FIRST FLIGHT OF 10-TON PAYLOAD ARIANE 5

Arianespace Flight 157 orbits communications and telecom technology satellites

The eleventh Arianespace mission of the year will orbit two satellites, the Hot Bird™ 7 communications satellite for Eutelsat, and the Stentor space telecom technology satellite for French space agency CNES.

This flight signals the service entry of the ESC-A cryogenic upper stage, based on the third stage of Ariane 4, which increases Ariane 5's geostationary transfer orbit payload capacity to 10 metric tons. The new upper stage will help Arianespace better meet customer requirements, by making Ariane launch service even more powerful, flexible and competitive.

Reliable and available, the Ariane launch system continues to set the standard for all major European operators.

HOT BIRD™ 7 will be located at 13 degrees East, Eutelsat's prime orbital location for broadcasting television channels and radio stations to cable and satellite homes in Europe, North Africa and the Middle East. Delivered to Eutelsat by Astrium, the satellite is equipped with 40 Ku-band transponders. It will replace Eutelsat's HOT BIRD™ 3 broadcasting satellite that will be relocated to a new orbital position and contribute to raising in-orbit sparing levels at 13 degrees East, the world's leading satellite position for consumer television broadcasting. HOT BIRD™ 7 is the 19th Eutelsat satellite launched by Arianespace.

The **STENTOR** *(Satellite de Télécommunications pour Expérimenter de Nouvelles Technologies en Orbite)* satellite is part of the space telecom technology program launched by French space agency CNES, France Telecom, French defense procurement agency DGA and prime contractors Alcatel Space and Astrium. Featuring the latest technologies from the partners advanced R&D programs, it will provide in-orbit validation of these technologies. It will also demonstrate new telecommunications services, including broadband and multimedia transmissions to small user terminals.

Follow the launch live on the internet broadband
at www.arianespace.com
(starting 20 minutes before lift-off)

1. Arianespace Flight 157 mission

The 156th Ariane launch (Flight 157/Ariane 517) will use an Ariane 5 to place 2 satellites into geostationary transfer orbit: the HOT BIRD™ 7 telecommunications satellite for Eutelsat and STENTOR, a space telecom technology satellite for CNES.
For Arianespace, this marks the eleventh commercial mission of the new Ariane 5 launcher. Arianespace has performed 10 other launches this year (7 ARIANE 4 and 3 ARIANE 5).
The Ariane 517 launcher will carry a dual payload of 8,266 kg (18,185 lb), including 5,560 kg (12,232 lb) for the satellites. To validate the launcher's performance, 3 ballast weights (total mass 1,960 kg) are integrated in the upper composite.
The launch will be carried out from the ELA 3 launch complex in Kourou, French Guiana.

Injection orbit

Perigee altitude	***250 km***
Apogee altitude	***35,836 km at injection***
Inclination	***4° degrees***

The lift-off is scheduled on the night of November 28 to 29, 2002 as soon as possible within the following launch window :

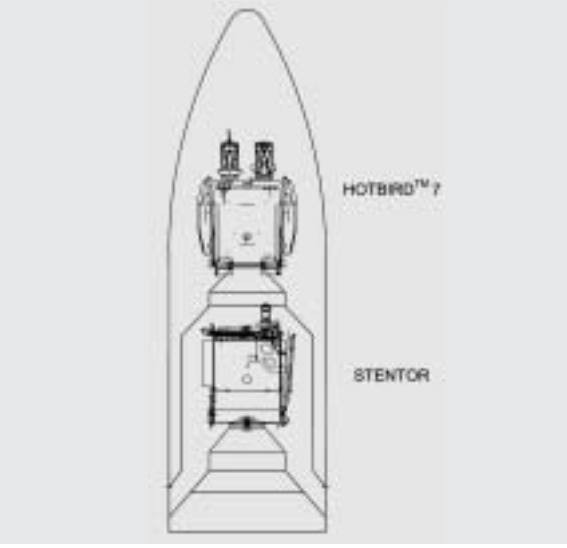
Launch opportunity

	Universal time (GMT)	*Paris time*	*Washington time*	*Kourou time*
Between	*10:25 pm*	*11:25 pm*	*05:25 pm*	*07:25 pm*
and	*11:05 pm*	*00:05 am*	*06:05 pm*	*08:05 pm*
on	*November 28, 2002*	*November 28/29, 2002*	*November 28, 2002*	*November 28, 2002*

Ariane 517 payload configuration

The HOT BIRD™ 7 satellite was built by Astrium for EUTELSAT.
Orbital position: 13° Est, over the Atlantic Ocean.

The STENTOR satellite was built by Alcatel Space and Astrium for French Space Agency, CNES.
Orbital position: 11° West, above Gabon.



2. Range operations campaign : ARIANE 5 – HOT BIRD™ 7-STENTOR

The actual work for satellite range operations lasts 18 working days for HOT BIRD™ 7 from its arrival in Kourou (before beginning combined operations).
The actual work for satellite range operations lasts 16 working days for STENTOR from its arrival in Kourou (before beginning combined operations).
About 2 weeks of reduced activity was conducted on the 2 payloads before starting the filling operations.

Satellites and launch vehicle campaign calendar

Ariane activities	*Dates*	*Satellites activities*
Campaign start review	*August 22, 2002*	
EPC Erection	*August 22, 2002*	
EAP transfer and positionning	*August 23, 2002*	
Integration EPC/EAP	*August 26, 2002*	
ESC-A Erection	*September 5, 2002*	
Integration equipement bay	*September 11, 2002*	
Roll-out from BIL to BAF	*September 30, 2002*	
	October 2, 2002	*Arrival in Kourou and beginning of HOT BIRD™ 7 preparation campaign in S5C-South building*
	October 9, 2002	*Arrival in Kourou and beginning of STENTOR preparation campaign in S5C-North building*
Launcher systems rehearsal (RSL)	*October 16, 2002*	
2nd Launcher systems rehearsal (RSL)	*November 5, 2002*	
	November 7, 2002	*Transfert of HOT BIRD™ 7 into the S5B building*
	Nov. 8 and 12, 2002	*HOT BIRD™ 7 filling operations in S5B building*
	November 8, 2002	*Transfert of STENTOR into the S5A building*
	Nov. 13 and 15, 2002	*STENTOR filling operations in S5A building*

Satellite and launch vehicle campaign final calendar

J-9	*Friday, November 15*	*HOT BIRD™ 7 integration on ACU*
J-8	*Saturday, November 16*	*HOT BIRD™ 7 integration on Sylda*
J-7	*Monday, November 18*	*STENTOR integration on ACU*
J-6	*Tuesday, November 19*	*STENTOR integration on launcher.*
J-5	*Wednesday, November 20*	*HOT BIRD™ 7 integration on launcher*
J-4	*Thursday, November 21*	*ESC-A final preparations*
J-3	*Friday, November 22*	*Launch rehearsal*
J-3 bis	*Monday, November 25*	*Final preparation of launcher*
J-2	*Tuesday, November 26*	*Launch rediness review (RAL) and arming of launch vehicle*
J-1	*Wednesday, November 27*	*Roll-out from BAF to Launch Area (ZL), launch vehicle connections and filling of the EPC Helium sphere*
J-0	*Thursday, November 28*	*Launch countdown including EPC and ESC-A filling with liquid oxygen and liquid hydrogen*

3 - Launch countdown 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-7 minutes.
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.

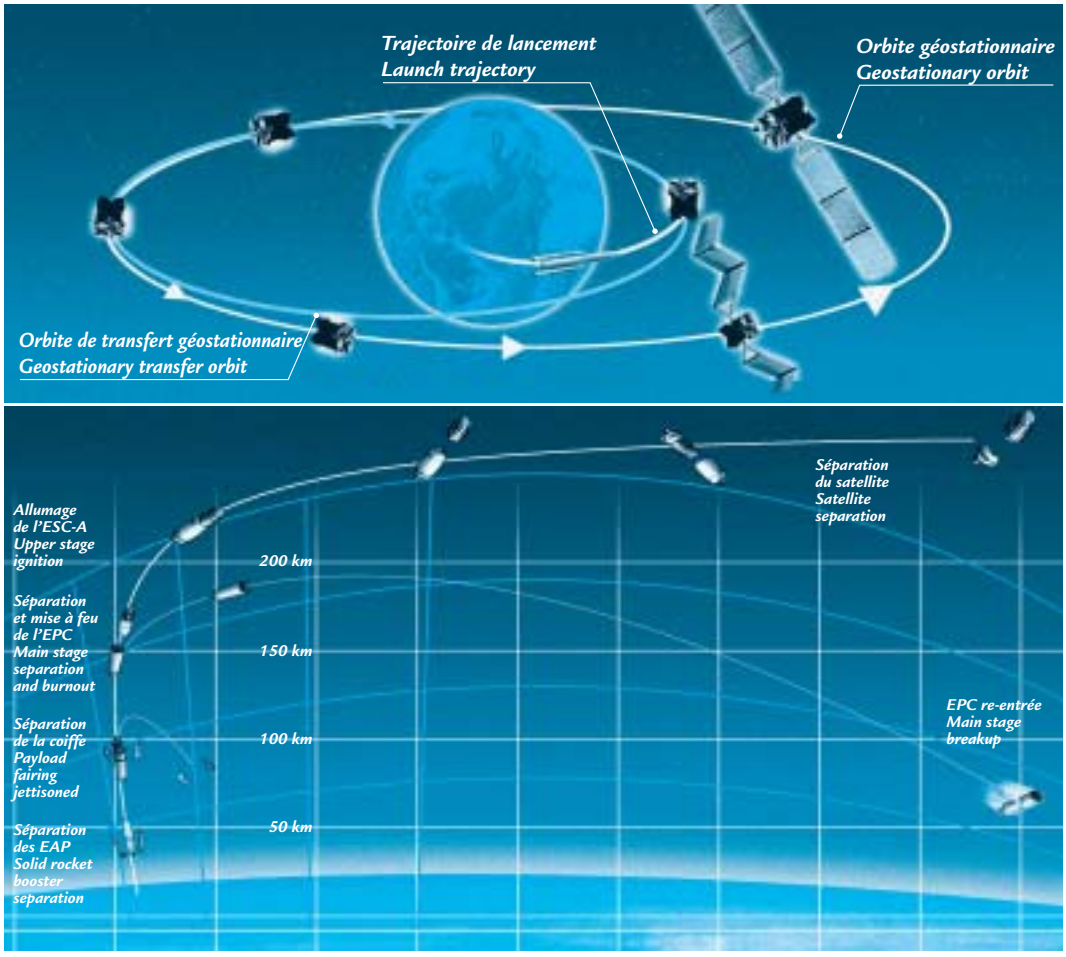
Time	Events
– 11h 30 mn	Start of final countdown
– 7 h 30 mn	Check of electrical systems
– 4 h 50 mn	Start of filling of main cryogenic stage and ESC-A with liquid oxygen and hydrogen
– 3 h 20 mn	Chilldown of Vulcain main stage engine
– 3 h 00 mn	Start of ESC-A filling operations
– 1 h 10 mn	Check of connections between launcher and telemetry, tracking and command systems
– 7 mn 00 s	"All systems go" report, allowing start of synchronized sequence
– 4 mn 00 s	Tanks pressurized for flight
– 1 mn 00 s	Switch to onboard power mode
– 05.5 s	Command issued for opening of cryogenic arms
– 04 s	Onboard systems take over
– 03 s	Unlocking of guidance systems to flight mode

HO	Ignition of the cryogenic main stage engine (EPC)	ALT (km)	V. rel. (m/s)
+ 7.0 s	Ignition of solid boosters	0	0
+ 7.3 s	Liftoff	0	0
+ 13 s	End of vertical climb and beginning of pitch rotation (10 seconds duration)	0.082	35.7
+ 17 s	Beginning of roll maneuver	0.342	76.0
+ 2 mn 17 s	Jettisoning of solid boosters	68.9	1920.7
+ 3 mn 08 s	Jettisoning of fairing	113.2	2103.6
+ 6 mn 52 s	Acquisition by Natal tracking station	211.4	4292.4
+ 8 mn 47 s	Extinction of main cryogenic stage	214.8	6744.4
+ 8 mn 53 s	Separation of main cryogenic stage	214.9	6770.4
+ 8 mn 57 s	Ignition of upper cryogenic stage (ESC-A)	214.9	6772.8
+ 13 mn 11 s	Acquisition by Ascension tracking station	201.1	7410.2
+ 18 mn 12 s	Acquisition by Libreville tracking station	228.8	8274.1
+ 23 mn 20 s	Acquisition by Malindi tracking station	509.6	9158.8
+ 24 mn 31 s	Extinction of ESC-A	649.6	9358.4
+ 27 mn 25 s	Separation of HOT BIRD™ 7 satellite	1089.5	8995.9
+ 31 mn 25 s	Separation of Sylda 5	1886.7	8407.5
+ 35 mn 41 s	Separation of STENTOR satellite	2878.6	7773.8
+ 49 mn 01 s	End of ARIANESPACE Flight 157 mission	6274.8	6140.9

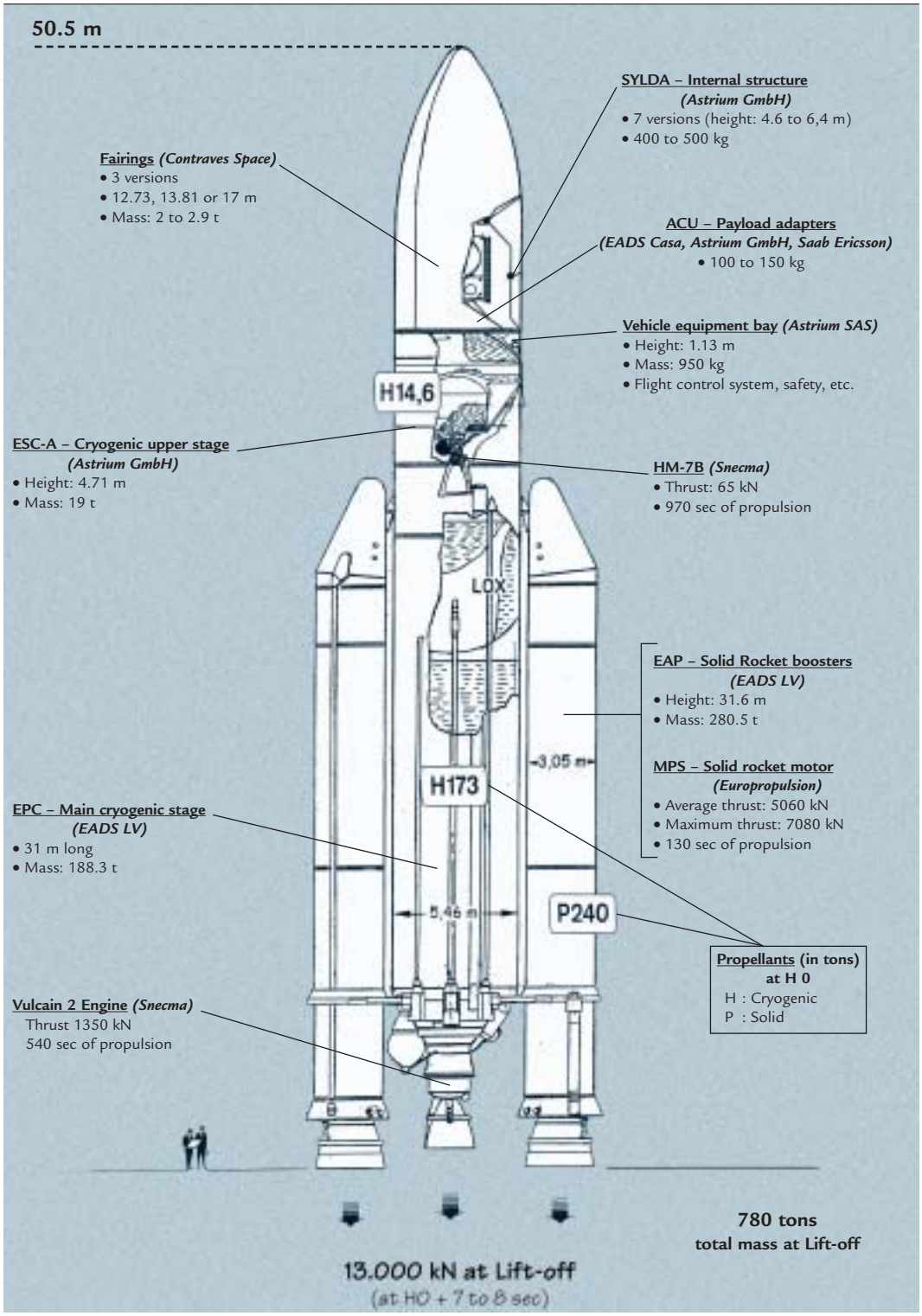
4 - Flight 157 trajectory

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 cryogenic stage.
The main stage falls back off the coast of Africa in the Atlantic Ocean (in the Gulf of Guinea).
On orbital injection, the launcher will have attained a velocity of approximately 9,358 meters/second, and will be at an altitude of about 650 kilometers.
The fairing protecting the HOT BIRD™ 7/STENTOR spacecrafts is jettisoned shortly after the boosters are jettisoned at about T+188 seconds.

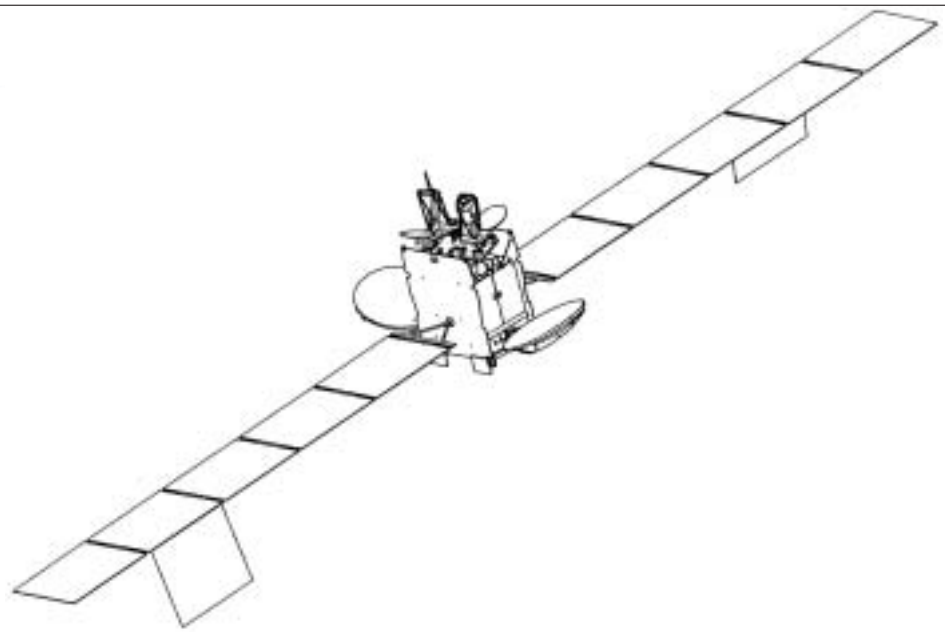
Standard Ariane 5 trajectory for geostationary transfer orbit



5 - The Ariane 5-ECA (Industrial architect: EADS Launch Vehicles)



6 - The HOT BIRD™ 7 satellite

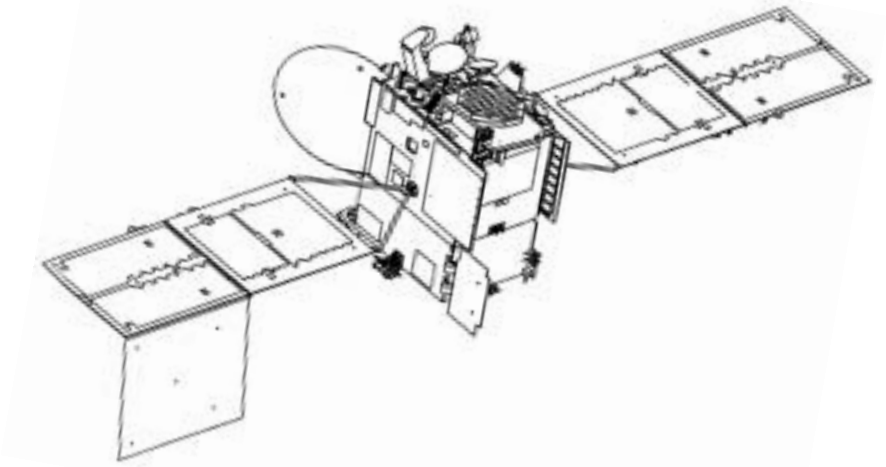


Customer	***EUTELSAT***	
Prime contractor	*Astrium*	
Mission	*Broadcasting of TV channels, radio stations and multimedia services to cable and satellite homes*	
Mass	*Total mass at lift-off*	*3,300 kg*
	Dry mass	*1,500 kg*
Stabilization	*3 axis stabilized*	
Dimensions		*2.3 x 3.4 x 5.2 m*
	Span in orbit	*27.9 m*
Plate-form	*Eurostar 2000 +*	
Payload	*40 Ku band transponders (11.70 - 12.50 GHz)*	
On-board power	*7,500 W (end of life)*	
Life time	*more than 15 years*	
Orbital position	*13° East (above the Atlantic Ocean)*	
Coverage area	*Europe, North Africa and near Middle East*	

Press Contact :

Vanessa O'CONNOR
EUTELSAT
Tel. + 33 (1) 53 98 47 57 - Fax: + 33 (1) 53 98 37 88
E-mail: voconnor@eutelsat.fr

7 - The STENTOR satelitte



Customer	***CENTRE NATIONAL D'ETUDES SPATIALES (CNES)***	
Prime contractors	*Alcatel Space and Astrium*	
Mission	*Telecommunications technology satellite*	
Mass	*Total mass at lift-off* *Dry mass*	*2,210 kg* *1,186 kg*
Stabilization	*3 axis stabilized*	
Dimensions	 *Span in orbit*	*4.5 x 3.2 x 2.6 m* *15.6 m*
Payload	*3 Ku band transponders (12 - 14 GHz)* *1 transponder (20 - 44 GHz)*	
On-board power	*2,100 W (at end of life)*	
Life time	*9 years*	
Orbital position	*11° West (above Gabon)*	
Coverage area	*Europe (thanks to fixed beams) and all the visible terrestrial zone (thanks to a steerable beam)*	

Press Contact:

Sandra LALY
CNES
Tel. + 33 (1) 44 76 77 32
E-mail: sandra.laly@cnes.fr

Annex 1 - Arianespace Flight 157 key personnel

In charge of the launch compaign

Mission Director	*(CM)*	*Gilles TRIAY*	*ARIANESPACE*

In charge of the launch service contracts

ARIANE Payload Manager	*(RCUA)*	*Michael CALLARI*	*ARIANESPACE*
ARIANE Deputy Mission Manager	*(RCUA/A)*	*Jean-François LAUMONIER*	*ARIANESPACE*

In charge of HOT BIRD ™ 7 satellite

Satellite Mission Director	*(DMS)*	*Jean-Jacques DUMESNIL*	*EUTELSAT*
Satellite Project Director	*(CPS)*	*Philippe MATHON*	*EUTELSAT*
Satellite Preparation Manager	*(RPS)*	*Olivier DUCHMANN*	*ASTRIUM*

In charge of STENTOR satellite

Satellite Mission Director	*(DMS)*	*Jean-Pierre DULMO*	*CNES*
Satellite Project Director	*(CPS)*	*Eric ZEIS*	*ASTRIUM*
Satellite Project Director	*(RPS)*	*Pierre FAUROUX*	*ALCATEL SPACE*

In charge of the launch vehicle

Launch Site Operations Manager	*(COEL)*	*Jean-Louis LEBLANC*	*ARIANESPACE*
ARIANE Production Project Manager	*(CPAP)*	*Denis SCHMITT*	*ARIANESPACE*

In charge of the Guiana Space Center (CSG)

Range Operations Manager	*(DDO)*	*Thierry WILMART*	*CNES/CSG*
Flight Safety Officer	*(RSV)*	*Patrice BENNAROCHE*	*CNES/CSG*

Annex 2 - Launch environment conditions

Acceptable wind speed limits at liftoff range from between 7.5 m/s. to 9.5 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 mn 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 two redundant computers at the ELA 3 launch complex until T-4 seconds.
The computers command the final electrical operations (startup of the flight program, servocontrols, switching from ground power supply to onboard batteries, etc.) and associated checks. They also place the propellant and fluid systems in flight configuration ans perform 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-5.5 sec);
- command for opening the cryogenic arms (T-5.5 sec).

At T-4 seconds, the onboard computer takes over control of final engine startup ans liftoff operations :

- checks the appropriate position of the cryogenic arms after release;
- It starts the ignition sequence for the Vulcain main stage engine (T-0);
- It checks engine operation (from T+4.5 to T+7.3 sec);
- It commands ignition of the solid boosters for immediate liftoff at T+7.3 seconds.

Any shutdown of the synchronized sequence after T - 7 mn automatically places the launcher back in its T-7 min configuration.

Annex 5 - ARIANESPACE, its relations with ESA and 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 317,362,320 €.
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.