

# FLIGHT 126

## FIRST LAUNCH IN 2000 FIFTEENTH LAUNCH FOR PANAMSAT

Arianespace Flight 126 will place the Galaxy XR communications satellite into geostationary transfer orbit for the world's leading private satcom operator, PanAmSat. Galaxy XR is the 15th PanAmSat satellite boosted into orbit by the European launcher, following PAS 1, 2, 3, 4, 6, 6B, 3R and 7, Galaxy IV, VI, VII and XI, and SBS 5 and 6.

Built by Hughes Space and Communications using an HS 601 HP platform, Galaxy XR is a high-power satellite with 28 Ku-band and 28 C-band transponders. It will be positioned at 127 degrees West, and will provide television, Internet and data transmission services for all of North America. It will be the 36th satellite built by Hughes Space and Communications and the 18th using an HS 601 platform for the European launcher.

This year marks a new high point in the long relationship between Arianespace and PanAmSat – now stretching back over 12 years – as Arianespace plans a total of three launches for the American operator, with PAS-1R and PAS-10 slated to follow Galaxy XR.

For its first launch of the year, Arianespace will use an Ariane 42L launcher, the Ariane 4 model with two liquid-propellant strap-on boosters. Arianespace closed out 1999 on a very successful note with its 10th successful launch of the year, boosting PanAmSat's Galaxy XI satellite into orbit on December 21.

1. ARIANESPACE FLIGHT 126 MISSION
2. RANGE OPERATIONS : ARIANE 42L - GALAXY XR
3. COUNTDOWN AND FLIGHT EVENTS
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5. THE ARIANE 42L LAUNCH VEHICLE
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# ***ARIANESPACE FLIGHT 126***

## **1. ARIANESPACE FLIGHT 126 MISSION**

The 126th ARIANE launch (Flight 126) is scheduled to place the GALAXY XR satellite into a geostationary transfer orbit using an ARIANE 42L launch vehicle equipped with two liquid strap-on boosters (PAL). This will be the 94th ARIANE 4 launch and the 10th in the 42L configuration.

It will be launched from the Ariane launch complex N° 2 (ELA2), in Kourou, French Guiana.

The launch vehicle performance requirement is 3,950 kg (8,690 lb) of which 3,651 kg (8,032 lb) represent the mass of the spacecraft to be separated on the injection orbit.

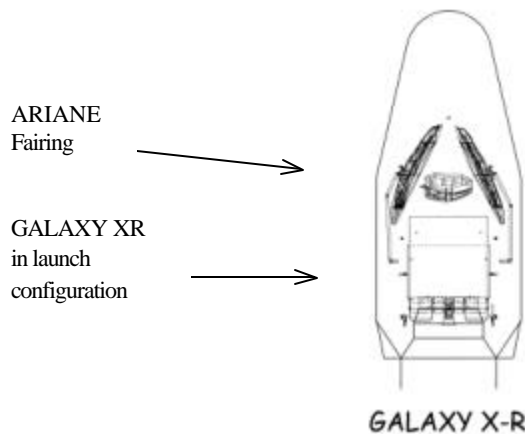
<b>INJECTION ORBIT</b>		
Perigee Altitude:	200	km
Apogee Altitude:	33 260	km at injection
Inclination:	7°	degrees

The ARIANE 42L launcher liftoff for Flight 126 is scheduled on **the night of January 24 to 25, 2000** as soon as possible within the following launch window :

<b>KOUROU TIME</b>
<b>Between 10: 12 pm and 10: 44 pm</b>
<b>on January 24, 2000</b>

Launch opportunity (GMT)	Paris Time	Washington Time
<b>from 01: 12 am</b>	<b>02: 12 am</b>	<b>08: 12 pm</b>
<b>to 01: 44 am</b>	<b>02: 44 am</b>	<b>08: 44 pm</b>
<b>on January 25, 2000</b>	<b>on January 25, 2000</b>	<b>January 24, 2000</b>

## **ARIANE PAYLOAD FLIGHT CONFIGURATION**



The GALAXY XR satellite was built by Hughes Space & Communications à El Segundo, Cal. for PanAmSat.

Operational on orbit position: 127° West

**2. RANGE OPERATIONS CAMPAIGN:  
ARIANE 42L - GALAXY XR**

The actual work for satellite range operations lasts 22 working days for GALAXY XR from its arrival in Kourou ( before encapsulation ).

The ARIANE 42L preparation campaign lasts 25 working days.

**SATELLITE AND LAUNCH VEHICLE CAMPAIGN CALENDAR**

ARIANE ACTIVITIES				DATES	SATELLITE ACTIVITIES
				<b>Dec 10, 1999</b>	<b>LAUNCH OF XMM -FLIGHT 119 - 504</b>
CAMPAIGN START REVIEW and First stage erection				Dec 13, 1999	
Second stage erection				Dec 14, 1999	
Third stage erection				Dec 20, 1999	
				<b>Dec 21, 1999</b>	<b>LAUNCH OF GALAXY XI - FLIGHT 125</b>
				Dec 27, 1999	GALAXY XR arrival in Kourou and beginning of its preparation in S1A building
				Jan 7, 2000	GALAXY XR transfer from S1B to S3B building and beginning of GALAXY XR filling operations in S3B building
ROLL-OUT TO LAUNCH PAD				Jan 11, 2000	
<b>D-7</b>	<b>Sat.</b>	<b>Jan.</b>	<b>15</b>	<b>START OF COMBINED OPERATIONS &amp; LAUNCH COUNTDOWN REHEARSAL (RCL)</b>	
D-6	Mon.	Jan.	17	Satellite encapsulation operations	
D-5	Tues.	Jan.	18	Satellite composite transfer to the launch pad	
D-4	Wed.	Jan..	19	Satellite composite mating onto launcher and overall checks	
D-3	Thur.	Jan..	20	LAUNCH REHEARSAL	
D-2	Fri.	Jan..	21	LAUNCH READINESS REVIEW (RAL) and launcher arming	
D-1	Sat.	Jan.	22	Filling of 1st stage, PALs, and 2nd stage with UH 25 and N <sub>2</sub> O <sub>4</sub> .	
D-0	Mon.	Jan..	24	LAUNCH COUNTDOWN including 3rd stage filling with liquid oxygen and liquid hydrogen.	

### 3. LAUNCH COUNTDOWN AND FLIGHT EVENTS

The final launch countdown runs through all the final launcher and satellites related operations and configures the vehicle and its payload for ignition of the 1st stage and PAL engines at the selected launch time, as soon as possible within the launch window authorized by the spacecraft.

A synchronized sequence (see Appendix 3), controlled by the Ariane ground check-out computers, starts at H0 - 6 min and concludes the countdown.

Should a hold in the countdown delay the H0 time beyond the launch window, the launch is postponed to (in days): D + 1 or D + 2 (or later) depending on the source of the problem and the time to solve it.

TIME	EVENTS
- 14 h 30 min	Start of Final Countdown
- 5 h 55 min	Start of gantry withdrawal
- 3 h 35 min	Start of the 3rd stage filling operations with liquid hydrogen and liquid oxygen
- 1 h 05 min	Activation of launcher telemetry, radar transponders, telecommand
- <b>6 min 00 s</b>	<b>"Green status for all systems"</b> to authorize : <b>START OF SYNCHRONIZED LAUNCH SEQUENCE</b>
- 3 min 40 s	Spacecraft switched to on-board power (latest time)
- 1 min 00 s	Launcher equipment switched to on-board batteries
- 9 s	Inertial platform released
- 5 s	Release command to cryogenic arms retraction system
H0	First stage and liquid strap-on boosters engines IGNITION
+ <b>4.4 s</b>	<b>Liftoff</b>
+ 16 s	End of vertical ascent phase and start of pitch motion (10 s duration)
+ 2 min 20 s	Liquid strap-on booster jettison
+ 3 min 14 s	First stage separation
+ 3 min 17 s	Second stage ignition
+ 4 min 05 s	Fairing jettison
+ 5 min 26 s	Second stage separation
+ 5 min 31 s	Third stage ignition
+ 6 min 20 s	Launcher acquired by Natal station
+ 12 min 55 s	Launcher acquired by Ascension Island station
+ 18 min 00 s	Launcher acquired by Libreville station
+ 18 min 40 s	Third stage shutdown sequence
+ 18 min 42 s	Injection into the required orbit
+ <b>20 min 48 s</b>	<b>GALAXY XR separation</b>
+ 20 min 52 s	Start of the third stage avoidance maneuver
+ 22 min 37 s	End of ARIANESPACE FLIGHT 126 Mission

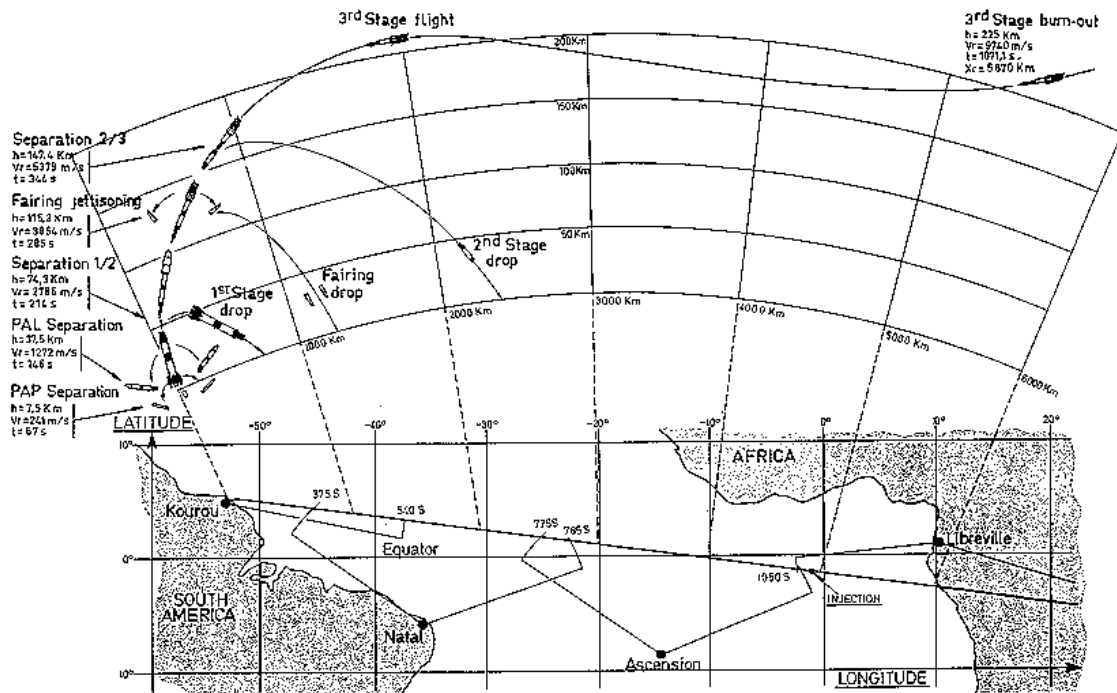
## 4. FLIGHT 126 TRAJECTORY

The launcher ascends vertically from liftoff up to H0 + 13 sec. During a period of 10 sec. after this vertical ascent, it tilts in the pitch plane defined by the trajectory and pre-calculated by the on-board computer.

The vehicle's attitude is commanded by a predetermined law. The guidance phase is initiated 10 sec. after ignition of the 2nd stage. The attitude law in the pitch-and-yaw plane is optimized in order to minimize the 3rd stage propulsion time necessary to reach the target orbit with a performance margin of about 66 kg. This ensures reaching this orbit with a probability of 50 % before third-stage propellants exhaustion.

The roll law is applied so as to improve the launcher/ground station radio link budget.

### TYPICAL TRAJECTORY FOR STANDARD GEOSTATIONARY TRANSFER ORBIT AND GROUND STATION VISIBILITY



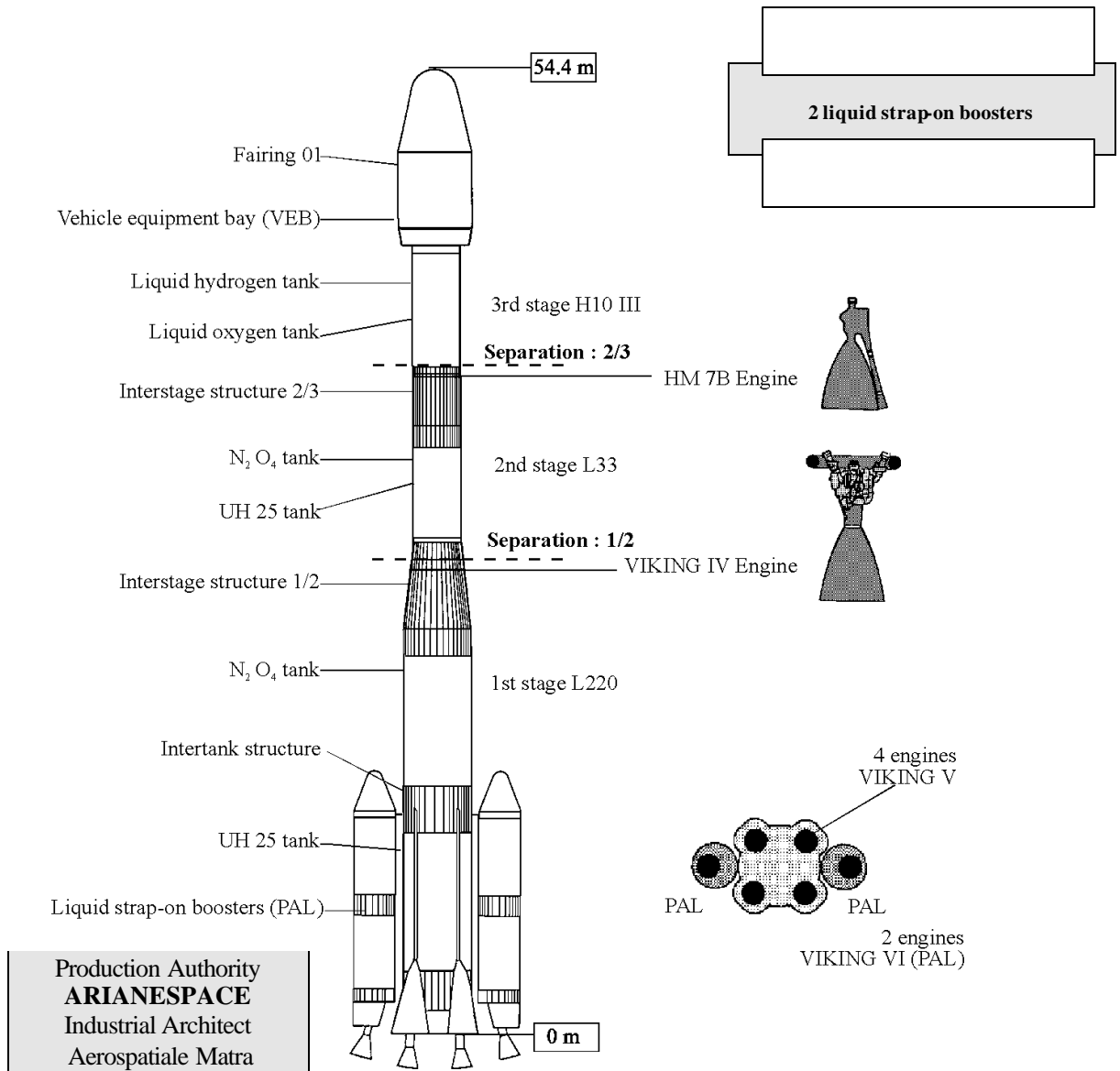
#### Down - range stations

In French Guiana	:	KOUROU (Montagne des Pères) and CAYENNE (Montabo)
In Brazil	:	NATAL
Atlantic Ocean	:	ASCENSION ISLAND
In Gabon	:	LIBREVILLE

#### Launch main events

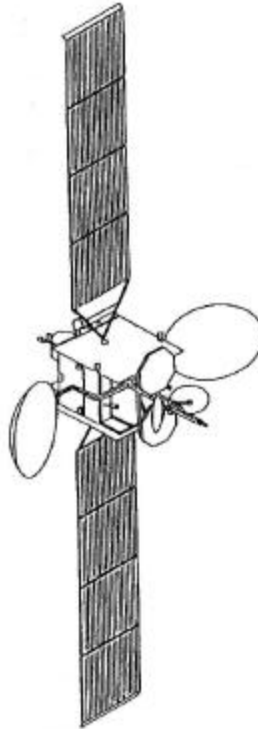
1	:	First stage separation
2	:	Fairing jettison
3	:	Second stage separation
4	:	Third stage shutdown

## 5. THE LAUNCH VEHICLE



	Length	⌀	Dry mass	Prime
Fairing	9.6 m	4 m	740 kg	Oerlikon Contraves
VEB	1 m	4 m	530 kg	Matra Marconi Space France
3rd stage	11.7 m	2.6 m	1.25 t	Aerospatiale Matra
2nd stage	11.6 m	2.6 m	3.2 t	DaimlerChrysler Aerospace
1st stage	23.2 m	3.8 m	17.5 t	Aerospatiale Matra
PAL	19 m	2.2 m	4.5 t	DaimlerChrysler Aerospace
VIKING IV, V, VI				Snecma
HM 7B				Snecma

## 6. THE GALAXY XR SATELLITE



**CUSTOMER:** PanAmSat Corp.

**MISSION:** Digital TV networks, Internet and data transmission

**PRIME CONTRACTOR:** Hughes Space & Communications, El Segundo, California, USA

<b>MASS:</b> - Total mass (at lift-off)      3,651 kg (8,032 lb) - Dry mass                              1,987 kg (4,371 lb)		<b>DIMENSIONS:</b> - Dimension at launch 6.00 x 3.40 x 2.28 m - Operational configuration (deployed) 26,20 m	
<b>STABILIZATION:</b> 3-axis			
<b>ON-BOARD POWER:</b> 7 800 W at end of life		<b>LIFE TIME:</b> 15                      years	
<b>PAYLOAD:</b> - 28 Ku-band transponders ( 24 X 36 MHz ) - 28 C band transponders ( 24 X 36 MHz )			
<b>ORBITAL LOCATION:</b> 127° West longitude			

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## ANNEXES

### ANNEX 1 - ARIANESPACE FLIGHT 126 KEY PERSONNEL

<i>In charge of the launch campaign</i> Mission Director	(CM)	<b>Daniel MURE</b>	ARIANESPACE
<i>In charge of the launch service contracts</i> GALAXY XR Mission Manager and ARIANE Payload Manager	(RCUA)	<b>Stephen HALL</b>	ARIANESPACE
<i>In charge of the GALAXY XR satellite</i> Satellite Mission Director Satellite Project Manager Satellite Preparation Manager	(DMS) (CPS) (RPS)	<b>Brian BENEDICT</b> <b>Bernie BINSTOCK</b> <b>Timothy USERT</b>	PANAMSAT HSC HSC.
<i>In charge of the launch vehicle</i> Launch Site Operations Manager ARIANE Production Project Manager	(COEL) (CPAP)	<b>Daniel GROULT</b> <b>Jean-Marc PENEAU</b>	ARIANESPACE ARIANESPACE
<i>In charge of the Guiana Space Center (CSG)</i> Range Operations Manager Flight Safety Officer	(DDO) (RSV)	<b>Philippe GILSON</b> <b>Yves BORDES</b>	CNES/CSG CNES/CSG

### ANNEX 2 - LAUNCH ENVIRONMENT CONDITIONS

The allowable weather conditions for gantry withdrawal depend on the ARIANE stage pressurization values. Wind speed has to be below 17 m/s.

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 speed on the ground (Kourou) and at a high altitude (between 10,000 and 20,000 m) is also taken into account.

### ANNEX 3 - SYNCHRONIZED SEQUENCE

The synchronized sequence starts at H0 - 6 min. This sequence is used for final preparation of the launcher, and for checkout operations related to switchover to flight configuration. The sequence is fully automatic, and is controlled in parallel, up to H0-5s., by two computers in the Ariane Launch Center (CDL). All resources used for launch are synchronized on a common countdown sequence.

One computer configures fluids and propellants for flight and performs associated checks. The other computer executes final preparation of the electrical systems (initiation of flight program, start-up of servomotors, switchover from ground power to flight batteries, etc.) and corresponding checkout operations.

After H0 - 5 s. and cryogenic arm retraction from the launcher, a majority logic sequencer delivers the main timing pulses for :

- first stage & liquid booster engine ignition (H0)
- engine parameter checkout (conducted in parallel by the two computers, starting at H0 + 2.8 s.)
- opening of the launch table clamps (releasing the launch vehicle between H0 + 4. 1s. and H0 + 4.6 s.) as soon as engine parameters are found nominal by one of the computers.

**Any hold in the synchronized sequence before H0 - 5 s. automatically resets the launcher to the H0 - 6 mn configuration**

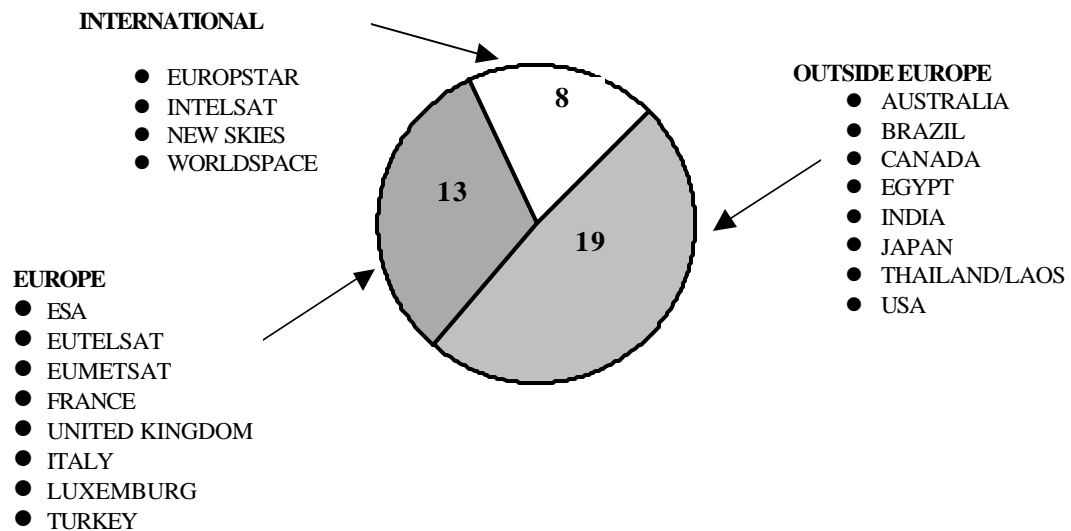


## ANNEX 4 - ARIANESPACE ORDER BOOK

To date **163** satellites and **28** auxiliary payload have been launched by ARIANESPACE.

Out of **206** launch services contracted since 1981 by ARIANESPACE and **before** Flight 126, **40** satellites remain to be launched.

EUROPE 13 SATELLITES	OUTSIDE EUROPE 27 SATELLITES
<p>ASTRA 1K, 2B, X, 2D</p> <p>ENVISAT-1/PPF</p> <p>EURASIASAT 1</p> <p>MSG-1 &amp; 2</p> <p>SICRAL 1</p> <p>SKYNET 4F</p> <p>STENTOR</p> <p>W4 &amp; 1R</p>	<p><b>INTERNATIONAL ORGANIZATIONS : 8 satellites</b></p> <p>ASIASTAR (WorldSpace) AMERISTAR (WorldSpace) EUROPESTAR FM 1 INTELSAT 902, 903, 904 NEW SKIES SATELLITES 6 &amp; 7</p> <p><b>OTHERS: 19 satellites</b></p> <p>ANIK F1 (Canada) BRASILSAT B4 (Brazil) BSAT 2A &amp; 2B (Japan) <b>GALAXY XR</b> (USA) GE 7, 8 &amp; 9 (USA) INSAT 3A &amp; 3B (India) LORALSAT 3 (USA) L-STAR A &amp; B (Thailand/Laos) NILESAT 102 (Egypt) N-SAT 110 (Japan) OPTUS C1 (Australia) PAS-1R &amp; PAS-10 (USA) SUPERBIRD-4 (Japan)</p>
<b>32 %</b>	<b>68 %</b>



## APPENDIX 5 - ARIANESPACE, its relations with ESA & CNES

### *FROM A PRODUCTION 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).

ARIANESPACE is a European venture, the direct result of nation's commitment to bringing the ARIANE family of launch vehicles from the drawing board to the launch pad. To do so, they turned to the European Space Agency (ESA) and mobilized the scientific and technological expertise of CNES.

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 directly present worldwide: 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 330. Share capital totals FF 2,088 million.

As a space transportation company, ARIANESPACE :

- markets launch services to customers throughout the world.
- finances and supervises the construction of ARIANE expendable launch vehicles.
- conducts launches from the Europe space center 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. Our customers appreciate the time and cost savings made possible by our efficiency and flexibility.

Most of the world's commercial satellite operators have contracted to launch at least one payload with ARIANESPACE. This record is the result of our company's realistic cost-effective approach to getting satellites 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 commercialisation, production and launching of operational launchers to private-law industrial structure, in the form of the 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 updated 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. All these programs are run under the overall direction of ESA, which has appointed CNES as prime contractor.

In general, as soon as an updated version of the launcher has been qualified, 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, 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, support from the CSG's technical and operational facilities. The French Government has granted ESA the right to use the CSG for its space 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.