LAUNCH KIT

April 2021

VV18

Pléiades Neo

and five auxiliary payloads

esa

AIRBUS

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CENTRE NATIONAL D'ÉTUDES SPATIALES

FLIGHT VV18

For its third mission of the year and the first Vega flight of 2021, Arianespace will put in orbit the Pléiades Neo 3 satellite on behalf of Airbus Defence and Space along with five auxiliary payloads through the piggyback mission, Small Spacecraft Mission Service (SSMS).

Flight VV18 underscores Arianespace's comprehensive range of innovative and very competitive services to address the nano- and micro-satellite market sub-segment, serving both institutional and commercial needs.

CONTENTS

Pléiades Neo 3 satellite

The ambitious project of Airbus Defence and Space: Pléiades Neo, the first European satellite constellation at 30 cm resolution.

Pléiades Neo 3 is the first of the Pléiades Neo constellation to be launched. Entirely funded, manufactured, owned and operated by Airbus, Pléiades Neo is a breakthrough in Earth observation domain.

With 30 cm resolution, best-in-class geolocation accuracy and twice-a-day revisit, the four Pléiades Neo satellites unlock new possibilities with ultimate reactivity. Thanks to these state-of-the-art satellites, each step of the acquisition and delivery cycle offers top-level Earth observation services now and going forward for the next ten years. In addition, their reactive tasking ability allows urgent acquisitions 30 to 40 minutes following request - which is five times higher than previous constellations - and respond to the most critical situations in near real-time, very useful for natural disaster. Pléiades Neo will also operate for mapping, urban and defence applications.

The Pléiades Neo constellation is 100% commercially available and will provide institutional and commercial customer's needs. Images captured by Pléiades Neo will be streamed into the OneAtlas on-line platform, allowing customers to have immediate data access, analytics and correlation with Airbus' unique archive of optical and radar data.

There are two additional Airbus Defence and Space Intelligence missions, for three satellites in the Arianespace backlog to be launched on Vega from the Guiana space center.

Arianespace and Airbus Defence and Space, a fruitful cooperation since the creation of the European launch services provider in 1980.

Pleiades Neo 3 will be the 131st Airbus Defence and Space built satellite to be launched by Arianespace. There are currently 20 Airbus Defence and Space built satellites in Arianespace's backlog: CERES (x3), SYRACUSE 4B (COMSAT NG 2), EUTELSAT QUANTUM, METOP-SG A1 & METOP-SG B1, THEOS-2, CSO 3, Pléiades Neo (x3), JUICE, Measat-3d, Biomass, EarthCARE and CO3D (x4). In addition, Airbus Defence and Space is involved in the construction of the OneWeb satellites.

The five auxiliary payloads

Arianespace will put in orbit five auxiliary payloads through the piggyback mission SSMS via three deployers integrated on the Hexamodule.

NorSat-3 satellite on behalf of Norwegian Space Agency

NorSat-3 was developed by the Space Flight Laboratory (SFL) for the Norwegian Space Agency. NorSat-3 will carry an experimental navigation radar detector to augment ship detection capabilities from its on-board Automatic Identification System (AIS) receiver. It follows from the highly successful NorSat-1 and NorSat-2, all producing data related to maritime traffic monitoring.

NorSat-3 will be the first satellite to be launched by Arianespace for the Norwegian Space Agency and the third satellite to be launched by Arianespace for Norway. NorSat-3 will also be the third SFL-built satellite to be launched by Arianespace.

The satellite uses the Space Flight Laboratory XPOD Duo deployer.

BRAVO satellite on behalf of Aurora Insight signed with SAB Launch Services

BRAVO is a 6U CubeSat built by NanoAvionics with integrated spectrum survey payload, developed by Aurora Insight. It is one-half of two-satellites mission aimed to expand Aurora Insight's radio frequency spectrum data gathering infrastructure.

BRAVO will be the first satellite to be launched by Arianespace for Aurora Insight and will also be the first NanoAvionics built satellite to be launched by Arianespace.

BRAVO and LEMUR-2 uses the Astrofein PSL12U-3w deployer.

LEMUR-2 satellites on behalf of Spire signed with SAB Launch Services

Spire's LEMUR-2 satellites collect earth data to provide some of the most advanced maritime, aviation, and weather tracking in the world. The LEMUR-2 also supports hosted software and payloads through Spire Space Services.

These two LEMUR-2 satellites will be the ninth and tenth Spire satellites manifested by Arianespace and will share the Astrofein PSL12U-3w deployer with BRAVO.

Tyvak-182A (Eutelsat ELO alpha) satellite on behalf of Eutelsat

Tyvak-182A (Eutelsat ELO alpha) is a 6U CubeSat, it will provide information on backhaul from objects located in areas not served by terrestrial networks and will provide redundancy of existing terrestrial network coverage.

It will be the 35th Eutelsat satellite to be launched by Arianespace. There are currently seven satellites to be launched on behalf of Eutelsat in the Arianespace's backlog: Quantum, KONNECT VHTS, Eutelsat 10B, as well as four additional satellites under a Multi-Launch Services Agreement (MLSA) with the operator. Tyvak-182A (Eutelsat ELO alpha) will also be the fourth Tyvak International satellite as a customer to be launched by Arianespace.

Tyvak-182A (Eutelsat ELO alpha) uses the Tyvak 6U Deployer.

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MISSION DESCRIPTION

Arianespace's third launch of 2021 will place its satellites passengers into Sun-synchronous orbits (SSO).

The launcher will be carrying a total payload of approximately 1,278 kg.

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

DATE AND TIME

Liftoff is scheduled for **Wednesday, April 28, 2021** at exactly:

- **9:50 p.m.**, in Washington, D.C.,
- **10:50 p.m.**, in Kourou,
- **01:50** Universal Time (UTC) on April 29,
- **03:50 a.m.**, in Paris on April 29,
- **09:50 a.m.**, in Singapore on April 29,
- **10:50 a.m.**, in Tokyo on April 29.

MISSION DURATION

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

1 hour, 41 minutes and 52 seconds.

TARGETED ORBIT FOR PLÉIADES NEO 3

Orbit	Altitude at separation (approximative)	Inclination
SSO	628 km.	97.89 degrees

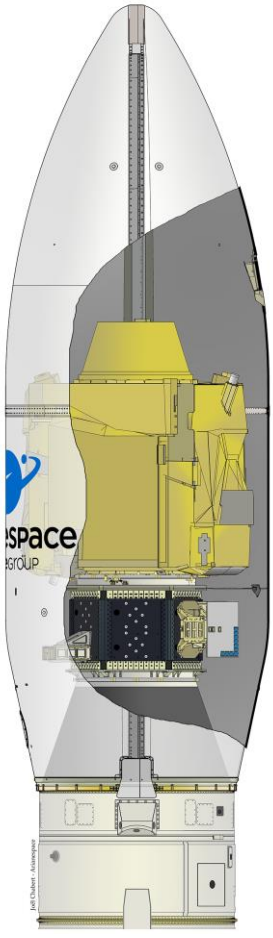
TARGETED ORBIT FOR THE FIVE AUXILIARY PAYLOADS

Orbit	Altitude at separation (approximative)	Inclination
SSO	613 km.	97.79 degrees

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 33 seconds. After this first phase, the launcher's third stage will separate from the upper composite, which includes the AVUM upper stage, the SSMS dispenser and the six passengers. The lower three stages will fall back into the sea.

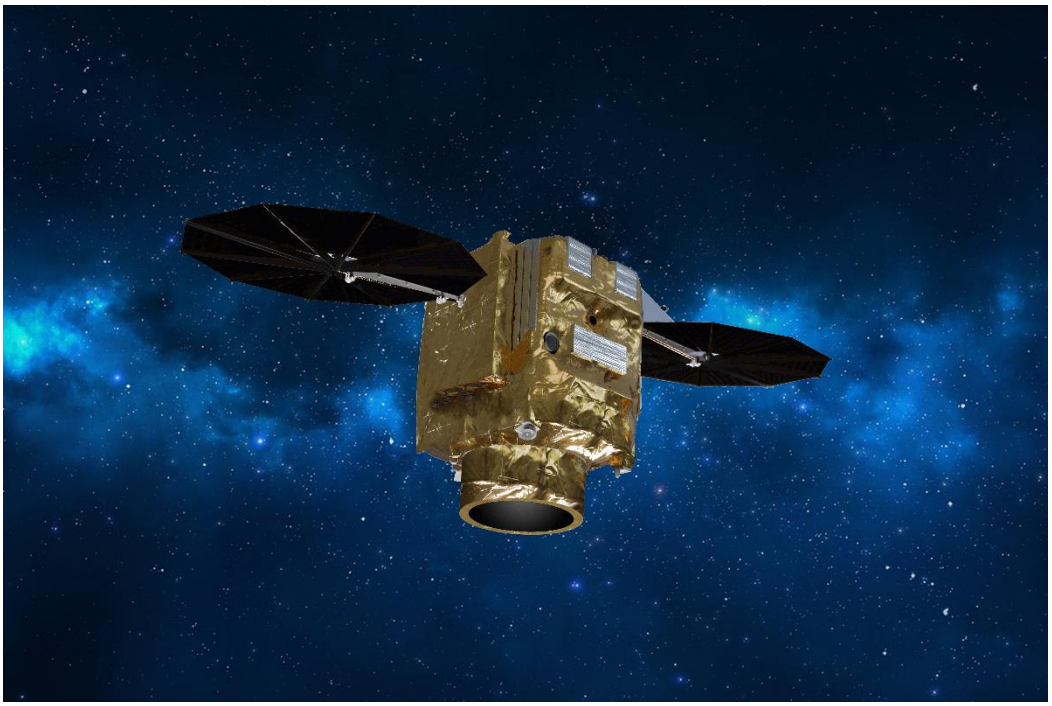
The AVUM upper stage will ignite its engine for the first time, operating for seven minutes and 51 seconds, followed by a ballistic phase lasting 36 minutes and 42 seconds. The AVUM stage will then reignite its engine for about one minute, 21 seconds, prior to releasing the Pléiades Neo 3 satellite. A third and a fourth AVUM ignition phase will have durations of four seconds and seven seconds, respectively, prior to releasing the five auxiliary payloads, which are to be deployed at one hour, 41 minutes and 52 seconds after liftoff.



VEGA PAYLOAD CONFIGURATION

- **Payloads:** Pléiades Neo 3 and five auxiliary payloads
- **SSMS structure**
- **Vega Payload Adaptor (PLA)**

PLÉIADES NEO 3 SATELLITE



FINAL CUSTOMER	**Airbus Defence and Space - Intelligence**
MANUFACTURER	**Airbus Defence and Space**
MISSION	Earth observation
PLATFORM	AstroBus M Compact
MASS AT LAUNCH	920 kg. (923 kg. max)
BATTERIES	Li-Ion – 156 Ah
PAYLOADS	X-Band and Ka-Band
DESIGN LIFE	10 years (nominal)

PRESS CONTACTS

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THE VEGA LAUNCH VEHICLE

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

Payload fairing
(RUAG Space)

Payload(s)

Payload adaptor
(Airbus Spain)

AVUM structure
(Airbus Spain)

AVUM integration & testing
(Avio)

AVUM engine
(KB Yuzhnoye)

Interstage - 3/AVUM
(Airbus Spain)

ZEFIRO 9 production, integration & testing
(Avio)

Interstage - 2/3
(Rheinmetall)

ZEFIRO 23 production, integration & testing
(Avio)

Interstage - 1/2
(Airbus Netherlands)

P80 integration & testing
(Europropulsion)

P80 motor case
(Avio)

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

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

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

P80 nozzle
(ArianeGroup)

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

VEGA – THE SMALL SPACECRAFT MISSION SERVICE

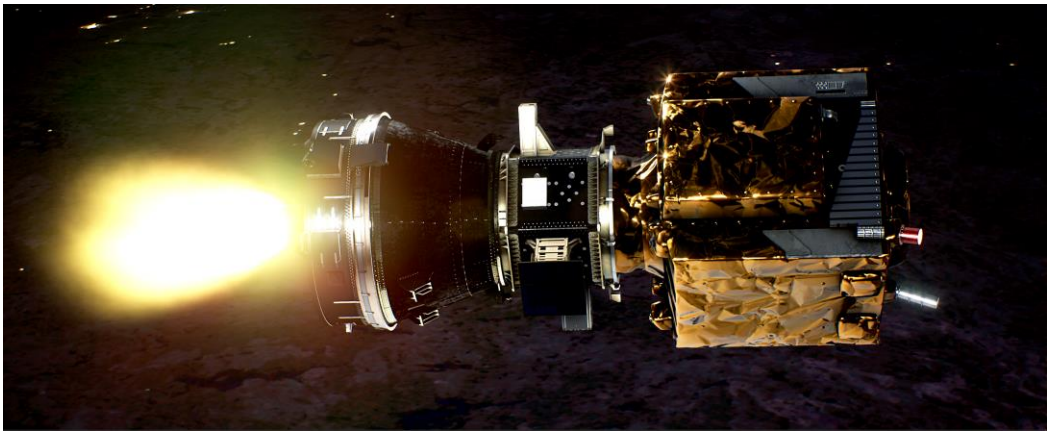
For VV18's mission, the SSMS dispenser also named HEXA module offers six vertical faces for the integration of microsatellites/cubesats deployers. The HEXA module is integrated in between the adapter on the Avum stage and the Main Passenger.

The SSMS piggyback mission is part of Arianespace commercial offer, as a new service to address the small satellite market.
This Vega mission service is specifically conceived to provide a regular, flexible and affordable access to space to all European and worldwide small satellite customers.

The Vega Proof of Concept flight on VV16's mission used SSMS hardware conceived initially in the context of ESA's LLL (Light satellite, Low-cost, Launch opportunity) Initiative. The flight was then organized by Arianespace with ESA and European Union support.

ESA's contribution to the PoC flight was approved by European ministers at the CM-16 ESA Ministerial Council meeting in Lucerne (2016), with the aim of demonstrating European capability to aggregate, prepare, launch and deliver a set of lightweight satellites into orbit; enabling timely, standardized and guaranteed access to space for lightweight satellites of the institutional and commercial user communities by means of a dedicated and optimized European launch service.

The European Union support for this first flight was provided in the framework of the Horizon 2020 program, In-Orbit Demonstration/Validation Program (IOD/IOV).



SSMS is based on simplified contractual clauses and a lean integration chain, with CubeSat integration and flight readiness performed for the first time in Europe (Czech Republic).

The service is leveraging on the extreme flexibility of a modular dispenser, which provides an interface to all kinds of small satellites ranging from 1 kg. to 500 kg. in several configurations based on the same structural elements.

Two main type of missions can be supported by the SSMS dispenser:

- Piggyback mission with a dispenser configuration based on one or two hexagonal modules below the main payload interface;
- Rideshare mission, based on a dispenser configuration using one or two hexagonal modules and a main deck, equipped with or without spacers, a central column, and multiple tower modules.

The SSMS hardware, as well as the specific mission preparation process, were developed under ESA leadership by Avio, which also is the Vega launcher's industrial prime contractor.

The dispenser design authority is SAB Aerospace s.r.o. (CZ), while SAB-Launch Services is the entity selected by Arianespace to carry out payload integration activities in Europe and support the introduction of this new European small satellite service.

LAUNCH CAMPAIGN: VEGA – PLÉIADES NEO 3 AND FIVE AUXILIARY PAYLOADS

SATELLITES AND LAUNCH VEHICLE CAMPAIGN TIMETABLE

DATE	SATELLITE ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
March 5, 2021		Campaign start review Transfer of P80 stage
March 9, 2021		Start of preliminary inspections Interstage 1/2 integration
March 10, 2021		Z23 stage integration
March 11 to 17, 2021	Integration of BRAVO, LEMUR-2, and Tyvak-182A (Eutelsat ELO alpha) on the Hexamodule in the Czech Republic	
March 17, 2021		Z9 integration
March 19, 2021	Arrival in French Guiana of the Hexamodule with the four co-passengers and transfer to the S3B building	
March 24, 2021	Arrival in French Guiana of Pléiades Neo 3	
March 26, 2021	Arrival in French Guiana of NorSat-3 to the S3B building	AVUM integration
March 30, 2021	Integration of the Hexamodule on the payload adaptor	
April 9, 2021	Integration of NorSat-3 in its deployer on the Hexamodule	Synthesis control test
April 13 to 15, 2021	Inspection of the fairing, the Hexamodule and the payload adaptor prior to encapsulation	
April 15, 2021	Pleiades Neo 3 mating on Hexamodule	
April 16, 2021	Encapsulation of the upper composite in Vega's payload fairing	
April 16 to 19, 2021		Launcher filling activities

SATELLITES AND LAUNCH VEHICLE CAMPAIGN FINAL TIMETABLE

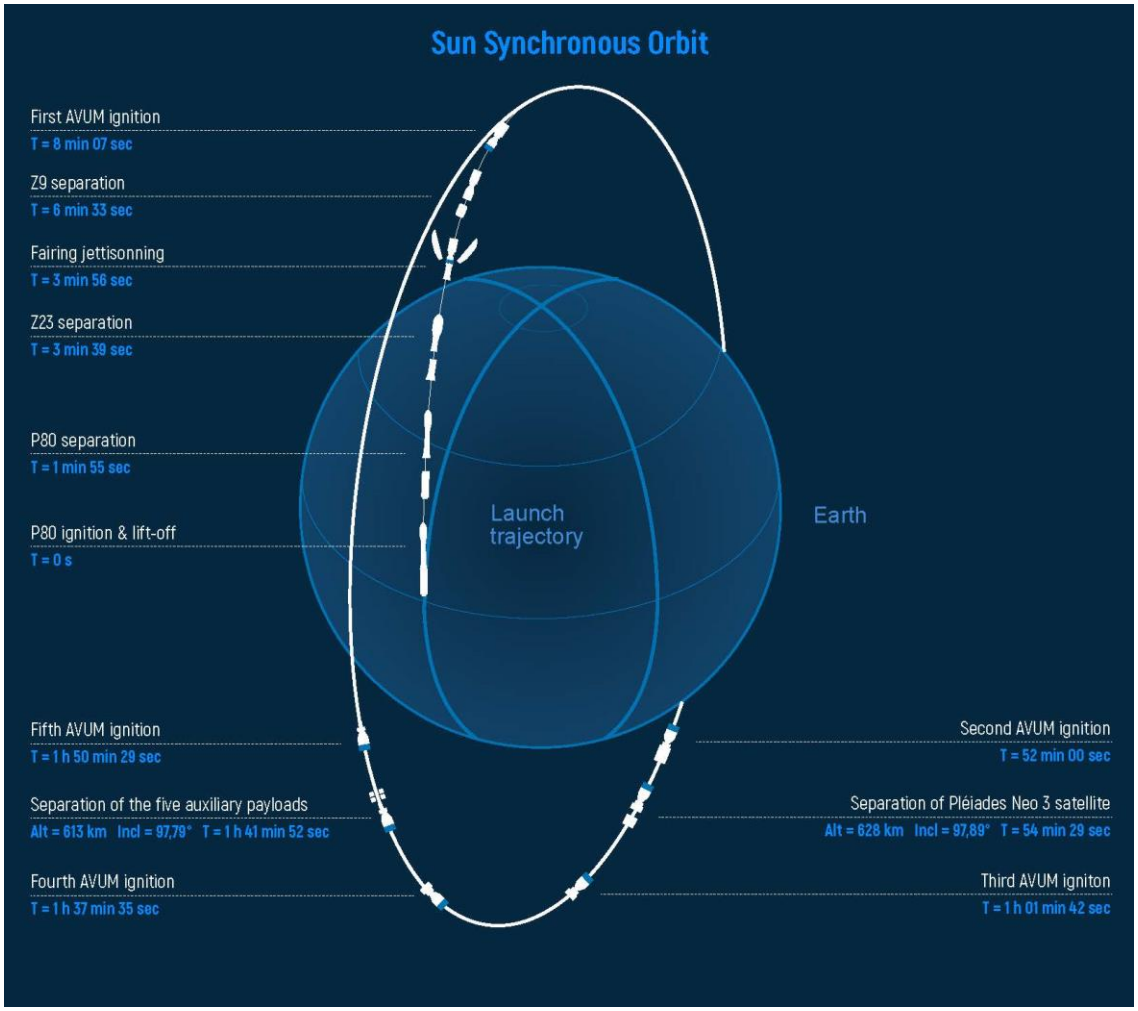
DATE	SATELLITE ACTIVITIES	LAUNCH VEHICLE ACTIVITIES
Tuesday, April 20, 2021	Transfer of upper composite to ZLV (Vega Launch Zone)	
Wednesday, April 21, 2021	Upper composite integration on the launcher	
Friday, April 23, 2021		General dress rehearsal
Saturday, April 24, 2021		Arming of P80, Z23, Z9 and AVUM
Monday, April 26, 2021		Arming of fairing Launch Readiness Review (LRR) Final preparation of launcher and final inspection of the fairing
Wednesday, April 28, 2021		Final launch countdown

COUNTDOWN AND FLIGHT SEQUENCE

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

TIME	EVENT
- 09 h 10 min	Start of final countdown
- 06 h 25 min	Activation of Multi-Functional Unit (MFU)
- 06 h 05 min	Activation of Inertial Reference System (IRS)
- 06 h 05 min	Activation of telemetry
- 05 h 35 min	Activation of Safeguard Master Unit (SMU)
- 05 h 15 min	Removal of safety devices
- 05 h 05 min	Activation of onboard computer and loading of flight program
- 04 h 55 min	IRS alignment and checks
- 03 h 40 min	Mobile gantry withdrawal (45 min.)
- 02 h 50 min	IRS alignment and checks after withdrawal gantry
- 01 h 15 min	Activation of the telemetry transmitter after withdrawal 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
H0 00 s	**LIFTOFF**
+ 00 h 01 min 55 s	1st stage (P80) separation
+ 00 h 01 min 56 s	2nd stage (Zefiro-23) ignition
+ 00 h 03 min 39 s	2nd stage (Zefiro-23) separation
+ 00 h 03 min 51 s	3rd stage (Zefiro-9) ignition
+ 00 h 03 min 56 s	Fairing separation
+ 00 h 06 min 33 s	3rd stage (Zefiro-9) separation
+ 00 h 08 min 07 s	1st ignition of AVUM
+ 00 h 15 min 58 s	1st cut-off of AVUM
+ 00 h 52 min 00 s	2nd ignition of AVUM
+ 00 h 53 min 21 s	2nd cut-off of AVUM
+ 00 h 54 min 29 s	**Separation of Pléiades Neo 3 satellite**
+ 01 h 01 min 42 s	3rd ignition of AVUM
+ 01 h 01 min 46 s	3rd cut-off of AVUM
+ 01 h 37 min 35 s	4th ignition of AVUM
+ 01 h 37 min 42 s	4th cut-off of AVUM
+ 01 h 41 min 52 s	**Separation of five auxiliary payloads**
+ 01 h 50 min 29 s	5th ignition of AVUM
+ 01 h 51 min 44 s	5th cut-off of AVUM

MISSION PROFILE



ARIANESPACE AND THE GUIANA SPACE CENTER

ARIANESPACE, A LEADING GLOBAL LAUNCH SERVICES COMPANY

Arianespace was founded in 1980 as the world's first commercial launch 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 650 launch contracts and launched more than 790 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 Tokyo, Singapore and Washington DC. Arianespace offers launch services of any mass, to any orbit, at any time. These services call on three different 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 Russian cosmodromes in Baikonur and Vostotchny.

> The Vega light-lift launcher, operated from the Guiana space center.

THE GUIANA SPACE CENTER: EUROPE'S SPACEPORT

For more than 50 years, the Guiana space center, Europe's spaceport in French Guiana, has offered a complete array of facilities for rocket launches. It comprises primarily the following:

> CNES, the French space agency, 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 (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 Regulus, Europropulsion, Air Liquide spatial Guyane and ArianeGroup. 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), CNES, the French space agency, and Arianespace. ESA was 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.

PAYLOAD FAIRING LOGO FOR FLIGHT VV18

Tyvak
A Terran Orbital Corporation

UTIAS SFL