ARIANE 5 to boost satellites for Europe and Japan

Arianespace's fifth launch of the year will orbit two telecom satellites: Artemis for the European Space Agency, and BSAT-2b for B-SAT of Japan, as part of a turnkey contract with Orbital Sciences Corp. of the United States. This latest launch confirms Arianespace's position as the benchmark launch services provider for operators in Europe, the United States and Japan.

ARTEMIS, the most advanced telecommunications satellite ever built by ESA, will help develop the application of satellite navigation systems to land, air and maritime transport.
Built by prime contractor Alenia Spazio of Italy, ARTEMIS has a three-pronged mission: provide communications between mobile terminals, transmit GPS-type signals as part of Europe's Egnos satnav enhancement system, and establish high-speed inter-satellite communications links.

BSAT-2b is the fourth satellite in this series to be launched by Arianespace, following BSAT-1a on Flight 95, BSAT-1b on Flight 108, and BSAT-2a on Flight 140. Today, over 16 million households receive TV programs via these three satellites operated by Brodcasting Satellite System Corporation (B-SAT).
BSAT-2b is also the 16th satellite to be launched by Ariane for Japan. Out of the 24 commercial launch contracts issued to date in Japan, Arianespace has won 18. It also launched the LDREX experimental satellite for NASDA on Flight 138.
Two other Japanese satellites are slated for an Arianespace launch: JCSAT-8 for JSAT Corp., and N-STAR c for mobile telecoms giant NTT DoCoMo.

Artemis and BSAT-2b will be launched by an Ariane 5.

1. Arianespace flight 142 mission

The 142th Ariane launch (Flight 142/Ariane 510) will use an Ariane 5 to place 2 telecommunications satellites into geostationary transfer orbit: ARTEMIS for the European Space Agency (ESA) and BSAT-2b for US manufacturer ORBITAL SCIENCES CORP. for Japanese operator B-SAT.
The launch will be carried out from the ELA 3 launch complex in Kourou, French Guiana.
For Arianespace, this marks the seventh commercial mission of the new Ariane 5 launcher.
Arianespace has performed 4 other launches this year (3 ARIANE 4 and 1 ARIANE 5).
The Ariane 510 launcher will carry a dual payload of 5,316 kg (11,695 lb), including 4,403 kg (9,686 lb) for the satellites.

INJECTION ORBIT

Perigee altitude	***858 km***
Apogee altitude	***35 853 km at injection***
Inclination	***2° degrees***

The lift-off is scheduled on the night of July 12 to 13, 2001 as soon as possible within the following launch window :

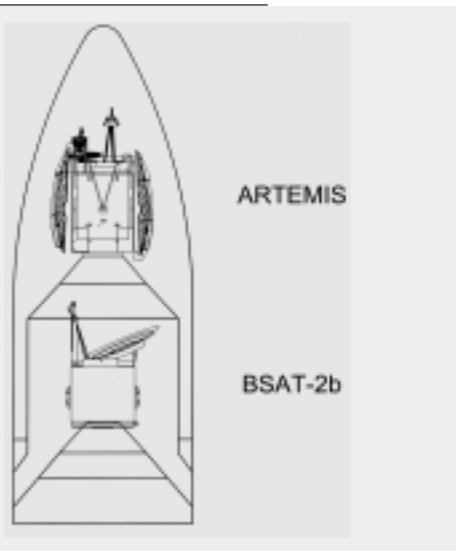
LAUNCH OPPORTUNITY

	Universal time (GMT)	*Paris time*	*Tokyo time*	*Washington time*	*Kourou time*
Between	*09:58 pm*	*11:58 pm*	*06:58 am*	*05:58 pm*	*06:58 pm*
and	*11:31 pm*	*01:31 am*	*08:31 am*	*07:31 pm*	*08:31 pm*
on	*July 12, 2001*	*July 12/13, 2001*	*July 13, 2001*	*July 12, 2001*	*July 12, 2001*

Ariane 510 payload configuration

The ARTEMIS satellite was built by ALENIA SPAZIO in Rome, Italy, for ESA.
Orbital position: 21.5° East, over Central Africa.

The BSAT-2b satellite was built by Orbital Sciences Corporation in Dulles, Virginia (USA), for Orbital Sciences Corp for Japanese operator, B-SAT.
Orbital position: 110° East, above the Island of Borneo.



2. Range operations campaign : ARIANE 5 – ARTEMIS/ BSAT-2b

The actual work for satellite range operations lasts 65 working days for ARTEMIS from its arrival in Kourou (before beginning combined operations).
The actual work for satellite range operations lasts 16 working days for BSAT-2b from its arrival in Kourou (before beginning combined operations).
The ARIANE 5 preparation campaign lasts 30 working days.

Satellites and launch vehicle campaign calendar

Ariane activities	***Dates***	***Satellites activities***
	March 26, 2001	*Arrival in Kourou and beginning of ARTEMIS preparation campaign in S1B building.*
Campaign start review	*May 29, 2001*	
EPC Erection	*May 30, 2001*	
EAP transfer and positionning	*May 31, 2001*	
Integration EPC/EAP	*June 1, 2001*	
EPS Erection	*June 6, 2001*	
Integration equipement bay	*June 7, 2001*	
Arianespace Flight 141	***June 9, 2001***	***INTELSAT 901***
	June 11, 2001	*Transfer of ARTEMIS into the S3B building.*
	June 13, 2001	*Beginning of ARTEMIS filling operations in S3B building.*
	June 13, 2001	*Arrival in Kourou and beginning of BSAT-2b preparation campaign in S1A building.*
	June 21, 2001	*Transfer of BSAT-2b into the S3A building.*
	June 25, 2001	*Beginning of BSAT-2b filling operations in S3A building.*
ROLL-OUT FROM BIL to BAF	*June 26, 2001*	

Satellites and launch vehicle campaign final calendar

J-9	*Friday, June 29*	*ARTEMIS integration on Sylda.*
J-8	*Monday, July 2*	*BSAT-2b integration on launcher.*
J-6	*Wednesday, July 4*	*Mating of upper composite (Sylda + ARTEMIS + fairings) on launcher.*
J-4	*Friday, July 6*	*Filling of SCA with N_2H_4.*
J-4	*Friday, July 6*	*Filling of EPS stage with MMH.*
J-3	*Monday, July 9*	*LAUNCH REHEARSAL.*
J-3	*Monday, July 9*	*Filling of EPS stage with N_2H_4.*
J-2	*Tuesday, July 10*	*LAUNCH READINESS REVIEW (RAL) and final mechanical preparation of launcher. Launcher arming*
J-1	*Wednesday, July 11*	*ROLL-OUT FROM BAF to LAUNCH AREA and filling of the EPC Helium sphere.*
J-0	*Thursday, July 12*	*LAUNCH COUNTDOWN including EPC filling with liquid oxygen and liquid hydrogen.*

3 - Launch coundown and flight events :

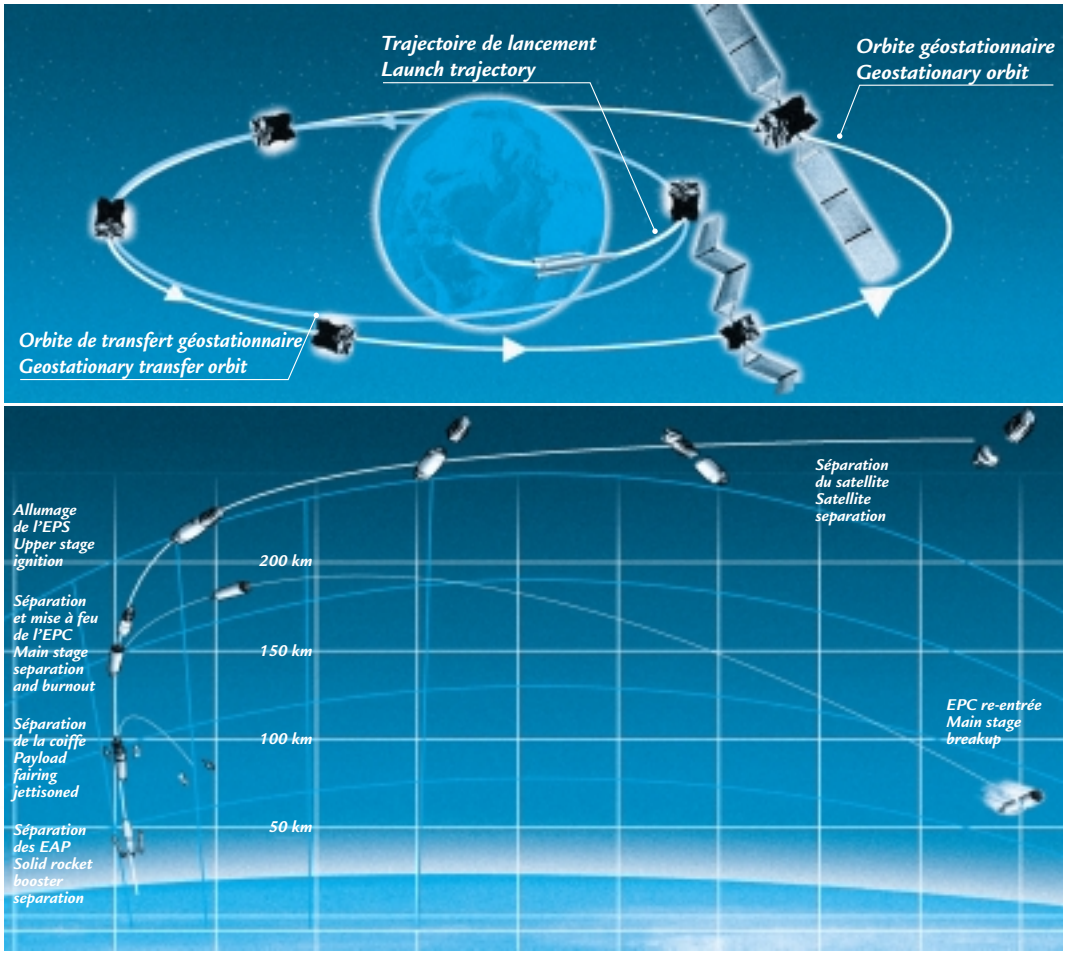
The countdown comprises all final preparation steps for the launcher, the satellites and the launch site. If it proceeds as planned, the countdown leads to the ignition of the main stage engine, then the two solid boosters, for a liftoff at the targeted time, as early as possible in the satellites launch window.
The countdown culminates in a synchronized sequence (see appendix 3), which is managed by the control station and onboard computers starting at T-6 minutes 30 s.
If an interruption in the countdown means that T-0 falls 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	***Events***
– 9 h 00 mn	*Start of final countdown.*
– 7 h 30 mn	*Check of electrical systems.*
– 5 h 20 mn	*Start of filling of main cryogenic stage with liquid oxygen and helium.*
– 3 h 20 mn	*Chilldown of Vulcain main stage engine.*
– 1 h 15 mn	*Check of connections between launcher and telemetry, tracking and command systems.*
– 6 mn 30 s	*"All systems go" report, allowing START OF SYNCHRONIZED SEQUENCE.*
– 35 s	*Start of automated ignition sequence.*
– 22 s	*Authorization for control handover to onboard computer.*
– 03 s	*Onboard systems take over.*
– 02 s	*Unlocking of inertial guidance systems to flight mode.*
HO	***Ignition of the cryogenic main stage engine (EPC)***
+7,0 s	*Ignition of solid boosters.*
+7,3 s	*Liftoff.*
+ 13 s	*End of vertical climb and beginning of pitch rotation (10 seconds duration).*
+ 17 s	*Beginning of roll maneuver.*
+ 2 mn 24 s	*Jettisoning of solid boosters.*
+ 3 mn 25 s	*Jettisoning of fairing.*
+ 8 mn 00 s	*Acquisition by Natal tracking station.*
+ 9 mn 59 s	*Extinction of main cryogenic stage.*
+ 10 mn 06 s	*Separation of main cryogenic stage.*
+ 10 mn 28 s	*Ignition of storable propellant stage.*
+ 12 mn 08 s	*Acquisition by Ascension tracking station.*
+ 23 mn 01 s	*Acquisition by Malindi tracking station.*
+ 26 mn 48 s	*Extinction of storable propellant stage.*
+ 28 mn 06 s	*Separation of ARTEMIS satellite.*
+ 29 mn 58 s	*Separation of SYLDA 5.*
+ 35 mn 35 s	*Separation of BSAT-2b satellite.*
+ 37 mn 58 s	*End of ARIANESPACE Flight 142 mission.*

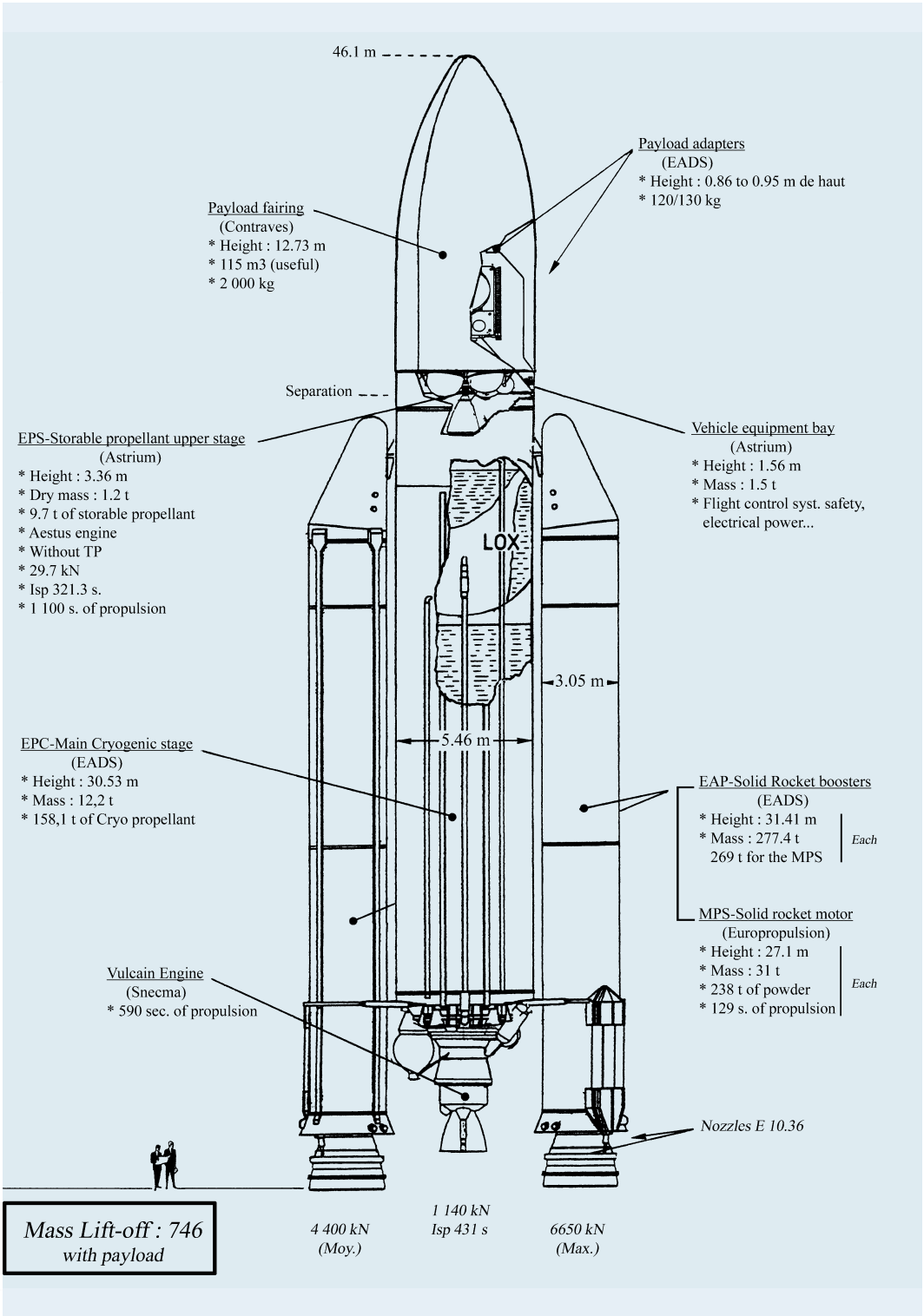
4 - Flight 142 trajectory:

The launcher's attitude and trajectory are totally controlled by the two onboard computers, located in the Ariane 5 vehicle equipment bay (VEB).
7.05 seconds after 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 6 seconds, then rotates towards the East. It maintains an attitude that ensures the axis of the launcher remains parallel to its velocity vector, in order to minimize aerodynamic loads throughout the entire atmospheric phase, until the solid boosters are jettisoned.
Once this first part of the flight is completed, the onboard computer optimizes 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 upper (storable propellant) stage.
The main stage falls back off the coast of the Galapagos Islands in the Pacific Ocean. On orbital injection, the launcher will have attained a velocity of approximately 9,065 meters/second, and will be at an altitude of about 1,732 kilometers.
The fairing protecting the ARTEMIS/BSAT-2b spacecrafts is jettisoned shortly after the boosters are jettisoned at about T+195 seconds.

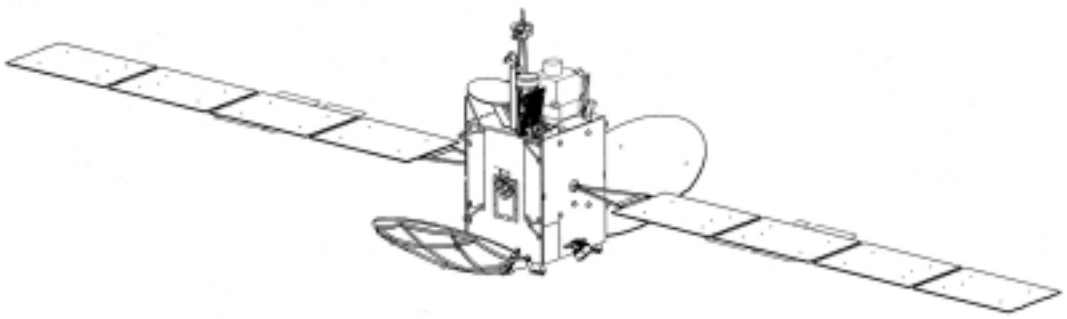
STANDARD ARIANE 5 TRAJECTORY FOR GEOSTATIONARY TRANSFER ORBIT



5 - Ariane 5 launcher



6 - The ARTEMIS Satellite:



Customer	***European Space Agency (ESA)***	
Prime contractor	*Alenia Spazio – Rome (Italy)*	
Mission	*Experimental telecommunications*	
Mass	*Total mass at lift-off*	*3,105 kg (6,831 lb)*
Stabilization	*3 axis stabilized*	
Dimensions		*4.86 x 2.85 x 2.95 m*
	Span in orbit	*24.73 m*
Payload	*1 mobile telecom payload in L band* *2 intersatellite links payloads in S and Ka bands and by laser*	
Frequency bands	*1.5/1.6 GHz (L band) from/to mobile* *12/14 GHz (Ku band) from/to fixed stations*	
On-board power	*4.00 kW (at beginning of life)*	
Life time	*10 years*	
Orbital position	*21.5° East, above Central Africa*	
Coverage area	*Europe, North Africa and Middle-East*	

Press Contact :

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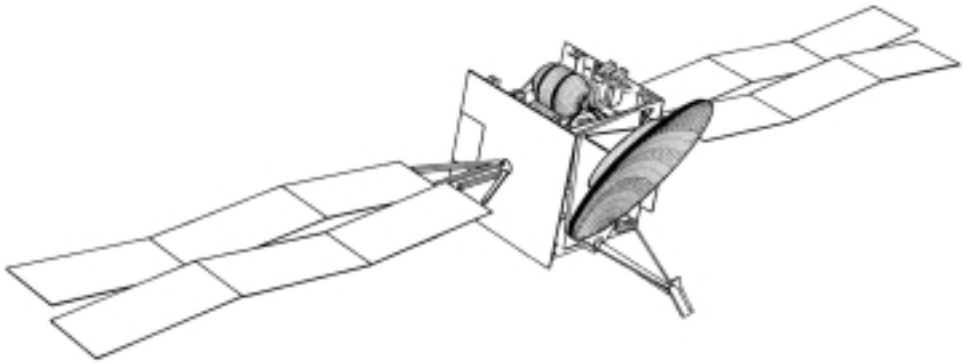
ESA
Tél. : 33 (0) 1 53 69 77 13
e-mail : franco.bonacina@esa.int

7 - The BSAT-2b satellite:



Customer	***ORBITAL SCIENCES CORP. (USA) for B-SAT Corp. (Japan)***	
Prime contractor	*Orbital Sciences Corp., Dulles, Virginia*	
Mission	*Telecommunications Direct Broadcasting.*	
Mass	*Total mass at lift-off*	*1,298 kg (2,855 lb)*
	Dry mass	*535 kg (1,177 lb)*
Stabilization	*3 axis*	
Dimensions	*Height*	*3.7 x 2.2 x 2.1 m*
	Span in orbit	*15.7 m*
Model	***STAR 1***	
Payload	*4 Ku band transponders*	
	Uplink	*17.3-17.6 GHz*
	Downlink	*11.7-12.0 GHz*
On-board power	*2,6 kW (at begining of life).*	
Life time	*10 years*	
Orbital position	*110°Est, above the Island of Borneo*	
Coverage area	*Japan*	

Press Contact :

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Annex 1 - Arianespace flight 142 key personnel

In charge of the launch compaign			
Mission Director	*(CM)*	*Didier CASSE*	*ARIANESPACE*
In charge of the launch service contracts			
ARTEMIS program director and ARIANE Payload Manager	*(RCUA)*	*Jean-François LAUMONIER*	*ARIANESPACE*
BSAT-2b program director and ARIANE Deputy Mission Manager	*(RCUA/A)*	*Michael CALLARI*	*ARIANESPACE*
In charge of ARTEMIS satellite			
Satellite Mission Director	*(DMS)*	*Gotthard OPPENHAUSER*	*ESA*
Satellite Project Director	*(CPS)*	*Fabio PALAMIDESSI*	*ALENIA SPAZIO*
Satellite Preparation Manager	*(RPS)*	*Marco COTOGNI*	*ALENIA SPAZIO*
In charge of BSAT-2b satellite			
Satellite Mission Director	*(DMS)*	*David STEFFY*	*OSC*
Satellite Project Director	*(CPS)*	*Tim HEMKE*	*OSC*
Satellite Project Director	*(RPS)*	*Steven THIBAULT*	*OSC*
In charge of the launch vehicle			
Launch Site Operations Manager	*(COEL)*	*André SICARD*	*ARIANESPACE*
ARIANE Production Project Manager	*(CPAP)*	*Bernard DONAT*	*ARIANESPACE*
In charge of the Guiana Space Center (CSG)			
Range Operations Manager	*(DDO)*	*Jean-Yves TREBAOL*	*CNES/CSG*
Flight Safety Officer	*(RSV)*	*Dominique POULAIN*	*CNES/CSG*

Annex 2 - Launch environment conditions

Acceptable wind speed limits at liftoff range from between 9 m/s. to 14 m/s. according to the wind direction. The most critical is a northerly wind. For safety reasons, the wind's speed on the ground (Kourou) and at a high altitude (between 10.000 and 2.000 m) is also into account.

Annex 3 - The synchronized sequence

The synchronized sequence starts 7 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, it is fully automatic, and is performed concurrently by the onboard computer and by a redundant computer at the ELA 3 launch complex until T-5 seconds.
The computer commands the final electrical operations (startup of the flight program, servocontrols, switching from ground power supply to onboard batteries, etc.) and associated checks. It also places the propellant and fluid systems in flight configuration ans performs associated checks. In additionn, it handles the final ground system configurations, namely :

- startup of water injection in the flame trenches and jet guide (T-30 sec) ;
- hydrogen aspiration for chilldown of Vulcain engine in the jet guite (T-18 sec) ;
- burnoff of hydrogen used for chilldown (T-7 sec).

At T-3 seconds, the onboard computer takes over control of final engine startup ans liftoff operations :

- It starts the ignition sequence for the Vulcain main stage engine (T-0) ;
- It checks engine operation (from T+4 to T+7 sec) ;
- It commands ignition of the solid boosters for immediate liftoff at T+7.5 seconds.

Any shutdown of the synchronized sequence up to T - 6 mn 30 seconds automatically places the launcher back in its T-6 min 30 sec configuration.

Annex 4 - Arianespace order book

To date 188 satellites and 38 auxiliary payloads have been launched by Arianespace.
Out of the 242 launch services contracted since 1981 by Arianespace and before Flight 142, 45 satellites and 9 ATV missions remain to be launched (3 confidential contracts at the request of customers).

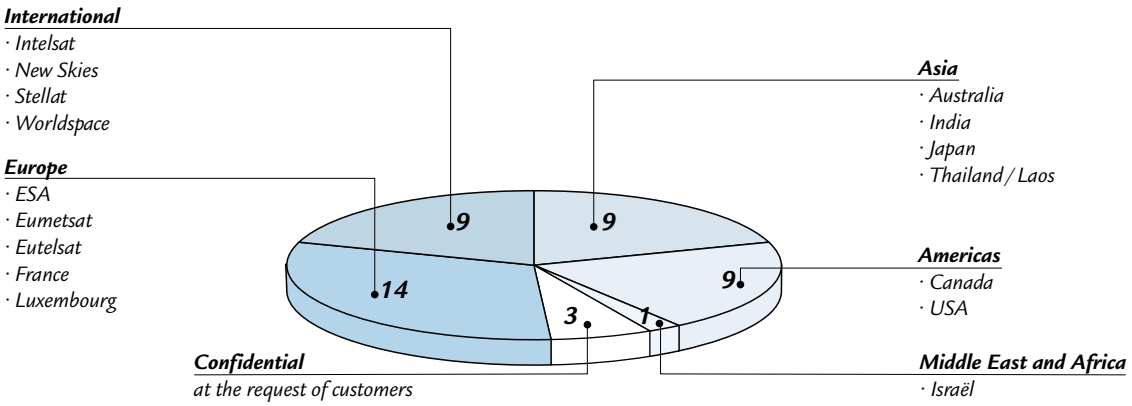
Europe **14 satellites**
Artemis
Astra 1K, X, 3A
Atlantic Bird 2
e-Bird
Envisat-1/PPF
Hot Bird 6
MSG-1 & 2
Rosetta
Spot 5
Stentor
Syracuse III
+ 9 ATV launches

International organizations **9 satellites**
Ameristar (Worldspace)
Intelsat 902, 904, 905, 906, 907
New Skies Satellites 6 & 7
Stellat

Middle-East and Africa **1 satellite**
Amos 2

Americas **9 satellites**
Anik F2 (Canada)
Directv-4S (USA)
Galaxy 12 (USA)
GE TBD (USA)
Loralsat 3 (USA)
PAS Light 2 & 3 (USA)
Wild Blue 1 & 2 (USA)

Asia **9 satellites**
BSAT-2b *(Japan)*
Insat 3C, 3A & 3E (India)
JCSat 8 (Japan)
L-Star A & B (Thaïland/Laos)
N-Star C (Japan)
Optus C1 (Australia)



Annex 5 - Arianespace, its relations with ESA et CNES

FROM A PRODUTION BASE IN EUROPE, ARIANESPACE, A PRIVATE COMPANY, SERVES CUSTOMERS ALL OVER THE WORLD.
Arianespace is the world's first commercial space transportation company, created in 1980 by 36 leading European aerospace and electronics corporations, 13 major banks and the French space agency CNES (Centre National d'Etudes Spatiales).
The shareholder partners in Arianespace represent the scientific, technical, financial and political capabilities of 12 countries : Belgium, Denmark, Germany, France, Great Britain, Ireland, Italy, Netherlands, Norway, Spain, Switzerland and Sweden.
In order to meet the market needs, Arianespace is present throughout the world : in Europe, with its head office located near Paris, France at Evry, in North America with its subsidiary in Washington D.C. and in the Pacific Region, with its representative offices in Tokyo, Japan, and in Singapore.
Arianespace employs a staff of 380. Share capital totals FF 2,088 million.
Arianespace is in charge of these main areas :
❍ markets launch services to customers throughout the world ;
❍ finances and supervises the construction of Ariane expendable launch vehicles ;
❍ conducts launches from Europe's Spaceport of Kourou in French Guiana ;
❍ insures customers for launch risks.
Personalized reliable service forms an integral part of Arianespace launch package. It includes the assignment of a permanent team of experts to each mission for the full launch campaign.

The world's commercial satellite operators habe contracted to launch with Arianespace. This record is the result of our company's realistic cost-effective approach to getting satllites into orbit.

RELATIONS BETWEEN ESA, CNES AND ARIANESPACE
Development of the Ariane launcher was undertaken by the European Space Agency in 1973. ESA assumed overall direction of the ARIANE 1 development program, delegating the technical direction and financial management to CNES. The ARIANE 1 launcher was declared qualified and operational in January 1982. At the end of the development phase which included four launchers, ESA started the production of five further ARIANE 1 launchers. This program, known as the "promotion series", was carried out with a management arrangement similar to that for the ARIANE 1 development program.
In January 1980 ESA decided to entrust the commercialization, production and launching of operational launchers to a private-law industrial structure, in the form of ARIANESPACE company, placing at its disposal the facilities, equipment and tooling needed of producing and launching the ARIANE launchers.
Ariane follow-on development programs have been undertaken by ESA since 1980. They include a program for developing uprated versions of the launcher : Ariane 2 and Ariane 3 (qualified in August 1984) ; the program for building a second ARIANE launch site (ELA 2) (validated in August 1985) ; the Ariane 4 launcher development program (qualified on June 15th, 1988) ; and the preparatory and development program of the Ariane 5 launcher and its new launch facilities : ELA 3 (qualified on November, 1997). All these programs are run under the overall direction of ESA, which has appointed CNES as prime contractor.
In general, as soon as an uprated version of the launcher has been qualified 5 Oct, 1998, ESA makes the results of the development program together with the corresponding production and launch facilities available to ARIANESPACE.
ESA is responsible (as design authority) for development work on the Ariane launchers. The Agency owns all the assets produced under these development programs. It entrusts technical direction and financial management of the development work to CNES, which writes the program specifications and places the industrial contracts on its behalf. The Agency retains the role of monitoring the work and reporting to the participating States.
Since Flight 9 Arianespace has been responsible for building and launching the operational Ariane launchers (as production authority), and for industrial production management, for placing the launcher manufacturing contracts, initiating procurements, marketing and providing Ariane launch services, and directing launch operations.

USE OF THE GUIANA SPACE CENTER
The "Centre Spatial Guyanais" (CSG), CNES's launch base near Kourou, has all the equipment needed for launching spacecraft-radar tracking stations, telemetry receiving stations, a meteorology station, a telecommand station, safety facilities, etc...
It became operational in 1968 for the purpose of the French National Space Program.
ESA has built its own launch facilities, the ELA 1 and ELA 2 and ELA 3 (for Ariane 5) complexes and the EPCU payload preparation complex inside the CSG compound, becoming the Europe Space Port. Using these launch pads requires, especially during launch operations, programs. In return, ESA shares in the costs of operating the CSG.
Arianespace directly covers the costs of use, maintenance and upgrading of the Ariane launch sites and the payload preparation complex.