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service & solutions

LAUNCH KIT

DECEMBER 2016

VV08

GÖKTÜRK-1

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FLIGHT VV08: A NEW VEGA MISSION AT THE SERVICE OF EARTH OBSERVATION

For its 10th launch of the year – and the eighth to be performed by the Vega launcher since its first liftoff from the Guiana Space Center in 2012 – Arianespace will orbit the GÖKTÜRK-1 satellite in the framework of a Telespazio turnkey contract with the Undersecretariat for Defence Industries of Turkey (SSM).

As a multi-purpose launch vehicle that already has demonstrated its capabilities during the seven initial missions, Vega is now fully operational in commercial service – and will be performing its fifth flight at the service of Earth observation. With Flight VV08, Turkey becomes a new export customer for this latest member of Arianespace's launcher family.

CONTENTS

GÖKTÜRK-1

GÖKTÜRK-1 is the first Turkish governmental satellite for Earth observation.
It also is the sixth satellite to be launched by Arianespace for Turkey, following five Türksat-series telecommunications spacecraft from 1994 to 2008.

GÖKTÜRK-1 is a very high-resolution optical Earth observation satellite.
Its images are intended for civilian and military applications.
The satellite will be injected in a Sun-synchronous orbit at an altitude of approximately 700 km. GÖKTÜRK-1 is capable of imaging the entire globe in 72 hours.

Telespazio – as prime contractor of the GÖKTÜRK-1 program under terms of a 2009 agreement signed with the Undersecretariat for Defence Industries of Turkey in Ankara (SSM) – is responsible for the satellite's integration and the associated ground segment.

SSM is the 55th operator to select Arianespace for the launch of its first satellite.

Thales Alenia Space and its Turkish partners – including the companies TAI A.S., Aselsan A.S., Tubitak Bilgem, Roketsan A.S. and TR Tecnoloji – built GÖKTÜRK-1 based on the PROTEUS spacecraft platform.

GÖKTÜRK-1 will be 145th Thales Alenia Space-produced satellite launched by Arianespace.

Eleven other satellites from this spacecraft manufacturer are in Arianespace's launch services order book: SENTINEL-2B, SGDC, TELKOM-3S, KOREASAT-7, COMSAT NG 1, four satellites for O3b, along with two "undisclosed" payloads.

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MISSION DESCRIPTION

The eighth Arianespace Vega launch from the Guiana Space Center (CSG) will place its satellite passenger into a Sun-synchronous orbit (SSO).
The launcher will be carrying a total payload of approximately 1,140 kg.

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

DATE AND TIME

Liftoff is scheduled for **Monday, December 5, 2016**, at exactly:

> **08:51:44 a.m.,** Washington D.C. time
> **10:51:44 a.m.,** local time in French Guiana
> **13:51:44,** Universal Time (UTC)
> **14:51:44 p.m.,** Paris time
> **16:51:44 p.m.,** Ankara time

MISSION DURATION

The nominal mission duration (from liftoff to separation of the satellite) is:
57 minutes, 19 seconds.

TARGETED ORBIT

SSO
(Sun-synchronous orbit)

Altitude at separation
700 km.
Semi major axis: 7,060 km.

Inclination
98.11 degrees

THE LAUNCH AT A GLANCE

Following liftoff from the Guiana Space Center, the powered phase of Vega's first three stages will last 6 minutes, 36 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 into the sea.

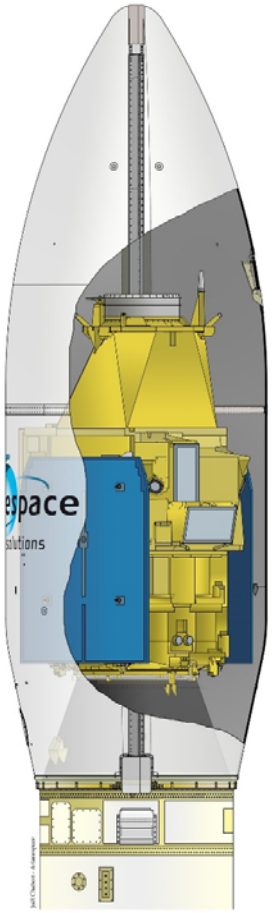
The AVUM upper stage will ignite its engine for the first time, operating for about six minutes, 20 seconds followed by a ballistic phase lasting approximately 40 minutes.

The AVUM stage will then reignite its engine for approximately one minute, 42 seconds, prior to releasing the GÖKTÜRK-1 satellite about two minutes after the engine is shut down.

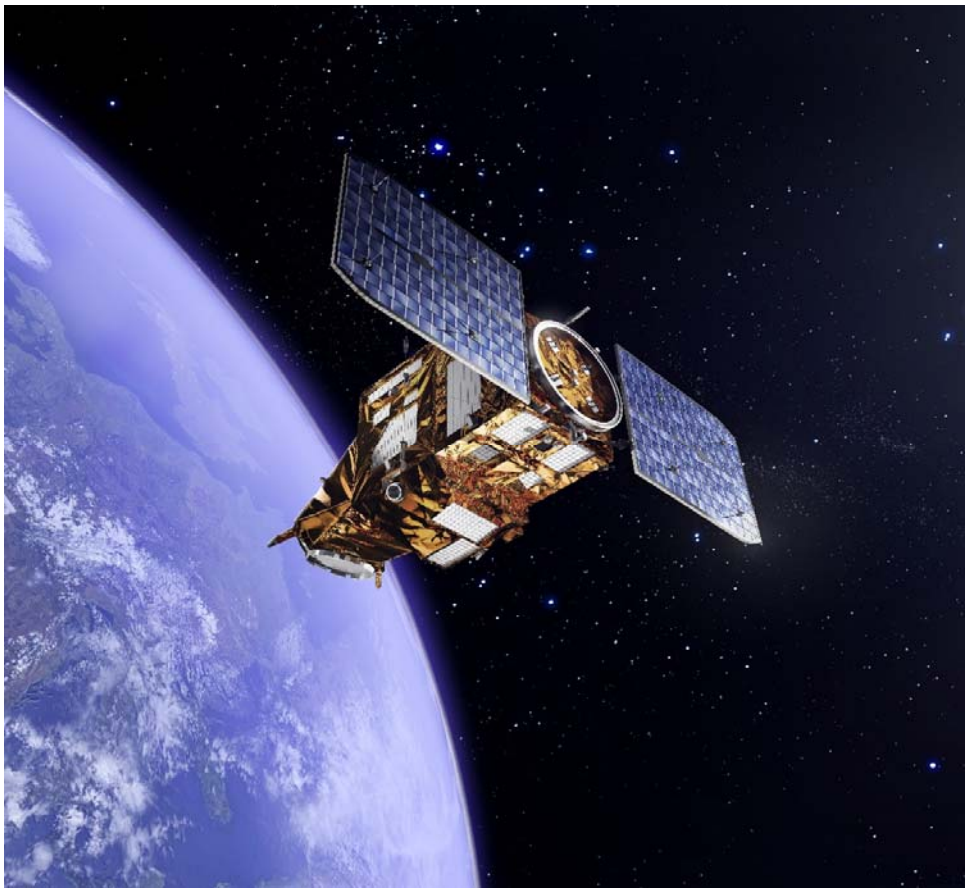
The GÖKTÜRK-1 satellite will be released 57 minutes, 19 seconds after liftoff.

VEGA PAYLOAD CONFIGURATION

> **Payload:** GÖKTÜRK-1
> **Mass at liftoff**: 1,060 kg.
> **PLA - Vega Payload Adaptor**



GÖKTÜRK-1 SATELLITE



CUSTOMER	Telespazio
PRIME CONTRACTOR	Telespazio
MISSION	Earth observation
PLATFORM	Based on the PROTEUS platform
MASS	Mass at launch of 1,060 kg.
STABILIZATION	Three-axis
DIMENSIONS	4.2 m. x 2.5 m. x 1.6 m.
TARGETED ORBIT	Low Earth Orbit
DESIGN LIFE	7 years, 3 months

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THE VEGA LAUNCHER

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

Payload Faring
(RUAG Space)

Payload adapter
(Airbus Defence and Space)

Integration & Testing
(Avio)
AVUM

Production, integration & testing
(Avio)
ZEFIRO-9

Production, integration and testing
(Avio)
ZEFIRO-23

Integration and testing
(Avio)
P80

AVUM structure
(Airbus Defence and Space)

AVUM engine
(KB Yuzhnoye)

Interstage - 2/3
(RheinmetalI)

Interstage - 1/2
(Airbus Defence and Space)

P80 engine
(Europropulsion)

Interstage - 0/1
(SABCA)

P80 Nozzle
(ASL)

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: .1

SATELLITE AND LAUNCH VEHICLE CAMPAIGN CALENDAR

	ELLITE ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
		Campaign start review - Transfer of P80 stage
October 22, 2016		Interstage 1/2 integration

October 24, 2016	Arrival in French Guiana of GÖKTÜRK-1; beginning of preparation in the S1B hall	Z23 integration
October 27, 2016		Z9 integration
October 31, 2016		AVUM integration
November 4, 2016	GÖKTÜRK-1 transfer from S1B to S5B hall	
November 9, 2016	GÖKTÜRK-1 fueling operations in S5B hall	Synthesis control test
November 17, 2016	GÖKTÜRK-1 integration on payload adapter	
November 18, 2016	GÖKTÜRK-1 encapsulation	
November 21, 2016		Completion of fairing, and preparation of upper composite for transfer

SATELLITE AND LAUNCH VEHICLE CAMPAIGN FINAL CALENDAR

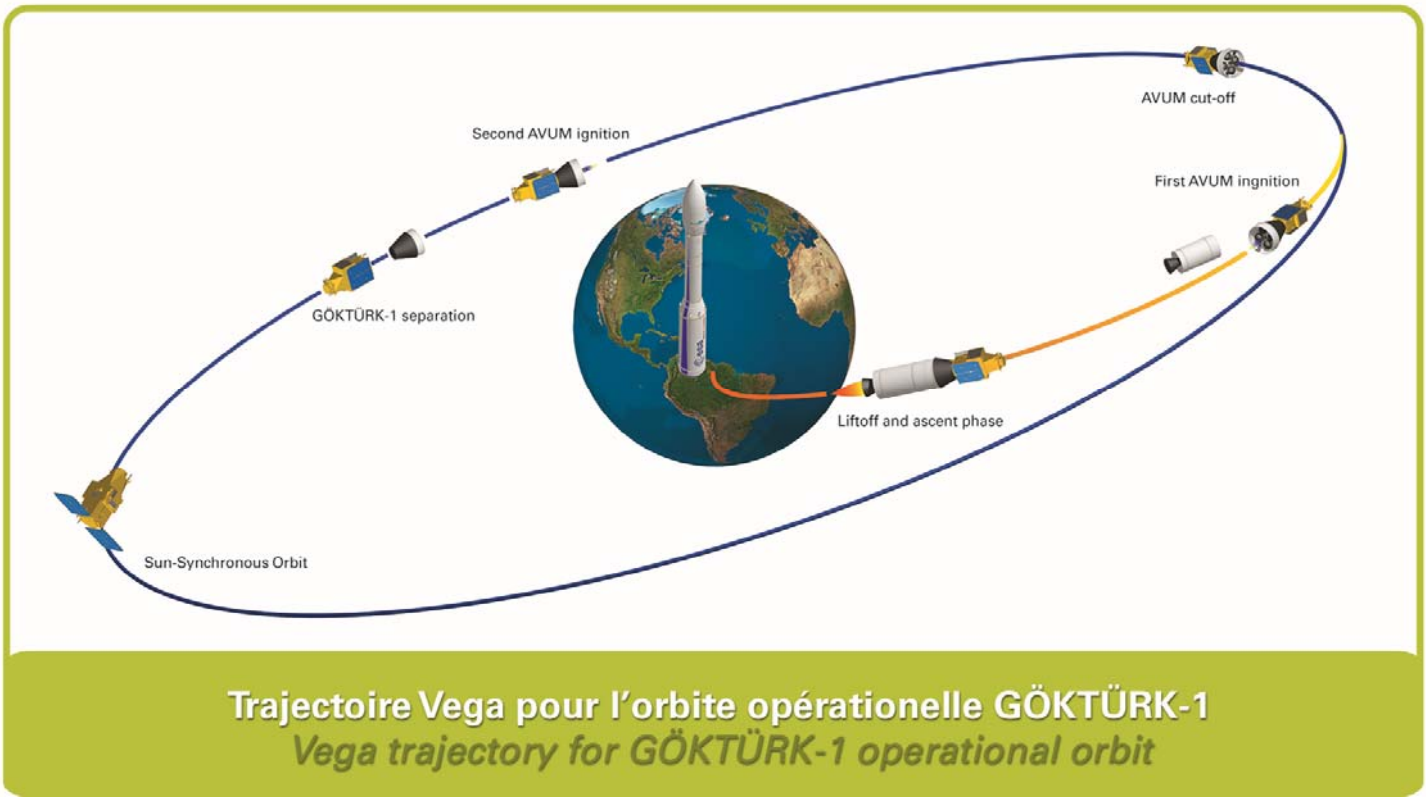
DATE	SATELLITE ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
Thursday, November 22, 2016	Transfer of upper composite from S5B to SLV (Vega Launch site)	
Wednesday, November 23, 2016	Composite Integration on the launcher	
Friday, November 25, 2016		Fueling operations AVUM (N_2O_4)
Monday, November 28, 2016		Fueling operations AVUM (UDMH)
Thursday, November 29, 2016		Fueling operations for RACS (Roll and Attitude Control Subsystem)
Wednesday, November 30, 2016		AVUM final pressurization and rehearsal
Thursday, December 1, 2016		Arming of launch vehicle and fairing
Friday, December 2, 2016		Launch readiness review (RAL), final preparation of launcher and final inspection of the fairing
Monday, December 5, 2016		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 00 min	Start of final countdown
- 05 h 50 min	Activation of Multi-Functional Unit (MFU)
- 05 h 30 min	Activation of Inertial Reference System (IRS)
- 05 h 30 min	Activation of telemetry
- 05 h 00 min	Activation of Safeguard Master Unit (SMU)
- 04 h 40 min	Removal of safety devices
- 04 h 30 min	Activation of onboard computer and loading of flight program
- 04 h 20 min	IRS alignment and checks
- 03 h 05 min	Mobile gantry withdrawal (45 min.)
- 02 h 15 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 30 min	Transfer to satellite internal power
- 00 h 40 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	37 s 2nd stage (Zefiro-23) separation
+ 00 h 03 min	54 s 3rd stage (Zefiro-9) ignition
+ 00 h 03 min	59 s Fairing separation
+ 00 h 06 min	36 s 3rd stage (Zefiro-9) separation
+ 00 h 08 min	21 s 1st ignition of AVUM
+ 00 h 14 min	40 s 1st cut-off of AVUM
+ 00 h 54 min	01 s 2nd ignition of AVUM
+ 00 h 55 min	43 s 2nd cut-off of AVUM
+ 00 h 57 min	19 s **Separation of GOKTURK-1**
+ 01 h 46 min	10 s 3rd ignition of AVUM
+ 01 h 47 min	36 s 3rd cut-off of AVUM
+ 02 h 00 min	56 s End of the Arianespace mission

MISSION PROFILE –



Trajectoire Vega pour l'orbite opérationelle GÖKTÜRK-1
Vega trajectory for GÖKTÜRK-1 operational orbit

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 now has 20 shareholders from 10 European countries (including Airbus Safran Launchers, CNES and all European companies participating in the production of Ariane launchers). Since the outset, Arianespace has signed over 530 launch contracts and launched 540-plus 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 2015.

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.

For Vega, Arianespace supervises the integration and inspection of the launcher built by ELV, which is the production prime contractor. Before taking official delivery of the launcher, Arianespace 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 ensure the launchers and their satellites 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.