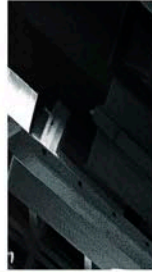
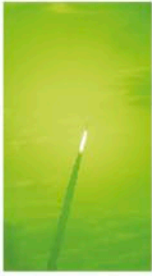


June  
2015



VV 05

Sentinel-2A





## ▼ FIFTH VEGA LAUNCH FROM THE GUIANA SPACE CENTER, AT THE SERVICE OF EUROPE'S COPERNICUS PROGRAM

**On the fifth Vega mission from the Guiana Space Center, and the fifth overall flight performed from this equatorial launch site in 2015, Arianespace will orbit the Sentinel-2A satellite - part of Europe's Copernicus Earth observation program - on behalf of the European Commission within the scope of a contract with the European Space Agency (ESA).**

Copernicus, the European Commission's second space program, following Galileo, is the new name for the program formerly known as GMES (Global Monitoring for Environment and Security). The aim of the Copernicus program is to give Europe continuous, independent and reliable access to Earth observation data. It covers a vast spectrum of missions that will enable this continent to better control and protect the environment, enhance understanding of the underlying phenomena in climate change, as well as improve security for European citizens.

ESA's Sentinel programs comprise five satellite families: Sentinel-1, to provide continuity for radar data from ERS and Envisat; Sentinel-2 and Sentinel-3, dedicated to the observation of the Earth and its oceans; and Sentinel-4 and Sentinel-5, dedicated to meteorology and climatology, with a focus on studying the composition of the Earth's atmosphere.

Sentinel-2A is the second satellite in the Copernicus program to be launched by Arianespace, following Sentinel-1A, which was launched by a Soyuz rocket from the Guiana Space Center on April 3, 2014.

Sentinel-2A is an Earth and ocean observation satellite with a high resolution multispectral optical payload, and a very wide swath.

Airbus Defence and Space is the prime contractor of Sentinel-2A. The satellite will weigh about 1,130 kg. at launch.

Sentinel-2A is the 5<sup>th</sup> satellite to be launched by Vega after the previous launches of four satellites and eight auxiliaries payloads.

Vega, the lightweight vehicle operated by Arianespace, gives Europe a launcher that is ideally suited for all types of scientific and governmental missions, as well as commercial flights.

Vega is a European Space Agency program, jointly financed by Italy, France, Spain, Belgium, the Netherlands, Switzerland and Sweden. ELV, an Italian company jointly owned by Avio (70%) and the Italian space agency ASI (30%), is the launcher design authority and prime contractor, while Arianespace handles launch operations.

With Soyuz, Ariane 5 and Vega all operating at the Guiana Space Center, Arianespace is the only launch services provider in the world capable of launching all types of payloads to all orbits, from the smallest to the largest geostationary satellites, scientific missions to clusters of satellites for constellations.



### CONTENTS

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# VV 05

## Sentinel-2A



## MISSION DESCRIPTION

The fifth Vega launch from the Guiana Space Center (CSG) will place the Sentinel-2A satellite on a Sun-synchronous orbit at an altitude of approximately 786 km.

The launcher will be carrying a total payload of 1,210 kg., including 1,130 kg. for the Sentinel-2A satellite, which will be released into its targeted orbit.

The launch will be from the Vega Launch Complex (SLV) in Kourou, French Guiana.

**Orbit** : Sun-synchronous  
**Apogee altitude** : 786 km  
**Inclination** : 98.5 °

Liftoff is scheduled for **June 22, 2015**, at exactly:

- 10:51:58 pm (local time in French Guiana),
- 09:51:58 pm (Washington, DC),
- 01:51:58 am (UTC), on June 23,
- 03:51:58 am (Paris), on June 23.

## The launch at a glance

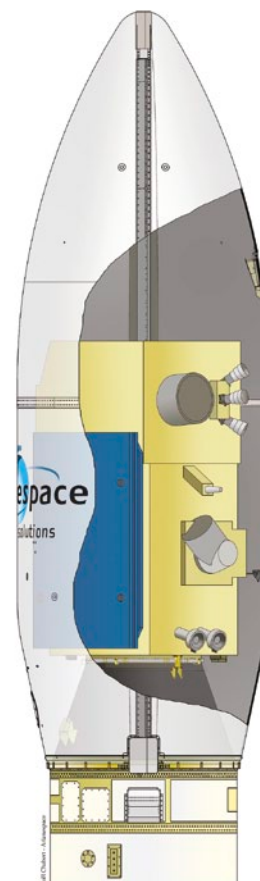
Following liftoff from the Guiana Space Center, the powered phase of the first three stages of Vega will last six minutes and 30 seconds. After this first phase, the launcher's third stage will separate from the upper composite, which includes the AVUM upper stage, a payload adapter and the satellite. The lower three stages will fall back to sea.

The AVUM upper stage will ignite its engine for the first time, operating for about nine minutes followed by a ballistic phase lasting about 35 minutes. The AVUM stage will then reignite its engine for about two minutes, prior to releasing the Sentinel-2A satellite a minute after the engine is shut down.

The Sentinel-2A satellite will be released at 54 minutes and 43 seconds after liftoff

## Vega payload Configuration

The Sentinel-2A satellite was designed and built by Airbus Defence and Space in Friedrichshafen (Germany), prime contractor leading an european industrial consortium on behalf of the European Space Agency (ESA).



## Mission length

The nominal length of the mission (from liftoff to separation of Sentinel-2A) is

**54 minutes and 43 seconds.**



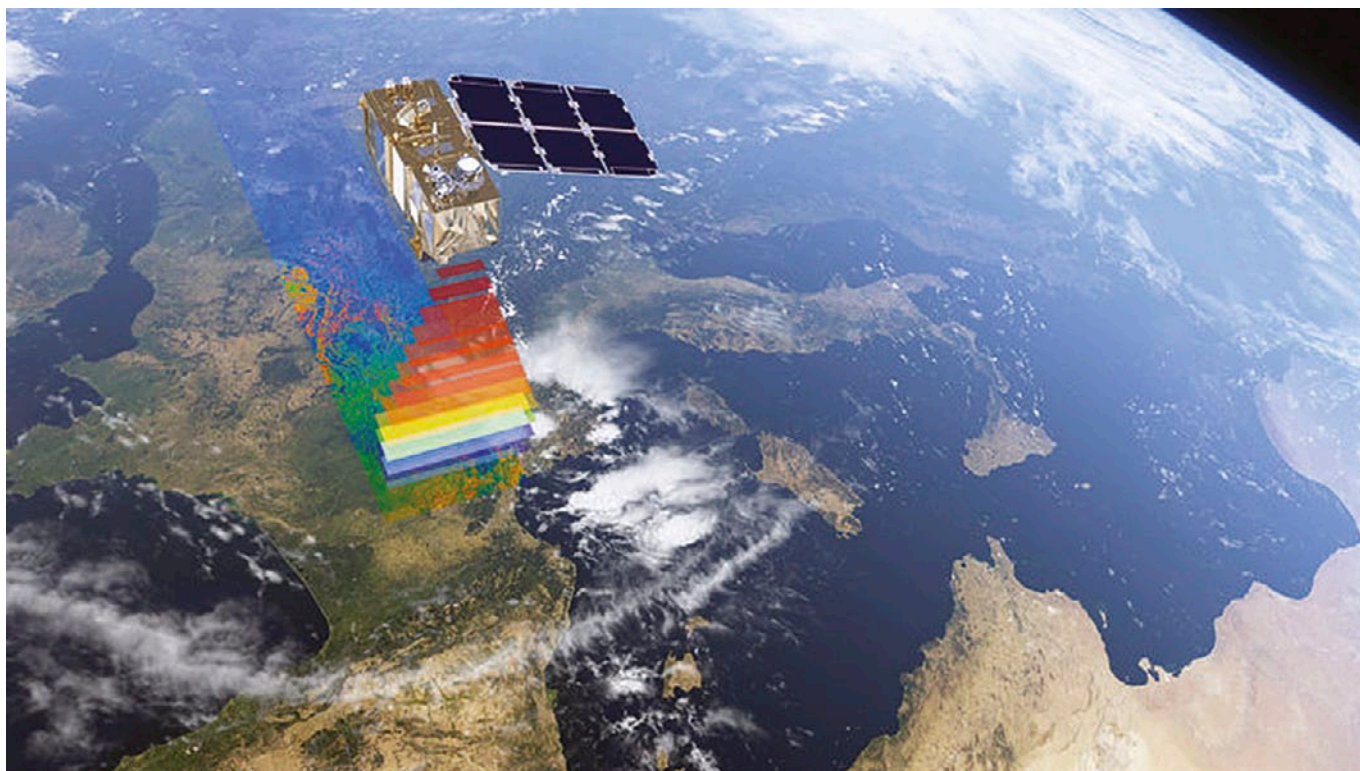


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Sentinel-2A

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## THE Sentinel-2A SATELLITE



<b>Customer</b>	European Space Agency (ESA)	
<b>Manufacturer</b>	Airbus Defence and Space	
<b>Mission</b>	Earth observation	
<b>Masse</b>	Total mass at lift-off approx. 1,130 kg.	
<b>Orbit</b>	Sun-Synchronous at an altitude of about 786 km	
<b>Stabilization</b>	3 axis	
<b>Dimensions</b>	3.3 x 2.3 x 1.7 m	
<b>Life time</b>	7.25 years	with consumables for 12 years of operations, plus de-orbiting at end of mission

### PRESS CONTACT:

#### ESA Media Relations Office

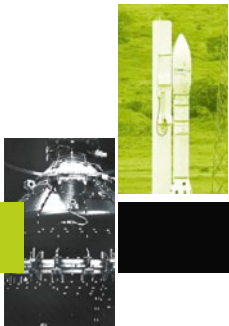
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For more information, visit us on [www.arianespace.com](http://www.arianespace.com)

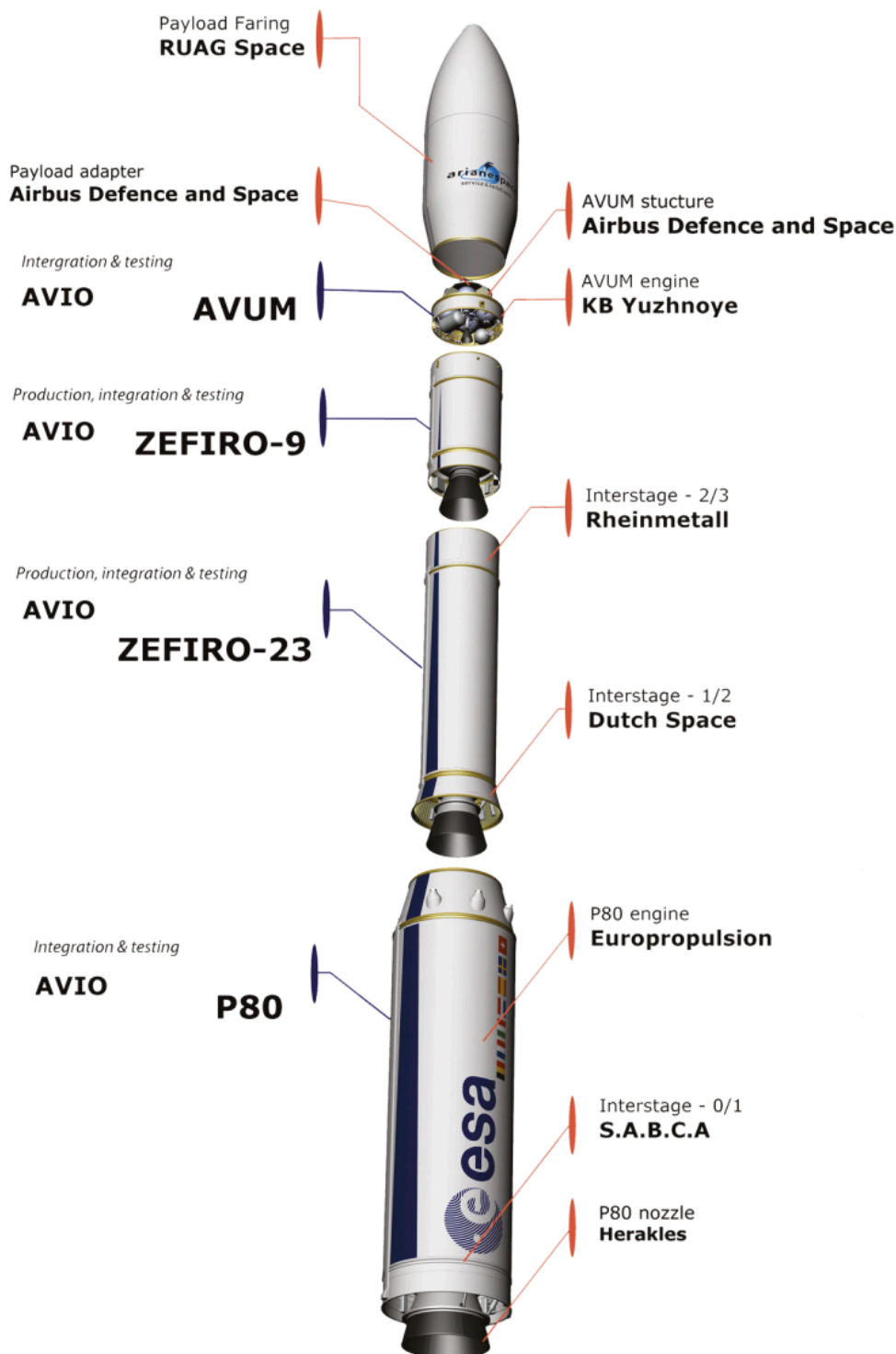


# VV 05

Sentinel-2A



## THE VEGA LAUNCHER



Thrust vector control system  
(P80, Zefiro-9, Zefiro-23 & AVUM)  
**S.A.B.C.A**

Igniters (P80, Zefiro-9 & Zefiro-23)  
**APP**

Avionics  
**Thales, IN-SNEC, Selex Avionica,  
CRISA, RUAG Space, SAFT**



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## VV 05 Sentinel-2A

### VEGA CHARACTERISTICS

Vega is a launch vehicle comprising three stages with solid rocket motors:

- P80 first stage
- Zefiro-Z23 second stage
- Zefiro-Z9 third stage

The fourth stage, AVUM, ensures mission versatility, injecting the payload(s) into precise orbits.

The fairing, 2.6 meters in diameter, can accommodate one or several payloads.

The total weight at liftoff is 139 metric tons. The launcher is 30 meter high and has a maximum diameter of 3 meters.

#### Launcher performance

The baseline performance set for Vega is to inject 1,500 kg. into circular polar orbit at 700 km altitude, inclined 90° to the Equator, with injection accuracy of 5 km for altitude and 0.05° for inclination (1σ).

The diversity of launch elevations possible from Europe's Spaceport in Kourou, along with the flexibility provided by AVUM, will enable Vega to inject a wide range of payloads into different orbits, including 2,500 kg. payloads into quasi-equatorial circular orbit at 200 km, 2,000 kg. payloads for the International Space Station, or 1,300 kg. payloads to be injected into Sun-synchronous orbit at an altitude of 800 km.

#### P80 first stage

Vega's first stage is powered by a large single-piece solid rocket motor containing 87,710 kg. of HTPB 1912 solid propellant. This SRM delivers maximum vacuum thrust of 3,015 kN and burns for 110 seconds prior to being jettisoned at an altitude of about 55 km.

The P80 stage, a filament-wound carbon-epoxy case, has the same diameter (3 m) as the solid boosters used on Ariane 5 and its overall length (11.2 m) is similar to that of one of the longest segments of the solid booster.

#### Zefiro stages

The second and third stages of Vega use Zefiro solid rocket motors. These two stages, each 1.9 m in diameter, comprise a filament-wound carbon-epoxy case, with low-density EPDM insulation and a nozzle with flex-joints, equipped with electromechanical actuators to direct the thrust. The Zefiro-Z23 stage is 8.39 m long, and is loaded with 23,820 kg. of solid propellant HTPB 1912, providing maximum vacuum thrust of 1,120 kN. It operates for 77 seconds.

The Zefiro-Z9 stage is 4.10 m long and is loaded with 10,570 kg. of solid propellant HTPB 1912, providing maximum vacuum thrust of 317 kN. Although it is the smallest solid rocket motor on Vega, it offers the longest burn time, of 119 seconds.

#### AVUM

AVUM (Attitude & Vernier Upper Module) has a bipropellant propulsion system to provide orbital injection, and a monopropellant propulsion system for roll and attitude control.

It is designed to inject different payloads into different orbits, and ensures the fine pointing of satellites prior to separation.

At the end of the mission, it is deorbited under safe conditions to limit the amount of orbital debris.

AVUM contains about 577 kg. of liquid propellant (UDMH/NTO), distributed in four tanks. It is powered by an engine derived from the reignitable RD-869, providing 2.45 kN of thrust. It has two also sets of three monopropellant thrusters to control roll and attitude. AVUM also contains Vega's avionics module, which handles flight control and mission management, telemetry and end-of-flight functions, along with the electrical power supply and distribution.

#### Fairing and payload adapters

The fairing, 2.6 m in diameter and with a volume of 20 m<sup>3</sup>, is made of two half-shells, each 7.90 m long.

#### The launch complex

The Vega launch pad ("Site de Lancement Vega" or SLV) was built on the former Ariane 1 launch pad (ELA-1). It is located about 1 km southwest of the ELA-3 launch pad, used for Ariane 5.

The concrete launch pad was modified to handle Vega and the new 50 meter mobile gantry, weighing about 1,000 metric tons, along with the umbilical mast, stretching 32 meters high. Four 60-meter-tall masts protect the pad against lightning strikes.

The three solid propellant stages and the bipropellant module are assembled on the launch pad. The payload composite is integrated on Vega about two weeks prior to launch. The mobile gantry is displaced on its 80-meter long rails several hours before the launch.

The Vega launch center (CDL) is in the building that already houses its Ariane 5 counterpart, 1.3 km from the launch pad.

Mission control is handled from the Jupiter building, already used for Ariane and Soyuz launches.





# VV 05

## Sentinel-2A



## LAUNCH CAMPAIGN OPERATIONS: VEGA - Sentinel-2A

### Sentinel-2A and launch vehicle campaign calendar

Dates	Satellite activities	Launch vehicle activities
April 20, 2015		Campaign start review - Launch transfer P80
April 21, 2015	Arrival in Kourou of Sentinel-2A and beginning of preparation campaign in building S5	
April 28, 2015		IS 1/2 Integration
April 02, 2015		Z23 Integration
April 09, 2015		Z9 Integration
May 15, 2015		AVUM Integration
May 22, 2015		Flight guidance system validation
June 04, 2015		Launcher final inspection
June 06, 2015	Sentinel-2A mating on adaptor ACU	
June 08, 2015	Encapsulation Sentinel-2A in building S5	
June 09, 2015		Completion of fairing preparation

### Sentinel-2A launch vehicle campaign final calendar

Dates	Satellite activities	Launch vehicle activities
Thursday, June 11, 2015	Sentinel-2A transfer from S5 to the Vega Launch pad	
Friday, June 12, 2015	Composite integration on the launcher with Sentinel-2A	
Monday, June 15, 2015		Launcher filling operations (RACS et AVUM)
Thursday, June 18, 2015		AVUM final pressurization
Friday, June 19, 2015		Launch rehearsal review (RAL) and final preparation of launcher
Monday, June 22, 2015		Final inspection and launch countdown







# VV 05

## Sentinel-2A



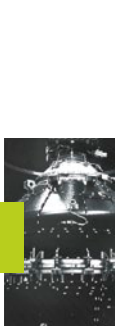
## ▼ COUNTDOWN AND FLIGHT

The countdown comprises all final preparation steps for the launcher, the satellite and the launch site, including the steps leading up to authorization of first-stage P80 ignition.

TIMES		EVENTS	
- 07 h	45 mm	Start of countdown	
- 05 h	40 mn	Activation of MFU (Multi Functional Unit)	
- 05 h	30 mn	Activation of Inertial Reference System (IRS)	
- 05 h	30 mn	Activation of telemetry transmitters	
- 04 h	55 mn	Activation of onboard computer and loading of flight program	
- 04 h	50 mn	Activation of SMU (Safeguard Master Unit)	
- 04 h	25 mn	Synchronization of onboard clock with Universal Time (UTC)	
- 04 h	20 mn	IRS alignment and checks	
- 03 h	40 mn	Removal of safety devices	
- 02 h	40 mn	Mobile gantry withdrawal (45 min)	
- 01 h	55 mn	Activation of IRS after withdrawal of gantry	
- 01 h	20 mn	Activation of telemetry transmitters after withdrawal of gantry	
- 01 h	20 mn	Activation of transponders	
- 00 h	34 mn	Launcher system ready	
- 00 h	10 mn	Last weather report prior to launch	
- 00 h	04 mn	Start of synchronized sequence	
TO		LIFTOFF	
+ 00 h	01 mn	52 s	Separation of first stage (P80)
+ 00 h	03 mn	37 s	Separation of second stage (Zefiro-23)
+ 00 h	03 mn	54 s	Jettisoning of fairing
+ 00 h	06 mn	32 s	Separation of third stage (Zefiro-9)
+ 00 h	07 mn	42 s	AVUM first burn
+ 00 h	16 mn	14 s	AVUM shutdown
+ 00 h	51 mn	46 s	AVUM second burn
+ 00 h	53 mn	52 s	AVUM shutdown
+ 00 h	54 mn	43 s	Separation of Sentinel-2A
+ 01 h	43 mn	35 s	AVUM third burn
+ 01 h	44 mn	04 s	AVUM shutdown





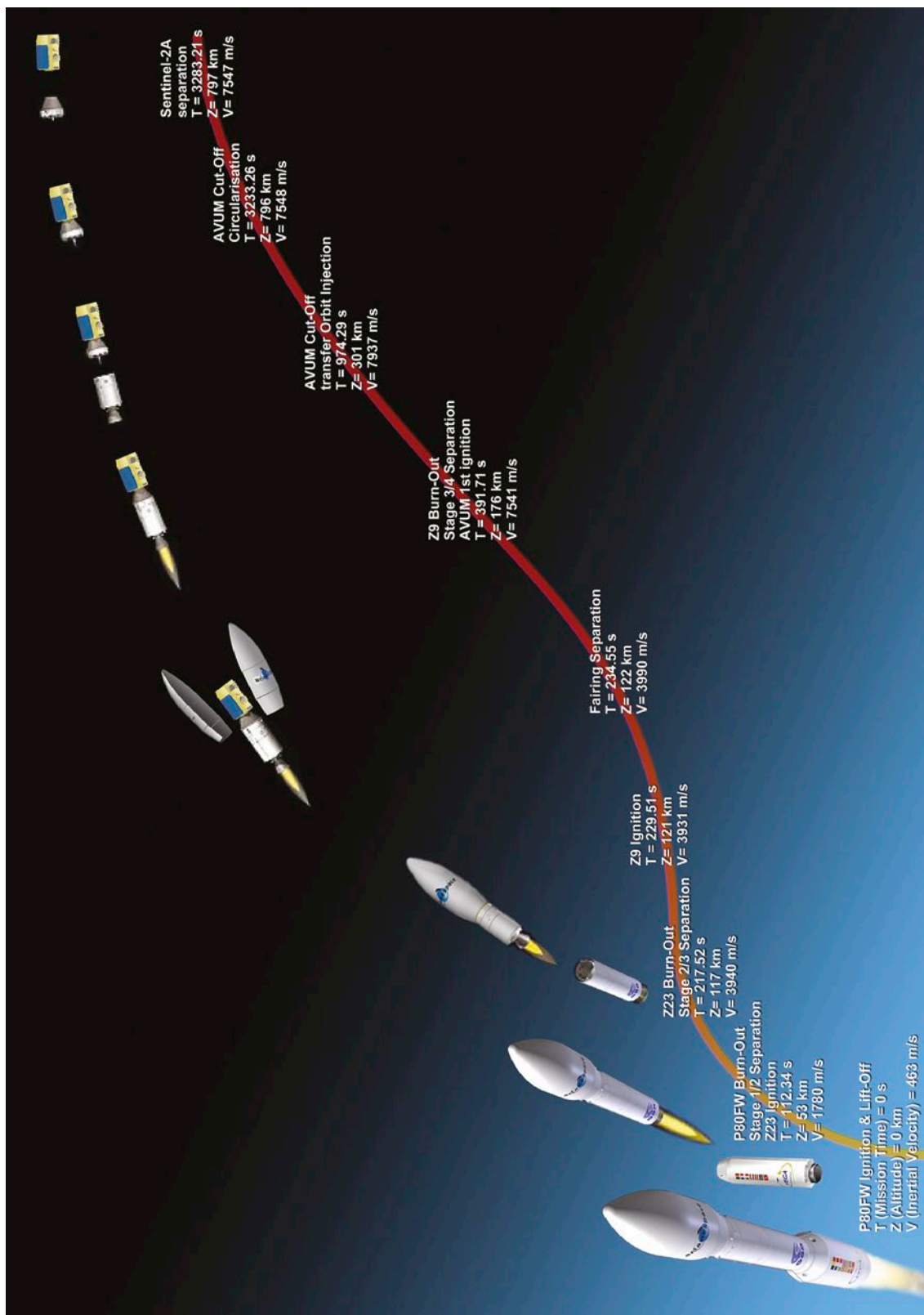


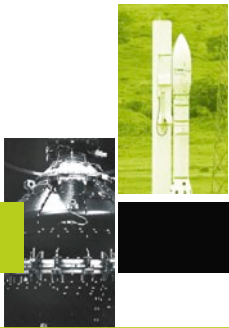
# VV 05

## Sentinel-2A



## MISSION PROFILE Sentinel-2A





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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 Service & Solutions company. Arianespace now has 21 shareholders from ten European countries (including Airbus Safran Launchers 40.99 % , CNES 34 % and all European companies participating in the production of Ariane launchers). Since the outset, Arianespace has signed more than 440 launch contracts and launched 509 satellites. More than two-thirds of the commercial satellites now in service worldwide were launched by Arianespace. The company posted sales of 1,399 million euros in 2014.

As of March 1, 2015, Arianespace had 322 employees, working at the company's headquarters in Evry (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 launcher, operated from the Guiana Space Center in French Guiana.
- The Soyuz medium launcher, currently in operation at the Guiana Space Center and the Baikonur Cosmodrome in Kazakhstan.
- The Vega light 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 40 years, the Guiana Space Center (CSG), Europe's Spaceport in French Guiana, has offered a complete array of facilities for rocket launches. It mainly comprises the following:

- 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 Regulux, Europropulsion, Air Liquide Spatial Guyane and Airbus Defence and Space, all involved in the production of Ariane 5 components. A total of 40 European manufacturers and local companies are involved in operations.

Europe's commitment to independent access to space is based on actions by three key players: the European Space Agency (ESA), French space agency CNES and Arianespace. ESA is responsible for the Ariane, Soyuz and Vega development programs. Once these launch systems are qualified, ESA transfers responsibility to the operator Arianespace. 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 French space program, the Guiana Space Center has gradually become 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 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 launcher for missions. Whether during tests or actual launches, CNES is also responsible for overall coordination of operations, 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.

For Vega, Arianespace supervises the integration and inspection of the launcher built by ELV, production prime contractor. Before taking official delivery of the launcher, it coordinates the preparation of satellites in the payload preparation facility (EPCU) operated by CNES/CSG, handles the final assembly of the launcher and integrates satellites on the launcher, and oversees the final countdown and launch from Launch Control Center 3 (CDL3).

Arianespace deploys a top-flight team and technical facilities to get launchers and satellites 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.

