LAUNCH KIT

November 2018

VV13

MOHAMMED VI - B satellite

esa

ThalesAlenia Space
a Thales / Leonardo company

MOHAMMED VI - B

AIRBUS

cnes

FLIGHT VV13: VEGA TO LAUNCH AN EARTH OBSERVATION SATELLITE FOR THE KINGDOM OF MOROCCO

For its ninth launch of the year, and the 13th Vega mission since this launcher began its career at the Guiana Space Center in 2012, Arianespace will orbit the MOHAMMED VI – B satellite. This Earth observation satellite for the Kingdom of Morocco was developed by a consortium comprising Thales Alenia Space as system prime contractor and Airbus as co-prime.

Flight VV13 marks the ninth Earth observation mission for Vega, a versatile light launcher.

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MOHAMMED VI – B satellite

The **MOHAMMED VI – B** satellite is an Earth observation satellite built for the Kingdom of Morocco by Thales Alenia Space as system prime contractor and Airbus as co-prime. It will be the second satellite of the MOHAMMED VI – A & B program, with the MOHAMMED VI – A satellite launched by Arianespace on November 7, 2017, also utilizing a Vega vehicle.

The **MOHAMMED VI – B** satellite will be mostly used for mapping and land surveying activities, regional development, agricultural monitoring, the prevention and management of natural disasters, monitoring changes in the environment and desertification, as well as border and coastal surveillance.

The **MOHAMMED VI – B** satellite will weigh approximately 1,108 kg. at launch.

Being complementary, the **MOHAMMED VI – A & B** satellites will jointly enable a faster coverage of zones of interests.

Thales Alenia Space, as system prime contractor, supplied the payload, including the optical instrument, the image transmission subsystem, and the ground segment for image processing and production. Airbus, as satellite prime contractor, was in charge of its integration, as well as supplying the platform and the ground segment for mission planning and satellite control.

The **MOHAMMED VI – B** satellite is the 155th satellite built by Thales Alenia Space to be launched by Arianespace, which has 11 more satellites from this manufacturer in its order book. It also will be the 123rd Airbus satellite to be orbited by Arianespace, which currently has 20 additional Airbus satellites in its backlog.

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MISSION DESCRIPTION

The 13th Arianespace Vega launch from the Guiana Space Center (CSG) will place the MOHAMMED VI – B satellite into a Sun-synchronous orbit (SSO).
The launcher will be carrying a total payload of approximately 1,184 kg.

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

DATE AND TIME

Liftoff is scheduled for **Tuesday, November 20, 2018**, at exactly:

> **8:42:31 p.m.**, in Washington D.C.
> **10:42:31 p.m.**, local time in French Guiana
> **01:42:31**, Universal Time (UTC), on November 21, 2018
> **2:42:31 a.m.**, in Paris, on November 21, 2018
> **2:42:31 a.m.**, in Rabat, on November 21, 2018.

MISSION DURATION

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

55 minutes, 21 seconds.

TARGETED ORBIT FOR THE MOHAMMED VI – B SATELLITE

Sun-synchronous orbit

THE LAUNCH AT A GLANCE

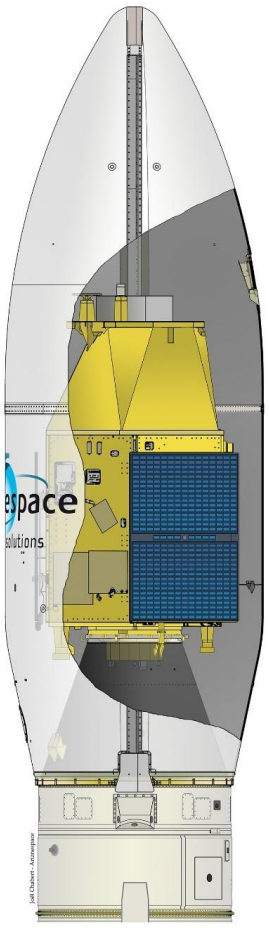
Following liftoff from the Guiana Space Center, the powered phase of Vega's first three stages will last six minutes and 29 seconds. After this first phase, the launcher's third stage will separate from the upper composite, which includes the AVUM upper stage, a payload adapter and the satellite. The lower three stages will fall back into the sea.

The AVUM upper stage will ignite its engine for the first time, operating for about seven minutes, followed by a ballistic phase lasting approximately 36 minutes and 30 seconds. The AVUM stage will then reignite its engine for about one minute and 41 seconds, prior to releasing the MOHAMMED VI – B satellite about one minute and 36 seconds after the engine is shut down.

The MOHAMMED VI – B satellite will be released 55 minutes and 21 seconds after liftoff.

VEGA PAYLOAD CONFIGURATION

> **Payload:** the MOHAMMED VI – B satellite
> **Weight at liftoff: 1,108 kg.**
> **Vega Payload Adaptor (PLA)**



THE VEGA LAUNCHER

ELV, the production prime contractor, delivers the Vega launcher to Arianespace.

Payload fairing
(RUAG Space)

Payload adaptor
(Airbus Spain)

Integration & testing
(Avio)
AVUM

Production, integration & testing
(Avio)
ZEFIRO-9

Production, integration & testing
(Avio)
ZEFIRO-23

Integration & testing
(Avio)
P80

AVUM structure
(Airbus)

AVUM engine
(KB Yuzhnoye)

Interstage - 2/3
(Rheinmetall)

Interstage - 1/2
(Airbus Netherlands)

P80 engine
(Europropulsion)

Interstage - 0/1
(S.A.B.C.A)

P80 nozzle
(ArianeGroup)

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

LAUNCH CAMPAIGN: VEGA – THE MOHAMMED VI – B SATELLITE

SATELLITE AND LAUNCH VEHICLE CAMPAIGN TIMETABLE

DATE	SATELLITE ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
October 1, 2018		Campaign start review - Transfer of P80 stage
October 5, 2018	Arrival in French Guiana of the **MOHAMMED VI - B** satellite at Felix Eboué Airport (Cayenne)	
October 06, 2018	Transfer of the **MOHAMMED VI - B** satellite to S3B	
October 10, 2018	Fitcheck of the **MOHAMMED VI - B** satellite on his adaptator	Interstage 1/2 integration
October 11, 2018	Start of electrical checks	Z23 integration
October 16, 2018		Z9 integration
October 19, 2017		AVUM integration
October 24 and 25, 2017	Fueling operations of the **MOHAMMED VI - B** satellite	
October 29, 2018	Integration of the **MOHAMMED VI - B** satellite on the payload adaptor	
October 30, 2018	Transfer of the **MOHAMMED VI - B** satellite to the Final Assembly Building (BAF)	Synthesis control test
November 06, 2017	The assembled payload is encapsulated in Vega's payload fairing	

SATELLITE AND LAUNCH VEHICLE CAMPAIGN FINAL TIMETABLE

DATE	SATELLITE ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
Thursday, November 8, 2018	Transfer of upper composite from BAF to SLV (Vega Launch Site)	
Friday, November 9, 2018	Upper composite integration on the launcher	
From Monday, November 12 to Wednesday, November 14, 2018		Fueling operations for AVUM and RACS (Roll and Attitude Control Subsystem)
Thursday, November 15, 2018		Arming of Z23/Z9 and AVUM and rehearsal
Friday, November 16, 2018		Arming of launch vehicle and fairing
Monday, November 19, 2018		Launch readiness review (RAL), final preparation of launcher and final inspection of the fairing
Tuesday, November 20, 2018		Final launch countdown

COUNTDOWN AND FLIGHT SEQUENCE

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

TIME	EVENT
- 09 h 10 min	Start of final countdown
- 06 h 00 min	Activation of Multi-Functional Unit (MFU)
- 05 h 40 min	Activation of Inertial Reference System (IRS)
- 05 h 40 min	Activation of telemetry
- 05 h 10 min	Activation of Safeguard Master Unit (SMU)
- 04 h 50 min	Removal of safety devices
- 04 h 40 min	Activation of onboard computer and loading of flight program
- 04 h 30 min	IRS alignment and checks
- 03 h 15 min	Mobile gantry withdrawal (45 min.)
- 02 h 25 min	IRS alignment and checks after withdrawal of gantry
- 01 h 15 min	Activation of the telemetry transmitter after withdrawal of gantry
- 01 h 15 min	Activation of transponders and receptors
- 00 h 50 min	Launcher system ready
- 00 h 10 min	Final weather report prior to launch
- 00 h 04 min	Start of synchronized sequence
T-O	**00 s LIFTOFF**
+ 00 h 01 min 54 s	1st stage (P80) separation
+ 00 h 01 min 55 s	2nd stage (Zefiro-23) ignition
+ 00 h 03 min 38 s	2nd stage (Zefiro-23) separation
+ 00 h 03 min 50 s	3rd stage (Zefiro-9) ignition
+ 00 h 03 min 55 s	Fairing separation
+ 00 h 06 min 29 s	3rd stage (Zefiro-9) separation
+ 00 h 08 min 00 s	1st ignition of AVUM
+ 00 h 15 min 33 s	1st cut-off of AVUM
+ 00 h 52 min 03 s	2nd ignition of AVUM
+ 00 h 53 min 45 s	2nd cut-off of AVUM
+ 00 h 55 min 21 s	Separation of **the MOHAMMED VI - B satellite**
+ 01 h 50 min 33 s	3rd ignition of AVUM
+ 01 h 51 min 30 s	3rd cut-off of AVUM

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 530 launch contracts and launched 580+ satellites. More than half of the commercial satellites now in service around the globe were launched by Arianespace.

The company posted sales of more than 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 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 comprises primarily the following:

> The CNES/CSG technical center, including various resources and facilities that are critical to launch base operations, such as radars, the 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 participating in the production of Ariane 5 components. A total of 40 European manufacturers and local companies are involved in 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 space agency CNES (Centre National d'Etudes Spatiales) 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 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.

CNES 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.

For Vega, Arianespace supervises the integration and inspection of the launcher constructed by ELV/Avio, the production prime contractor. At the same time, Arianespace coordinates the preparation of satellites in the payload preparation facility (EPCU) operated by CNES/CSG, handles the integration of satellites and preparation of the payload composite up to its transfer on the launcher to the Vega launch zone (ZLV), and also works with ELV/Avio 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 get launchers and satellites ready for launch. Building on this unrivalled expertise and outstanding facilities in French Guiana, Arianespace is the undisputed benchmark in the global launch services market.