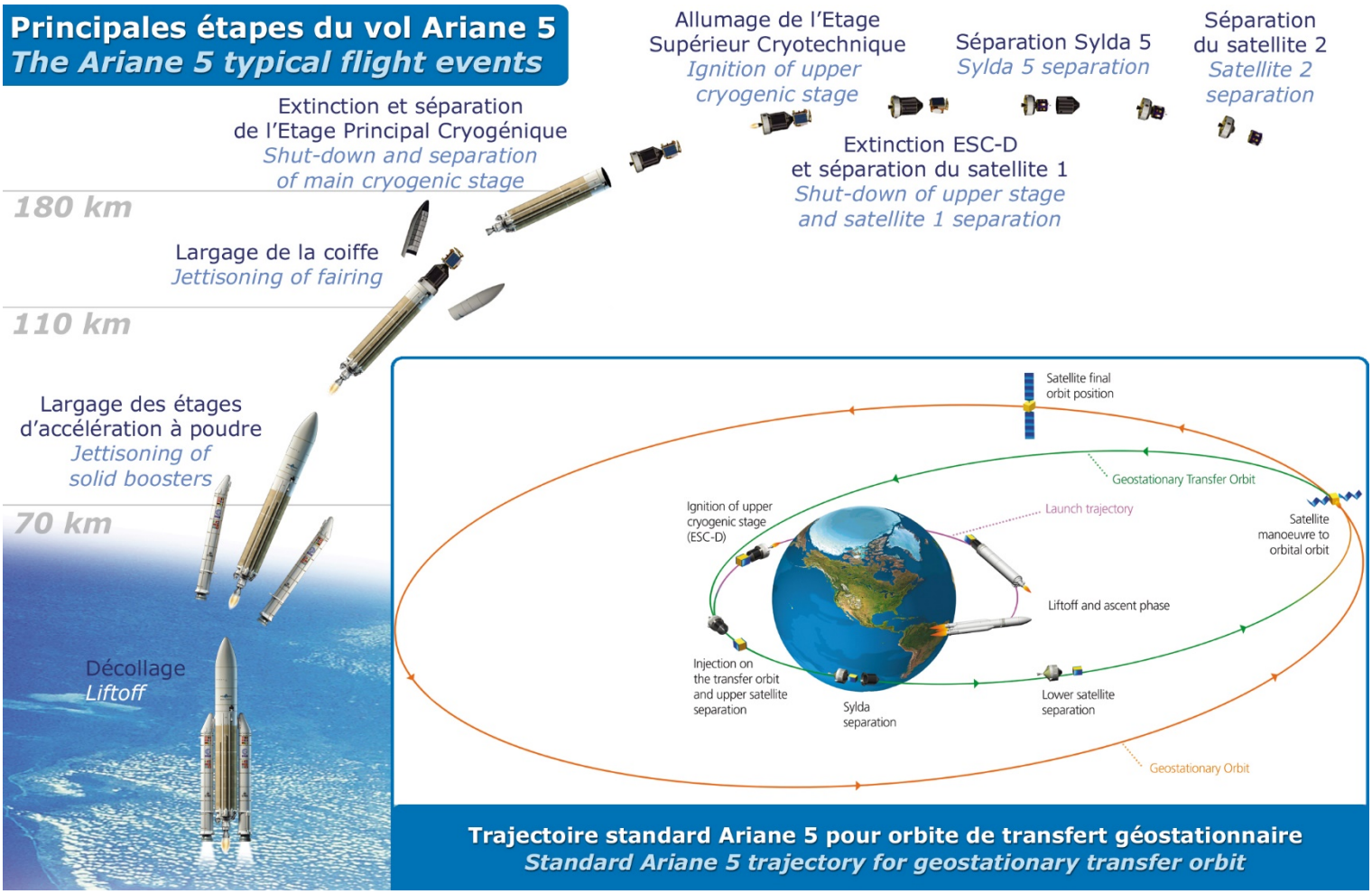
The synchronized sequence starts seven minutes before ignition (T-0). It is primarily designed to perform the final operations on the launcher prior to launch, along with the ultimate checks needed following switchover to flight configuration. As its name indicates, the sequence is fully automatic, and 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 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'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 (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.